



# ENERGY4MOBILITY HYDROGEN – A GAME CHANGER FOR FUTURE MOBILITY?

## SESSION 2 – EXPERT TALK

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### INSPIRING TECHNOLOGIES

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# AVIATION INDUSTRY AND THE SUSTAINABILITY NEED



3.7% increase in air transport expected by IATA from 2019 to 2039.



Hydrogen and electric powered airplanes well beyond 2050.



Kerosene (Jet A1) demand in 2019 will double to about 440 million tons in 2039.



Absolute demand of Sustainable Aviation Fuel (SAF) will reach 220 million tons in 2039.



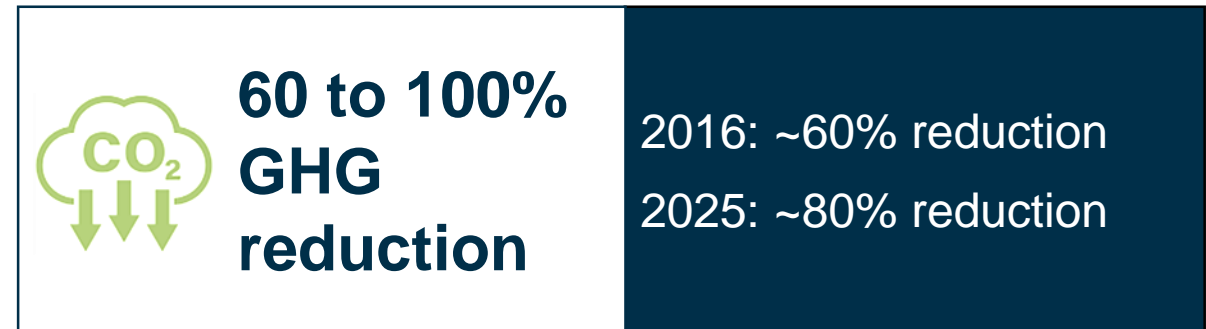
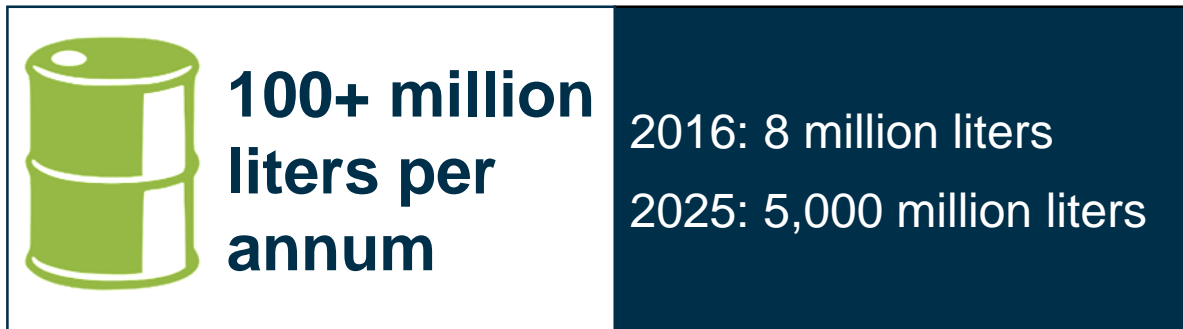
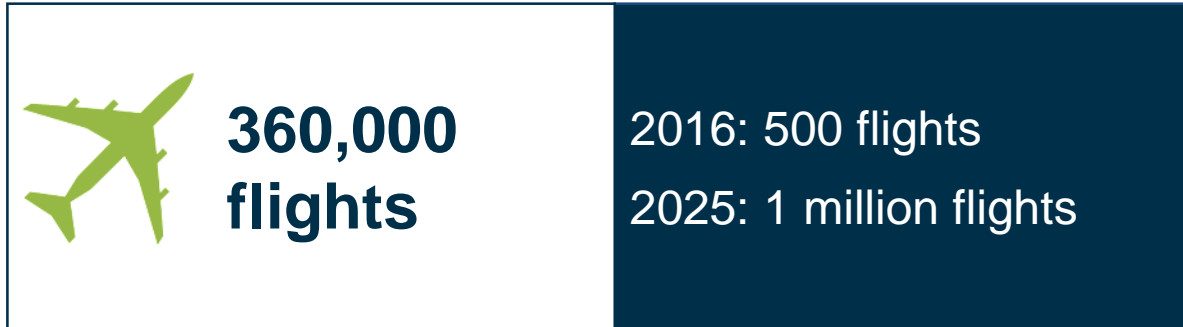
Aviation industry is committed to CO<sub>2</sub> neutral growth after 2020.



