ARTFuels

POSITION PAPER

IMPLICATIONS OF THE RED II PROPOSAL FOR DEPLOYMENT OF POWER-TO-X TECHNOLOGIES ("e-Fuels")

INTRODUCTION

The Commission's proposal in the recast of the Renewable Energy Directive to integrate more renewable energy in the transport sector via the use of, inter-alia, Renewable Fuels of Non-Biological Origin pathway is welcomed.

However, limiting the possibility for producing these fuels to either [i] a direct connection or [ii] measuring it via the EU's renewable grid average is not enabling the potential that these fuels have in decarbonising the transport sector whilst increasing the share of renewable energy in the economy.

INTRODUCTION

Thus, the possibility for these fuels to be recognised using different pathways is necessary and should be acknowledged in the RED recast.

Many suggestions and improvements have been proposed along the legislative process. Yet, none of the current proposals offer true technology neutrality. This restricts full deployment of some of the most promising sustainable technologies and innovations and therefore limits their potential to help reduce GHG emissions in Europe and improve energy independency.

This position paper addresses industry concerns with the potential consequences of the current policy proposals for the Power-to-X pathway.

Our asks can be summarised as follows:

- Creation of a **level playing field between direct and indirect electricity use** for the purpose of transport fuels;
- The recognition that Renewable Fuels of Non-Biological Origin (RFNBO), also known as Power-to-X fuels, can **sustainably reduce the GHG intensity of transport** - including those segments which are considered difficult to decarbonise (e.g. marine and aviation) - **already in the short-term;**
- The current requirements under Article 25.3 (a) are unnecessarily restrictive. They restrict the **use of the Guarantees of Origins (GOs) system**, and therefore limit the possibility to ensure a long-term confidence in this market provided through **power purchase agreements** between renewable electricity producers and Power-to-X suppliers.
- **Maintain RFNBO** on the list of eligible feedstocks under **Annex IX Table A**. The Annex IX list was agreed less than 3 years ago between Council and European Parliament in the framework of the negotiation on Directive 2015/1513 (ILUC Directive) and if this list is now changed it would [i] cause investment instability, [ii] undermine existing investments made, and [iii] undermine planned investments;
- It is important to have a **robust Life Cycle Assessment (LCA) methodology** which overcomes regulatory disparities in the different markets. The methods developed for the calculation of RFNBO's carbon footprints within the Fuel Quality Directive are a good basis; to ensure investors certainty, an encompassing LCA methodology should be developed early enough under RED II to include alternative production pathways for existing fuels as well;
- Power-to-X enables **large-scale seasonal and cross sectoral energy storage**.
- To avoid unnecessary carbon emissions and to maximise energy savings, **any air-CO_2 capture can be avoided** as long we have sufficient point sources of CO_2 at high concentrations.

POWER-TO-X EXPLAINED

'Power-to-X' - also known as e-fuels - refers to any technology which converts (renewable) electrical power to a gaseous or liquid energy carrier. The term Power-to-X is not mentioned in the RED. Instead the Commission uses the terminology 'Renewable liquid and gaseous transport Fuels of Non-Biological Origin' (RFNBO).

POWER-TO-X EXPLAINED

The Power-to-X concept covers several technologies and pathways. Considering the need to integrate increasingly high shares of variable renewable electricity in the grid, electrolysis is used today to convert electrical power to hydrogen thus allowing decoupling the energy from the electricity sector for use in other sectors. The resulting hydrogen can then be used directly as a fuel, or alternatively reacted with either carbon (in the form of CO2 or CO) or nitrogen to produce a range of different gaseous or liquid fuels, as illustrated by some examples below:

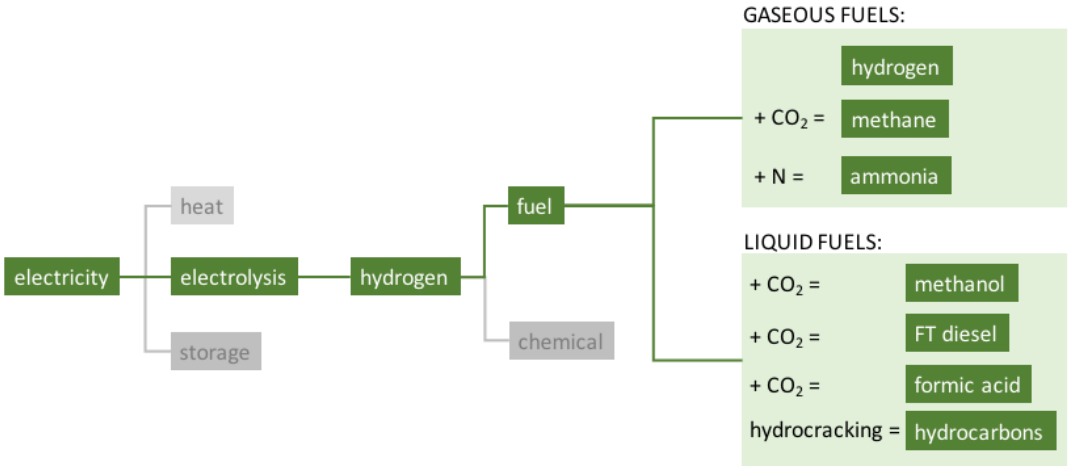

Figure 1 – Example of Power-to-X pathways in the transport fuel sector

Converting electricity to other forms of energy carriers offers numerous benefits:

- **Electrification**
  When electricity is converted to gaseous or liquid fuels, it can be stored and used in existing combustion engines and fuel cells enabling a different pathway for 'electrification' including those transport segments which are considered difficult to decarbonise (e.g. heavy goods vehicles, marine and aviation as has been recognised in a recent study[1] on the decarbonisation of EU transport commissioned by the TRAN Committee of the European Parliament)
- **Sustainability and availability**
  Power-to-X fuels have an excellent sustainability profile. Because renewable electricity can be produced in abundance anywhere in Europe, it enables the production of any type of Power-to-X fuels on demand locally (including on-site generation) and thus addresses the need for more energy independence in individual Member States without collateral impact on the environment.
- **Energy storage**
  Power-to-X has the potential to address the challenge of the volatility in the production of renewable electricity. Rather than curtailing the supply of renewable electricity when supply is larger than demand, Power-to-X enables practical, large-scale, daily to seasonal energy storage.
- **Existing infrastructure**
  Due to the high energy density, esp. of the liquid fuels, a lot of energy can be stored in existing infrastructure (e.g. gas grid, terminals, refuelling stations, chemicals), and this

[1] Research for TRAN Committee – Decarbonisation of EU Transport.
http://www.europarl.europa.eu/RegData/etudes/STUD/2017/601989/IPOL_STU(2017)601989_EN.pdf

POWER-TO-X EXPLAINED

energy can be used in existing components of different sectors such as power or transport, including generators, turbines and fuel cells to produce mechanical power or electricity on demand if required.

- **Cross-sectoral long term decarbonisation potential**
  Power-to-X investments offer a short to medium term option to decarbonise transportation while these same pathways can be used to transition e.g. chemical processes to low carbon alternatives that enables the phase out of fossil feedstocks. This is also indicated in the study[2] on the decarbonisation of EU transport "…renewable fuels produced using power-to-X technologies can also be used for decarbonising other sectors, for example as a replacement for natural gas in industry, for power generation in times of low wind and solar energy production and for heating in the built environment – all applications that could potentially induce significant demand for renewable liquid or gaseous fuels in a low-carbon, renewable energy system."

ENVIRONMENTAL POTENTIAL

The final report of the Sub-Group on Advanced Biofuels(SGAB) estimates that e-fuels can contribute between 0,5% and 0,7%of the total EU energy demand for transport[3]. Although this number may appear comparatively small, it corresponds to approximately 10% of the RED II target of 6,8% renewable energy in transport as proposed by the Commission for 2030.

The relevance of further developing Power-to-X concepts is also illustrated by the fact that the European Union is providing – through the Horizon 2020 programme – funding for work in this area.

The potential of Power-to-X fuels can improve significantly with the appropriate policy measures in place. Assuming for example that just 30% of the projected wind energy for 2030 is used for Power-to-X fuels, a contribution between 2%-4% of total EU energy demand in transport could be provided.

