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Welcome to our webinar

Methanol-to-Jet Opportunities and Challenges for SAF

Potential and limitations of Methanol-to-Jet vs Fischer-Tropsch pathways to produce eSAF in a global supply chain

Webinar Starting	26th Day	June Month	2025 Year	3:00 p.m. CET

Webinar agenda

5 min
Welcome by our CEO

25 min
Keynote Presentation

- Methanol-to-Jet (MtJ) and Fischer-Tropsch (FT) technology characteristics and project dynamics
- MtJ and FT value chain flexibility, including supply chain setup and pathway flexibility and the levelized cost of jet fuel (LCOJ)

30 min
Panel Discussion

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ABOUT HINICIO

Hans Kulenkampff
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About Hinicio

- Consulting firm specialized in the decarbonization challenges of hard-to-abate sectors with almost **20 years experience in hydrogen and its derivatives.**
- Our multidisciplinary team combines **engineering excellence, market insight, and regulatory expertise** across every engagement.
- We work with most of the **main O&G majors and H2 & SAF OEMs** and project developers.

The climate clock is ticking, and we are committed to delivering **the right actions, in the right sectors, at the right time—now**.

Sustainable Transport
- Shipping and Bunkering
- Material-Handling Equipment
- Off-Road Mobility
- Heavy Duty Mobility

Sustainable Aviation
- BioSAF / eSAF
- HVO/HEFA
- CCU

Sustainable (Process) Industry
- Hydrogen and Refineries
- Ammonia/Fertilizers
- Methanol
- Cement/Steel

Our Solution-Verticals

- **Policy & Regulation**
- **Engineering & Digital Solutions**
- **Investment & M&A**
- **Market & Off-Take**

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Methanol-to-Jet Opportunities and Challenges for SAF

Technical Characteristics & Project Dynamics

Louis-Philippe Lammertyn

Head of Sustainable Aviation Fuels

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Martin Chapuis

Senior Consultant

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There are many competing ways to produce SAF: from mature HEFA to upcoming eSAF MtJ & FT

Cost / t SAF (- to +)

