The role and importance of aviation biofuels

IEA Task 33 and GAFT workshop

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Business Development

SkyNRG
FUTURE FRIENDLY FLYING

SkyNRG: the market maker for biojet fuel

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Airline Customers

KLM, Air France, Air Canada, Virgin, SAS, Thai, Next Jet, Qantas, Thomson Airways, Finnair, Etihad Airways, LAN

Corporate Customers

Accenture, ABN AMRO, Nike, Heineken, Loyens & Loeff, DSM, FrieslandCampina, Fly Green Fund, Schiphol Group

Supply chain partners

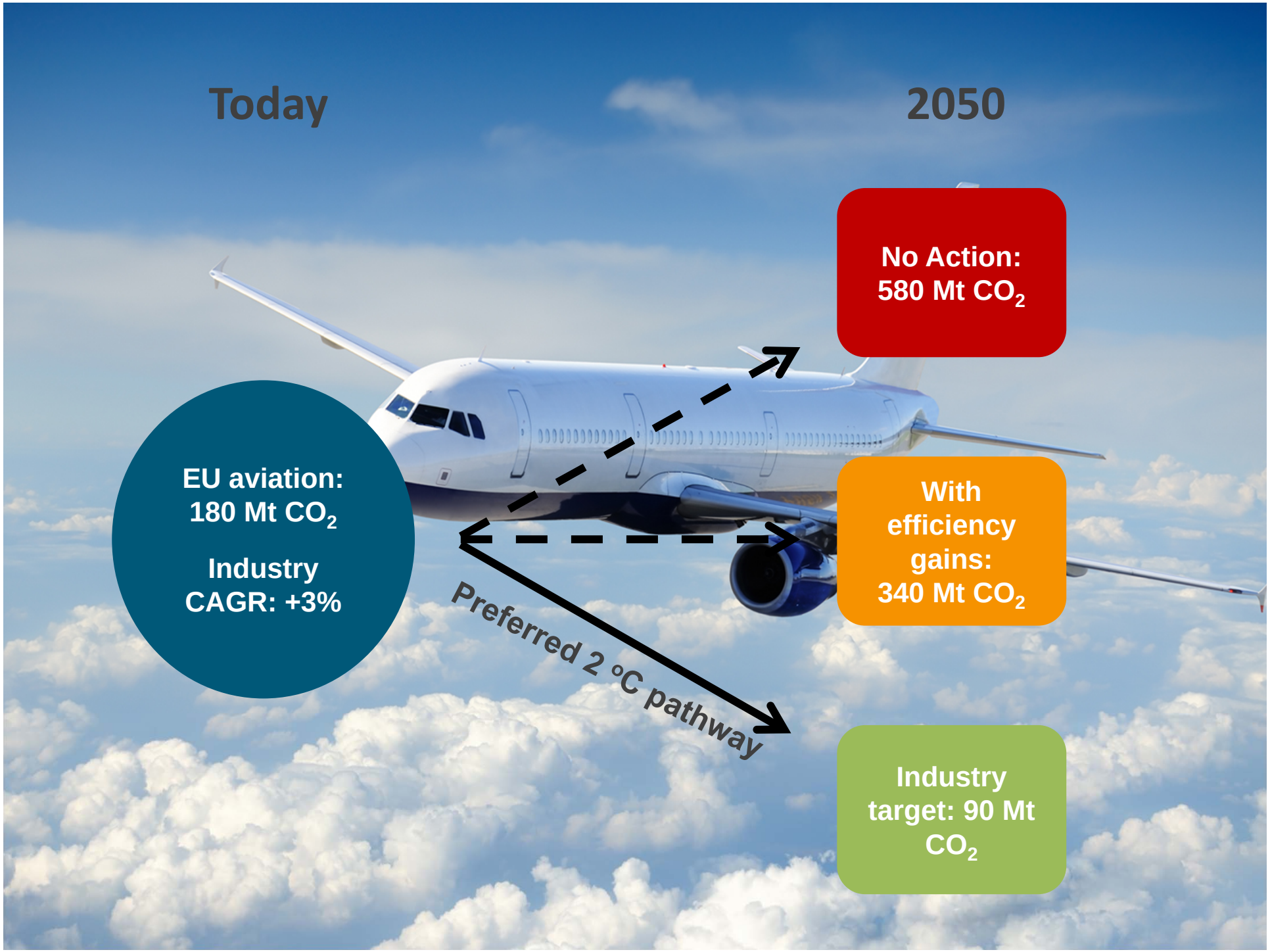
Neste, Itaka, SunChem, Avinor, Ascent, KLM, Schiphol Amsterdam Airport, AltAir Fuels, Swedavia Swedish Airports, Boeing, Airbus

