ADVANCE FUEL

Removing Barriers to Advanced Renewable Fuels

Context

The use of advanced renewable fuels (RESfuels) will need to grow significantly over the next decades to reduce EU transport sector GHG emissions. In order to achieve this, a substantial amount of sustainable feedstocks will need to be mobilised along with the deployment of conversion technologies.

This factsheet reviews the key barriers and proposes solutions to help secure the market uptake and commercial development of RESfuels.

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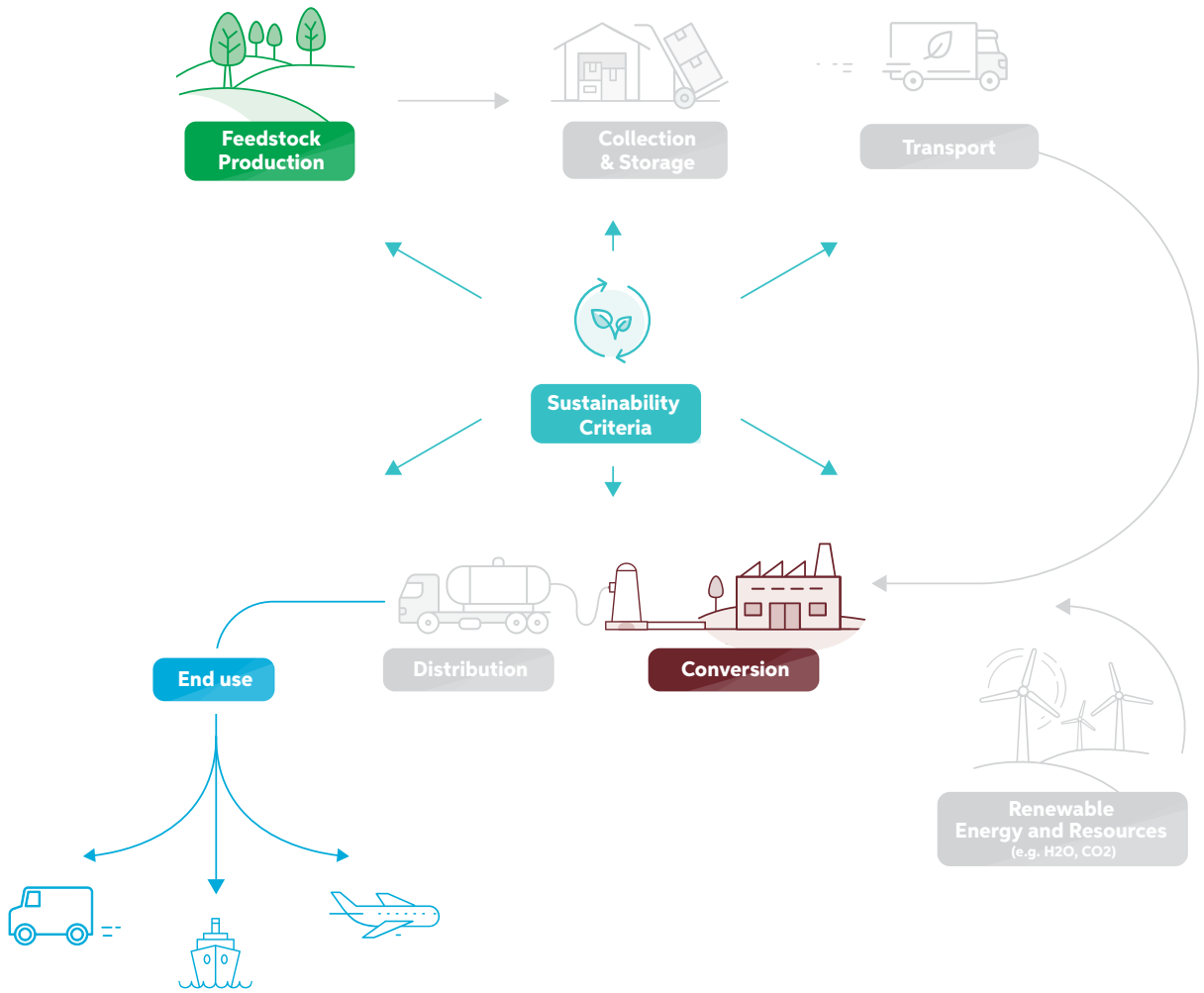

