



Future of Biofuels, October 2023, Copenhagen

PureSAFSM – A Renewable Hydrocarbon Platform

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Delivering Solutions, Changing the World.SM

KBR at a Glance



\$6.6 B



Revenue
Full year 2022



Houston

Texas, USA

Headquarters

KBR delivers science, technology and engineering solutions to governments and companies around the world.

Drawing from its rich 100-year history and culture of innovation and mission focus, KBR creates sustainable value by helping clients meet their most pressing challenges today and into the future.

Employees

Global Presence

~32,000



80+
Countries

We Deliver
NET ZERO

KBR Energy Transition



KBR has extensive experience in the following traditional sectors:



ONSHORE



OFFSHORE



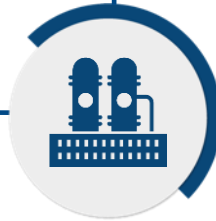
LNG



FLOATING



REFINING



PETROCHEMICAL

KBR are supplementing this activity by increasing involvement in the following sectors:



BLUE / GREEN AMMONIA



HYDROGEN



CCUS



DECARBONIZATION OF EXISTING ASSETS



RENEWABLES & INTERGRATION



RENEWABLE BIOFUELS



CIRCULAR ECONOMY

K-Green™, end-to-end green ammonia solution

Commercial-scale, proven blue ammonia solutions

Extensive H2 expertise incl NASA

Technology Expertise in Green and Blue H2 and H2 Liquefaction

Breadth of licensor and full value chain Know-How

Designed and delivered the world's largest carbon sequestration project

Proprietary software tools to monitor, optimize and reduce emissions

Design solutions to improve energy efficiency

Automated Tools, to drive efficiency in repetitive designs

Industry leading Project and Program Management

Developing and designing innovative biofuel solutions for clients

Global experience with start-ups to established players

Exclusive licensing partner for MURA proprietary plastics recycling technology.

Technology and Know How to enable the plastic circular economy

Delivering a cleaner, greener future with KBR energy transition *expertise* and *proprietary technologies*

Opportunity



SAF market is expected to be worth more than \$15 billion USD by 2030.



Exponential capacity ramp-up toward 30 Billion litres (globally) by 2030.



Projected demand for about 2.6 million tonnes of SAF in Europe.



Feedstock availability



Sustainability in SAF (today → future)



Product quality



SAF pricing

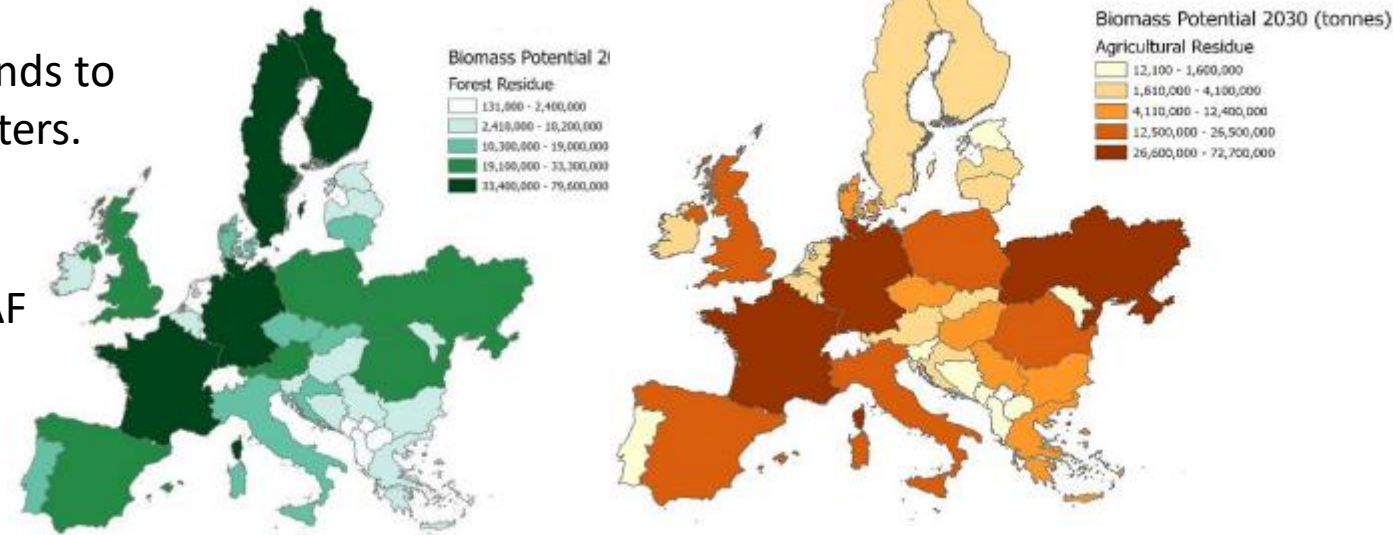
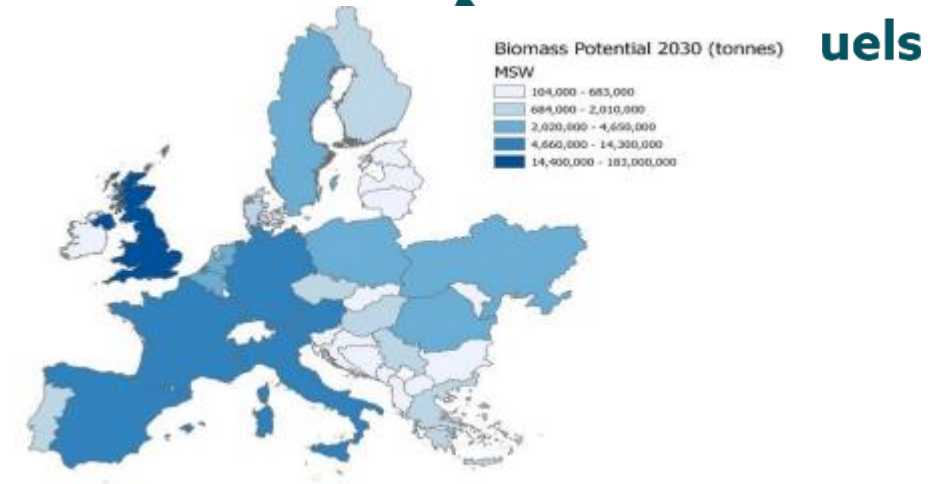


