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Page 1 of (32)

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Page 2 of (32)

Executive summary

Sustainable aviation fuels are currently, and for the years to come, more expensive than fossil jet fuels. This price gap is one of the main reasons for the limited activity in supply-chain development. Due to the price sensitivity of the aviation industry, airlines are not able to pay more for their fuel. A mechanism to cover the price premium on the short term, should therefore be developed.

An opportunity to cover part of the price premium emerged within the European Union's Renewable Energy Directive (RED). Suppliers of fuels to the road transport market are obliged to supply a certain percentage of these fuels from renewable sources as a result of the RED. Since 2013, a RED opt-in for aviation biofuels is applicable in the Netherlands; aviation biofuels are eligible under the Dutch renewable energy targets and HBEs can be generated and sold upon supply of aviation biofuels to the Dutch market. The regulatory framework for RED-opt in for aviation biofuels is the same as in the road transport.



Page 3 of (32)

The practical implementation of the HBE generation and sales has been developed over the last year by SkyNRG together with the DEA and has led to a set-up where the aviation biofuel supplier can be the registrant and seller of HBEs. Although any party could in specific situations be the aviation biofuels registrant, it was found that no matter what the supply chain set-up is and no matter who the final end-user is, registration by the aviation biofuel supplier at point of supply from the pre-airport storage can always be done in accordance with the regulatory framework.

A blueprint (figure 1) has been developed for the practical implementation of HBE generation in the Netherlands that can serve as a guideline for HBE generation and sales.

The practical implementation set-up has subsequently been validated by the supply of a small quantity of sustainable aviation fuel produced within ITAKA to the Dutch aviation market, resulting into the first-ever HBEs generated for aviation biofuels.

Table of Contents

Executive summary		
Document Information		
Abbreviations		
Definitions		
Introduction	9	
PART 1	10	
Voluntary RED opt-in for aviation biofuels in The Netherlands	10	
1. Introduction	10	
1.1. Background	10	
1.2. EU RED opt-in for aviation biofuels	10	
2. Aviation biofuel supply chain and regulatory framework for RED opt-in	11	
2.1. Aviation biofuel supply chain	11	
2.2. Regulatory framework	12	
3. From legislation to implementation	13	
3.1. Who and where to register and generate HBEs - Evaluated scenarios	13	
3.2. Conclusion	17	
4. HBE generation and sales guideline – a blueprint	18	
5. Conclusion	21	
PART 2	22	
Demonstrating HBE generation in The Netherlands	22	
1. Introduction.	22	
2. Overview supply chain for demonstration	23	
2.1. Aviation biofuel supply chain	23	
2.2. Regulatory framework	23	
3. Preparation of supply of sustainable aviation fuel in accordance with the regula	atory	
framework	25	
3.1. EU-RED certified sustainable aviation fuel	25	
3.2. Double counting feedstocks	25	
3.3. Adding supply location to SkyNRG's RSB certificate	25	
3.4. Obtaining Excise Good Place permit	26	
3.5. Obtaining HBE account at Dutch Emission Authority	26	
4. Supply of sustainable aviation fuel to Dutch market, registering supply and genera	ating	
HBEs	28	
4.1. Physical supply	28	
4.2. Excise waybill (e-AD)	28	
4.3. Registration of supply at HBE account	28	
4.4 Audit and Sales of HBE's	29	
Conclusion	30	
References	32	

Abbreviations

American Society for Testing and Materials
Carbon Dioxide
European Commission
European Union
Fuel Quality Directive
Green House Gas
Hernieuwbare Brandstof Eenheid (Renewable Energy Certificates)
Hydrotreated Esters and Fatty Acids
Indirect Land Use Change
Koninklijke Luchtvaart Maatschappij
Nederlandse Emissie Autoriteit (Dutch Emission Authority)
Proof of Sustainability
Renewable Energy Directive
Renewable Transport Fuel Certificate
Used Cooking Oil

Page 7 of (32)

Definitions

N/A

Introduction

Sustainable aviation fuels are currently, and for the years to come, more expensive than fossil jet fuels. This price gap is one of the main reasons for the limited activity in supply-chain development. Due to the price sensitivity of the aviation industry, airlines are not able to pay more for their fuel. A mechanism to cover the price premium on the short term, should therefore be developed.

An opportunity to cover part of the price premium emerged within the European Union's Renewable Energy Directive (RED). Suppliers of fuels to the road transport market are obliged to supply a certain percentage of these fuels from renewable sources as a result of the RED. Since 2013, a RED opt-in for aviation biofuels is applicable in the Netherlands; aviation biofuels are eligible under the Dutch renewable energy targets and HBEs can be generated and sold upon supply of aviation biofuels to the Dutch market. The regulatory framework for RED-opt in for aviation biofuels is the same as in the road transport.

The practical implementation of the HBE generation and sales has been developed over the last year by SkyNRG together with the DEA and has led to a set-up where the aviation biofuel supplier can be the registrant and seller of HBEs. With the supply of a small quantity of sustainable aviation fuel produced within ITAKA, this set-up has been validated.

