ADVANCEFUEL

Advanced Renewable Fuels From Barriers to Market Rollout

Insights with leading expert, Ayla Uslu, ECN part of TNO, into how to overcome barriers to deploying more renewable energy sources (RES) via transport fuels for more sustainable mobility across Europe.

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What are the barriers to renewable transport fuels across the different steps of the supply chain such as biomass supply, conversion, and end-use? What is the most important barrier to tackle to advance renewable transport fuels?

We have compiled a report [Barriers to advanced liquid biofuels and renewable liquid fuels of non-biological origin] presenting the barriers to RESfuels and we consulted stakeholders to present their views and define the most critical barriers. In the ADVANCEFUEL project, when we talk about "RESfuels" we are referring to liquid advanced biofuels and liquid renewable alternative fuels. More specifically, we are referring to liquid biofuels produced from lignocellulosic feedstock and liquid fuels produced from renewable hydrogen (as a product of electrolysis from renewable power) and CO_2 streams.

'Lignocellulosic feedstock' is material composed of lignin, cellulose and hemicellulose, such as biomass sourced from forests, woody energy crops and forest-based industries' residues and wastes.

The main concerns regarding lignocellulosic feedstock supply are related to regulatory and environmental issues. The lack of clarity on environmental constraints for lignocellulosic feedstocks and lack of harmonised regulation on residual biomass from farming practices, dedicated energy crops and also sustainable forest management are conceived as extensive barriers by a large number of stakeholders. This highlights the importance of having an EU-wide harmonised approach in dealing with the sustainability aspects of lignocellulosic feedstocks.

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The market development of renewable transport fuels in Europe has been driven by policies, mainly the binding target set in the Renewable Energy Directive [2009] for 10% of renewables in transport energy use by 2020. In the absence of a dedicated policy support there will be no RESfuels produced. In this regard, a long-term and stable policy support that provides both stability and security for the industry has been stated as crucial. **RESfuel technologies are capital intensive and investors expect reliable policy support, which is stable over a timeframe that is long enough to realize a return on investment.** The recast of the Renewable Energy Directive (REDII) is soon to be adopted and will provide the needed policy framework up to 2030. It is important that no significant legislative changes occur that may hamper the confidence to advance biofuels.

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The RESfuels industry is considered as a high-risk investment due to past failures.The RESfuels industry is considered as a high-risk investment due to the past failures, the need for high capital costs and reliance on policy support. This causes difficulties in access to project finance. Additionally, the high production costs of RESfuels when compared with fossil fuels and the absence of structural mechanisms to bridge the financial gap between RESfuels and conventional fuels have been stalling the market roll-out of RESfuels. It is, therefore, very important that enough support to demonstration and first-of-a-kind commercial plants are provided by the European Commission and the Member States so that the technology confidence increases. Appropriate and dedicated financial mechanisms and instruments need to be developed for the advanced fuels to facilitate technology development and market deployment.

What are the solutions to overcome economic, environmental and technical barriers?

ADVANCEFUEL project focuses on the different stages of the RESfuel value chain and aims to define innovative solutions to overcome existing barriers. This project seeks to reduce production costs of RESfuels that are on average around 2.5 times higher than the conventional fossil fuels. CAPEX and the cost of feedstock are the two most dominating factors that contribute – in most cases – to about 80% of the total production cost. ADVANCEFUEL project focuses on synergies with existing infrastructure and existing process technologies, such as refineries and other chemical industries, will be mapped. This will include relevant sites for co-production and/or conversion to biomass-based fuels (power plants, gasifiers, refineries). Possible cost reduction opportunities will be highlighted. Additionally, the potential for upgrading feedstock production and supply is being analysed for advanced liquid biofuels. And the project is developing innovative crop rotation schemes for the production of lignocellulosic feedstock for advanced liquid biofuels.

When it comes to environmental concerns, we are looking at the sustainability aspects of lignocellulosic feedstock to provide recommendations on the options for harmonisation of national and European sustainability certification schemes level.

How is the policy environment regarding advanced fuels and how can it be improved to remove barriers?