Potential Barriers

How To Meet SAF Production Capacity To Meet the 2030 Goal?

2.6 million tons of SAF required to meet the 2030 goal

- Considering feedstock availability and technology readiness, >60% of the European SAF supply in 2030 could be covered by HEFA and Alcohol-to-Jet pathway fuels
- Bio-Ethanol domestic production capacity corresponds to 5.7 billion Liters and imports of approx. 2.2 billion liters.
- Capitalizing on existing infrastructure to scale-up SAF production.



Source: EASA report 2022, ePure 2022, NLR, report 2021

Advanced Alcohol-to-Jet (ATJ-SKA) pathway by Swedish Biofuels with potential to achieve 100 % replacement of fossil jet fuel

Jet biofuel type	ATJ-SPK (isobutanol)	ATJ-SPK (ethanol)	ATJ-SKA (C2-C5 alcohols)
Year of certification	2016	2018	Ongoing, expected 2023
Blending rate	Max 50%	Max 50%	Max 50% (100% expected as second step)
Feedstock	Isobutanol from various feedstocks	Ethanol from various feedstocks	Mixed alcohols from various feedstocks

- 7 pathways certified to date (advanced ATJ (ATJ-SKA) in pipeline).
- Certain certified pathways are limited by availability of feedstock.
- Certain pathways are energy intensive having lower selectivity towards SAF.
- **Advance ATJ technology is not restricted by feedstock**, giving it the widest range of feedstock available.
- **Transition from renewable feed to efuels.**

Source: ASTM D7566-18



Develop: Swedish Biofuels

- Technology owner and developer with expertise in fundamental research
- 20+ Years of R&D activities developing sustainable biofuels
- Continuous pilot operation for over 55 000 operating hours

License: KBR

- Global Licensing Alliance
- Leverages KBR's expertise
- Scale Up and Delivery
- De-risks investment
- Lower cost of capital

