CIDADE DO MÉXICO

36° CONGRESSO AIGLP

pedro.turqueto@copaenergia.com.br

SUMMARY

Different types of LPG

What is rDME?

rDME Challenges

What is the Renewable LPG scenario?

Different types of LPG

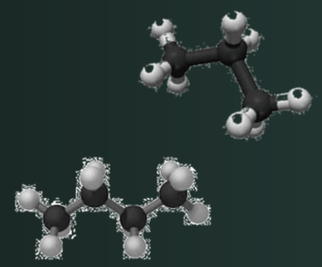
Fossil LPG
Crude Oil Refinary or NGPU

Synthetic LPG
Synthetically produced via chemical reactions

Renewable LPG
Synthetically produced with renewable sources

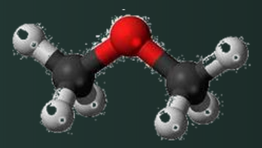
bioLPG
Synthetically produced with biobased sources

SAME MOLECULE



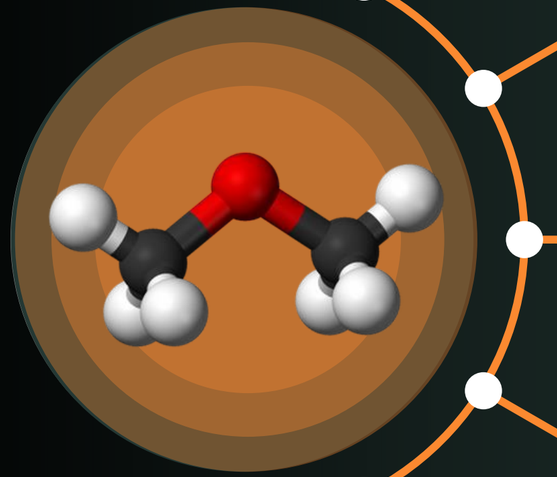
L P G

DIFFERENT MOLECULE



rDME (dimethyl ether)
rDME (dimethyl ether)
Slightly different molecule

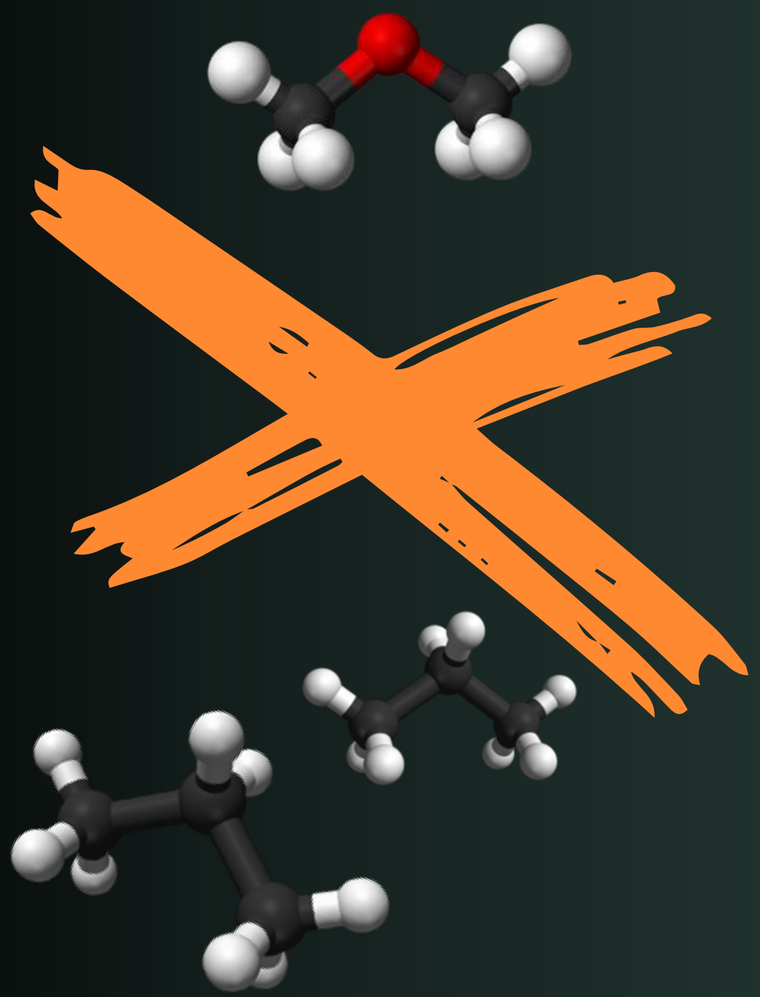
What is rDME?