Climate targets will be missed if ramp-up of SAF\* production does not start now.

\* SAF includes sustainable aviation fuel derived from biomass as well as from renewable power, latter also referred to as PtL kerosene

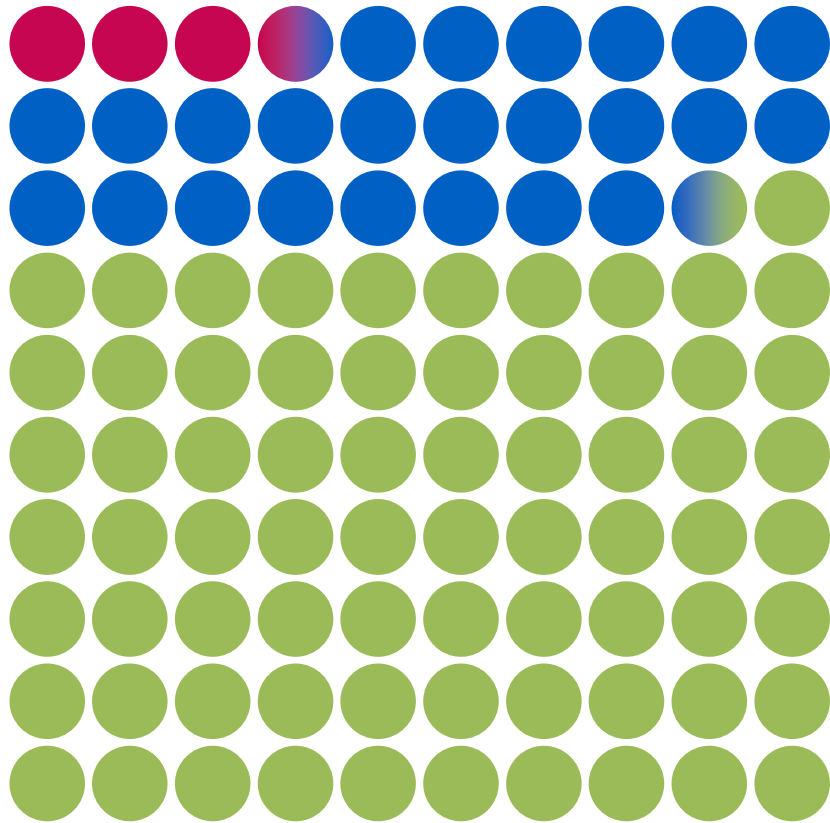
# GLOBAL SAF FACTS IN 2021



Source: IATA Environment

# IN 2050 AVIATION INDUSTRY WILL STILL RELY ON SAF

## Percentage of operations by energy source in 2050



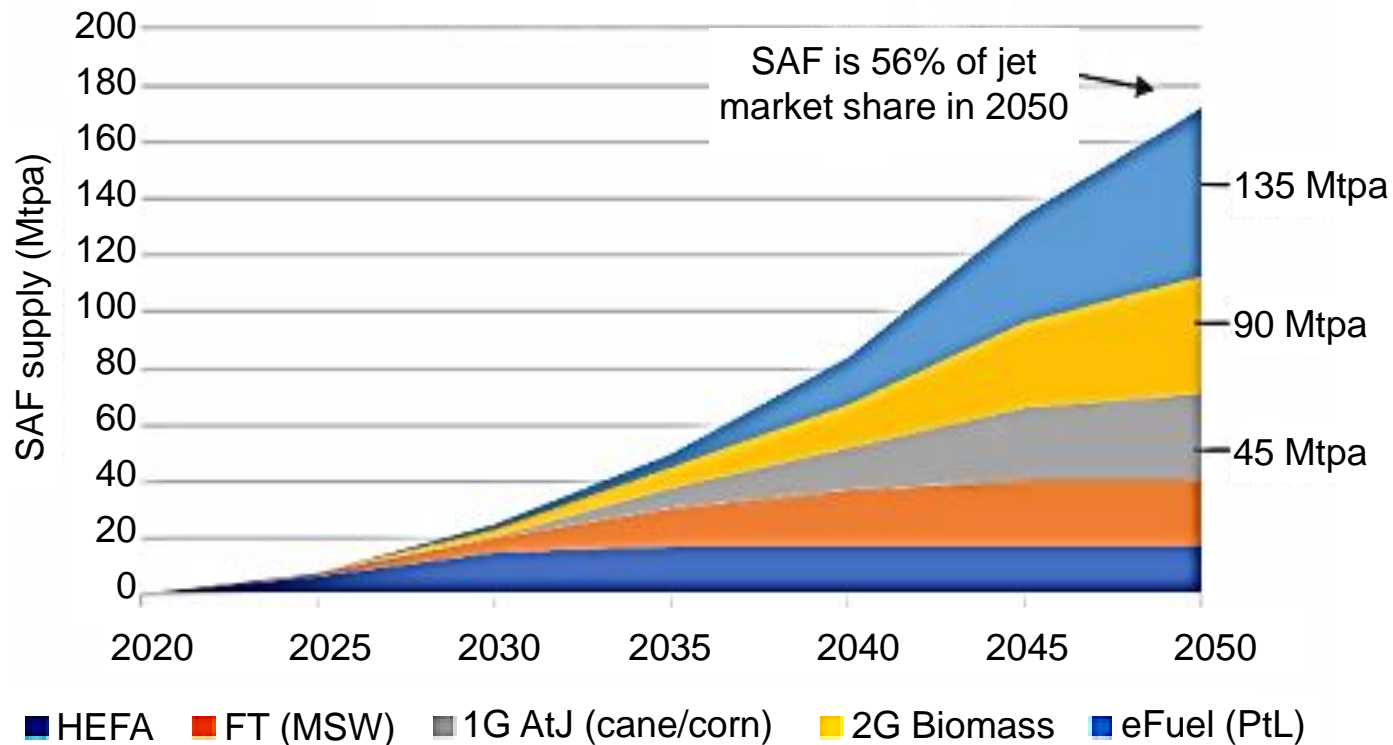
Even assuming highly optimistic use of **electric** and **hydrogen** energy for short-haul and some medium-haul operations in 2050, the vast majority of air traffic will still rely on the use of **SAF**.

