



Coordinating research and innovation in the field of sustainable alternative fuels for aviation

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Coordinating research and innovation in the field of sustainable alternative fuels for aviation

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Minutes of Stakeholder Telephone Conference
Working Group 1 on Feedstock and Sustainability

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Work Package Leader: WIP Renewable Energies

PROJECT PARTNERS

FNR – Fachagentur Nachwachsende
Rohstoffe e.V., Germany



BHL – Bauhaus Luftfahrt e.V., Germany



SENASA - Servicios y Estudios para la
Navegación Aérea y la Seguridad
Aeronáutica SA, Spain



IFPEN – IFP Energies Nouvelles, France



WIP- WIP Renewable Energies, Germany



AGI – Airbus Group Innovations



EXECUTIVE SUMMARY

Following-up on discussions held during the project's final conference in Brussels on 16 and 17 June 2016, CORE-JetFuel Stakeholder Working Group 1 conducted its second stakeholder telephone conference on feedstock and sustainability on 27 July 2016.

Questions that were posed to the conference call participants concerned the viability of waste and residues as a bio-jet feedstock, both in terms of its economic performance as well as with respect to its sustainable availability. Furthermore, lignocellulosic biomass as another promising feedstock was addressed. Here, particularly challenges in making this type of feedstock available and possible solutions to these, respectively, were of interest to the organizers of the telephone conference.

Lastly and accounting for the CORE-JetFuel objective of assessing the European R&D portfolio in the area of alternative aviation fuels, the conference call participants were asked to state in which areas of feedstock production R&D activities they see major gaps as well as potential measures to overcome these gaps.

The main conclusions drawn include:

- The (larger-scale) utilization particularly of straw as a bio-jet feedstock is difficult due to the well-established existing uses (on-site / electricity, heating and cooling)
- Taking into account the amount of fuel required by the aviation sector to reach its GHG emission reduction targets, straw will be by far not be available in sufficient quantities
- The issues concerning the economic viability of feedstock production (and conversion) are of course not solely tied to aviation
- Particularly for lignocellulosic biomass such as short-rotation coppices (SRC), shifting to small-scale applications, i.e. small scale conversion plants with a small feedstock collection radius will take away a large part of the logistical challenges as well as challenges in building a network of supply chains. In addition, small-scale (and decentralized) production sites have the advantage of generating socio-economic benefits for the local population
- Generally, the costs of bio-jet are largely dependent on regional feedstock availability as well as the logistics of biomass procurement (lignocellulose)
- Although marginal lands could potentially be used for feedstock production, defining the term itself is still problematic. Furthermore, it is questionable if desired (and required) production potentials can be achieved on marginal lands / soil qualities.

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LIST OF ABBREVIATIONS

C-JF	CORE-JetFuel - Coordinating research and innovation in the field of sustainable alternative fuels for aviation
CO ₂	Carbon Dioxide
e.g.	for example
EC	European Commission
GHG	Greenhouse Gas
i.e.	it est
iLUC	Indirect Land Use Change
R&D	Research and Development
RED	Renewable Energy Directive
SRC	Short Rotation Coppices
TRL	Technology Readiness Level
WG	Working Group

MINUTES

CORE-JetFuel Telephone Conference of Stakeholder Working Group 1 on Feedstock and Sustainability

27 July 2016, 11:00 – 12:30

Participants:

- *Rocio Diaz-Chavez, Imperial College, UK*
- *Sierk de Jong, SkyNRG, The Netherlands*
- *Rainer Janssen, WIP Renewable Energy Munich, Germany*

Moderation:

Johannes Michel, Fachagentur Nachwachsende Rohstoffe e.V. (FNR), Germany

1 Introduction

Following up on the panel discussion held in context of the project's final conference on 16 and 17 June 2016, Johannes Michel provided the participants with guiding questions prior to the conference call (cf. Appendix I).

Since potential measures how to decrease costs in the beginning of the bio-jet value chain as well as the sustainable biomass availability in Europe were vividly discussed during the panel discussion on feedstock and sustainability of the final conference, the telephone conference mainly addressed the viability of agricultural waste and residues as well as lignocellulosic material for the production of alternative aviation fuels. In addition, the participants were asked to identify the main gaps in the R&D landscape of feedstock production as well as to elaborate on an integrated European biomass policy – one that is often called for by various experts in the field.

The telephone conference was opened by Johannes Michel, FNR, Coordinator of the CORE-JetFuel project and leader of Stakeholder Working Group 1 on Feedstock and Sustainability.