Part 1 of this report provides background on the regulatory framework in the Netherlands and aviation biofuel supply chain that formed the basis for defining a practical structure for HBE generation and sales. It describes the considerations made to come up with a workable structure and subsequently provides a guideline (blueprint) for HBE generation and sales.

Part 2 of this report describes the demonstration of the generation of the HBEs for aviation biofuels based on the developed set-up.

PART 1

Voluntary RED opt-in for aviation biofuels in The Netherlands

1. Introduction

1.1. Background

As a result of the Renewable Energy Directive (RED), suppliers of fuels to the road transport market (gasoline, diesel or biofuels) are obliged to supply a certain percentage of these fuels from renewable sources. In order to show compliance with the renewable targets, these suppliers have to register their supplied fuels at the national authorities; they are 'mandatory participants'. In the Netherlands, compliance checking is arranged via tradable HBEs (translated from Dutch: Renewable Energy Units – formerly known as bio-tickets). For every gigajoule renewable fuel supplied to the Dutch market they receive one HBE. Suppliers of fuels to the Dutch road transport market have to meet their annual target amount of HBEs, set by the Dutch Emission Authority (DEA) depending on their annual fuel supply to the Dutch road transport market and that year's renewables percentage. Mandatory participants can either meet their annual HBE target by supplying self-produced or (inter)nationally procured renewable fuel, or by buying HBEs from other participants.

Fuel suppliers supplying only biofuels have no annual HBE target. These suppliers can however voluntarily participate in the system by registering their supplied biofuels, thereby receiving HBEs. These they can sell to the mandatory participants in the road transport market.

1.2. EU RED opt-in for aviation biofuels

SkyNRG among others, has put effort in making *aviation* biofuels eligible under the Dutch renewable energy targets. This was put into force in the national regulations in 2013 and since then suppliers of aviation biofuels to the Dutch transport market can generate and subsequently trade HBEs (sell to mandatory participants). The voluntary RED opt-in for aviation biofuels introduces a significant benefit for our market, as the generated and sold HBEs enable to lower the market price for aviation biofuels and as such help to further develop this market.

The regulatory framework for RED-opt in for aviation biofuels is the same as in the road transport. The practical implementation of the HBE generation and sales has been developed over the last year by SkyNRG together with the DEA.

Part 1 of this report provides background on the regulatory framework and aviation biofuel supply chain that formed the basis for defining a practical structure for HBE generation and sales. It describes the considerations made to come up with a workable structure and subsequently provides a guideline for HBE generation and sales.

2. Aviation biofuel supply chain and regulatory framework for RED opt-in

Since 2013, aviation biofuels are eligible under the Dutch renewable energy targets and HBEs can be generated and sold upon supply of aviation biofuels to the Dutch market. To be eligible under the renewable energy targets, both the biofuel in itself and the registrant (the party that is registering the biofuel with the authorities and thereby generating HBEs) need to meet the requirements set in the regulatory framework. This regulatory framework is the same framework as in the road transport market. Over the last year, the practical implementation of the HBE generation and sales has been developed, based on this regulatory framework and the aviation biofuel supply chain. This has been done in consultation with the Dutch Emission Authority and has led to a set-up where the aviation biofuel supplier to the market (SkyNRG) can be the registrant and generates the HBEs.

Before describing the considerations made that has led to this set-up, in this chapter we first provide an overview of the Dutch aviation biofuel supply chain and the regulatory framework.

2.1. Aviation biofuel supply chain

The market for aviation biofuels is still relatively new; there is a limited number of producers worldwide and the supply chains used are not yet standardized. The most straightforward (future) supply chain from feedstock to flight can though be described as follows:



- 1. Production: Bio-refinery produces aviation biofuel from sustainable feedstock.
- 2. **Delivery to aviation biofuel supplier**: Aviation biofuel supplier purchases this aviation biofuel and gets it delivered at a blending/storage terminal that the aviation biofuel supplier has contracted.
- 3. **Blending & storage at pre-airport storage:** Aviation biofuel supplier has the aviation biofuel blended with fossil jet fuel (technical requirement). The blend is certified to the relevant jet fuel quality specs (ASTM D1655/Def-Stan 91-91). The blend is stored at the pre-airport storage terminal until further downstream distribution.
- 4. Delivery to airport: Although so far the majority of aviation biofuel has been delivered to airports by trucks, pipeline transport to the airport, via existing systems, is expected to become the standard way to get aviation biofuel delivered at the airport. Either dedicated airport delivery pipeline systems can be used or multi-destination pipeline networks like the Central European Pipeline System (CEPS), of which approval for use of biofuels is on its way. At the airport the aviation biofuel blend is received into the (commingled) airport storage system, in many cases owned by the airport fuel consortium (usually a consortium of jet fuel suppliers and a major airline, like AFS at Schiphol airport).
- 5. **Sales to airline**: Aviation biofuel supplier sells the aviation biofuel blend to one of the suppliers in the airport fuel consortium and this supplier sells the fuel to the airline upon fueling the airline's aircrafts (in some cases, the airline itself is part of this consortium, e.g. KLM at Schiphol).