NGO network

National Wildlife Federation, Solidaridad, Climate Solutions, Carbon War Room, NRDC, RSB, WWF

Netherlands
Australia
USA
South Africa

ZERO


Today
2050
No Action:
580 Mt CO_2
EU aviation:
180 Mt CO_2
Industry
CAGR: +3%
With
efficiency
gains:
340 Mt CO_2
Preferred 2 °C pathway
Industry
target: 90 Mt
CO_2

This transition requires significant biojet fuel volumes in the coming decades

EU fossil jet use:
50 million tonne

Today

EU biojet fuel use:
85 million tonne

2050

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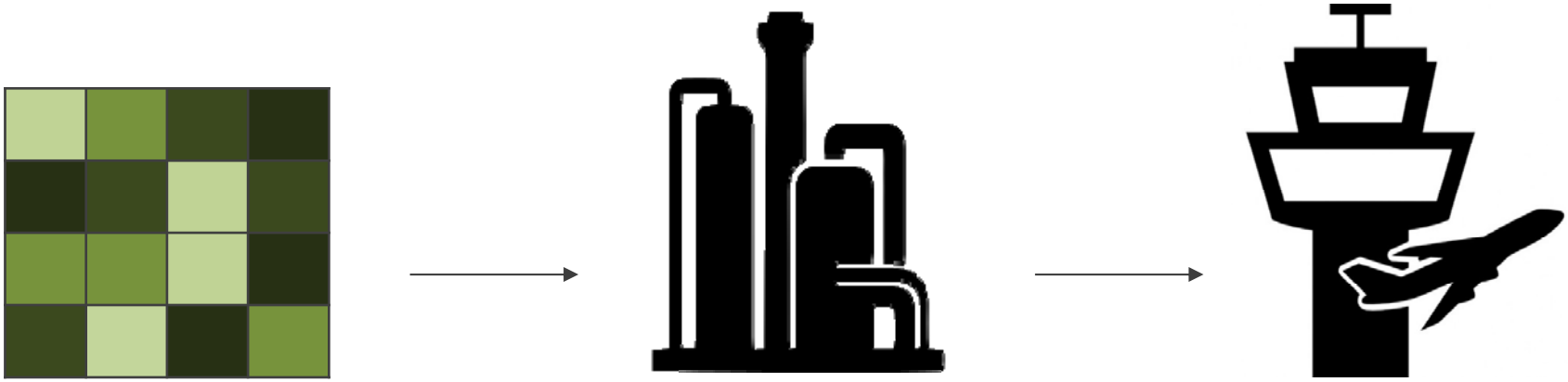
The development of biojet fuel supply chains involves various challenges across the supply chain

