Renewable LPG

Potential and advances worldwide

4º Congreso Internacional del GLP

October 2022

Agenda

01 Different types of LPG

- Synthetic vs Renewable vs bioLPG vs rDME
- What are the advantages of Renewable LPG?
- How is Renewable LPG produced?

02 What is the Renewable LPG scenario?

Different types of LPG

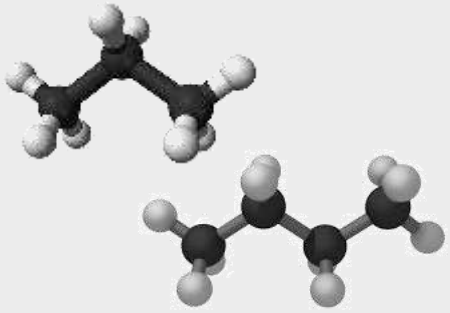
Different types of **LPG**

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

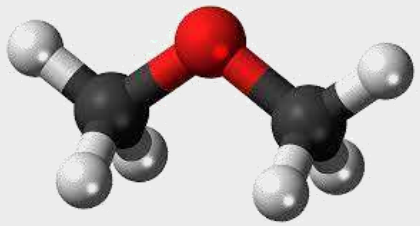


SAME MOLECULE

LPG

DIFFERENT MOLECULE

rDME (dimethyl ether)
Slightly different molecule



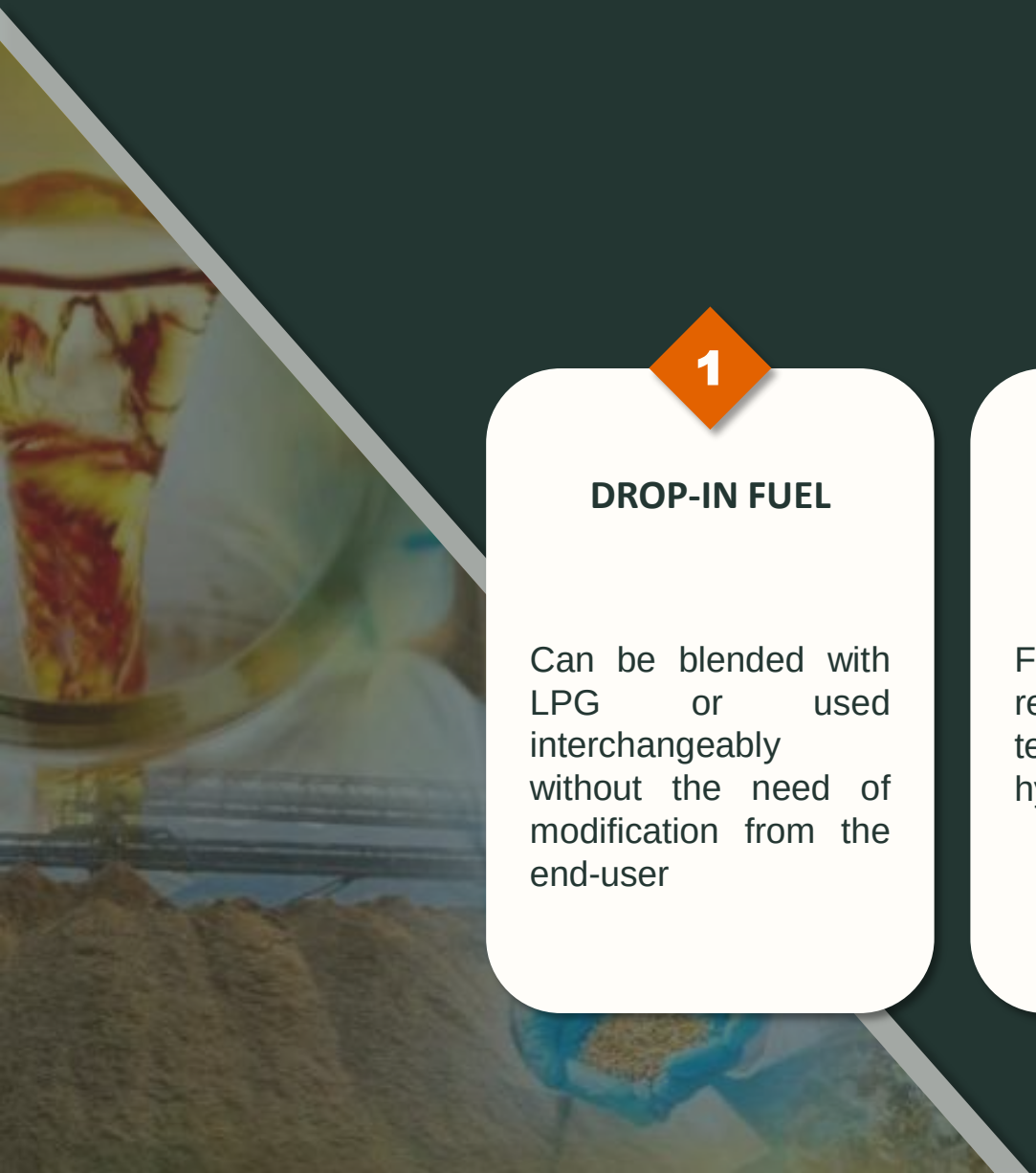
Renewable **LPG**

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



Renewable LPG
