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Getting SAF off the ground

Accelerating the deployment of advanced sustainable aviation fuels in the European Union

BACKGROUND

The EU's ReFuelEU Aviation Regulation sets binding targets for the use of sustainable aviation fuel (SAF), with the share of SAF rising from 2% in 2025 to 70% by 2050. Within the targets, a dedicated sub-mandate for synthetic fuels has a minimum requirement of 0.7% in 2030, increasing to 35% by 2050. Synthetic fuels include those from renewable hydrogen and its derivatives, such as e-kerosene.

Today's SAF market is dominated by first-generation HEFA fuels from waste oils and fats—feedstocks that are in limited supply and carry sustainability risks. Meeting ReFuelEU's targets will require widespread deployment of next-generation, or "advanced," SAF: fuels that rely on emerging technologies and scalable, non-food feedstocks. This includes second-generation biofuels from solid waste or cellulosic feedstocks and synthetic e-kerosene produced with renewable electricity.

The future of ReFuelEU is at risk if such emerging advanced fuel technologies fail to scale up. Second-generation bio-SAF and e-kerosene production has yet to reach commercial scale, and without adequate production capacity developed in the near term, it is uncertain whether the mandates will be met.

New ICCT research analyzes current barriers to commercial-scale deployment of these advanced fuels and identifies ways that current policy frameworks could be made more effective. Some of these policy suggestions could be adopted in the European Commission's upcoming Sustainable Transport Investment Plan, which aims to provide measures supporting renewable fuels for aviation.

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BARRIERS TO SAF DEPLOYMENT IN THE EUROPEAN UNION

Based on a survey of industry officials from technology providers and advanced SAF project developers, the ReFuelEU regulation serves as an effective signal that a regulated market for advanced fuels will exist within the European Union. However, the feedback also suggests that current policy measures do not fully address challenges faced by "first mover" facilities which will necessarily produce fuels at a high cost for a market that does not yet exist. Specifically, it appears that ReFuelEU SAF mandates are not sufficient to establish the bankability of advanced SAF projects.

Survey participants identified three barriers that are hindering the commercialization of advanced SAF technologies:

High capital costs: Capital costs for construction of advanced fuel facilities remain high, and production costs are expected to substantially exceed those of fossil jet fuel for at least the next 5–10 years. High capital costs mean that most projects depend on risk-averse debt financing, and respondents identified risk mitigation as a significant gap in current policies.

First-of-a-kind technology deployment: Despite technological progress, advanced fuel facilities remain unproven at scale, causing additional barriers to facility deployment. The perception that advanced SAF projects carry significant risk impedes investment in pre-construction engineering studies needed to move projects towards construction.

Offtake and price uncertainty: While EU mandates ensure future demand for SAF, uncertainty about the market price of advanced fuel remains a barrier to investment. Airlines may be unwilling to sign binding contracts at the current market price if they worry market prices will drop in the future. In addition, due to the perceived volatility of the aviation industry, even binding agreements with airlines may not secure financing.

The EU Emissions Trading System contains a mechanism setting aside allowances to bridge the airlines' price gap between fossil fuels and SAF. However, this scheme risks disproportionately benefitting mature HEFA rather than enabling investments in advanced SAF production. Moreover, these funds could be exhausted before the synthetic fuel mandate comes into effect. Even if the ETS aviation allowances were limited to advanced SAF purchases, they could still fall short of enabling investment in advanced SAF production. This is largely an issue of timing: project funding is often required years before the start of fuel production, but under the current framework, ETS aviation allowances can only be claimed by airlines after the use of fuel.

ESTABLISHING REVENUE CERTAINTY FOR ADVANCED FUEL PROJECTS

To address uncertainty about the future price of advanced fuels—identified as a barrier to commercialization—policymakers could consider establishing a revenue certainty mechanism for an initial wave of advanced fuel projects. A mechanism that guarantees an offtake price at an early stage of project development could reduce financial risk for all parties. The EU ETS could be leveraged as a source of funding to support such a mechanism.

The European Union could consider a policy similar to the revenue certainty mechanism instituted in the United Kingdom. Under the UK's general strike price (GSP) mechanism, fuel producers will enter an agreement with a government counterparty on a target sale price per unit of fuel, called the "strike price." Should sale prices fall below

the strike price, the counterparty would fund the difference. If sale prices exceed the strike price, the counterparty would be paid the excess revenue. The counterparty will be funded by a variable levy on aviation fuel suppliers. Not only could the GSP increase revenue certainty for alternative aviation fuel projects by making partial debt-financing available, it could also reduce the rate of return required by equity investors, lowering the overall cost of fuel to consumers.

ADDITIONAL POLICY CONSIDERATIONS

In addition to establishing a revenue certainty mechanism, the European Commission could consider the following policy actions to support the scale-up of emerging advanced SAF technologies and ensure that enough compliant fuel is available to meet ReFuelEU targets:

- **Reassess the scheme in the ETS that dedicates allowances to covering part of the price of SAF for airlines**. Policies to consider include placing limits on the annual disbursement of allowances to ensure that some are available in or after 2030 when the synthetic fuels target comes into effect, capping the amount of reimbursements allocated to HEFA, or excluding HEFA altogether.
- **Consider targeted support for synthetic fuels projects currently under development.** Given the limited time before the synthetic fuel sub-mandate goes into effect, immediate, targeted support may be required if ETS allowance revisions and a revenue certainty mechanism cannot be immediately deployed. For example, a synthetic fuel-specific round of Innovation Fund support could be a stopgap measure.
- **Reaffirm the synthetic fuel sub-mandate and disclose details of penalty administration.** Incumbent jet fuel providers—the obligated parties under ReFuelEU—have financial capacity and expertise in project development but have so far committed only limited resources to the deployment of advanced fuel facilities. Reaffirming the legislated ReFuelEU synthetic fuel sub-mandate could motivate obligated fuel providers to secure access to qualifying synthetic fuels rather than face penalties.

PUBLICATION DETAILS

Title: Industry perspectives on advanced sustainable aviation fuel: What barriers remain for these technologies to scale?

Download: theicct.org/publication/saf-what-barriers-remain-for-these-technologies-to-scale-jul25

Title: Staying aloft – Support mechanisms for 'sustainable aviation fuels' in the United Kingdom and European Union

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