- Physical properties similar to LPG
- Under pressure, it becomes a liquefied gas, in a similar way to LPG
- Produced from a wide range of renewable raw materials
- Mainly used as a propellant in aerosol and blend with LPG
- Can reduce GHG emissions by up to 85% compared to diesel

GHG: Greenhouse gas emissions from human activities strengthen the greenhouse effect, contributing to climate change. Most is carbon dioxide from burning fossil fuels: coal, oil, and natural gas.

rDME Challenges



- Calorific power 40% lower compared to LPG
- Incompatiblewith some elastomers
- As a propellant, it has a non-customizable vapor pressure
- Requires modifications to LPG equipment
- Low global productioncapacity

Renewable LPG

Drop-in fuel
No need for infracstructure change or equipment adjustments

Chemically identical to LPG
Same performance of LPG

Produced from renewable feedstocks
Such as plant and residues

Lower carbon footprint
Reduces CO2 emissions up to 80% when compared to fossil LPG depending on the feedstock

Advantages

DROP-IN FUEL

Can be blended with LPG or used interchangeably without the need of modification from the end-user

EASY TO USE

Flexible partner with renewable technologies and hybrid systems

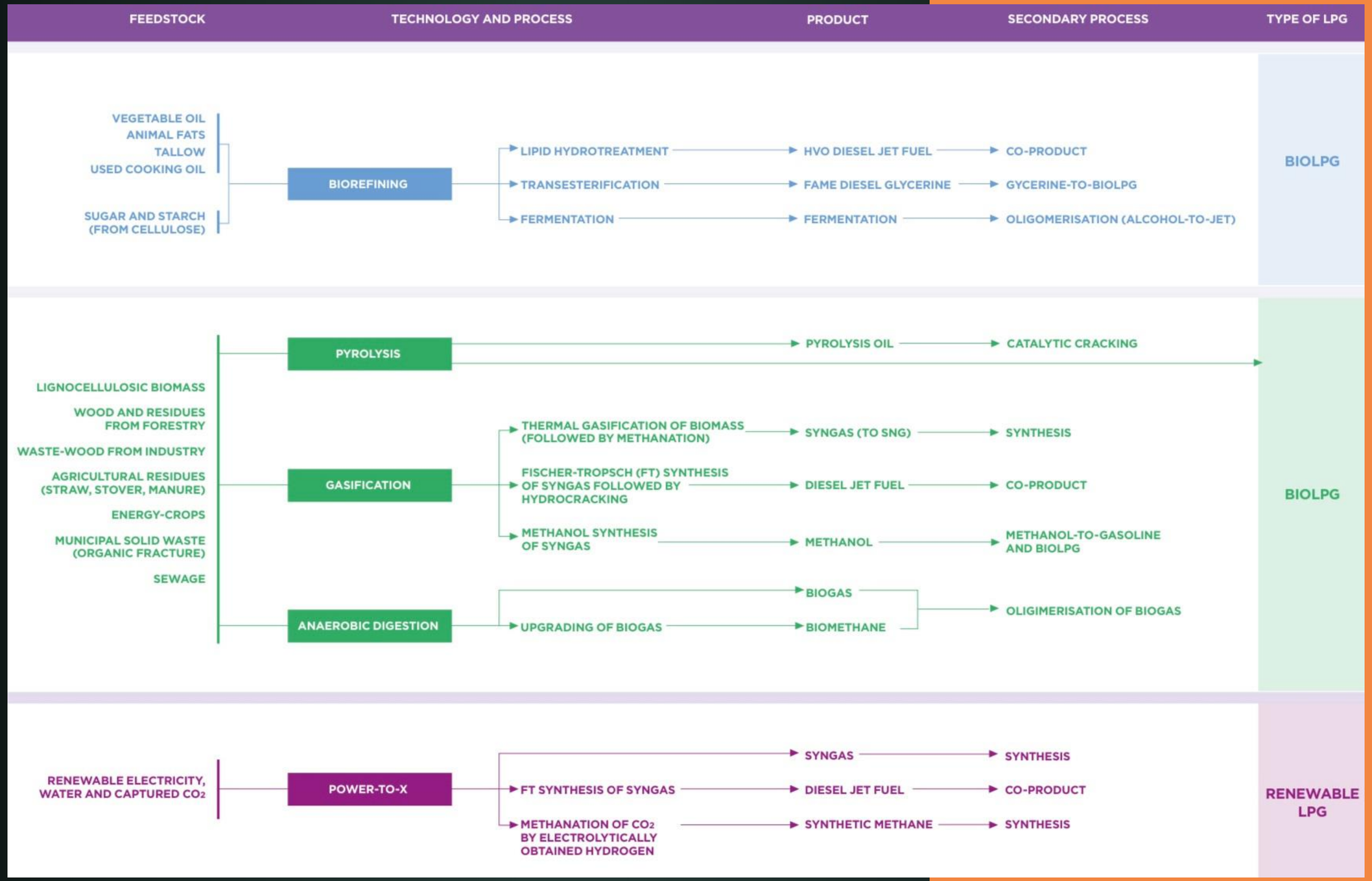