PureSAFSM Technology Platform Overview



Feedstock



Agriculture waste



Lignocellulosic waste



MSW



Biogas/waste gases

Intermediate processing facility

Fermentation unit



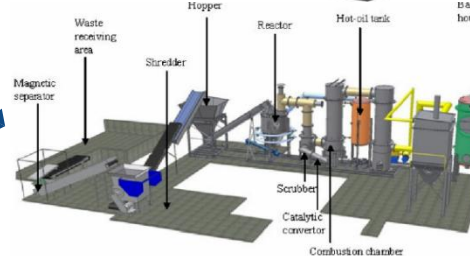
Biogenic CO₂

Green H₂

Ethanol/
Mix Alcohols

PureSAFSM

SAF



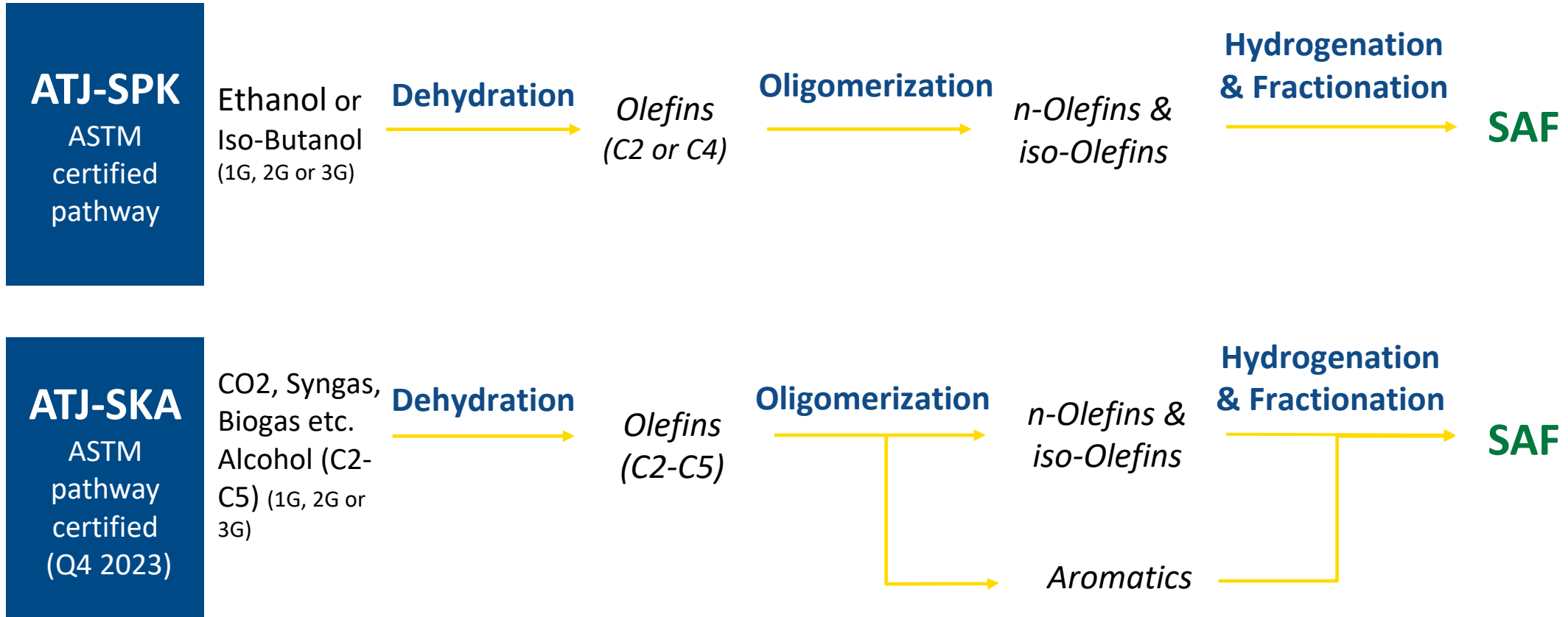
Syngas

Gasification unit

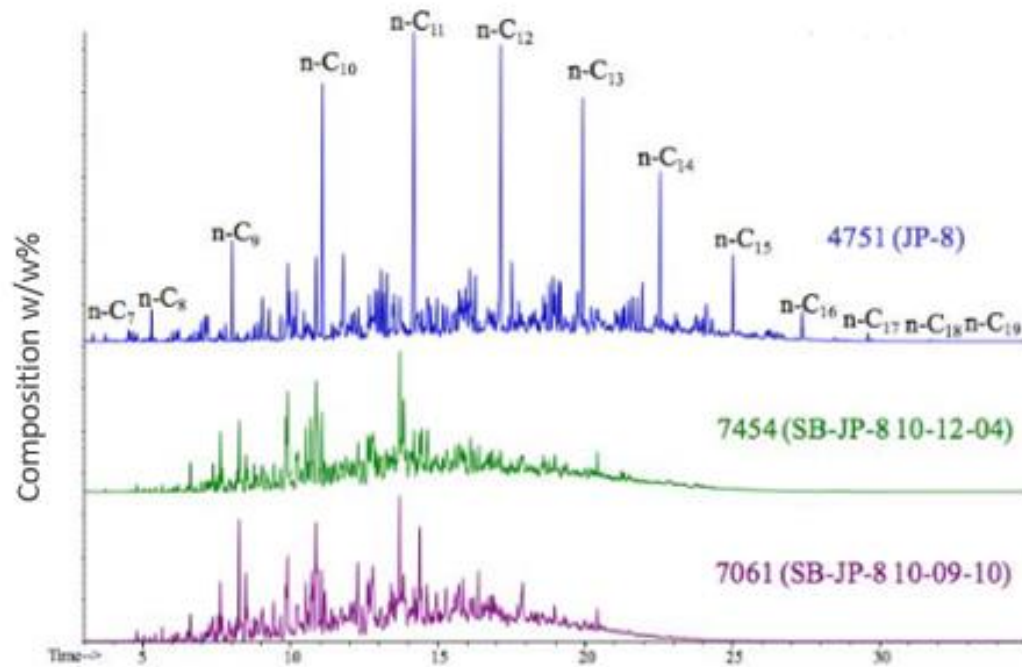
Biogenic CO₂ can also come from other industrial facilities e.g., CHP plants, and bio-carbon plants.

