Fuel Management LHG

Corporate Fuel Management Lufthansa Group
Thorsten Luft / International Hydrogen Symposium Oct 2019

Lufthansa group's fuel management at global level

~ 485 airports

>1 Mio. refuellings p.a.

~ 11 Mio. tons p.a.

Norway

~ 160 suppliers

Shell
Vitol
OMV
World Fuel Services
bp
TOTAL

Lufthansa
SWISS
Austrian
Eurowings
brussels airlines
edelweiss air
AirDolomiti
SunExpress
Lufthansa Cargo
AeroLogic

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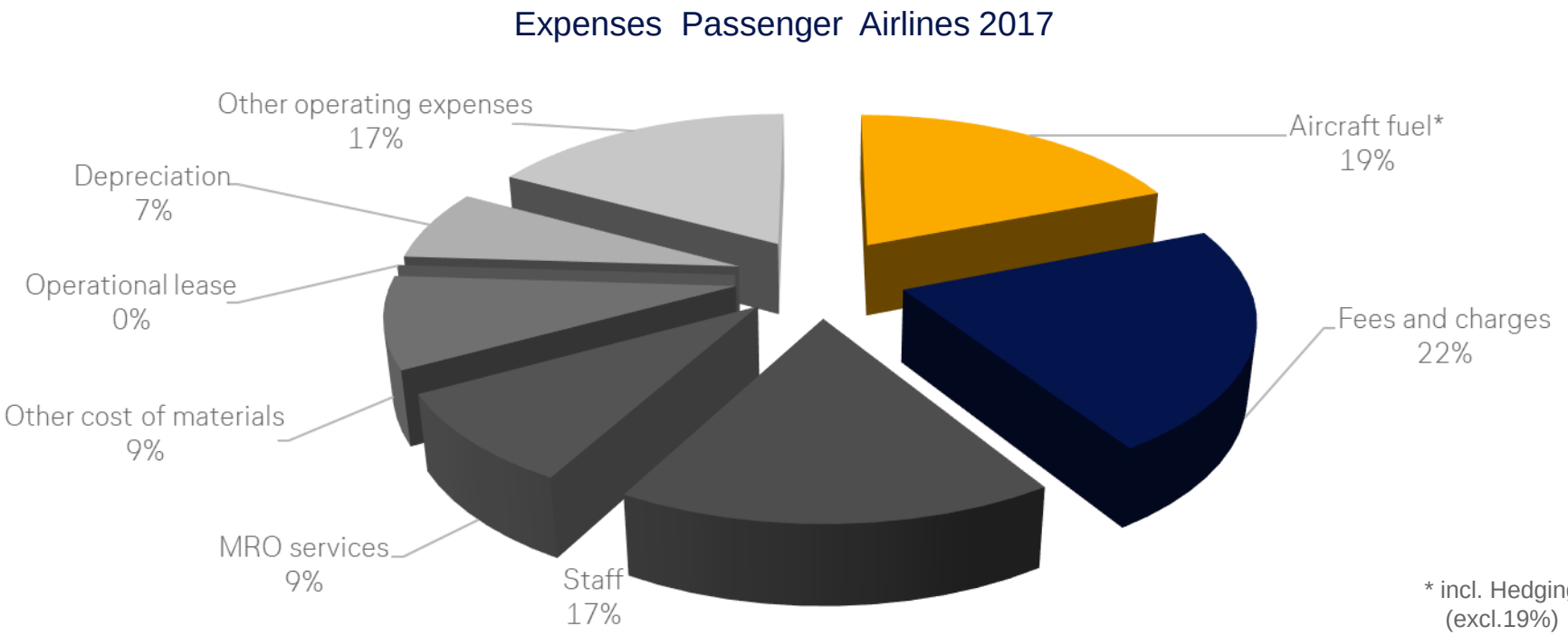
Fuel cost is the 2nd largest cost factor of LHG's passenger business



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Jet-Fuel Supply Chain includes diverse channels of supply

Crude Oil

Ship

Pipeline

Refinery process → Jetfuel

Ship

Pipeline

Rail

Terminal

Ship

Pipeline

Rail

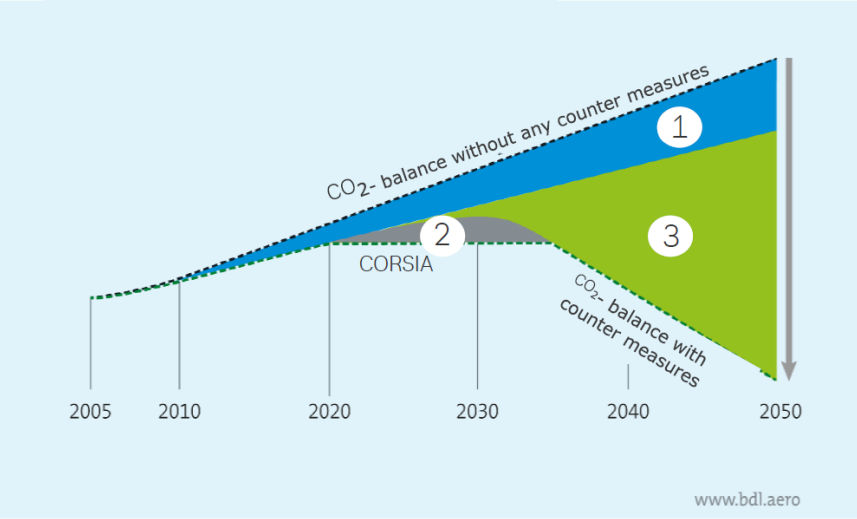
Tank farm

Tanker

Hydrant

Into Plane

We must act now to meet the ambitious goals of reducing CO2 emissions



Ambitious goals of international community of states

COP21:

Limit global warming to below 2°C

Requirement:

End fossil CO2 emissions before 2050

IATA:

Reduce CO2 emissions by 50% until 2050 (baseline: 2005)

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Lufthansa burnFAIR: Facts

Facts

Duration: July 15th to December 2011

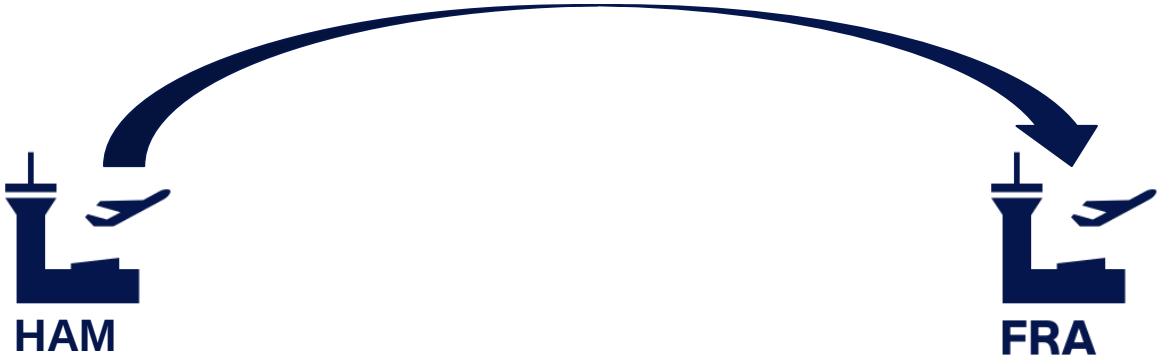
Route: HAM – FRA – HAM

Aircraft type: Airbus A321

SAF volume: 800 tons

SAF / Fossil proportion: 50% SAF in one wing

Costs: 6,6 Mio EUR



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Various SAFs methods are available today, yet current global production levels are very low compared to global fuel demand

Production methods

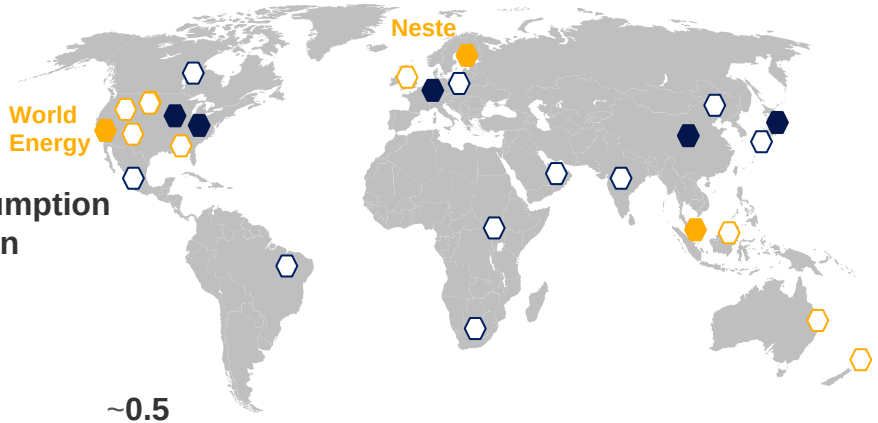
= partnerships

Power-to-Liquid (**PtL**)	RAFFINERIE HEIDE
Biomass-to-Liquid (**BtL**)	preem, LanzaTech, Fulcrum BIOENERGY, RED ROCK BIOFUELS, Swedish BioFuels
Sun-to-Liquid[1] (**StL**)	instituto IMDEA energía, ETH Zürich, DLR
HEFA	eni, VELOCYS, world energy, SG Preston, NESTE
Alcohol-to-Jet (**AtJ**)	LanzaTech, gevo

SAF characteristics

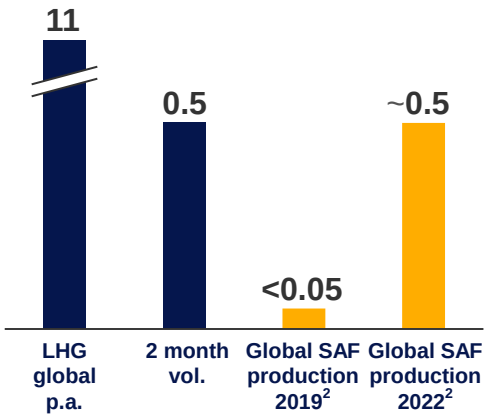
- 2-5 times more expensive
- max. 50:50 blend with conventional jet fuels
- higher fuel efficiency (up to 3%)

- Producing
- Under construction
- Advanced planning
- R&D activity



Annual fuel consumption vs. SAF production

in mio tons



In 2019, SAF production covered **ca. 0.01%** of global jet fuel demand

[1] research project still ongoing [2] current estimations

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Sustainable Aviation Fuels from Lufthansa perspective

→ **Various SAFs methods are available today, yet current global production levels are very low**

In 2019, SAF production covered ca. 0.01% of global jet fuel demand but production level are increasing

→ **Pressure from public perception and politics is continuously rising**

Public call for action firing up political debates / blend quotas starting in Scandinavian countries

→ **Airlines are increasingly looking at SAF as an alternative fuel**

Off-take agreements are ramping up for upcoming years, seldom direct investments

We are increasingly looking for SAF product availability in our markets and at the same seek acceptance from our passengers to proportionally pay for also using in.

Thank you very much for your attention