2.2. Regulatory framework

The requirements the biofuel and the registrant need to meet are stated in the national law; in The Netherlands this is recorded in the Environmental Management Act (Title 9.7 Renewable Energy for Transport). The regulatory framework can be summarized as follows:

- 1. The registrant:
 - a. is a Dutch enterprise;
 - b. holds title of the biofuel at a location certified for that type of biofuel;
 - c. is certified by an EU RED approved sustainability scheme (i.e. ISCC, RSB, etc.);
 - d. holds a permit for an Excise Goods Place for mineral oils, is a Registered Consignee, or an Importer.
- 2. The registered biofuel:
 - a. is certified by an EU RED approved sustainability scheme;
 - b. is supplied to the next consignee without Proof of Sustainability (PoS). A PoS is an official document stating the sustainability characteristics of the biofuel (GHG intensity, feedstock used, etc.) as valid under the used sustainability scheme. The PoS is addressed to the Dutch Emission Authority, and as a result the biofuel loses its sustainability status and is supplied as regular fuel;
 - c. has to be supplied from a location in The Netherlands to the Dutch transport market (supply to end-user by fulfilling excise duty, or supply to another Dutch Excise Goods Place permit holder including title transfer);
 - d. should be supplied from a location that is certified by an EU RED approved sustainability scheme and of which the registrant manages the mass balance. This in practice means that this supply location should be included on the sustainability certificate of the registrant.

Biofuels can either be registered for HBE generation or for tax reduction under EU ETS, not for both. Requirement 2.b prevents this from happening as on paper the biofuels lose their sustainability status upon registration for HBE generation. The end-user can therefore not claim the use of certified sustainable biofuels, hence under EU ETS the consumed biofuels are considered regular fossil fuel.

The DEA is responsible for checking compliance to this regulatory framework; its inspectors perform audits at each mandatory and voluntary party.

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3. From legislation to implementation

With the Netherlands being the first country to adopt eligibility of alternative aviation fuels under the national renewable energy targets, it also was the first to come up with a practical implementation of executing this eligibility. As the aviation biofuels industry still has to mature compared to the road transport biofuels industry and the aviation biofuel supply chain and roles within are not necessarily identical to that in the road transport biofuels market, while the directive and regulatory framework for HBE generation was primarily designed for the road transport industry only, this practical implementation wasn't that straightforward.

Various considerations have been made with respect to when, where and by whom in the Dutch aviation biofuel supply chain HBEs should be generated and sold, taking into account current and future supply chain setups (e.g. segregated vs non-segregated supply to airport) and the roles of the different supply chain partners. Different scenarios have been developed and evaluated by SkyNRG together with the DEA and the other partners in the supply chain. The starting point has been that the selected structure/scenario should work in different supply chain set-ups. We provide the considerations made below.

3.1. Who and where to register and generate HBEs - Evaluated scenarios

There are basically four actors in the supply chain that take title of the aviation biofuel and that were therefore considered potential aviation biofuel registrants (= can generate and sell HBEs):

- 1. Airport fuel supplier (in airport fuel consortium)
- 2. Airline
- 3. Bio-refinery
- 4. Aviation biofuel supplier

3.1.1. Airport fuel supplier (in airport fuel consortium) as registrant

The fuel suppliers in the airport fuel consortium hold title of their fuel they store at the airport and subsequently deliver to aircrafts. In principle they could be the registrant and register upon delivery from the airport storage to aircrafts (they own the fuel and they have an Excise Goods Place permit – requirements for being the registrant).

This would require the airport storage location to be EU RED certified. In addition, there is an issue with verifying the physical aviation biofuel delivery by this fuel supplier in the airport fuel consortium if the aviation biofuel has been delivered via a branched pipeline network system (the mode of transport we foresee as becoming the standard in the future). The policymakers request a proof of the physical delivery by the registrant while the book and claim way of delivery that is inherent to delivery via a pipeline network system makes this impossible:

Pipeline network systems like CEPS operate by the banking system principle (everywhere in = everywhere out) rather than by physical point-to-point deliveries. As such, when supplying biofuel through a pipeline network system, delivery of aviation biofuel at the airport is demonstrated on an administrative basis. Physical delivery cannot be guaranteed since in fact the biofuel molecules can theoretically end up at all other outputs of the pipeline network system. Nor can the physical delivery of aviation biofuel be proven as it is a drop-in fuel and chemically indistinguishable from regular fossil jet fuel. For the policymakers, the physical delivery of the biofuel to the next administrative consignee within the country needs to be verified; just assuming that the aviation biofuel is fed into the system at one location in The Netherlands and by mass balancing delivered to the administrative consignee in The Netherlands is not sufficient. For the DEA the disability to provide physical evidence in case of delivery via a multi-destination pipeline system in practice means that any actor after the pre-

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airport storage location is unable to claim there has been a supply of certified sustainable aviation biofuel and hence can be the registrant.



NB. The airport fuel consortium itself could never be considered as the registrant, as the airport fuel consortium as an entity does not take title of the stored jet fuel.