PureSAFSM - Unique feed flexibility offers high integration possibilities with existing downstream energy parks

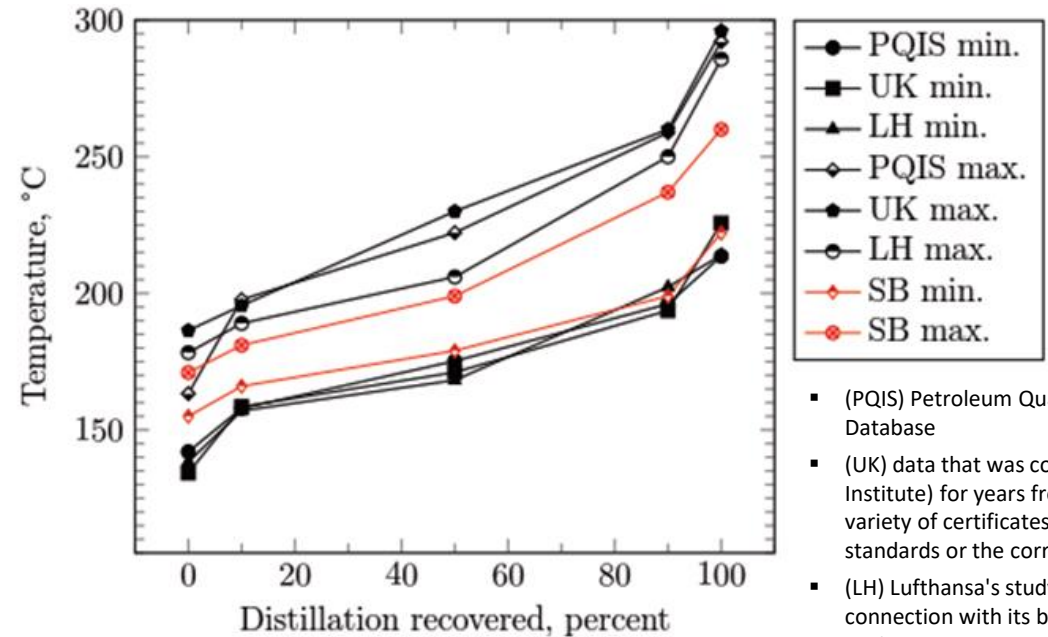
PureSAFSM achieves 100% drop in SAF



PureSAFSM closely resembles conventional petroleum-based jet fuel thanks to a more even distribution of hydrocarbon species and distillation in the final product



JP-8: Fossil Jet fuel, SB-JP-8: Swedish Biofuels fuel



ASTM D86 boiling range data, minimum and maximum values.

- (PQIS) Petroleum Quality Information System Database
- (UK) data that was compiled by the EI (Energy Institute) for years from 2009-2013 from a variety of certificates that used either ASTM standards or the corresponding IP standards.
- (LH) Lufthansa's study at German airports in connection with its burnFAIR HEFA in-flight evaluation program in 2012/2013.
- (SB) Swedish Biofuels data

Data of Swedish Biofuels fuel produced by Wright-Patterson USAF. Public release approved by DARPA

Why PureSAFSM

Ability to process a **variety of feedstocks**



Shows credible pathway to **Net Zero**



100% sustainable fuel with or without aromatics



Attractive IRR and **High integration possibilities**





Thank you!

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