After all the only real constraint is the current regulatory framework.

The CO2 reduction and business potential for the different pathways vary depending on the final production and the energy efficiency of the process, but they all offer a significant contribution to reducing Well-to-Wheel emissions.

It is important to have a robust LCA methodology which overcomes regulatory disparities in the different markets.

[2] Ibid
[3] Final report SGAB, page 29; http://bit.ly/2rOU8QW

POLICY DIMENSIONS

The policy challenges facing the development and large scale deployment of Power-to-X pathways evolve around one primary variable: the source and availability of renewable electricity.

RED II article 25.3 related to the use of renewables in transport

According to article 25.3, to determine the renewable share of Power-to-X fuels output, suppliers can only count the average share of renewable electricity in the Union or the share of electricity from renewable energy sources in the country of production.

Only if the installation is directly connected to a renewable electricity installation is it possible to qualify the entire output as renewable, but in this case the installation may not be connected to the electricity grid.

These requirements are unnecessarily restrictive. They not only restrict the use of the Guarantees of Origins ("GOs") system already in place for renewable electricity, and limit the possibility to guarantee a long-term confidence in this market provided through power purchase agreements between renewable electricity producers and Power-to-X suppliers.

Furthermore, this restrictive provision contradicts the RED recast Articles 2 and 19, which describe how GOs should be used:

> ***Art 2.h:*** *'guarantee of origin' means an electronic document which has the sole function of providing proof to a final customer that a given share or quantity of energy was produced from renewable sources*
>
> ***Art. 19.8:*** *Where an electricity supplier is required to prove the share or quantity of energy from renewable sources in its energy mix for the purpose of Article 3(69) of Directive 2003/54/EC2009/72/EC, it shall do so by using its guarantees of origin*

The logic of these provisions should be sufficient to ensure that the origin of the electricity used in Power-to-X solutions is renewable, which is in line with the current proposal from ITRE. The proposal does require some further clarification though. Further improvements to the current GO-system to include additional information, and to avoid 'double counting' are encouraged.

Additionally, the use of grid carbon footprints only, does not provide a level playing field for all regions / countries in this new technological era. Technology concepts such as the "virtual power plant" – combining energy and digitalisation – provide online validation of production and consumption of energy, which in turn identify energy flows as a modern variant of "certificates of origin".

The concern of 'double counting' of the renewable energy across sectors can easily be resolved within the certificate system by 'cancelling' an electricity GO, when the electricity is converted into a fuel. Once the electricity is sold to a Power-to-X supplier, the guarantee of origin proves the renewable character of the fuel supplied.

Allowing the use of GOs to produce Power-to-X fuels would provide a practical solution to enable the continuous operation of Power-to-X installations, allowing economies-of-scale for larger installations. To ensure a level playing field, any changes to the GO system to improve its

POLICY DIMENSIONS

consistency regarding traceability and quantity of renewable electricity produced should be applied to all sectors using renewable electricity either directly or indirectly.

Article 25 – part 3 – sub 3 – point a – paragraph 2	
Commission's position	**Proposal**
However, electricity obtained from direct connection to an installation generating renewable electricity [i] that comes into operation after or at the same time as the installation producing the renewable liquid and gaseous transport fuel of non-bio-logical origin and [ii] is not connected to the grid, can be fully counted as renewable electricity for the production of that renewable liquid and gaseous transport fuel of non-biological origin.	However, **electricity obtained from a direct connection to an installation generating renewable electricity shall be fully counted as renewable electricity.** **Equally, electricity obtained through power purchase agreements for renewable electricity or certified with guaranties of origin shall be fully counted as renewable electricity for the production of renewable liquid and gaseous transport fuel of non-biological origin. If the guarantees of origin are used** an equivalent amount of guarantees of origin issued in accordance with article 19 shall be cancelled.

RED II qualification of Power-to-X under Article 25.1, Annex IX and Annex X

Whereas Annex IX part A in RED listed feedstocks of which the energy content counts twice toward the target in article 3.4, RED II drops the concept of double counting in favour of sub-targets.

These sub-targets are introduced in article 25.1 and the different sub-quotas are listed in Annex X.