Simplified biojet supply chain



Feedstock **Conversion** **End use**

Some key challenges

- Volume
- Sustainability
- Price
- Logistics

- Production capacity
- Technology readiness
- Investments

- Logistics
- Airport and pipeline access
- Price premium

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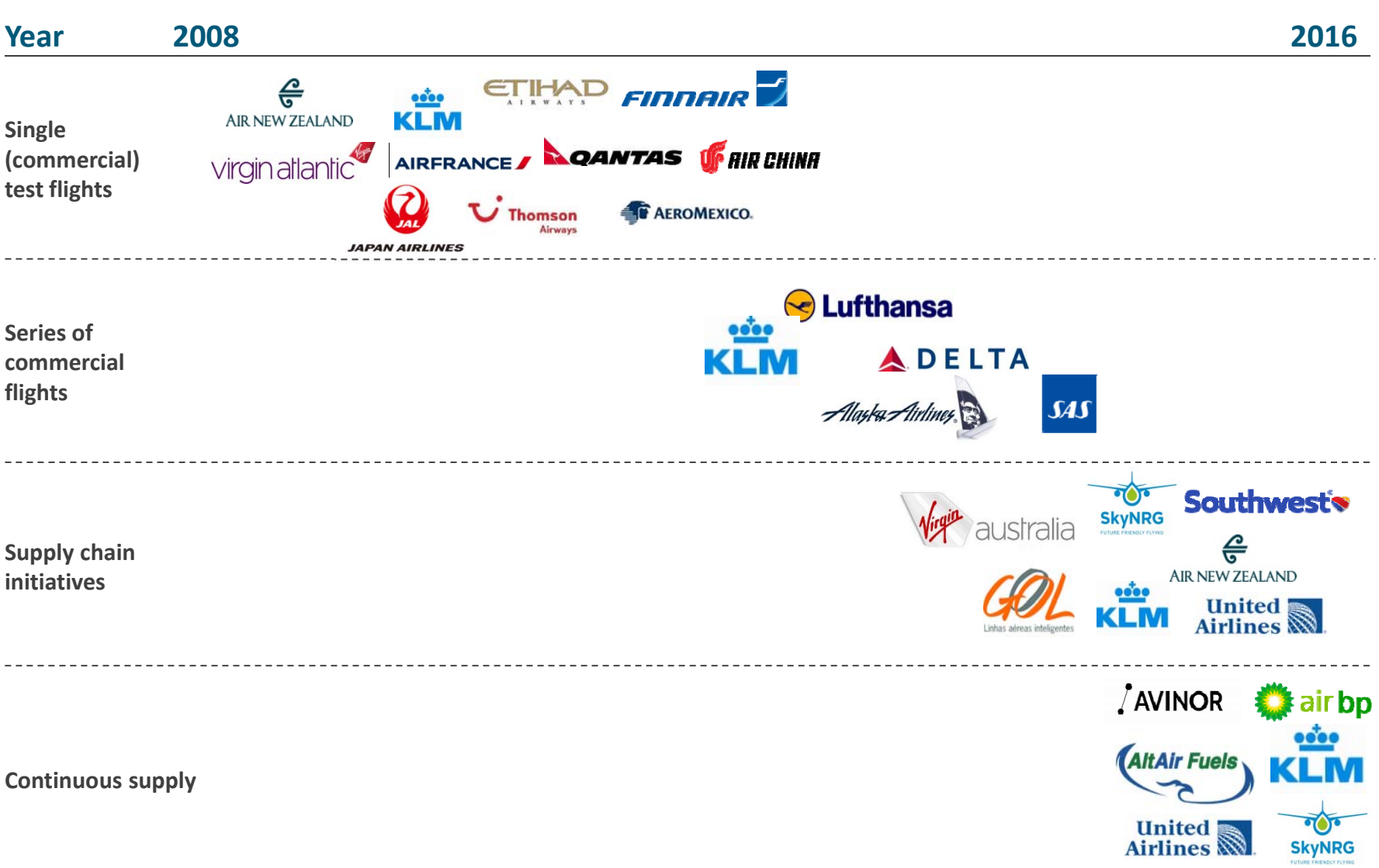
Nonetheless, the biojet fuel market is maturing – we see a shift from single flights towards continuous supply



On the short term, three factors will spur the uptake of biojet; in particular in the US and EU

To date, the uptake of biojet has been limited by the absence of production capacity and high price premiums. But that is about to change:

A **Dedicated production capacity.** The AltAir refinery will be the first biojet factory in the world.

B **Certification of Hydrotreated Renewable Diesel (HRD).** Unlocking 3 million tonne of production capacity.

C **Government incentives that apply to aviation, mainly in the EU and the US.** Decreasing the biojet premium.

Overview of HEFA jet fuel and HRD biorefineries

1 **HEFA jet fuel and HRD refinery**

2 **HRD refinery**

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The development of additional conversion pathways in the coming decade(s) is cardinal to reach scale

Pathway	ASTM certified	Description	Target feedstock
Hydrotreated Esters and Fatty Acids (HEFA)	✓	Converts oil to jet via deoxynation with hydrogen and cracking	Oils and fats
Gasification and Fischer-Tropsch (FT)	✓	Converts any carbon-rich material (e.g. biomass) into sugars which is then catalytically converted to jet	All biomass & MSW
Alcohol to Jet (ATJ)	✓	Uses alcohols derived from sugars and starches and converts them to jet via dehydration, oligomerization and hydrogenation	All biomass, MSW and waste gasses
Direct sugars to hydrocarbons (DSHC)	✓	Ferments plant sugars and starches to hydrocarbons which are subsequently upgraded to jet fuel	Sugars (also cellulosic sugars)
Hydrotreated Depolymerized Cellulosic Jet (HDCJ)		Converts any carbon-rich material into a bio-crude oil via thermochemical depolymerization which can then be upgraded to jet	All biomass
Hydrotreated Renewable diesel (HRD/Green Diesel)		Converts oil to deoxygenated diesel using hydroprocessing	Oils and fats

And some more in the pipeline, including catalytic hydrothermolysis, aquous phase reforming, co-processing of oils and fats in existing refineries

Thank you for your attention!

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