ADVANTAGES

1

DROP-IN FUEL

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

2

EASY TO USE

Flexible partner with renewable technologies and hybrid systems

3

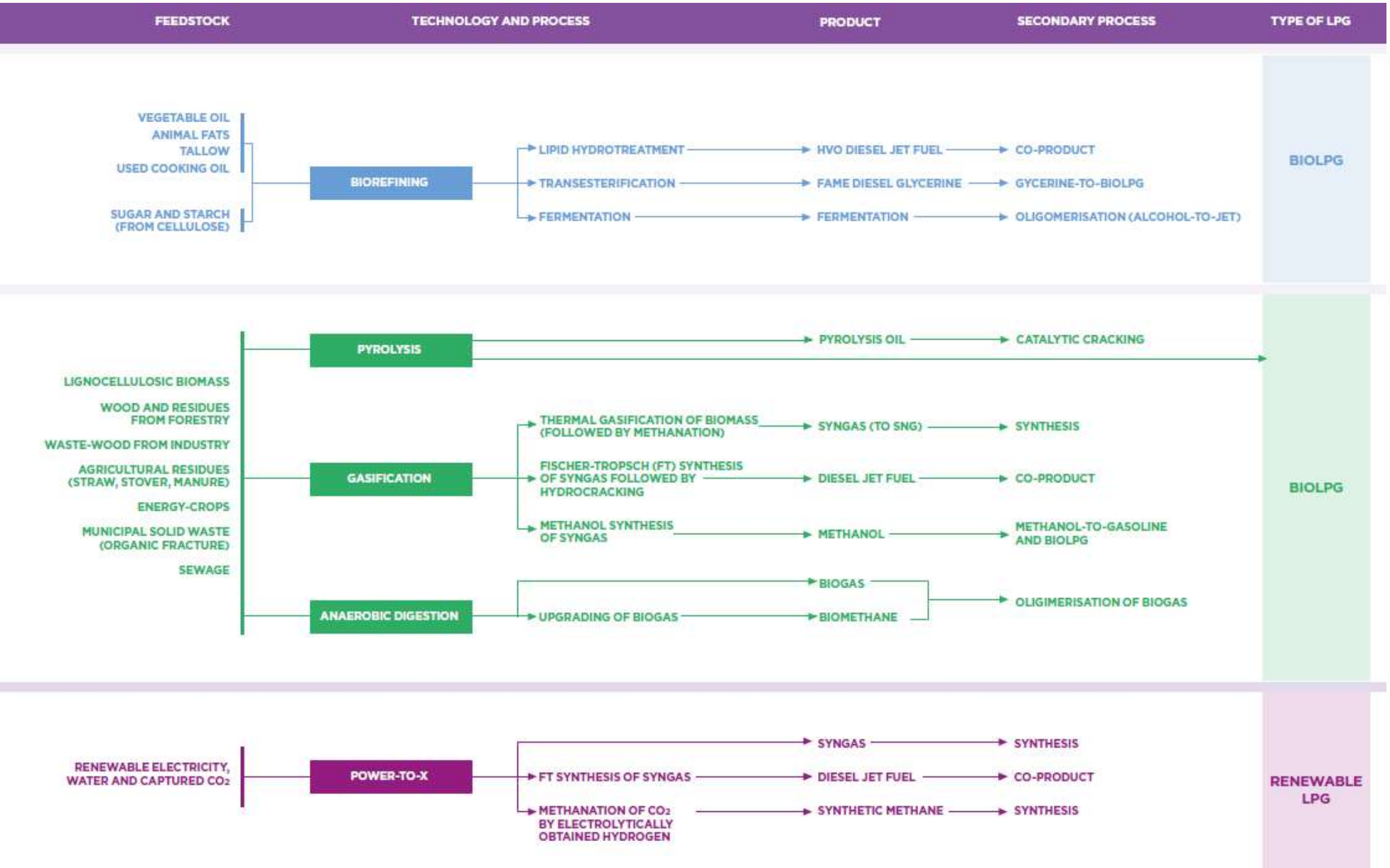
AFFORDABLE TRANSITION

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

4

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