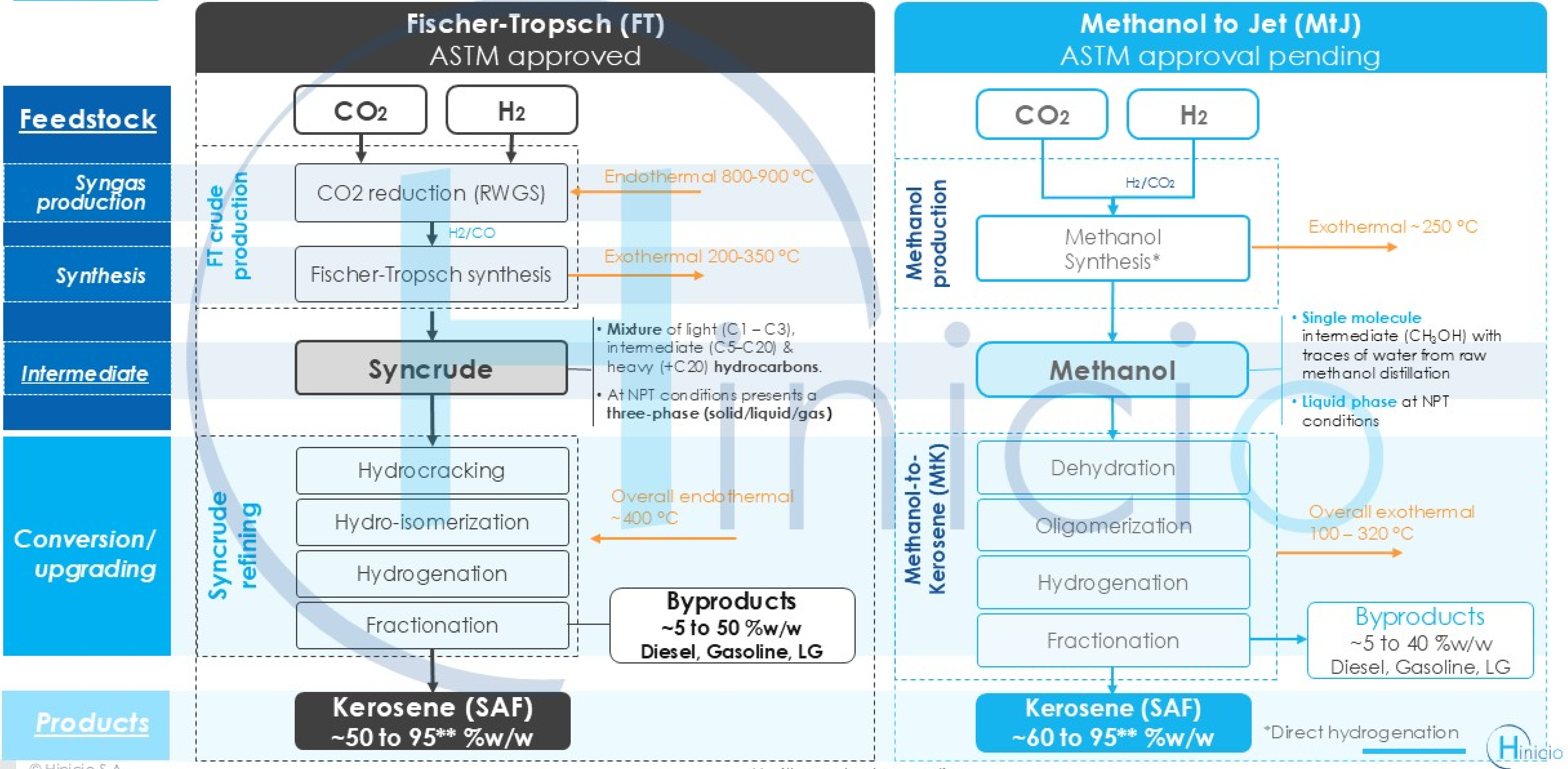
Route	Process	Abbreviation	ASTM	Feedstock
Oleo-chemicals	▶ Synthesized paraffinic kerosene from hydro-processed esters and fatty acids+	HEFA SPK	Recognized	Waste oil
	▶ Co-hydroprocessing of esters and fatty acids in a conventional petroleum refinery	Co-processed HEFA	Recognized	Waste oil
	▶ Catalytic hydrothermolysis jet fuel	CHJ	Recognized	Waste oil
	▶ Synthesized paraffinic kerosene from hydrocarbon-hydroprocessed esters and fatty acids	HC-HEFA SPK	Recognized	Algae
Thermo-chemical	▶ Fischer-Tropsch hydroprocessed synthesized paraffinic kerosene	FT SPK	Recognized	Biomass
	▶ Synthesized kerosene with aromatics derived by alkylation of light aromatics from non-petroleum sources	FTSPK/A	Recognized	Biomass
	▶ Co-hydroprocessing of Fischer-Tropsch hydrocarbons in a conventional petroleum refinery	Co-processed FT	Recognized	Biomass
Bio-chemical	▶ Alcohol to jet synthetic paraffinic kerosene	AJT	Recognized	Biomass
	▶ Synthesized iso-paraffins from hydro-processed fermented sugars	SIP	Recognized	Biomass
Power to Liquids	▶ Synthesized kerosene from hydrogen produced through water electrolysis and CO2 (or co-electrolysis of H2O and CO2) and FT	eSAF FT	Recognized	Electricity **(hydrogen)**
	▶ Synthesized kerosene from hydrogen produced through water electrolysis and CO2 (or co-electrolysis of water and CO2) and Me-OH-to-Jet	eSAF MeOH-to-Jet	Under approval	Electricity **(hydrogen)**

Source: Hinicio analysis

Non-exhaustive list. More pathways coming, including combinations of pathways e.g. Green H2 injection in BioSAF FT or MSW