On 14 June 2018 the Commission, the Parliament and the Council reached a political agreement on recasting the renewable energy directive (REDII). This replaces the 2009 renewable energy directive. REDII includes a renewable energy target of 32% for the EU for 2030. REDII also introduces an EU incorporation obligation to transport fuel suppliers in Europe. The share of renewable fuels consumed in all transport modes and renewable electricity in road and rail transport should reach 14% by 2030 (on energy based). There is also a binding

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obligation regarding biofuels produced from feedstocks included in Part A list of Annex IX. These biofuels shall be 0.2% in 2022, 1% in 2025 and, 3.5% by 2030. Part A list of Annex IX includes a long list of feedstocks, where the majority are lignocellulosic. While REDII will provide a positive investment climate within the time frame 2020-2030 it is necessary that the framework continues beyond 2030.

The latest version of REDII includes multiple counting for compliance with the obligations imposed on the sector. Biofuels produced from biomass listed in Annex IX, for instance, can be counted twice administratively. Thus, the 3.5% share of advanced biofuels by 2030 can be met by having only a physical supply of 1.75% biofuels (on energy basis). Such an amount does not appear very ambitious, especially when the GHG emission mitigation targets are considered. Therefore, it is necessary to revoke this double counting mechanism once the industry is mature enough. The directive includes a clause for an upward revision by 2023. During this revision, depending on the developments in industry, this double counting mechanism could be revoked to allow production of advanced biofuels in larger volumes.

What kind of collaborations and interactions with other sectors are beneficial for the implementation of advanced fuels?

The advanced biofuels' value chain consists of biomass feedstock supply, its conversion to biofuels and its use in transport sectors. Among other things, their success depends on a good collaboration and sufficient interaction among the different stakeholders across the value chain. When it comes to other advanced fuels, such as renewable power-to-liquid for transport sector, the involvement of renewable energy sectors (like wind and solar) and industries that produce CO_2 and hydrogen are obviously also needed. In parallel, good collaboration between researchers and industry would allow results to be implemented in practice. This will help to increase conversion technologies' reliability.

How are advanced fuels going to develop by 2030? What are the different scenarios and which one is the most likely?

Within the ADVANCEFUEL project, a scenario analysis will be conducted applying the RESolve Biomass model that covers the complete biofuels value chain (from production of feedstock to conversion technologies to end-use). This will help us analyse different scenarios with the time frame up to 2050.
A wide range of conversion technologies are now in different stages of maturity. Hydrotreated vegetable oils (HVO) produced from animal fats and used cooking oils for instance are already commercial today. However, their future capacity growth is capped within the REDII to 1.7% of final energy demand in transport in 2030. REDII also defines a 3.5% share of advanced biofuels from biomass listed in Annex X part A. This list includes, next to lignocellulosic feedstock, residues and wastes that can be fermented to produce biogas. The anaerobic digestion technology is already for commercial use and biogas is already used in transport in some of the member states. This technology can easily play a role in achieving the obligations by 2030 – provided that the car fleet that can run on biogas and bio-LNG is present. Lignocellulosic ethanol is close to commercialisation. There are several first-of-a-kind plants using agricultural residues as feedstock. The shutdown of Beta Renewables in Italy has been an unfortunate event, but there seem to be new plans to build lignocellulosic ethanol plants in Europe for instance in Romania and Slovakia. While gasification technology lags behind in relation to advanced ethanol, it is a matter of scaling-up and reducing the perceived risks of this technology. In the Transport White Paper (EC 2011), the European Commission sets out two targets: 1) a 20% GHG emission reduction from 2008 levels by 2030 and 2) a 60% reduction from 1990 levels by 2050. While this target has its origin in limiting the global warming to no more than 2°C above pre-industrial levels a more ambitious target was adopted through the 2015 Paris Agreement that refers to a 1.5°C target, which have implications for all sectors, including transport. Scenarios aiming to further reduce GHG emission in the transport sector may result in the need for different deployment pathways. ADVANCEFUEL project will analyse such scenarios and inform policy-makers and the public.

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