3.1.2. Airline as registrant

As an end-user of jet fuel, airlines have to register their fuel consumption under EU ETS. Given that biofuels can either be used for HBE generation or tax reduction under EU ETS, and both incentives vary in magnitude, it could be beneficial for an airline to have the flexibility to choose between both. Being the registrant for HBE generation, all requirements for claiming the use of aviation biofuels under EU ETS are also met (procurement with PoS).

Basically an airline could only be the registrant if it is a shareholder in the airport fuel consortium (owning the airport storage and distribution system). Only in that case, it supplies as owner of the fuel from the airport storage into the Dutch aviation market (supply for its own use or supply to another airline) and can have an Excise Goods Place permit (both requirements for being the registrant). However, most airlines are not part of the airport fuel consortium and if they are, this generally only is the case at their 'hub airports'. For example, in The Netherlands it would only be KLM that could be the registrant on this basis. And obviously only if they would have their relevant operations certified under an EU RED approved sustainability scheme; although this is not impossible it might be considered a hassle for an airline to do this.

In addition, the same limitation as described in above paragraph holds here as well; if the aviation biofuel is supplied to the airport via a multi-destination pipeline system, no evidence of the physical delivery can be provided.



3.1.3. Bio-refinery as registrant

In theory, the bio-refinery (if located in the country the RED opt-in for aviation biofuels is eligible) itself can be the aviation biofuels registrant and would register when it sells the biofuels from its refinery to the Dutch transport market. In practice however, the bio-refinery is likely to be located outside the country the RED opt-in is applicable in as there are not yet many bio-refineries producing aviation biofuels. For example, in The Netherlands there would only be one which might not automatically be the most favourable option; importing aviation biofuels could be more economical. For other countries considering the aviation RED opt-in importing might be required as well, having no bio-refineries yet producing aviation biofuels.

Furthermore, bio-refineries may not have blending facilities and may want to sell unblended fuel. Selling unblended aviation biofuels without Proof of Sustainability might be a challenge and registering unblended biofuels is not per se possible (in The Netherlands it is).



3.1.4. Aviation biofuel supplier as registrant

The aviation biofuel supplier, described before as the party that sources the neat aviation biofuel, blends it and sells it from a pre-airport storage terminal into the Dutch aviation market (either directly to an airline or to a fuel supplier in the airport fuel consortium).

The aviation biofuel supplier holds title of the fuel up to the moment of delivery from the preairport storage terminal and has an (fictive) Excise Goods Place permit on the pre-airport storage terminal where it (blends and) stores the fuel. On that basis the aviation biofuel supplier could be the registrant. Since the requirement of providing evidence of the physical supply of the aviation biofuel holds only up to the point of registration – supplying from the pre-airport storage terminal – no further requirements are set on the transport to the airport. Hence this setup works for any mode of transport, e.g. pipeline network systems, rail cars, tanker trucks, etc.

NB: As a pipeline system is an Excise Goods Place itself, the physical supply of aviation biofuel is actually not directly to the administrative consignee (the supplier in the airport fuel consortium, holding an Excise Goods Place permit and taking title of the aviation biofuel), but to the pipeline system's Excise Goods Place. In discussing the set-up of the aviation biofuel supply chain in The Netherlands, the DEA confirmed that the pipeline system is seen as a transporter of the biofuels only. Hence, the pipeline operator taking title of the supplied biofuel is not required in order for the aviation biofuel supplier to be the registrant (requirement 2.c from the regulatory framework).



3.2. Conclusion

The investigation and evaluation of the different scenarios with the DEA has led to the conclusion that, although any party could in specific situations be the aviation biofuels registrant, no matter what the supply chain set-up is and no matter who the final end-user is, registration by the aviation biofuel supplier at point of supply from the pre-airport storage can always be done in accordance with the regulatory framework.

4. HBE generation and sales guideline – a Blueprint

In the Netherlands, in the practical set-up of the voluntary RED opt-in, the aviation biofuel supplier is registering the biofuels at the Dutch Emission Authority upon supply to the Dutch aviation market, generating HBEs by doing so and selling these HBEs to the Dutch road transport market.

Below we provide a guideline of how this process works in practice and how the requirements set by the regulatory framework are met throughout the supply chain.



0. The aviation biofuel supplier is the registrant and therefore has to comply to the set of requirements of the regulatory framework.

