

Sustainable aviation fuel

Prospects for forest-based fuels

June 2024



Sustainable Aviation Fuel (SAF) demand is surging with efforts to decarbonize aviation. This study projects SAF demand through 2030, details capacity growth by region and technology, and considers the implications for forest biomass demand. It looks at raw material availability for SAF, with a focus on forest biomass. Three case studies highlight the challenges that SAF project developers face, in raw material sourcing, technology, construction and finance.

Contents

1. Demand drivers

- Aviation decarbonization and the role of SAF
- Airline SAF commitments and consumer demands
- Government regulations and support for SAF
- Forecast SAF demand to 2030 by region

2. Production technology

- Overview of the main SAF production pathways
- HEFA; Alcohol-to-Jet; Fischer-Tropsch; Power-to-Liquid
- Raw material requirements and yields
- Production costs and future outlook

3. Project pipeline

- Announced capacity to 2030 by pathway and status
- Overview of leading producers today and projected
- Offtake agreements between producers and airlines
- Production shifts from road and marine biofuels

4. Raw materials

- Evolution of SAF raw material mix
- Projected forest biomass demand for SAF
- Forest biomass supply globally and by region
- Forest biomass supply potential and cost in the US

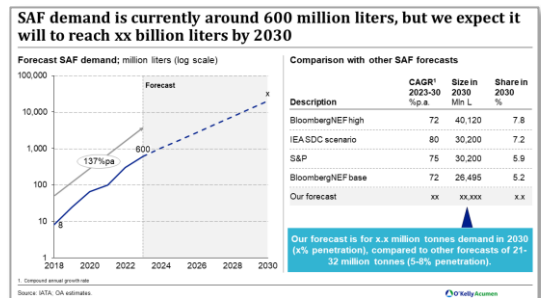
5. Case studies – SAF producers using forest biomass¹

- Learnings: common hurdles for and how to address
- Company overview; facilities, technology, raw materials
- Company evolution, challenges and success factors

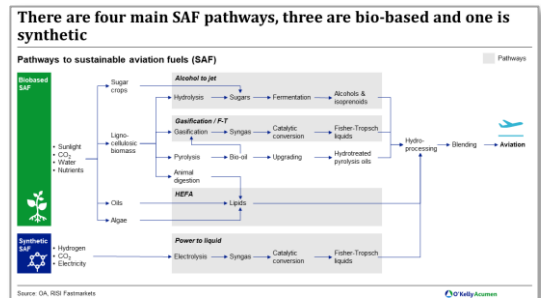
1. Fulcrum BioEnergy, Red Rock/NXTClean Fuels, DG Fuels

Example exhibits

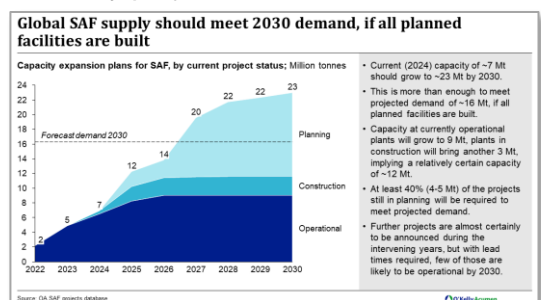
SAF demand forecast to 2030, compared with other analysts' forecasts



SAF production pathways and raw material requirements



Announced SAF capacity expansion to 2030, by project status



Questions the report helps answer

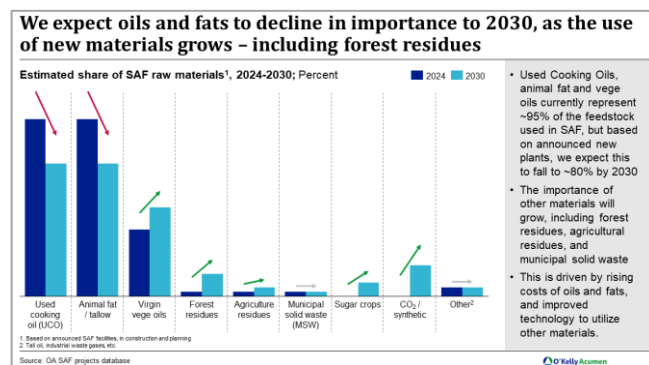
- How will SAF demand grow to 2030
- What are key demand drivers, uncertainties and range of demand forecasts?
- How can SAF be made?
- How will production costs evolve?
- What is the capacity expansion pipeline?
- Who are the leading producers?
- What airline off-take agreements exist?
- How will the raw material mix evolve?
- How much forest biomass will be required?
- What is forest biomass supply potential and cost? How can it be sourced?
- What challenges do SAF project developers face, and what can be done differently?

Who the report is most relevant for

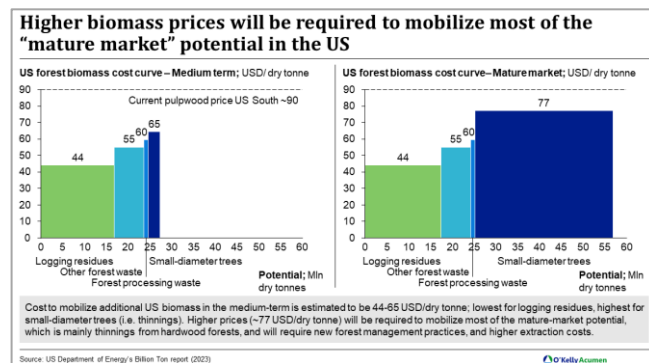
- SAF project developers
- Airlines and other SAF buyers
- SAF technology suppliers
- Forest biomass suppliers; forest owners, sawmill and pulp mill operators
- Competing raw material consumers; pulp, panel, pellet, bioenergy sectors
- Investors in forest and forest industry assets
- Analysts, consultants, financial institutions and industry associations

Example exhibits

SAF raw material mix today and 2030 expected



US forest biomass potential cost curves



Overview of SAF producer case studies

We studied three SAF projects that will use forest biomass through the F-T pathway

Summary of case studies - SAF producers using Fischer-Tropsch / Gasification

	Fulcrum BioEnergy	Red Rock Biofuels ¹	DG Fuels
Status	Operational	Construction	Planning
	One plant operational, three in planning phase.	First plant in construction, following bankruptcy and new owner.	Two plants in planning phase.
Plants	Reno, Nevada, US Gary, Indiana, US Gulf coast, US Ellesmere Port, Cheshire, UK	Lakeview, Oregon, US	St. James, Louisiana, US Aroostook, Maine, US
2030 SAF capacity (ktyr)	300	0 No longer expected to make SAF initially	1,075
Other products	Biodiesel	Biodiesel, renewable natural gas, hydrogen	Biodiesel
Raw materials	Municipal solid waste (MSW)	Forest residues	Woodwaste, sugarcane bagasse
Partners and offtakes	United Airlines, Essar	FedEx, Southwest Airlines, Velocys	Air France-KLM, Airbus

1. Now owned by BCT/Deer Park
SOURCE: Company websites; Phos

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- Access to some ppt slides can be discussed

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