2 Waste and Residues – promising feedstock for the aviation industry?

The call's first discussion topic concerned agricultural as well as forestry waste and residues. Advantages of these types of feedstock include, inter alia, high potential (and sustainable) availability, relatively easy collection as well as a high GHG reduction potential. However, considering that particularly straw is already utilized as a feedstock for a variety of bioenergy applications, and increased straw removal rates can potentially have detrimental environmental effects, the question was raised if waste and residue material is an appropriate feedstock to rely on by the aviation industry – also in light of the high conversion costs.

The experts participating in the call addressed the following issues to be considered when aiming at utilizing residues as a bio-jet feedstock:

- The (larger-scale) utilization particularly of straw as a bio-jet feedstock is difficult due the well-established existing uses (on-site / electricity, heating and cooling)
- If a business case for straw-based bio-jet is to be established, conversion will need to take place in a bio-refinery where the jet fuel makes up a fraction of the refinery's output
- Collection logistics of forestry residues are challenging, the residue material itself is very diverse which makes it difficult to process in a bio-refinery
- Taking into account the amount of fuel required by the aviation sector to reach its GHG emission reduction targets, straw will be by far not be available in sufficient quantities
- The aviation sector is not in a position to exclude any type of feedstock. In order to reach the GHG emission reduction targets, all available biomass has to be utilized. It is not a matter of picking the 'winning' feedstock and technology, a basket of various, fully established value chains will be / are needed. In order to set up these value chains, considerable investments are required.
- The viability (and sustainability) of different value chains is region-specific, also depending on the location of the plant / refinery
- Particularly in case of agricultural residues the willingness of farmers to sell straw to the refining industry instead of using it themselves for animal bedding and the like is crucial
- Taking into account the different uses and applications for biomass, a strategic approach to the utilization of biomass is required

3 Lignocellulosic biomass – potentials and challenges

Due to its fast-growing nature, lignocellulosic biomass received a lot of attention as a potential feedstock for the production of advanced biofuels in recent years. Some challenges, however, particularly with respect to its collection and transportation still exist and therefore may hinder the economic viability of utilizing this type of feedstock for bio-jet production. The experts participating in the telephone conference were therefore asked to recommend measures how these obstacles may be overcome in their point of view.

- The issues concerning the economic viability of feedstock production (and conversion) are of course not solely tied to aviation
- While the petrochemical industry always followed the motto 'bigger is better' and scale is everything, for alternative aviation fuels the concept of economies of scale and its appropriateness have to be re-evaluated, at least in the near-term
- Particularly for lignocellulosic biomass such as short-rotation coppices (SRC), shifting to small-scale applications, i.e. small scale conversion plants with a small feedstock collection radius will

Coordinating research and innovation of jet and other sustainable alternative aviation fuels take away a large part of the logistical challenges as well as challenges in building a network of supply chains. In addition, small-scale (and decentralized) production sites have the advantage of generating socio-economic benefits for the local population

- Ports are a good example of a potential small-scale production site with an existing infrastructure and local socio-economic benefits. In addition, using/supplying heat and steam from/to pulp mills could present itself as another option. Considering the comparably low value of bio-kerosene, it will always have to be produced with more valuable products
- Taking into account the special situation aviation is in, particularly in comparison to other transport sectors, a strategic approach is essential.

4 Decreasing costs in feedstock production

Possibilities to reduce costs in the beginning of the value chain, i.e. during feedstock cultivation and further processing have been discussed in the final conference's panel on feedstock and sustainability. However, seeing as costs are one of the most important factors to consider when aiming at bringing alternative aviation fuels to the market, this topic was also briefly addressed in the call.

- In line with the comments on economies of scale outlined above, particularly in case of lignocellulosic biomass decentralized initiatives with small capital investment and the according smaller risk will be the solution in medium-term. Building large-scale facilities for the conversion of lignocellulose is from economic point of view not recommendable at the moment. It is nevertheless important that these decentralized initiatives are linked and coordinated at larger scale.
- Energy/material integration is very important for the overall costs of feedstock processing, possible synergy effects with existing industry should be explored
- Generally, the costs of bio-jet are largely dependent on regional feedstock availability as well as the logistics of biomass procurement (lignocellulose)
- For energy crops with higher energy density, i.e. oil crops, large-scale facilities can make sense – the Finish company Neste Oil being at the forefront of these installations

5 Gaps in the R&D landscape of feedstock production

One of the main objectives of the CORE-JetFuel project is to assess the R&D landscape of alternative aviation fuels, and based on these assessments to identify gaps as well as to give recommendations to the European Commission with respect to the re-definition and re-orientation of its funding strategy. Hence, the experts participating in the conference call were asked where they see the major gaps in feedstock research and development. In addition, the question was posed on which types of feedstock the EC should focus in its funding strategy in the near-, medium- and long-term.