-> Unclarity about eSAF co-processing & eHEFA pathways

Pathway comparison - MtJ offers higher selectivity, but FT remains the approved standard



**with products recycling

MtJ vs FT – characteristics comparison

Target product (eSAF) yields is the most relevant parameter to define renewable H_2 and energy demands

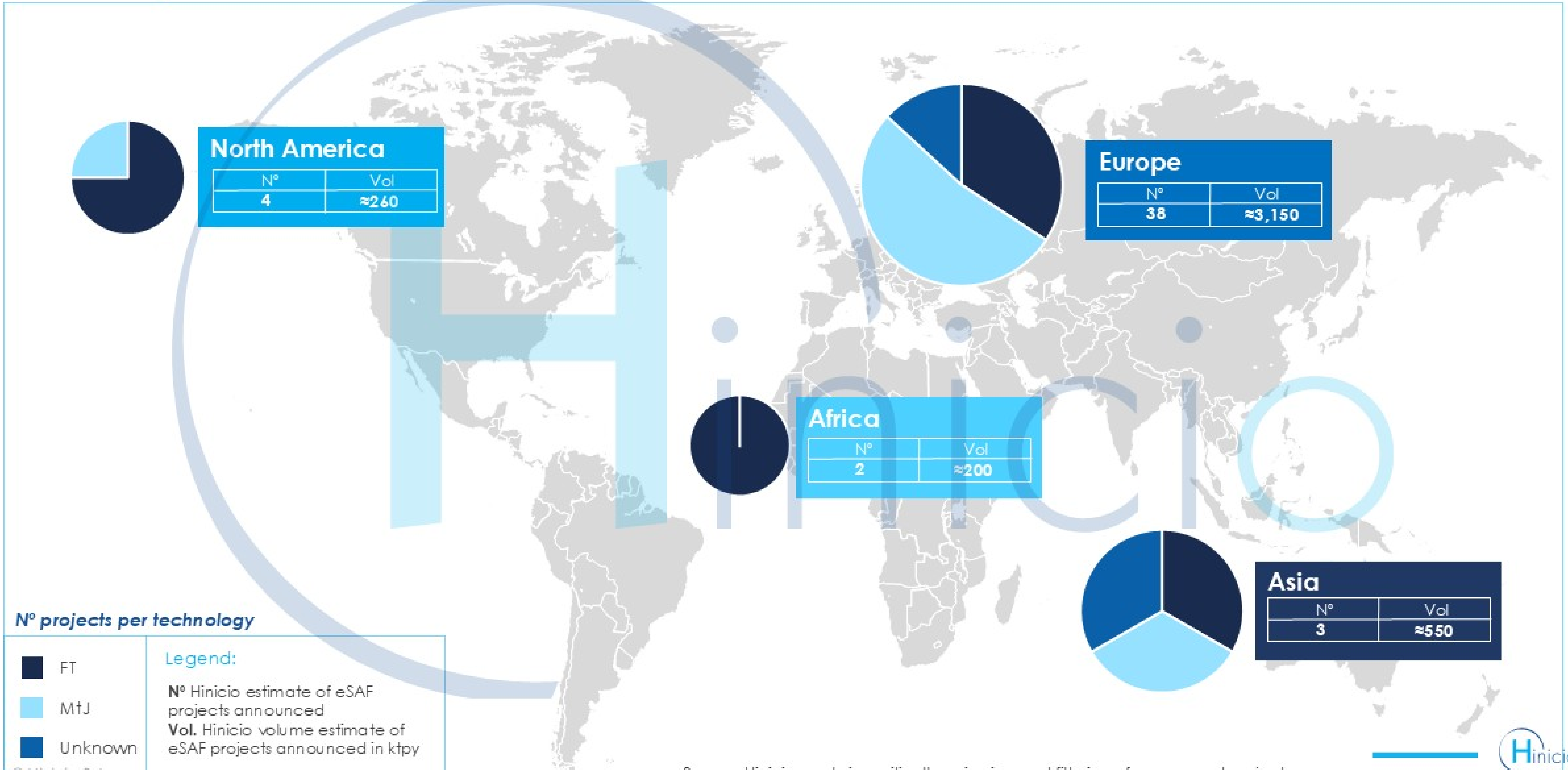
Parameter	Unit	Fischer-Tropsch pathway	Methanol-to-Jet pathway
Current scale	Scale (Start-up-year)	Demonstrative (2022) Commercial (2025)	Demonstrative (2022) Commercial (~2028-2030)
TRL	-	**8 - 9**	**7 - 8**
Critical technical element	-	Large-scale RWGS	ASTM approval
Process flexibility	-	Limited	MeOH reactor flexible
Overall kerosene selectivity	t kerosene/t efuel	~50 to 95%*	~60 to 95%*
Specific Consumption (t efuel)	t H_2/t efuel t CO_2/t efuel	0.5 3.8	0.4 3.2
Specific Consumption (t eSAF)	**t H_2/t eSAF** t CO_2/t eSAF	**1.0 to 0.5** 7.6 to 4.0	**0.7 to 0.4** 5.3 to 3.4