- The registrant is a Dutch enterprise.
- The registrant is certified by an EU RED approved sustainability scheme (i.e. ISCC, RSB, etc.). The certificate should cover the aviation biofuels operations (e.g. blending and storage) and the type of biofuel that will be supplied.
- The registrant holds title of the aviation biofuel at the moment of supply to the Dutch aviation market (in practice, at the moment it supplies from pre-airport storage location into transport system to one of the airport fuel consortium's suppliers). This is because the registrant may only register its own biofuels that they supply to the Dutch transport market and not those from other parties. Hence only biofuels recorded in the mass balance of the registrant can be registered.
- The location from where registrant supplies to the Dutch aviation market (the pre-airport storage location) needs to be part of the registrant's sustainability certificate. This is to ensure that the entire supply chain up to the point of supply is certified (required for claiming a supply of certified biofuel) and to ensure the (relevant part of the) terminal's mass balance is linked to the registrant and as such can be verified by independent auditors.
- The registrant holds an Excise Goods Place permit on the location from which is supplied (the pre-airport storage location). In case the contracted location already has such a permit, the registrant may obtain a fictional Excise Goods Place permit that will be coupled to the location's original permit. In case the aviation biofuel is procured internationally, an Importer permit is needed instead.
- The registrant holds an HBE account (at the DEA) that allows for registering biofuel supplies.

1. The aviation biofuel supplier purchases biofuel from a bio-refinery with a PoS.

- The purchase should be accompanied with a Proof of Sustainability (PoS). This PoS demonstrates that the feedstock used for production and the fuel produced by the biorefinery complies with the EU RED sustainability requirements.
- The PoS contains information on the GHG intensity of the aviation biofuel, the supplier's sustainability certificate, type of feedstock used, etc.

2. Aviation biofuel supplier blends and stores at pre-airport storage location.

- The pre-airport storage location is the location from where the aviation biofuel is supplied to the Dutch aviation market. The registrant needs to control the biomaterials mass balance of this location, hence this location needs to be included on the registrant's sustainability certificate.
- If blending and pre-airport storage take place in different locations, only the pre-airport storage location (being the location from where the biofuel is supplied to the Dutch aviation market) needs to be included on the registrant's sustainability certificate. However, the blending location itself should be certified as well to not disrupt the certified supply chain.

3. Aviation biofuel supplier supplies to Dutch aviation market.

- Registering a supply of biofuel to the Dutch transport market is possible either when the registrant supplies to another Excise Goods Place permit holder including title transfer (actual consumption of the biofuel is not required prior to registration), or when supplied to end-users by fulfilling the excise duty. From the pre-airport storage location, the aviation biofuel is supplied to the supplier in the airport fuel consortium; an Excise Goods Place permit holder. Title transfers at the moment the aviation biofuel leaves the storage location and enters the transport system, e.g. pipeline.
- Upon supplying to the Dutch aviation market, the PoS of the aviation biofuel is addressed to the DEA, not to the physical consignee. As a result, the supplied aviation biofuel cannot again be claimed under EU RED, preventing double counting of the same biofuel.

4. Aviation biofuel supplier registers biofuel supply at the DEA after supplied to Dutch aviation market.

- The supply of aviation biofuel can be registered at the registrant's account at the DEA directly after supplying to the Dutch aviation market.
- Information on the aviation biofuel needs to be provided (e.g. GHG intensity, volume, used feedstock and double counting eligibility, etc.) and should be accompanied by the PoS.
- Evidence of the physical supply is not needed at this stage, but will be needed during audits. The registrant needs to have its registrations verified by an independent auditor before the end of each year of compliance. The DEA checks this verification report. Next to this, also the DEA's inspectors perform audits at the registrant, which can be throughout the year.
- HBEs are granted directly upon registration and can be traded subsequently.

5. Aviation biofuel supplier sells HBEs to obligated parties in road transport market.

- Directly after registering the supplied aviation biofuel, the (instantly granted) HBEs can be sold.
- HBEs have no expiry date, but only a certain percentage (after mandatory HBEs are subtracted from the account at the end of each compliance year by the DEA) can be saved for the next year. From the mandatory HBE target (road transport suppliers) 25% can be saved, from the amount voluntarily registered (e.g. aviation biofuel suppliers) 10% can be saved.
- There is no open and transparent system for HBE trading, hence trading of HBEs is done bilaterally between parties on contractual basis. As a result, the value of an HBE may not be harmonized system wide and depends on each contract.
- Trading can be outsourced to brokers, having more information on the trade market and also offering long term hedging (usually up to one year).

5. Conclusion

Suppliers of fuels to the road transport market are obliged to supply a certain percentage of these fuels from renewable sources as a result of the RED. Since 2013, a RED opt-in for aviation biofuels is applicable in the Netherlands; aviation biofuels are eligible under the Dutch renewable energy targets and HBEs can be generated and sold upon supply of aviation biofuels to the Dutch market. The regulatory framework for RED-opt in for aviation biofuels is the same as in the road transport.

The practical implementation of the HBE generation and sales has been developed over the last year by SkyNRG together with the DEA and has led to a set-up where the aviation biofuel supplier is the registrant and seller of HBEs. Although any party could in specific situations be the aviation biofuels registrant, it was found that no matter what the supply chain set-up is and no matter who the final end-user is, registration by the aviation biofuel supplier at point of supply from the pre-airport storage can always be done in accordance with the regulatory framework. The considerations that have been made to come to this set-up as well as the practical guideline for aviation biofuel registration and HBE sales can offer relevant insight to other EU countries considering voluntary RED opt-in for aviation biofuels.

