Technology and Costs

Biorenewable Insights: Sustainable Aviation Fuel (SAF)

Sustainable Aviation Fuel (SAF) is one in a series of reports published as part of NexantECA's 2021 Biorenewable Insights program.

Overview

Global aviation generates approximately two percent of global greenhouse gas (GHG) emissions, and this is expected to increase over the next few decades. However, the aviation industry has limited alternatives to conventional jet fuel to lower its carbon footprint. At present, electrification is only viable for smaller aircrafts (i.e., up to 10 passengers), while hydrogen-fueled planes would require significant investments in new infrastructure. Thus, a solution acceptable to the industry must be compatible with existing infrastructure, and SAF fits this criterion well. Currently, SAF is blended with conventional jet fuel at levels less than or equal to 50/50 by volume.

Despite the global destruction of jet fuel demand due to the COVID-19 pandemic, the aviation industry is anticipated to pick up, albeit at a slower pace in the near term. During this recovery period, the aviation industry is expected to undergo major changes, driven by initiatives from both government and industry stakeholders. For instance, several countries in Europe such as Norway, France and Sweden have started introducing SAF mandates in recent years. As such, the importance of SAF is expected to continue growing over the longer term. Additionally the valuable credits from programs such as California's LCFS incentivize low carbon intensity fuels and is helping to drive major expansions in HVO capacity.

This report aims to answer the following strategic questions:

- What are the major existing technologies for SAF production? Who are the key technology holders? What are some of the developing or alternative technologies?
- Are these existing and developing SAF technologies competitive in terms of costs relative to fossil-based fuel?
- What is the current global capacity, and which announced projects are likely to materialize?

Technologies

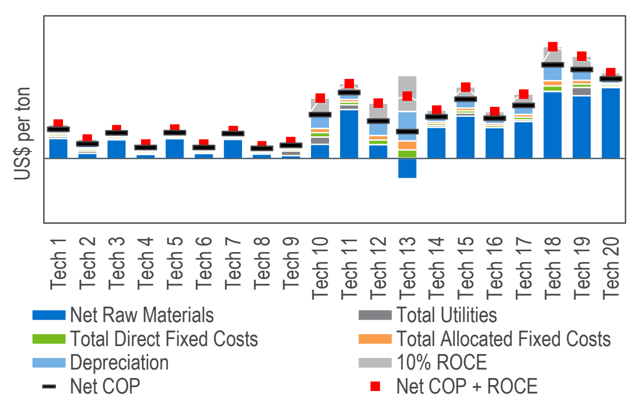
This report covers existing technology routes as per ASTM D7566:

- Hydroprocessing of fatty acids and esters (HEFA)
- Alcohol-to-jet (ATJ)
- Syngas-to-jet
- Synthetic iso-paraffin from fermented hydroprocessed sugar (SIP)
- Catalytic hydrothermolysis
- Hydrocarbon-hydroprocessed esters and fatty acids (HC-HEFA SPK)

Additionally, other emerging routes such as aqueous phase reforming (APR), power-to-liquid (PtL), pyrolysis, acid hydrolysis, etc. have also been included.

Process Economics

Estimates of overall competitiveness for various leading technologies are presented for five locations (US, Brazil, Western Europe, Southeast Asia, China). Regional pricing is set on a Q1 2021 basis. All major routes to SAF are included, with reference to specific technology developers if applicable.



Commercial Impact

This report covers existing SAF capacity and includes a risk-adjusted capacity list, which considers the likelihood of success of announced capacity additions in light of recent business developments. The report also examines the key success factors to increase SAF deployment.

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Capacity tables of plants and analysis of announced capacities

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Cost of production tables in spreadsheet format (as requested)

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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