Main take aways

- **Overall system performance** within each pathway is highly **dependent on specific project configurations**. Key factors such as **technology choices, plant design or integration level** all influence performance. As such, results vary project by project, and **performance must be assessed in relation to the business model and site-specific constraints**.
- **With regards to technology readiness, Fischer-Tropsch pathway has the advantage** over MtJ given its matured synthesis process for eSAF with already approved 50/50 % blendings with conventional jet fuel. MtJ has still developing steps to follow to reach ASTM approval for SAF production.

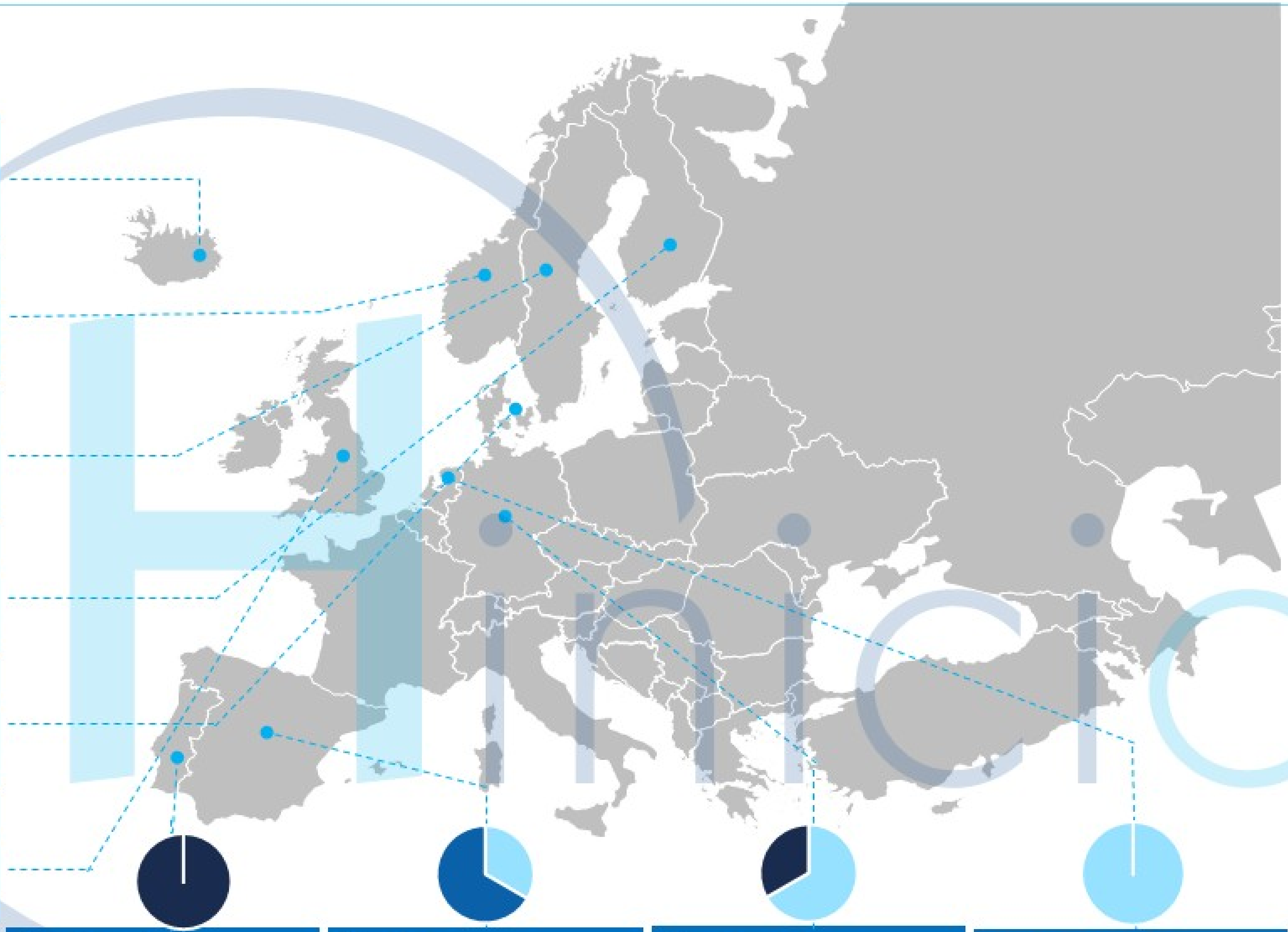
* Considering product recirculation, with acceptable cost impact