AFFORDABLE TRANSITION

Enables the switch to a cleaner energy source, without the hassle of changing equipment or vehicles that run on conventional LPG

LOW CARBON

Is a clean burning fuel, which produces very low concentrations of particulates and NOx and with a lower carbon footprint compared with fossil LPG

PRODUCTION Pathways



*Source: BioLPG a renewable pathway towards 2050 , 2021

Biorefining

CO-PROCESSING

§ Co-processing vegetable oils with conventional fossil fuel in crude oil refinaries

§ Low CAPEX since the same refining infrastructure is used

§ Partially renewable LPG obtained

HVO PROCESS

§ In the Hydrotreatment of Vegetable Oils (HVO) process, Renewable LPG is obtained as co-product (main products are Green Diesel and SAF)

§ Different vegetable oils can be used, including used cooking oil (UCO) and other waste oils/residues

§ Renewable LPG currently commercialized comes from this process

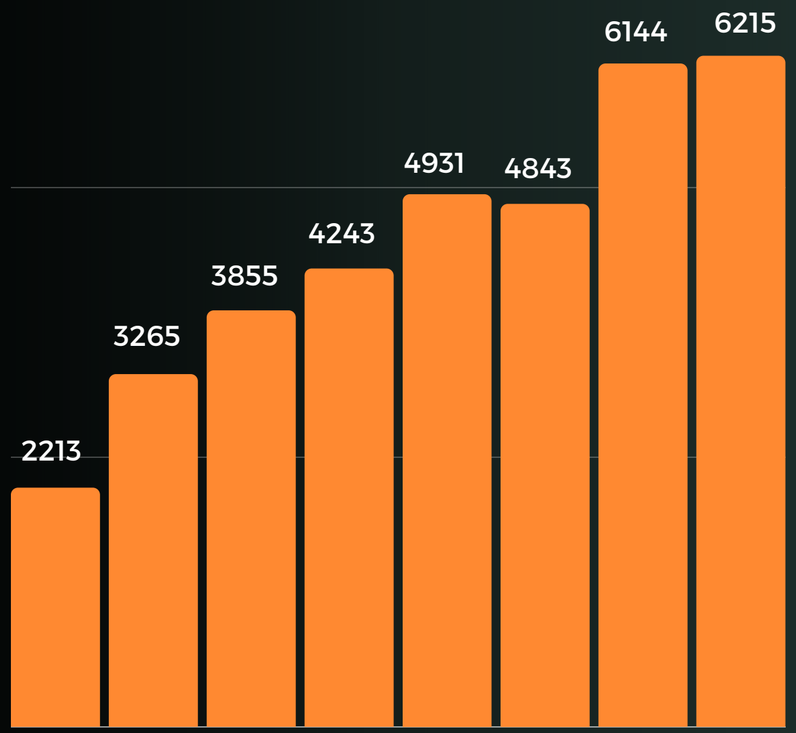
Other promising ROUTE

ETHANOL-TO-BIOLPG

- Interesting route considering feedstock availability in national territory (Brazil is the second largest ethanol producer)
- Methanol-to-gasoline is already being deeply studied
- Ethanol-to-gasoline caught the attention of LPG distribuitors