- The assessment of major gaps in feedstock R&D is always closely linked to the location of the cultivation site as well as its surrounding conditions
- Although marginal lands could potentially be used for feedstock production, defining the term itself is still problematic. Furthermore, it is questionable if desired (and required) production potentials can be achieved on marginal lands / soil qualities.
- In addition and as outlined previously, land availability and the presence of other resources required for feedstock production are essential
- In the United States grasses such as switchgrass become an increasingly viable option for biofuel production. While the utilization of grasses is in its infancy in Europe, in the medium-term short-rotation coppices have good chances of becoming an economically viable biofuel feedstock.

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- Socio-economic benefits are often neglected when discussing feedstock production and its sustainability. Therefore, feedstocks that provide such benefits additional to a satisfying sustainability performance should be focused on
- Due to the negative image in the public as being one of the most unsustainable sectors, the aviation sector has imposed on itself to be the 'front-runner' in terms of sustainability, focusing on so-called 2nd generation or advanced types of feedstock. However, this approach tends to neglect the regional character of feedstock production. For example, in some regions food crops might be the best, most easily realizable and sustainable option for biofuel production. If that is the case, focus should be placed on utilizing the emerging residues instead of the food crop itself.
- An assessment of biomass demand sectors is needed in order to determine if a prioritization of biomass between the different sectors is necessary or not
- Generally, policies and fuel producers should aim at higher Technology Readiness Levels (TRL) of novel bio-jet pathways

6 Integrated biomass policy

An integrated European biomass policy regulating and prioritizing the use of biomass is often brought forward as a means to ensure the utilization of biogenic raw materials. The telephone conference sought to outline what such a policy could look like.

- An integrated biomass policy is direly needed as a lot of issues are not addressed in the RED. It is more a plan than it is a policy
- An overall policy that addresses industry integration is required
- Focus should be placed on the different value chains – it is not of interest to the feedstock producer to whom they sell their product
- If incentives in terms of GHG emission reduction with bio-based fuels are shifted to aviation, the systemic view proposed above must include a strategy how to deal with GHG emissions of the road transport sector
- A holistic integrated biomass policy will also depend on the parameter of choice: which sector needs a renewable target?
- The strategy has to include all demand sectors
- Biomass availability will not suffice for all sectors. The strategy should therefore include wind and solar so biomass sectors are freed
- Sustainability assessments need to have a strategic view
- Stable tools for environmental and socio-economic issues are needed, policies with a more strategic focus should be set up
- It has to be acknowledged that aviation is not an island. As large parts of the challenges aviation is facing today have already been experienced by road transport sector, aviation and the policies addressing alternative aviation fuels have to learn from what has already been done
- If competitive distortion is to be minimized global market-based measures would good first step to create a level playing field between the transport sectors

The organizers would like to thank all participants of this first CORE-JetFuel WG1 telephone conference for their active contributions and fruitful discussions.

Minutes drafted by:
Johannes Michel

7 Appendix I: Telco Questions

CORE-JetFuel Telephone Conference of Stakeholder Working Group 1 on Feedstock and Sustainability

27 July 2016

Stakeholder:

- Rocio Diaz-Chavez, Imperial College, UK
- Sierk de Jong, SkyNRG, The Netherlands

Moderation: Johannes Michel

Agricultural / forestry **wastes and residues** become an increasingly interesting feedstock option for the aviation sector, as making them available is comparably cheap and according to the RED emission-free. In addition, these types of feedstock have a number of sustainability advantages compared to so-called first generation feedstocks and show a high sustainable availability.

- **However, considering detrimental environmental effects of increased straw removal, competing uses (on-farm, heating and cooling), high costs of conversion, as well as a comparably low energy content, do you think that straw is / will be an appropriate feedstock to rely on?**

Especially in the case of lignocellulosic biomass, logistical barriers (collection of biomass and transport distances) and ownership issues may hinder the economic viability of utilizing this type of feedstock for bio-jet production.

- **What measures would you recommend to overcome these obstacles?**

Feedstock cultivation and production account for the largest cost share of bio-kerosene production.

- **Where do you see possibilities to reduce costs in the beginning of the supply chain?**

While there are a lot of different feedstock options to produce bio-kerosene, only very few have shown sufficient maturity in terms of cultivation, processing as well as availability / production potential.

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- ***Which major gaps do you see in the current R&D landscape?***
- ***On which types of feedstock should the European Commission focus in its funding strategy in in the near-, mid-, and long-term?***

An integrated (European) biomass policy regulating (and prioritizing) the use of biomass is often brought forward as a means to ensure the sustainable utilization of biogenic raw materials.

- ***However, considering that all stakeholders directly affected by such a policy will most likely show small willingness to compromise, what could such an integrated policy look like?***
- ***What would be the core areas of an integrated biomass policy in your view?***