Renewable LPG **PRODUCTION PATHWAYS**

*Source: BioLPG a renewable pathway towards 2050 , 2021

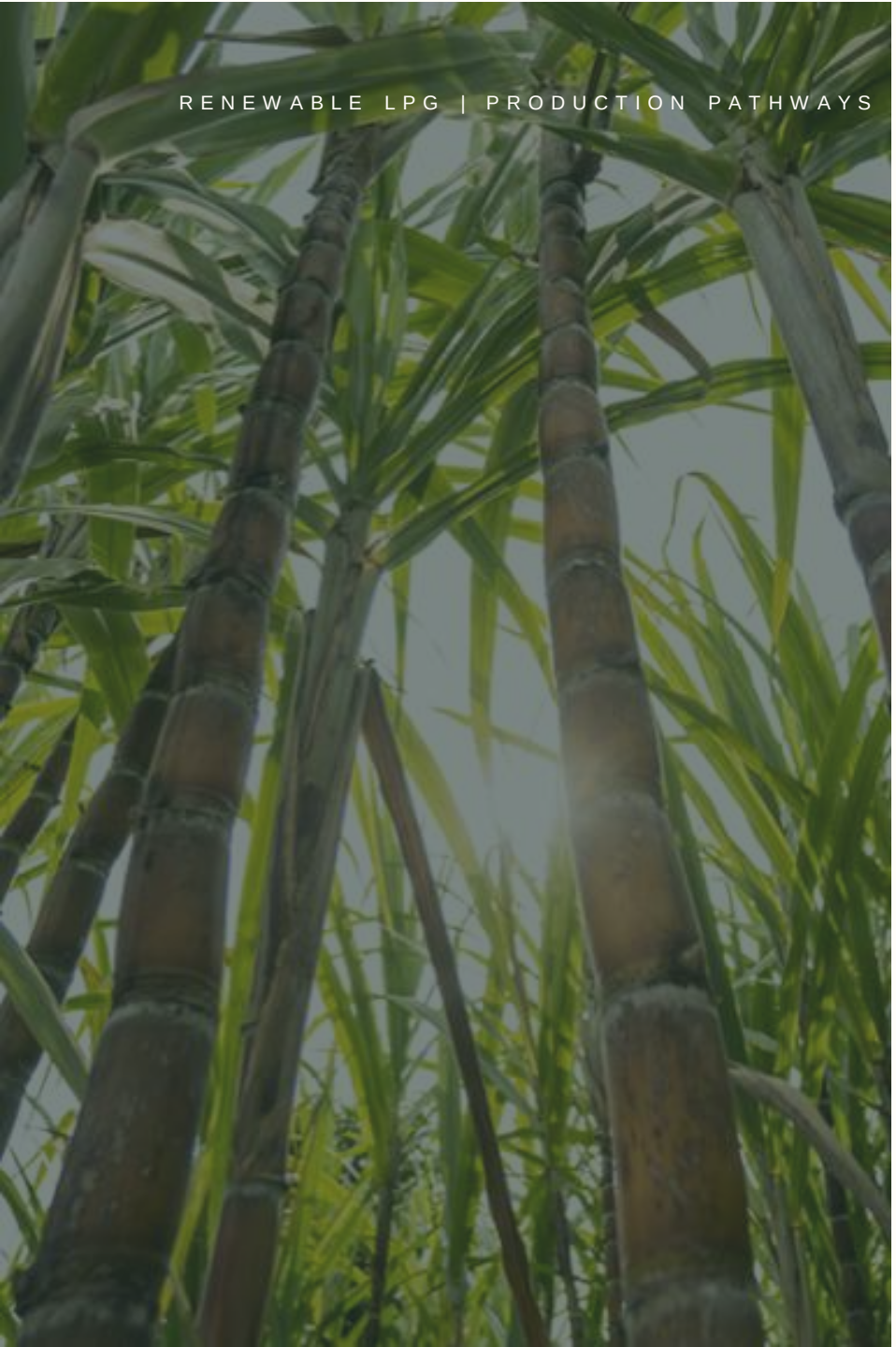
Biorefining

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**

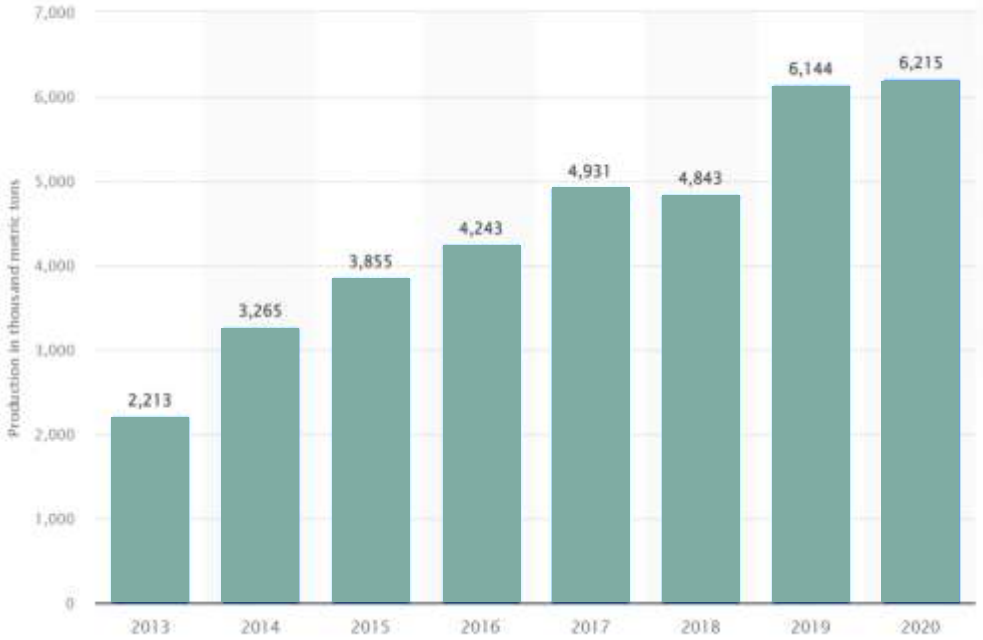
ETHANOL-TO-BIOLPG

- 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

Renewable LPG scenario