On a global scale, announced eSAF projects lean on both FT and MtJ



Source: Hinicio analysis – critically reviewing and filtering of announced projects

EU zoom shows a lot of MtJ in France, and more FT in Portugal & Sweden



Iceland

Nº	Vol
1	≈70

Norway

Nº	Vol
2	≈140

Sweden

Nº	Vol
4	≈350

Finland

Nº	Vol
3	≈240

Denmark

Nº	Vol
5	≈230

United Kingdom

Nº	Vol
2	≈100

France

Nº	Vol
11	≈900

Portugal

Nº	Vol
3	≈140

Spain

Nº	Vol
3	≈350

Germany

Nº	Vol
3	≈240

Netherlands

Nº	Vol
1	≈250

Nº projects per technology

- FT
- MtJ
- Unknown

Legend:

Nº Hinicio estimate of eSAF projects announced
Vol. Hinicio volume estimate of eSAF projects announced in ktpy

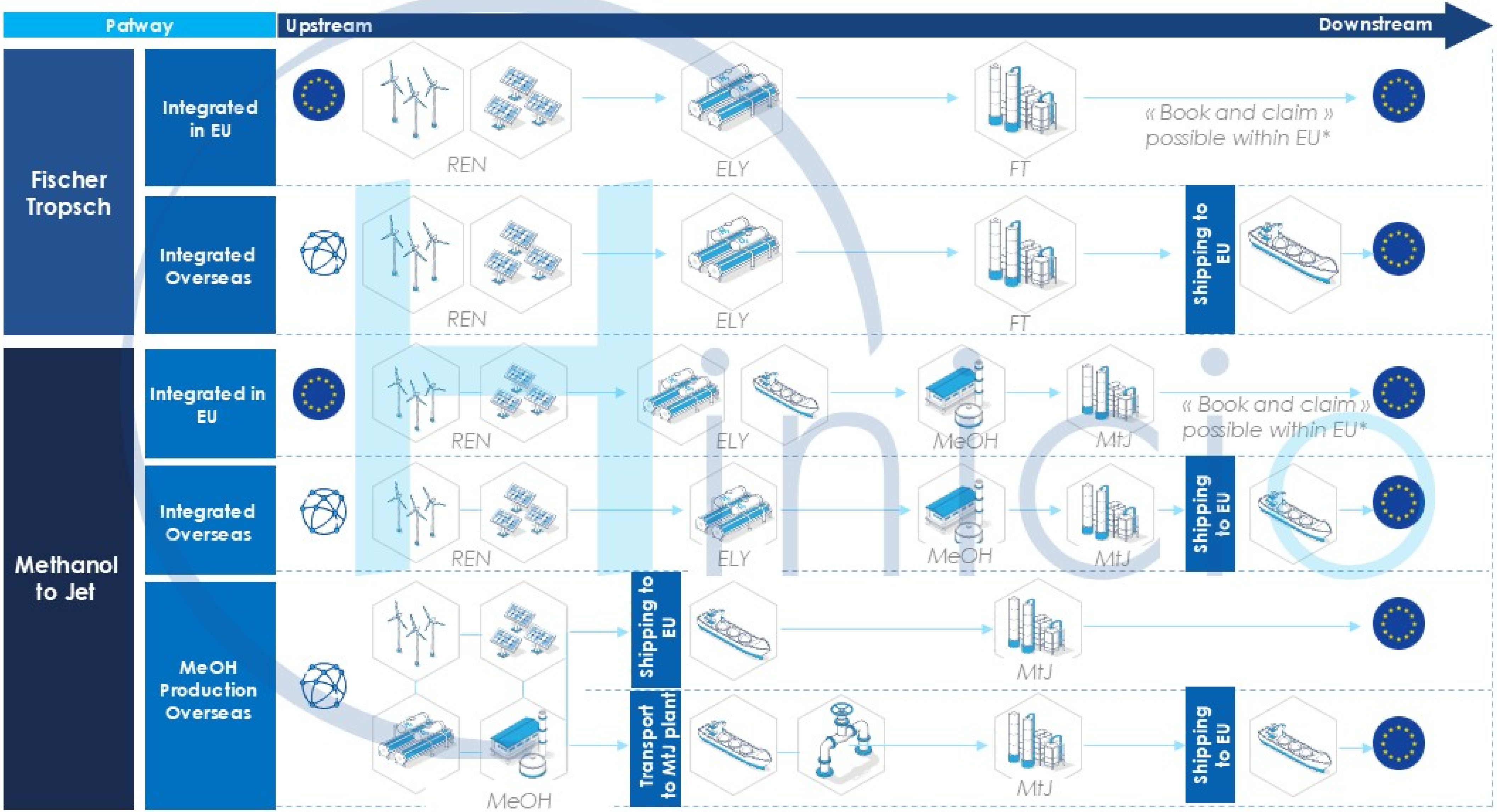
Source: Hinicio analysis – critically reviewing and filtering of announced projects

Methanol-to-Jet Opportunities and Challenges for SAF

Value Chain & Pathway Flexibility, Supply Chain Setup & LCOJ

MtJ enables decoupled production while FT requires full integration

Example of eSAF global supply chain for EU delivery based on FT and MtJ pathway



*« Book and claim » like system possible within EU for fuel supplier with flexibility mechanism of the RefuelEU aviation regulation

REN = Renewable electricity; ELY = Electrolyser; FT = Fischer-Tropsch; MeOH = Methanol production; MtJ = Methanol to Jet installation