- Lack of clarity about environmental constraints and land availability
- High cost of feedstock

- Consider location specific biophysical characteristics which steer environmental constrains
- The use of marginal land to increase available land for lignocellulosic energy crops production

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TYPE OF BARRIER	BARRIER	ADVANCEFUEL SOLUTIONS AND EVIDENCE
LIGNOCELLULOSIC FEEDSTOCK SUPPLY		
ENVIRONMENTAL	Lack of clarity about environmental constraints and land availability	**Lignocellulosic crops on marginal land** Sustainable land use for dedicated biomass production is an essential element for resource efficient advanced fuel value chains. A spatial explicit approach that assesses the current and future availability of marginal land under RED II sustainability criteria, and land-use change related environmental impacts from lignocellulosic energy crops production on these lands provides valuable evidence for Europe to prioritise planting lignocellulosic crops on marginal land. ADVANCEFUEL's assessment covers current/future land availability, biomass potentials and environmental impacts of lignocellulosic energy crops cultivated on marginal lands in Europe for 2030, 2040 and 2050. See ADVANCEFUEL report D 4.3
ECONOMIC	High cost of feedstock	**Cost efficient lignocellulosic feedstock availability, market status and suitability for RESfuels** Learning effects of innovations, i.e. breeding and selection of new genotypes as well as improved agricultural management and logistics, knowledge exchange and training, have greater potential to increase biomass yields and reduce biomass production costs. ADVANCEFUEL analysed the potential availability of non-food biomass from forests and agriculture to determine key factors including the availability of land (marginal lands) and constraints (sustainable removal rate, competing uses etc.). Furthermore, up-to-date lignocellulosic biomass extra-EU import scenarios have been assessed. See ADVANCEFUEL report D2.1 **Innovative crop rotation schemes** ADVANCEFUEL analysed innovation in cropping schemes assessing fields of innovation in cropping lignocellulosic energy crops and evaluating these innovations. The evaluation focuses on: (a) the potential of these innovations to reduce biomass production costs, (b) the environmental impact of growing such crops, and (c) the willingness of farmers to grow lignocellulosic energy crops and public acceptance regarding post implementation of new cropping schemes. Crop rotation increases yield and, hence, decreases biomass production costs, and at the same time have potentially positive effects on environmental (e.g. erosion, soil fertility, soil organic carbon) and social impacts (e.g. jobs, environmental values). See ADVANCEFUEL report D2.2

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Conversion

- **Absence of policy support and finance**
- **Concerns on stability of the industry due to financial risks**

- **Supportive policy framework and instruments**
- **Symbiosis with current infrastructure**
- **Further technical learning to reduce production costs requires significant ramp-up of installed capacities**

CONVERSION		
REGULATORY/ ECONOMIC	Absence of dedicated policy support and access to project finance	**Recommendations for policy support tailored to the conversion technology type** Significantly high targets must be introduced within the time frame 2030-2050 and combined by policy instruments that can help bridge the financial gap between RESfuels and fossil fuels. The commercialisation of RESfuels requires a series of steps for further development and innovations as well as clear and long-term policy measures. ADVANCEFUEL identified the required actions – such as introducing policy measures - for the development of RESfuels production technologies in order to increase their TRL levels. See ADVANCEFUEL report D3.3
REGULATORY	Concerns on stability/security of the industry	**Symbiosis with current infrastructure** Using existing fossil fuel infrastructures to incorporate biomass has been found to constitute a low-risk option for ramping up renewable fuels in the EU. ADVANCEFUEL analysed key European fossil-fuel infrastructures which can facilitate the ramp-up of biomass use. See ADVANCEFUEL report D3.4