Annex X – Part A sets a maximum contribution of 3,8% from liquid biofuels made from food or feed crops in 2030

Annex X – Part B sets a minimum share of energy from all feedstocks listed in Annex IX, renewable transport fuels of non-biological origin, waste-based fossil fuels and renewable electricityat 6,8% in 2030

Annex X – Part C sets a minimum share of advanced biofuels from feedstocks listed in Annex IX Table A at 3,6% in 2030

Surprisingly RFNBO has been removed from Annex IX Part A for no apparent reason. Considering the sustainability characteristics of Power-to-X fuels, and the excellent CO_2 reduction potential it would make sense to maintain RFNBO back in the list of eligible feedstocks under Annex IX Table A. Annex IX list was agreed less than 3 years ago between Council and European Parliament in the framework of the negotiation on Directive 2015/1513 (ILUC Directive) and if this list is now changed it would [i] cause investment instability, [ii] undermine existing investments made, and [iii] undermine planned investments.

By maintaining RFNBO in Annex IX Table A, these fuels are than able to contribute to meeting both Annex X parts B and C, and it avoids having to amend Article 25.1 and Annex X Part C.

POLICY DIMENSIONS

RED II ENVI amendment related to origin of CO2

In ENVI compromise amendment 2A the definition of RFNBO is amended by adding an additional requirement "where any carbon feedstock is captured from the ambient air".

To illustrate how detrimental to the environment this proposal is, one can compare the situation to the clean up operation of an oil spill from a damaged oil tanker. What ENVI suggests here is to first let all the crude spill into the sea before cleaning it up, whereas a lot of damage could have been prevented if the oil would have been pumped out of the hull of the ship straight away.

In Europe alone there are 9.000 point sources of CO2 at high concentrations, emitting more than 1.5 billion tons of CO2 per annum. This amount of CO2 equals more than 500 million tons of oil equivalent in terms of Power-to-X fuels.

Source	Type CO_2	Output (ton/hour)	Concentration
Industrial flue hasses (e.g. steel mill, refinery)	Fossil	700	10%-15%
Ethanol fermentation (e.g. brewery, fuel production)	Biogenic	50	95%
Biogas upgrading	Biogenic	0,7	90%

Capturing this CO2 at the source, requires significant lower amounts of energy than having to capture it from ambient air. From an energy efficiency perspective, it makes a lot more sense to capture the CO2 at point sources first, before we need to capture it from the air (at CO2 concentrations of approx. 0,04%).

While it is obvious that for decades to come multiple point sources are available for RFNBO, it also is a fact that the energy demand for CO2 capture from point sources is 75% less than the energy needed to capture CO2 from the air. To maximise energy savings, any air-CO2 capture should be avoided as long we have sufficient point sources of CO2 at high concentrations. Allowing the use of these point sources of CO2 increases the chance that energy intensive industries will consider the use of Power-to-X technologies as part of their strategy to reduce emissions.

We therefore recommend not to add an additional burden to the definition of RFNBO.

CONCLUSION

Although Power-to-X fuels are in a relatively early stage of deployment, they have a real potential to contribute significantly to addressing challenges regarding grid stability, energy storage, and reduction of GHG emissions in transportation.

Due to the flexible nature of the processes, a broad range of gaseous and liquid fuels can be produced. It offers a clean, sustainable, and flexible option to convert renewable electricity into energy carriers for use in mobility, heat and industrial applications, and helps at the same time

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strengthening our independence from fossil fuels.

Investment, innovation and deployment of these types of fuels will be seriously delayed when the limitations addressed in this position paper are not considered.

We firmly believe this is a 'luxury' we cannot afford if we are serious about reducing our GHG emissions.

DISCLAIMER - The above Position paper on Power-to-X has been drafted by the assigned committee of the Alternative & Renewable Transport Fuels Forum (ART Fuels Forum) after exchange of opinions and internal consultation among the Forum members. The content of the Position paper does not necessarily reflect the views of all members of the ART Fuels Forum, but is a synthesis of the main positions. The positions and recommendations listed above are those of the members of the ART Fuels Forum and do not necessarily reflect either the official position of the Commission or the complete position of the members of the ART Fuels Forum.

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