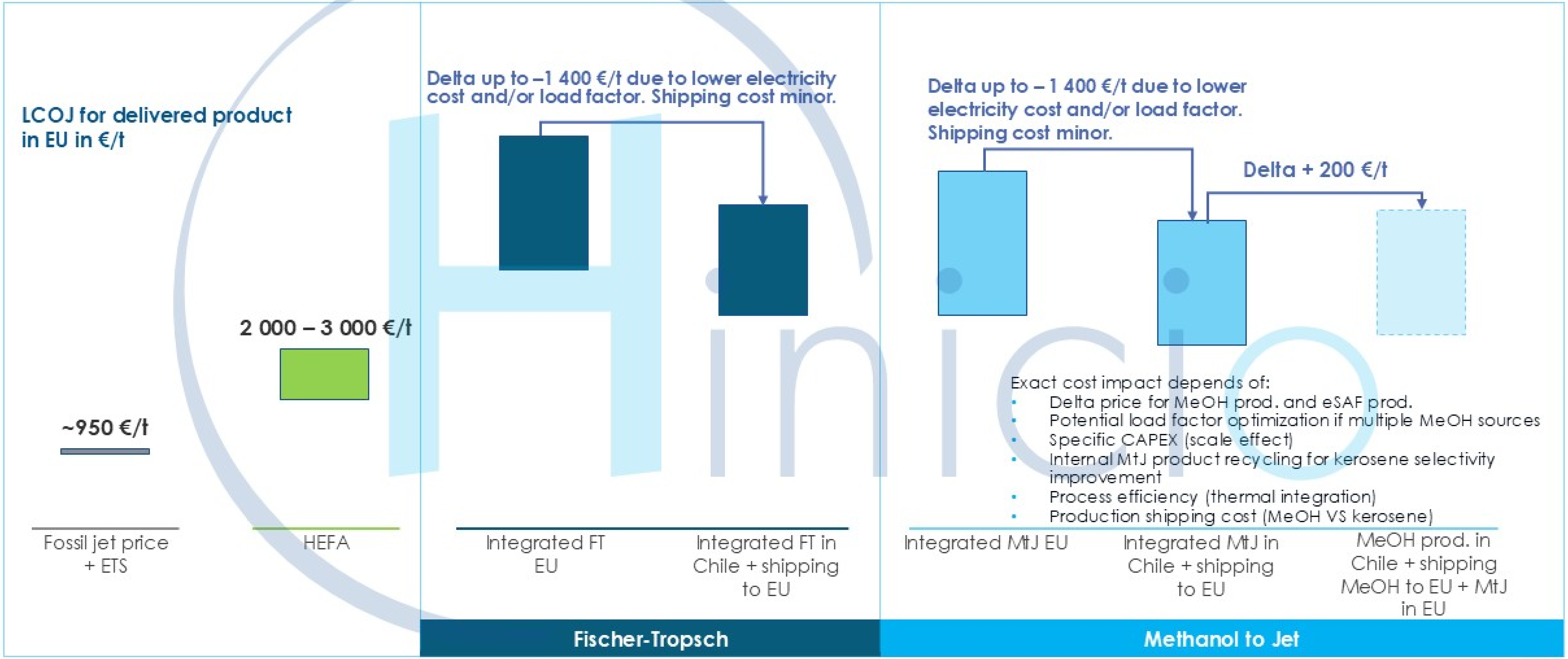
Opportunities & challenges per supply chain setup

Risk

	Risk	Integrated FT	Integrated MtJ	Globalized MtJ
1	**CO-PRODUCT** A high kerosene selectivity means less co-products like eNaptha or eDiesel to deal with on a market that does not benefit from firm mandates	✔ (green) 50-95% Kerosene selectivity	✔ (green) 60-95% Kerosene selectivity	✔ (green) 60-95% Kerosene selectivity
2	**PROJECT FINANCING** *Proven technologies at large scale like FT and pathway being approved by ASTM ease project's bankability*	✔ (green)	✔ (yellow)	✔ (yellow)
3	**COMMON USER INFRASTRUCTURES** Dependency on CUI for supply chain, risk on project development n	✔ (green)	✔ (green)	✔ (yellow)
4	**PHASING APPROACH** Splitting the value chain into independent production blocks (e.g. eMeOH prod. split from MtJ facility) allows for a construction of the plant in different phases	✔ (yellow)	✔ (green) Methanol plant → MtJ plant	✔ (green) Methanol plant → MtJ plant
5	**CAPEX OPTIMIZATION** Scale effect can affect project CAPEX depending on exact setup. e.g. equipment design for internal product recycling for kerosene selectivity improvement	✔ (green)	✔ (green)	✘ (red) ✔ (green)
6	**OPEX OPTIMIZATION** Depend on electricity cost on each side of the supply chain + lower thermal integration for split MtJ supply chain, especially impactful when considering SOEC electrolysis	✔ (yellow)	✔ (yellow)	✘ (red) ✔ (green)
7	**INTERMEDIATE PRODUCT VALORISATION & SOURCING** Being able to valorize and/or source an intermediate like methanol (or eventually syncrude) derisks the production of SAF by adjusting to a market also concerned by mandates or limiting risks of methanol supply disruption.	✔ (yellow) Syncrude	✔ (green) Methanol	✔ (green) Methanol

eSAF production cost is extremely project-dependent & global supply chain optimisation can help