Scenario

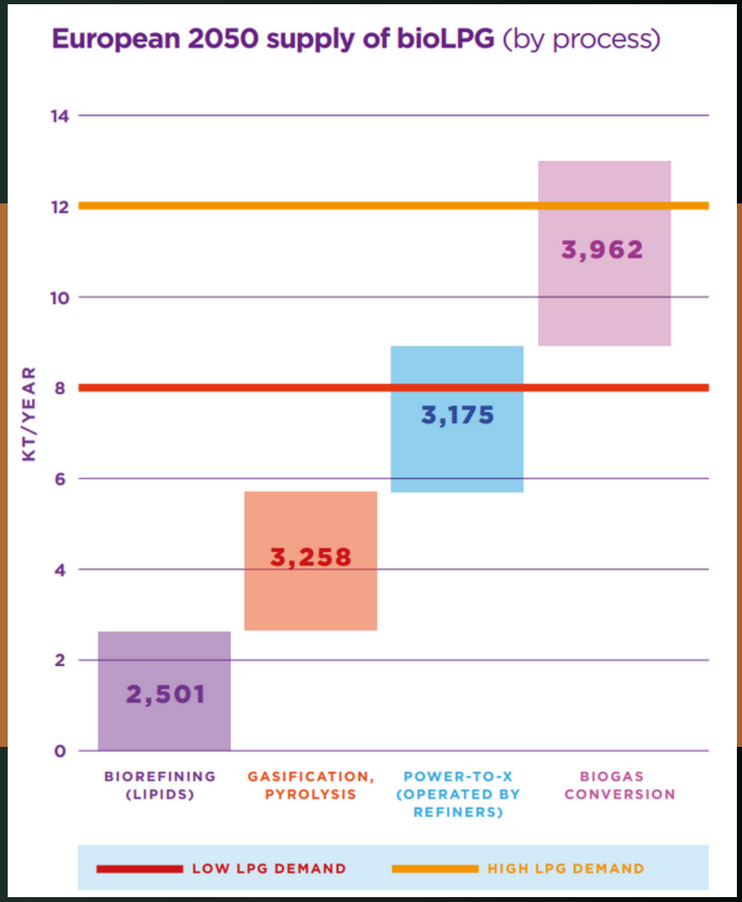
HVO biodiesel production volume worldwide from 2013 to 2020
(in 1,000 metric tons)



*Source: N. Sönnichsen, 2022

Predicting Renewable LPG supply in the coming years is still difficult as routes and yields are still UNCERTAIN