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PART 2

Demonstrating HBE generation in The Netherlands

1. Introduction

Since 2013, aviation biofuels are eligible under the Dutch renewable energy targets. As a result, suppliers of sustainable aviation biofuels to the Dutch transport market can generate tradable HBEs (Renewable Energy Units). There is no obligation for jet fuel suppliers to supply a minimum percentage renewable fuel, hence these HBEs can subsequently be sold to mandatory participants, e.g. fuel suppliers for the road transport market.

As discussed in part 1 of this report, although aviation biofuels are eligible for HBE generation already since 2013, so far no HBEs were generated, since there were still uncertainties about the practical implementation. Over the last year, the practical implementation of the HBE generation and sales has been developed, based on the regulatory framework and the aviation biofuel supply chain. To demonstrate that HBE's can actually be generated, SkyNRG has delivered a small quantity of the ITAKA fuel to KLM at Schiphol airport, registered this quantity with DEA and thereby generated the first-ever HBEs for aviation.

This report describes the supply chain that was set-up for this demonstration process, how the overall supply chain complies with the regulatory framework and how the actual registration of the supply at the DEA worked.

2. Overview supply chain for demonstration

2.1. Aviation biofuel supply chain

The sustainable aviation biofuel used for this demonstration was part of a larger batch produced for the European ITAKA project. This batch was stored by Air BP at a tank terminal in Gävle (Sweden), ASTM D1655 and Def-Stan 91-91 certified and EU RED compliant. The figure below gives an overview of the demonstration supply chain.



For the demonstration a small quantity of the ITAKA batch was shipped per ISO container to The Netherlands.

- 1. **Transport to The Netherlands:** For the demonstration SkyNRG procured a small volume of this batch. It was shipped to The Netherlands per ISO container, under excise-duty suspension.
- 2. **Temporary storage at Excise Goods Place:** The ISO container was temporarily stored at an Excise Goods Place, under excise-duty suspension. As SkyNRG has no self-owned storage locations, the ISO container was stored at a third party storage location, Liquid Handling and Storage (LHS) in Amsterdam.
- 3. **Delivery to airport:** The ISO container was trucked to KLM's Excise Goods Place at Amsterdam Schiphol Airport, under excise-duty suspension. The fuel was received into an KLM airport refueler truck.
- 4. **Sales to airline**: The aviation biofuel was sold by SkyNRG to airport fuel supplier KLM, under excise-duty suspension.

2.2. Regulatory framework

The requirements the biofuel and the registrant need to meet for making the aviation biofuel supply eligible for HBE generation are stated in the Dutch law and can be summarized as follows:

- 1. The registrant:
 - a. is a Dutch enterprise;
 - b. holds title of the biofuel at a location certified for that type of biofuel;
 - c. is certified by an EU RED approved sustainability scheme (i.e. ISCC, RSB, etc.);
 - d. holds a permit for an Excise Goods Place for mineral oils, is a Registered Consignee, or an Importer.
- 2. The registered biofuel:
 - a. is certified by an EU RED approved sustainability scheme;

- b. is supplied to the next consignee without Proof of Sustainability (PoS). A PoS is an official document stating the sustainability characteristics of the biofuel (GHG intensity, feedstock used, etc.) as valid under the used sustainability scheme. The PoS is addressed to the Dutch Emission Authority, and as a result the biofuel loses its sustainability status and is supplied as regular fuel;
- has to be supplied from a location in The Netherlands to the Dutch transport market (supply to end-user by fulfilling excise duty, or supply to another Dutch Excise Goods Place permit holder including title transfer);
- d. should be supplied from a location that is certified by an EU RED approved sustainability scheme and of which the registrant manages the mass balance. This in practice means that this supply location should be included on the sustainability certificate of the registrant.

Using the above described supply chain, all requirements of this framework were met:

- 1. SkyNRG (the registrant):
 - a. is a Dutch enterprise.
 - b. holds title of the aviation biofuel after procurement from Air BP in Sweden, until sale to KLM. The biofuel is stored at a third party storage location which is stated on SkyNRG's RSB certificate.
 - c. is RSB certified.
 - d. holds a permit for a fictional Excise Goods Place. This is one of the three Excise Goods Place permits the Dutch customs offers, created for companies that have no self-owned storage locations.
- 2. The aviation biofuel:
 - a. is EU RED compliant as all supply chain operators are either ISCC or RSB certified. The biofuel comes with an PoS.
 - b. is supplied to KLM without PoS, hence as non-certified biofuel. The PoS is addressed to the Dutch Emission Authority.
 - c. is physically supplied from LHS in Amsterdam to KLM at Schiphol Airport, under excise-duty suspension. Administratively, the biofuel is sold from SkyNRG's EGP to KLM's EGP.
 - d. is supplied from LHS, being RSB certified under SkyNRG. As a result, SkyNRG holds the mass balance of the biomaterials at LHS, as these are SkyNRG's assets.

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3. Preparation of supply of sustainable aviation fuel in accordance with the regulatory framework

3.1. EU-RED certified sustainable aviation fuel

To be able to generate HBE's, the registered biofuel should be certified by an EU RED approved sustainability scheme and should be accompanied with a PoS throughout the supply chain.