80% of today's airplanes for medium- and long-haul operations will still be in operation in 2050.



# BP OUTLOOK – ACHIEVING NET ZERO IS POSSIBLE

## SAF supply pathway



## Key conclusions

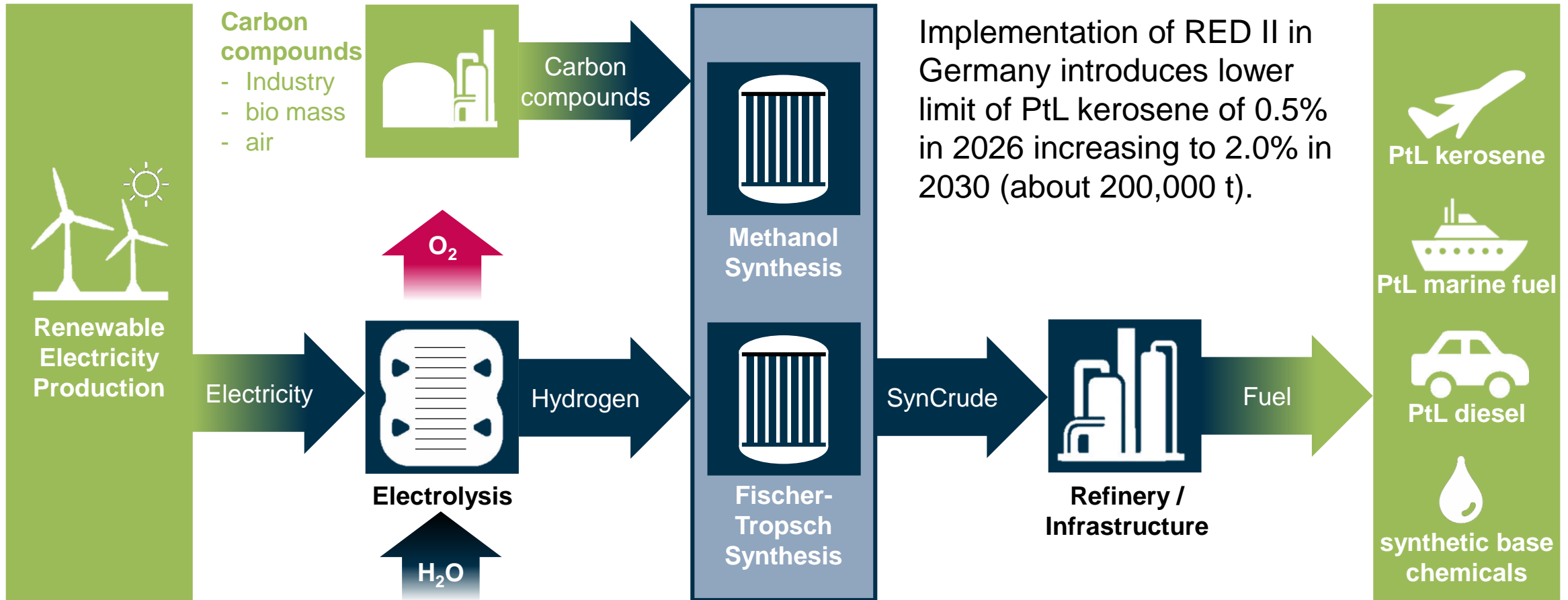
- Multiple SAF pathways required.
- New technology developments and scaling lead to competitive prices (at < \$2,500 /t).
- Some regions will prioritize specific pathways with strong focus on land use and sustainability resulting in growth of eFuels (PtL) and 2G biomass.