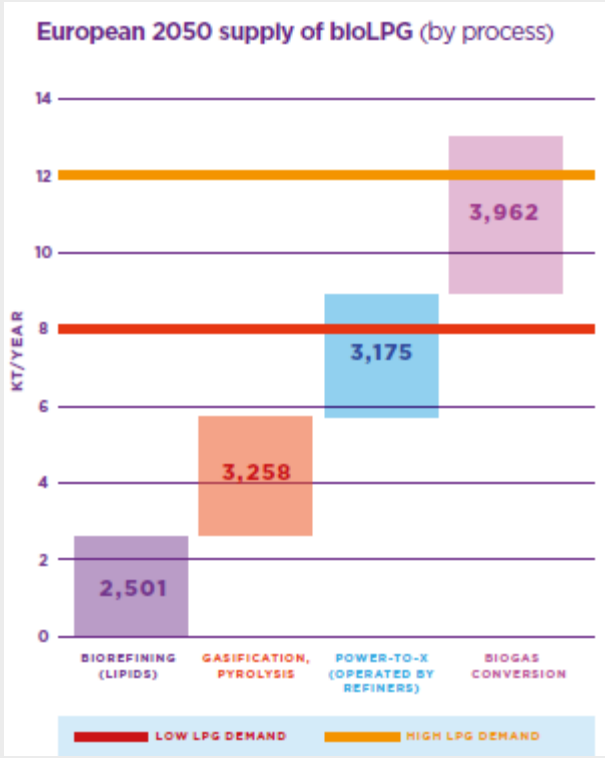
Renewable LPG **SCENARIO**

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



*Source: N. Sönnichsen, 2022

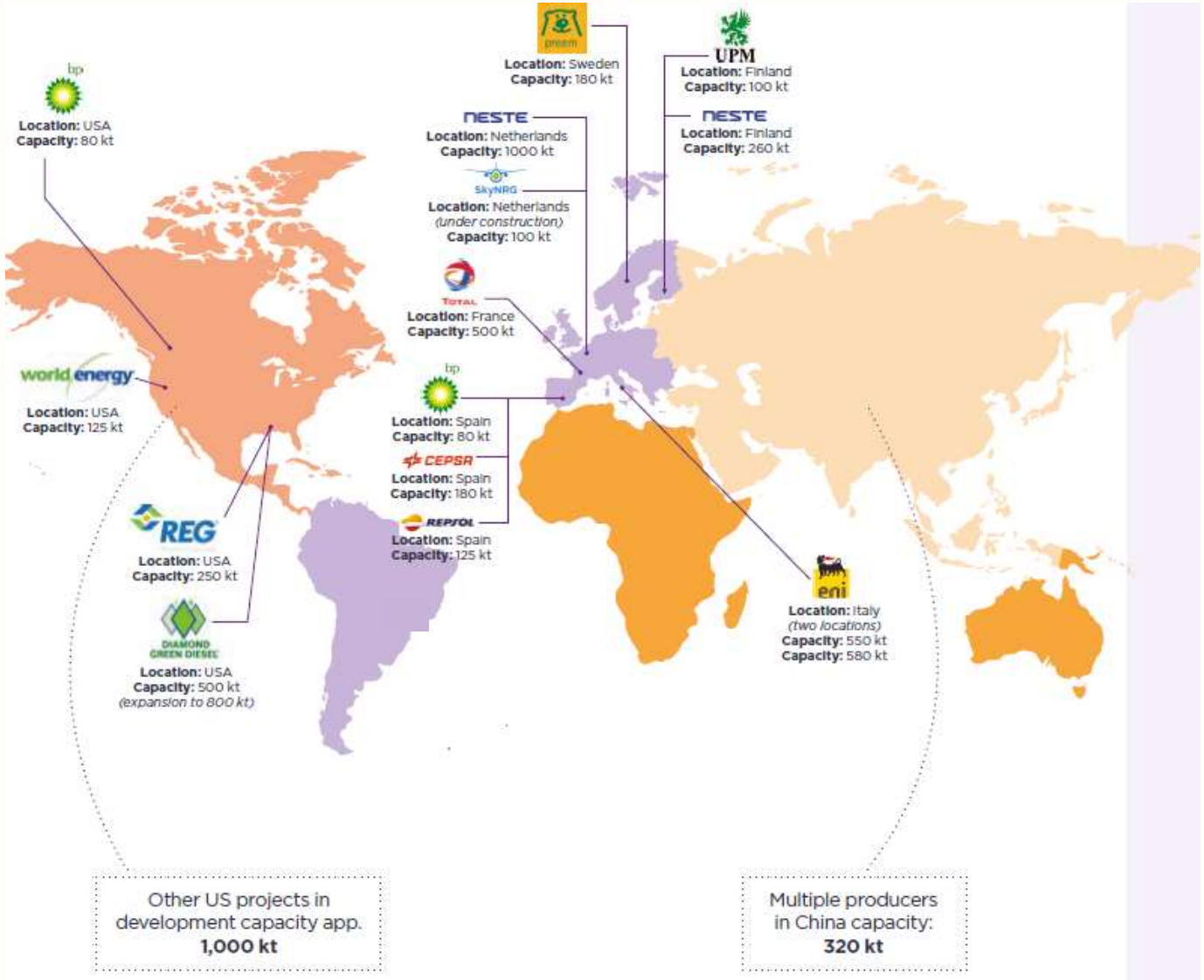
- Predicting Renewable LPG supply in the coming years is still difficult as routes and yields are still **UNCERTAIN**
- It is necessary to invest in **PURPOSE ROUTES**