The volume used for this demonstration was part of the EU RED compliant ITAKA fuel batch, stored at Gävle (Sweden) by Air BP. At Gävle, the biojet was loaded into an ISO container and shipped to The Netherlands under excise-duty suspension.

As the majority of the ITAKA fuel batch was supplied to German based airline Lufthansa, the associated GHG savings for the deliveries to Lufthansa are claimed at the German Emission Authority (Deutsche Emissionshandelsstelle, DEHSt). In Germany, claiming GHG savings following from the usage of certified biofuels is done through the online biofuel accounting platform Nabisy (https://nabisy.ble.de). The entire ITAKA fuel batch was registered in this platform by producer Neste. Every physical transfer of fuel was recorded in Nabisy, thereby transferring an equal volume to the consignee's account (i.e. producer Neste to supplier AirBP, or supplier AirBP to airline Lufthansa). With each such transfer in Nabisy a Proof of Sustainability (PoS) is created, being the evidence of the fuel's EU RED compliancy.

As SkyNRG holds no account in Nabisy, the transfer of fuel from AirBP to SkyNRG was still registered in Nabisy (as the entire fuel batch was already registered in this platform), but the consignee in this case was the "Discharge/validation – The Netherlands" account. This resembles that certified biofuel is transferred to a Dutch company without a Nabisy account, and that the GHG savings are to be attributed to the Dutch renewable energy targets instead. A separate PoS was created by AirBP to SkyNRG, linking the Nabisy PoS to the physical transfer.

3.2. Double counting feedstocks

The Dutch government recognizes a number of feedstocks as double counting, yielding 2 HBEs per GJ renewable energy. Eligible feedstocks are listed in Tables 1, 2 and 3 of Annex 2 of the Renewable Energy for Transport Regulation, and amongst others include waste products (biomass, MSW, used cooking oil, etc.), forestry residues and other non-food cellulosic materials. Camelina oil is considered a vegetable oil, listed in Table 4 "Products and co-products" and hence is not recognized as double counting.

3.3. Adding supply location to SkyNRG's RSB certificate

Criteria 1.b and 2.d (see Paragraph 2.2) of the regulatory framework require the supply location to be added to the sustainability certificate of the HBE registrant. As SkyNRG already holds a Chain of Custody RSB certificate for biofuels, including blending and logistics, the third party storage location LHS could be added to SkyNRG's RSB certificate.

Following RSB standards and protocols, no audit was required as LHS would not chemically modify the biofuel and SkyNRG had covered LHS' operations in their Chain of Custody procedures (an Operating Procedure document was created for LHS, taking into account the RSB principles). With LHS included on SkyNRG's RSB certificate, SkyNRG now have to hold the mass balance of the biofuels SkyNRG stores at LHS.

3.4. Obtaining Excise Good Place permit

There are three different Excise Goods Place (EGP) permits in The Netherlands:

- EGP permit for storage of excise products
- EGP permit production and storage of excise products
- "Fictional EGP" permit, designed for excise product traders having no physical storage

The main difference between a physical EGP and a fictional EGP is physical storage. Traders that outsource the storage of excise products but like to receive them at and send them from their own administration (like SkyNRG) should request a fictional EGP permit. However, actual storage should always be at a registered physical EGP. Whereas a minimum inventory requirement is applicable to physical EGP permits (at least 1.000.000 liter/year for mineral oils), this is not applicable to fictional EGP's. Obtaining an EGP permit is for free and is granted within 8 weeks of submission.

The DEA confirmed either of all three types are suitable for complying to rule 1.d, after which SkyNRG applied for the EGP permit. The procedure for obtaining an EGP permit:

- Submitting the standard form "Request for EGP permit" at the Dutch Tax Authority / Customs. Information to be provided:
 - General company information
 - Banking and accounting details
 - Contact person for Dutch Customs
 - Storage and/or production locations (if any)
 - What types of excise products, including volume estimations of monthly release into free market (fulfilling of excise-duty), monthly transported under excise-duty suspension, yearly in storage, monthly produced
 - o Detailed description of administration structure
- After submission, a meeting is planned with a Customs representative who investigates the request in more detail. Especially the administration structure is checked. Later audits of the administration are based on throughputs and not regularly scheduled. In case of low throughput, audits are not necessarily yearly.
- Upon approval of this investigation, a positive advice is send to the Customs department granting the permits.
- Permit is granted.

One limitation for fictional EGP's is that received excise products cannot be released into the free market as fulfilling the excise duty is not possible. For this a calibrated flow meter is required for reporting the physical flows, which fictional EGP's don't have. For the sustainable aviation fuel supply chain this is not a problem as almost all airports receive jet fuel under excise-duty suspension. For future larger supply chains, the same fictional EGP is suitable.