Example of LCOJ for different supply chain setups for SAF delivered in Rotterdam (NL) by 2035



LCOJ calculation based on project archetypes. Large scale (100+ kt/year eSAF), COD ~2035. Hypothesis for product transportation from Chile to Rotterdam between 50 to 60 €/ton

LCOJ = Levelized Cost Of Jet fuel

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Experts Panel

Methanol-to-Jet opportunities and challenges for SAF

Understanding the potential and limitations of MtJ vs FT pathways to produce eSAF in a global supply chain.

Webinar Starting 26 Day 06 Month 2025 Year

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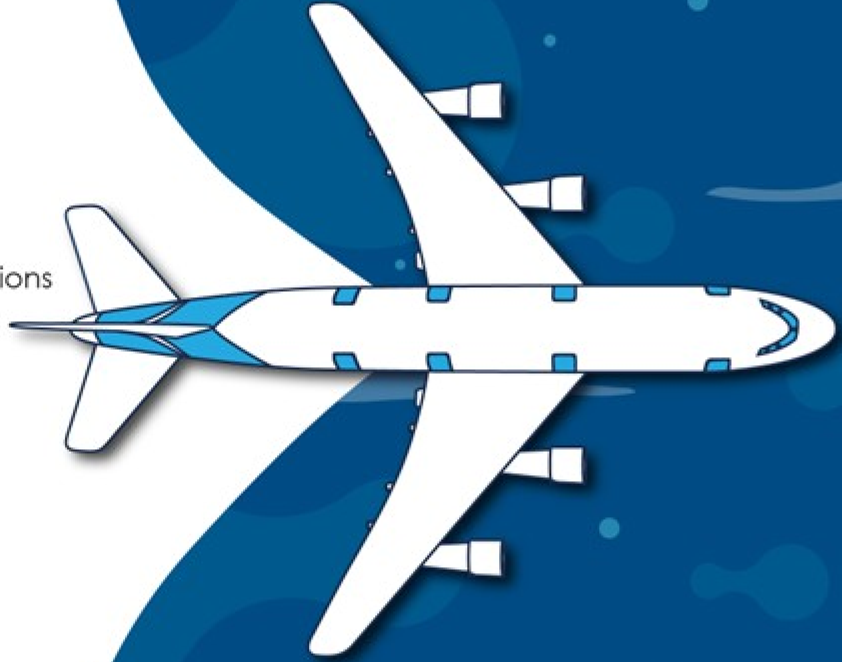

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Honeywell UOP

As a trailblazer in renewable fuel technology, Honeywell UOP enables broad flexibility of feedstock supplies for sustainable aviation fuel, diesel and other renewable fuels. Honeywell UOP eFining™ and FT Unicracking™ are the latest in a line of technologies driving decarbonization in the aviation sector. Honeywell UOP offers multiple routes to market using a variety of feedstocks, including Ecofining™ technology (utilizing fats, oils and greases), ethanol to jet technology, and UOP eFining™ using eMethanol from green hydrogen and recycled CO_2. Contact: richard.mathers@honeywell.com

TOPSOE

Topsoe is a leading global provider of technology and solutions for the energy transition. We combat climate change by helping our customers and partners achieve their decarbonization and emission reduction goals.

Built on decades of scientific research and innovation, we offers world-leading solutions for transforming renewable resources into fuels and chemicals for a sustainable world, and for efficient low-carbon fuel production and clean air.

We were founded in 1940 and are headquartered in Denmark, with over 2,800 employees serving customers all around the globe.

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