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SUSTAINABILITY OF BIOMASS SUPPLY		
REGULATORY/ ENVIRONMENTAL	Lack of harmonised regulations	**Clarity for sustainability requirements** Sustainability criteria for biofuels will need to be harmonised and implemented for all uses. Further social sustainability criteria is recommended to be included. ADVANCEFUEL and stakeholders assessed the sustainability requirements in voluntary schemes that are recognised by the European Commission and national initiatives used to certify sustainable biofuels used in transport. See ADVANCEFUEL report 4.1 **Sustainability criteria & certification for lignocellulosic biorefineries** Harmonising sustainability criteria of voluntary schemes focusing on RESfuels is essential. ADVANCEFUEL assessed current/future sustainable production of RESfuels against sustainability criteria, including harmonisation of national standards, certification schemes and sustainability initiatives for stimulating sustainable production of RESfuels, and national guidance on sustainability reporting required for economic operators and sustainability criteria related to feedstock production and land use, methods and data collection to calculate GHG emissions, chain of custody and social & economic criteria. See ADVANCEFUEL report D4.2

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End use

- **Absence of structural mechanism to bridge the price gap between renewable and fossil-based fuels**
- **High production cost of RESfuels**

- **Stable investment climate enabled by policy frameworks, feed-in tariffs, reduction of financial valorisation up to penalisation of fossil fuels**
- **Reduction of capital and operational expenditures via technical learning and using current infrastructure**

TYPE OF BARRIER	BARRIER	ADVANCEFUEL SOLUTIONS AND EVIDENCE
END-USE		
REGULATORY	Absence of structural mechanism to bridge the price gap between renewable and fossil-based fuels	**Stable investment climate enabled by policy frameworks and feed-in tariffs** A combination of policy instruments, such as quota obligation combined with feed-in premiums, can provide a stable investment climate and help bridging the gap. ADVANCEFUEL reviewed existing policies and illustrated that respective countries and regions are actively implementing sustainability provisions and have national mandates and targets in place to support the growth of advanced biofuels. However, their market shares are at different scales and countries need to introduce new financial and provisional measures to build and sustain their national capacities. See ADVANCEFUEL report D5.2
ECONOMIC	High production cost of RESfuels	**Reduction of CAPEX and OPEX** Reduction in conversion technologies' capital expenditures (CAPEX) via learning will help reducing the production costs only with a significant increase in installed capacities (e.g., 20%-40% reduction. Next to that, using existing infrastructure can further reduce both CAPEX and OPEX. ADVANCEFUEL analysed biomass conversion technologies with respect to their basic characteristics for feed, process conditions and output products based on qualitative and quantitative information. Special attention was paid to TRL and cost related KPIs (OPEX and CAPEX) of biofuels for road, aviation and maritime transport. See ADVANCEFUEL report D3.5 See ADVANCEFUEL report D3.4

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Conclusion

- To reduce pressure on the lignocellulosic feedstock markets that are largely supplied from forest biomass sources and agricultural residues, growing energy crops on marginal land will require major policy efforts, infrastructure, farming experience, and regulatory compliance and support, as they are more expensive compared to other supply options.

- Policies could prioritise biomass supply to the sectors with few alternatives for decarbonisation, including the transport sector, at the expense of other sectors that have good alternatives such as electricity generation. Such prioritisation could (to some degree) reduce the pressure on lignocellulosic feedstock markets.

- The cost reduction in RESfuels technologies depends on the large-scale deployment of RES fuels (i.e., via technology learning) and effective symbiosis with current infrastructure.

- The capacity expansion needed will happen only when there is strong and stable policy support over a longer period to gain confidence of the relevant stakeholders and to ensure that significant amounts of RESfuels are deployed.

- Shifting RESfuels to the sectors that will need them most – aviation and maritime – requires dedicated policy support.

- Both maritime and aviation sectors have adopted RESfuels as key solutions for their future decarbonisation and have been engaged actively in research, innovation and commercial activities. The unprecedent COVID-19 crisis however is expected to restrict ability of private funding and necessitates prioritisation of public funds towards green aviation and maritime systems.

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