## Transition scenario until 2050

- 705 SAF plants built ( 23 /year average).
- \$535 billion capital invested (~\$17 billion /year average).



# PRODUCTION PATHWAYS FOR E-FUELS (PTL FUELS)

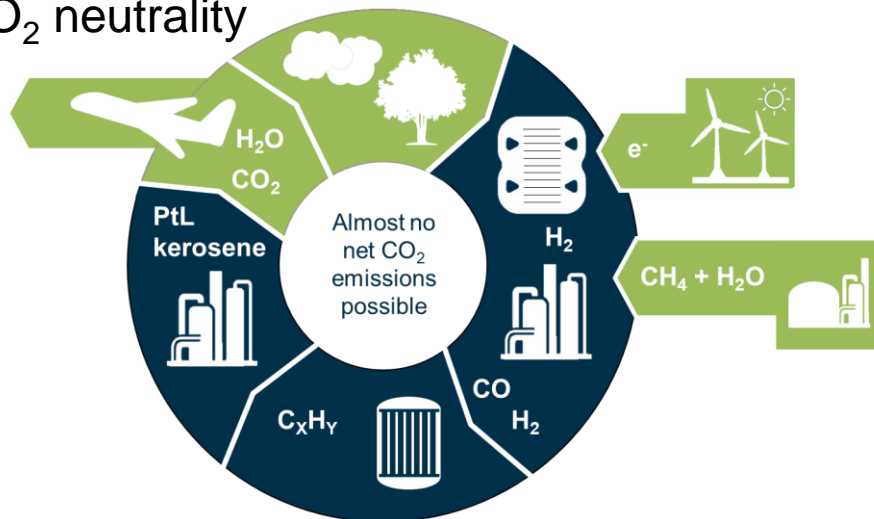


Source: PtL-Roadmap - Nachhaltige strombasierte Kraftstoffe für den Luftverkehr in Deutschland, Government of Germany, 04/2021

# PTL KEROSENE – THE INDUSTRIAL HYKERO PROJECT

## Key facts PtL kerosene

- Sustainable aviation fuel (SAF) with significant GHG emission reduction.
- Meets international standards (ASTM D7566 A1) as drop-in kerosene (max. 50%).
- No change of existing aircrafts, fuel transport and infrastructure required to utilize PtL kerosene.
- Allows CO<sub>2</sub> neutrality along full life cycle.



## The industrial HyKero project

- Green electrical energy, water and green methane are used as feedstock.
- Annual production of 41,000 t PtL kerosene, 11,000 t green naphtha and 1,400 t green hydrogen.
- Fully integrated plant design by EDL with complete reutilization of by-products within the plant ensuring zero CO<sub>2</sub> emission from production.
- Selected project of IPCEI Hydrogen.



# THANK YOU



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