*Source: BioLPG a renewable pathway towards 2050 , 2021

Renewable LPG **SCENARIO**

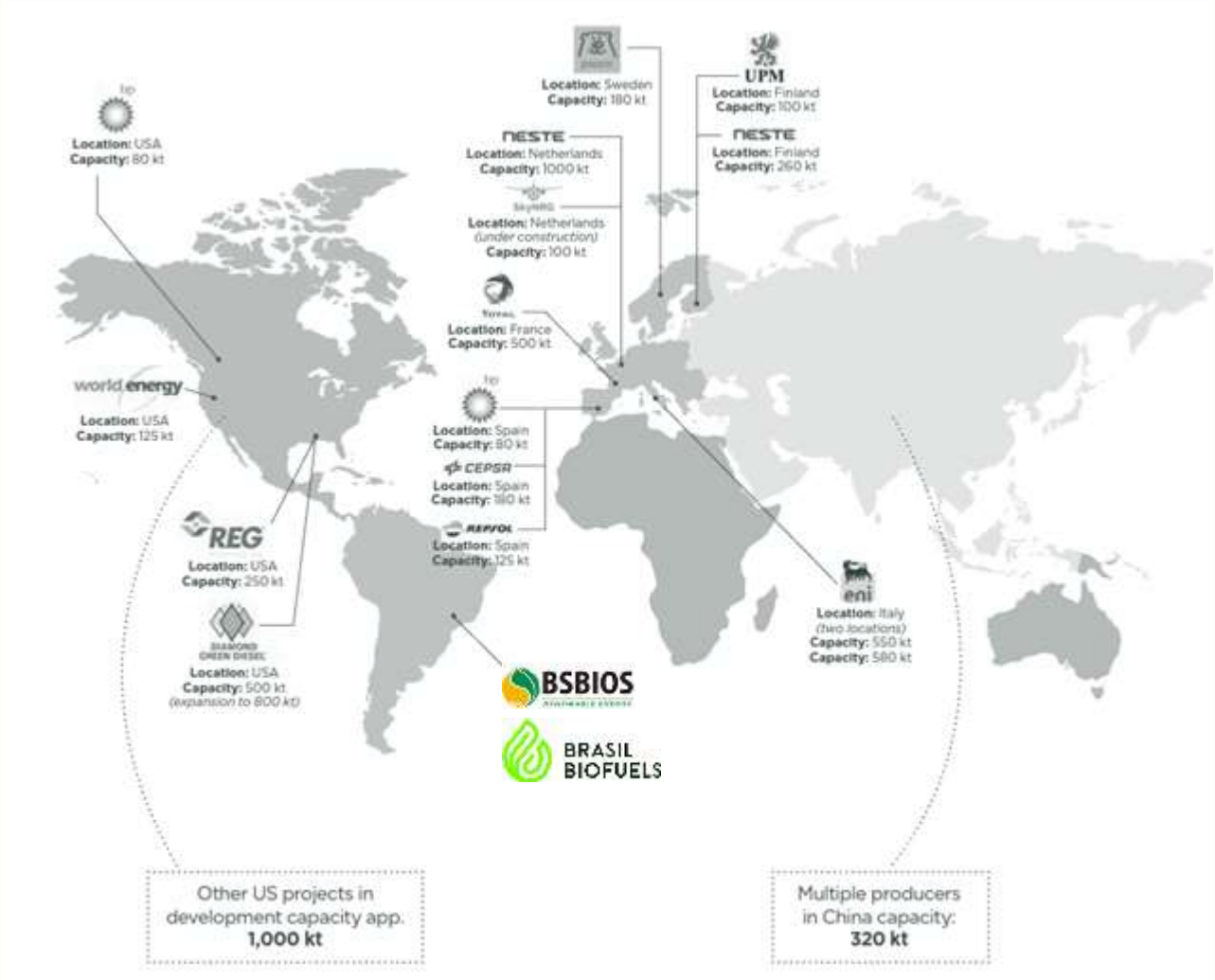
- Renewable LPG is already produced and commercialized (current worldwide production of 200 thousand tons per year)
- All Renewable LPG commercialized come from the HVO process and co-processing
- New conversions routes need to be developed in order to meet the market demand



**Refinery capacity figures represent capacities for HVO biodiesel Source: Atlantic Consulting: * Process Technologies and Projects for BioLPG (2018) E. Johnson

Renewable LPG **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



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Renewable LPG
SCENARIO

- 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

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

*Source: Exame, 2022

Thank you!

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