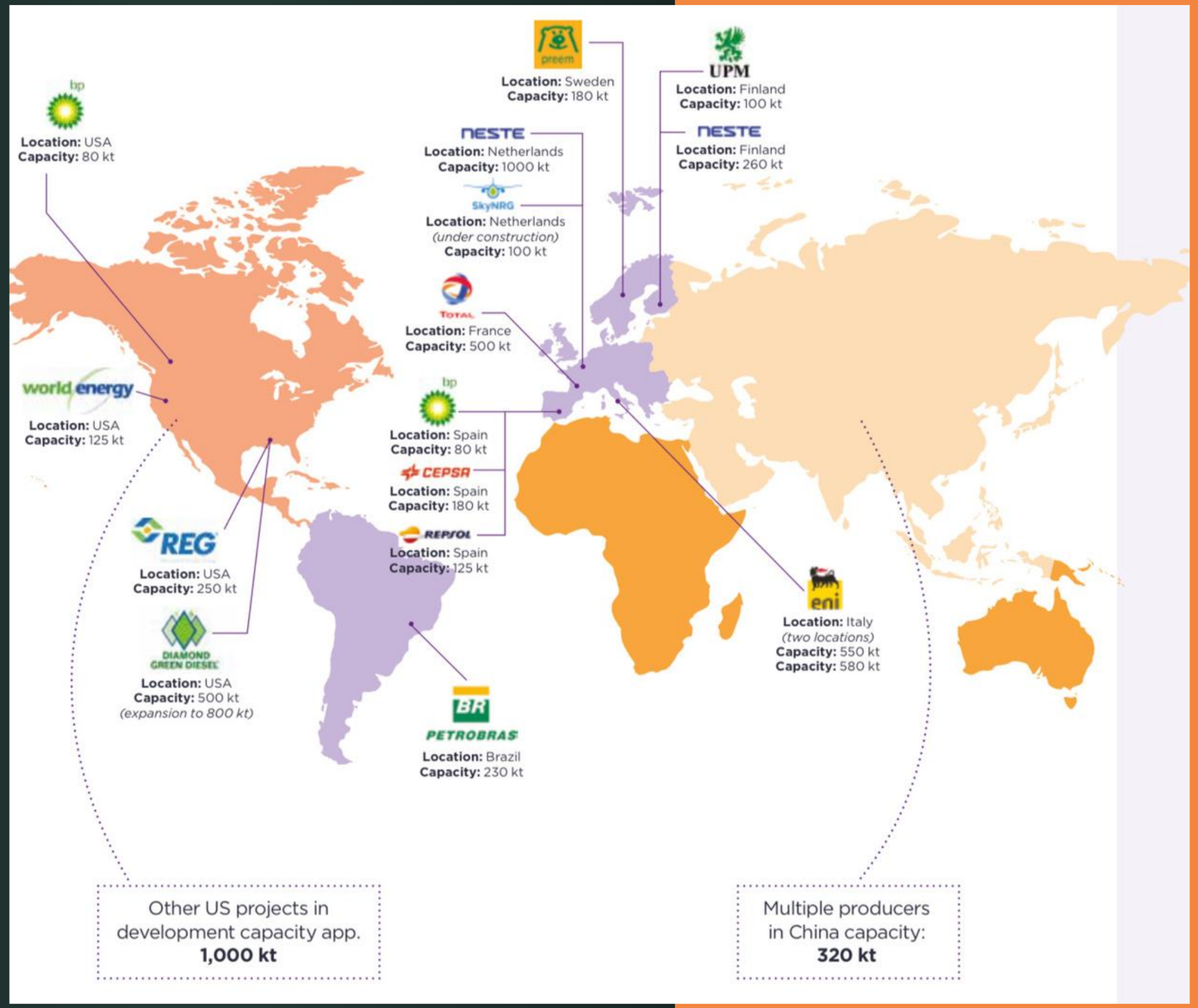
It is necessary to invest in PURPOSE ROUTES



