Decarbonisation or Defossilisation?
Innovative Alternative Fuels for the Aviation in Brazil.
An international reference model.
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Global Aviation Challenges
Global aviation will increase its CO₂ emissions - business as usual
Today: aviation accounts for more than 2% of anthropogenic CO₂ emissions
By 2034 (15 years): Global flight volume is doubling due to strong growth, esp. in Asia (esp. China) and Middle East

Aviation and Power-to-Liquid
What is Power-to-Liquids?
- Power-to-Liquids (PtL) is a production pathway for liquid hydrocarbons based on electric energy, water and CO₂ as resources.
- There are two principle pathways to produce renewable PtL jet fuel:
  - Fischer-Tropsch (FT) synthesis and upgrading.
  - Methanol (MeOH) synthesis and conversion.
- PtL production comprises three main steps:
  1. Hydrogen production from renewable electricity using the electrolysis of water.
  2. Provision of renewable CO₂ and conversion.
  3. Synthesis to liquid hydrocarbons with subsequent upgrading and conversion to refined fuels.
- Like any other synthesis process, PtL production results in a mix of gasoline, kerosene, diesel, and other fuel products.

IATA: Aviation and Climate Change
- Air transport accounts for 2% of global man-made CO₂ emissions. In 2016, flights worldwide produced 815 million tons of CO₂.
- Air transport’s relative contribution has not increased in the past 20 years and is not expected to increase beyond 3% by 2050.
- Each new generation of aircraft is on average 20% more fuel efficient than the model it replaces and over the next decade airlines will invest $1.3 trillion in new planes.
- Airlines have continued to improve their fuel efficiency performance between 2009 and 2016.
- In 2016, fuel efficiency for total system-wide service was at 1.28 liters per 100 RTK, an improvement of 10.2% compared to 2009.

Sustainable Aviation Fuels in Practice
All over the world, multi-stakeholder groups (airlines, airports, aircraft manufacturers, governments, biomass and biofuel producers and suppliers) are working together on initiatives for the deployment of sustainable aviation fuels

Main milestones so far:
- 2008 – The first test flight with biojet fuel was performed by Virgin Atlantic.
- Between 2011 and 2015 – 22 airlines have performed over 2,500 commercial passenger flights with blends of up to 50% biojet fuel from used cooking oil, jatropha, camelina, algae and sugarcane.
- Jan. 2016 – Regular sustainable fuel supply through the common hydrant system started at Oslo Airport. Alternative fuel producer Neste and supplier SkyNRG as well as Air BP are involved.
- Mar. 2016 – United commenced daily flights using sustainable alternative fuel from Los Angeles Airport (LAX), supplied by Altair. United is the first airline in the world to have introduced alternative jet fuel into normal business operations.
- Nov. 2017 – The milestone of 100,000 commercial flights using SAF was reached.
- 2018 – Boeing/Fedex EcoDemonstrator flights with 2200 tons (~300h) with 100% HEFA SAF

Brazil – the Biofuel country
- 3rd Largest (domestic) aviation market
- 2nd Largest Biofuel producer __ BioEthanol/Diesel
- Rising Kerosene Demand __exp. 14.8 Mto (2050)
- Aviation fuels +40% expensive than global average
- Huge niche markets in numerous remote airports
- Strong focus on Science, Technology and Innovation
- Rising Employment in Renewables

Environmental Issues

Conclusions
- Alternative fuels play an significant role in the reduction of climate effects on aviation.
- Synthetic fuels from renewable energy, like Fischer-Tropsch Kerosene (without aromaties!) are a prefect alternative fuel for the state of the art and future aviation.
- Brazil has already huge (niche) markets in decentralised application (see German “EGG” 2000).
- Brazil has opportunities of advanced developments of its biofuel industry.
- Brazil has excellent conditions for an expansion of production and use of sustainable aviation fuels with renewable energies (hydro, wind, solar, …).

Vision and Mission: REfuels > ProQR (BR4)

More information on www.iata.org/leitig/environment

Aviation is a crossroads.
- The 2015 Paris Climate Change Agreement requires a massive reduction in greenhouse gas emissions across all sectors by the middle of this century.
- Future innovative - or even disruptive – technologies like aviation engines and alternative fuels can become more important in the long term.
- However, a drop-in option for renewable fuels, which produces almost zero greenhouse gas emissions, is the key to a significant reduction in greenhouse gas emissions from aviation.
- Timing and size are essential because it is the emission integral over time that counts.

Water demand per liter of jet fuel

PtL water demand compared to production of jet fuel. Benefits of #1 100% decarbonized fuel.

How far I could fly with the energy

FLY with sustainable alternative fuel from Los Angeles Airport.

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