3.5. Obtaining HBE account at Dutch Emission Authority

Supplied biofuels are registered at the Register Energy for Transport, an online platform developed by the Dutch Emission Authority. An account with registration permits is required for this, which can be obtained only if the registrant holds a permit for an Excise Goods Place for mineral oils, is a Registered Consignee, or an Importer (requirement 1.d). Upon registration, the following documentation is to be submitted:

• Validated copies of passports of account's authorized signatories (2 persons)

- If account authorizers are registered next to the account's authorized signatories, validated copies of passports of account's authorizers (up to 2 persons)
- Validated copies of passports of company's authorized signatories
- Company's latest annual financial report
- Proof of active bank account within the EEA (European Economic Area)
- Copy of RSB certificate, mentioning the location from where biofuel is to be supplied

The account is granted for free within a few weeks after request.

4. Supply of sustainable aviation fuel to Dutch market, registering supply and generating HBEs

With the preparations as described in the previous chapter in place, SkyNRG supplied the sustainable aviation fuel to the Dutch aviation market.

4.1. Physical supply

The ISO container with sustainable aviation fuel that was stored at LHS in Amsterdam, was transported by EBTL transport company to Schiphol airport Amsterdam (AMS) on October 27, 2016. At AMS the sustainable aviation fuel was transferred into KLM's airport refueler truck. The refueler truck subsequently fuelled KLM aircrafts.

4.2. Excise waybill (e-AD)

As the transport to AMS was performed under excise-duty suspension, a digital excise waybill (e-AD) accompanied the transport. When the ISO container was originally transported to The Netherlands, SkyNRG was not yet granted the EGP permit, hence the original e-AD was addressed to LHS' EGP. To comply to requirements 1.b and 2.c of the regulatory framework, the following steps were needed:

- The biofuel was first transferred from LHS' EGP to SkyNRG's EGP through the EMCS (Excise Movement Control System)
- SkyNRG confirmed the reception at their EGP
- SkyNRG transferred the biofuel to KLM's EGP, the accompanying e-AD was printed and added to the physical transport to AMS
- KLM approved the reception and reported the discharges volume measured at the pump's flow meter

4.3. Registration of supply at HBE account

The physical supply to KLM at AMS did not accompany a PoS, SkyNRG issued the PoS to the DEA (requirement 2.b). The PoS was not physically sent to the DEA but kept in SkyNRG's administration for later audits.

After the physical supply to KLM was completed, the supplied biofuel was registered in SkyNRG's HBE account. Required data for this registration:

- Type: liquid biofuel
- Date of supply: 27 November 2016
- Volume in liters at 15°C: 2.190,86
- Reference to internal administration: SKY1610KLM01
- Supply location: LHS
- Type of supply: to EGP
- Sustainability scheme: RSB, certificate code SCS/RSB-C-0014
- Feedstock: Camelina oil
- Contribution to supply (based on energy content): 75,17 GJ
- GHG intensity: 46,03 gCO2eq/MJ
- Double counting: No

After registering the supply, 74 HBEs were added to SkyNRG's account.

4.4 Audit and Sales of HBEs

Each registration of biofuel in the HBE account is checked during a yearly audit by DEA at the end of the HBE book year. Transport documentation, Proofs of Sustainability and all other administration can be checked to confirm that the registration of biofuel is valid. SkyNRG will therefore carefully file all relevant documentation as evidence of the supply.

The HBEs generated can be sold into the road transport market to obligated parties. This can either be done directly or by using a broker. SkyNRG will, as a next step, look into the best way to set up the sales of HBEs and sell the HBEs generated with the batch supplied.

Conclusion

Sustainable aviation fuels are currently, and for the years to come, more expensive than fossil jet fuels. This price gap is one of the main reasons for the limited activity in supply-chain development. Due to the price sensitivity of the aviation industry, airlines are not able to pay more for their fuel. A mechanism to cover the price premium on the short term, should therefore be developed.

An opportunity to cover part of the price premium emerged within the European Union's Renewable Energy Directive (RED). Suppliers of fuels to the road transport market are obliged to supply a certain percentage of these fuels from renewable sources as a result of the RED. Since 2013, a RED opt-in for aviation biofuels is applicable in the Netherlands; aviation biofuels are eligible under the Dutch renewable energy targets and HBEs can be generated and sold upon supply of aviation biofuels to the Dutch market. The regulatory framework for RED-opt in for aviation biofuels is the same as in the road transport.



Page 30 of (32)

The practical implementation of the HBE generation and sales has been developed over the last year by SkyNRG together with the DEA and has led to a set-up where the aviation biofuel supplier can be the registrant and seller of HBEs. Although any party could in specific situations be the aviation biofuels registrant, it was found that no matter what the supply chain set-up is and no matter who the final end-user is, registration by the aviation biofuel supplier at point of supply from the pre-airport storage can always be done in accordance with the regulatory framework.

A blueprint (figure 1) has been developed for the practical implementation of HBE generation in the Netherlands that can serve as a guideline for HBE generation and sales.

The practical implementation set-up has subsequently been validated by the supply of a small quantity of sustainable aviation fuel produced within ITAKA to the Dutch aviation market, resulting into the first-ever HBEs generated for aviation biofuels.

For future larger supply chains, the created blueprint is still valid as the supply chain setup remains identical.

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