*Source: BioLPG a renewable pathway towards 2050 , 2021

Scenario

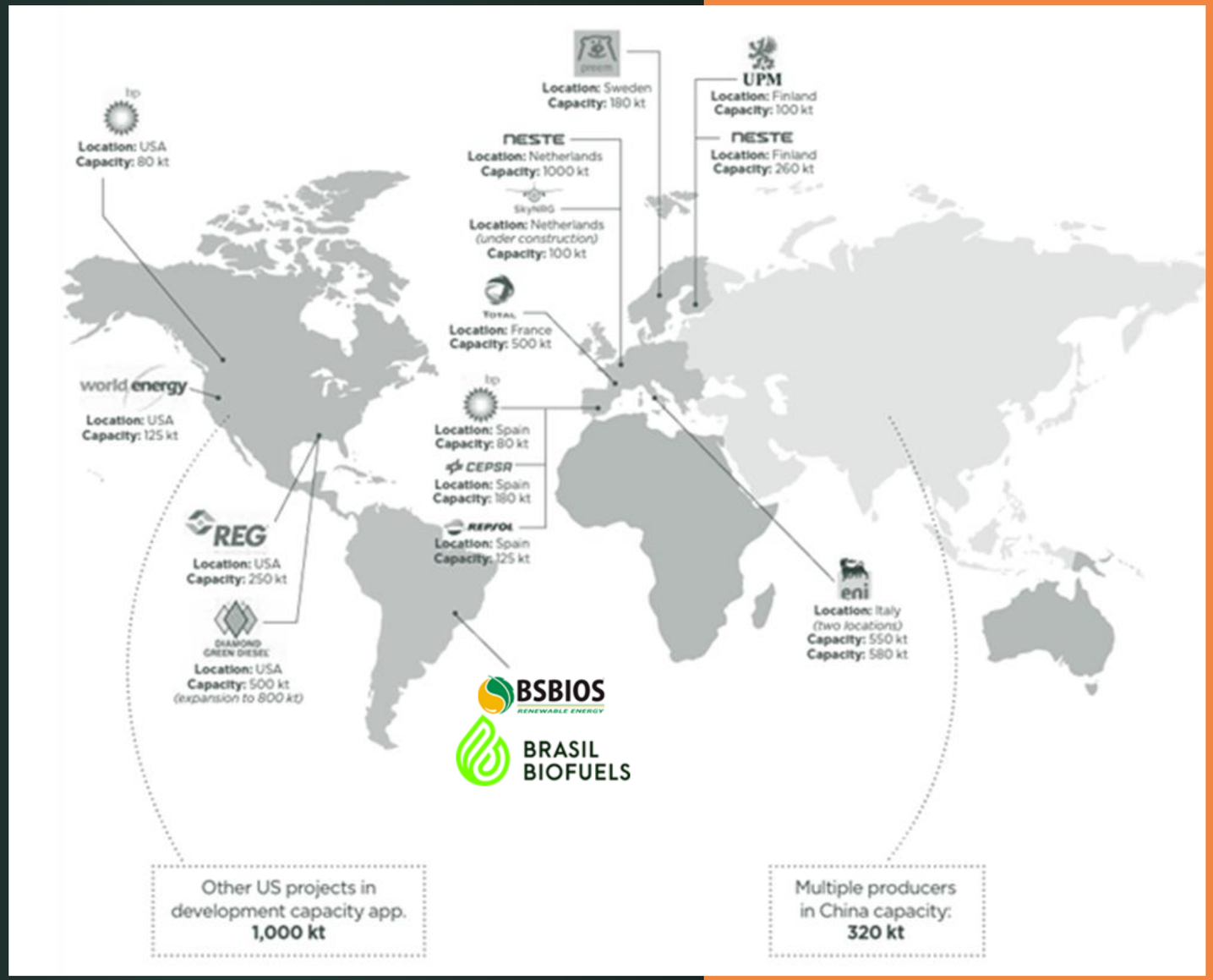
- Renewable LPG is already produced and commercialized (current worldwide production of 200 thousand tons per year)
- All Renewable LPG commercialized come from the HVO process and co-processing
- New conversions routes need to be developed in order to meet the market demand



Source: Atlantic Consulting: * Process Technologies and Projects for BioLPG (2018) E. Johnson

Scenario

- In Brazil, there is still no Renewable LPG commercialization
- Copa Energia has made efforts to change this scenario and use the fuel as a renewable alternative do diversify the energy matrix



Source: Atlantic Consulting: * Process Technologies and Projects for BioLPG (2018) E. Johnson

Scenario

Copa Energia faz acordo com a USP para desenvolver projeto de BioGLP

Durante quatro anos, a Copa Energia, dona das marcas Copagaz e Liquigás, investe em pesquisas para soluções em BioGLP, que emite até 80% menos carbono na combustão do que o de origem fóssil

Partnership with USP (University of São Paulo) to develop bioLPG solution specifically designed for Brazilian conditions

Line of research based on modeling and optimizing the whole value chain of bioLPG in Brazil

*Source: Exame, 2022

THANK YOU!

AVENIDA CHUCRI ZAIDAN, 1170
Rochaverá – Crystal Tower
30rd floor – Brooklin Paulista
São Paulo - SP