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KEROGREEN

"Production of Sustainable aircraft grade Kerosene from water and air powered by Renewable Electricity, through the splitting of CO_2, syngas formation and Fischer-Tropsch synthesis"

Project No: 763909

Deliverable D7.7
Leaflet for stakeholders on business concept

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Responsible partner (& person) for deliverable:	**DIFFER (Marieke van Ee]**
Contributing partners:	**all**

Coordinator:	Adelbert P H Goede, Dutch Institute for Fundamental Energy Research (DIFFER) De Zaale 20, 5612 AJ Eindhoven (NL). Postal address: PO Box 6336 5600 HH Eindhoven (NL)		
Project Partners:	DIFFER (NL), KIT (D), VITO (B), Cerpotech (N), HyGear (NL), INERATEC (D)		
Start date of project:	1st April 2018	**Project duration:**	54 months
Project web site:	http://www.kerogreen.eu		

DOCUMENT INFO

Dissemination level

Dissemination level		
PU	Public	**x**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Deliverable Nature

Nature of Deliverable		
R	Report	**x**
P	Prototype	
D	Demonstrator	
O	Other	

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Changes with respect to the DoA

Issue	Comments
Delay in submission	The leaflet was finished and available on the Final Event, held on the 27th of September. The delay is due to finalizing the Deliverable for uploading.

Document Control

Document version #	Date	Author	Comments
V1.0	26.09.2022	Marieke van Ee	A.P.H.Goede

Table of Contents

1 Introduction

The KEROGREEN deliverable 7.7 reports on the production of a leaflet for stakeholders presenting the business concept. This leaflet has been produced by DIFFER based on the KEROGREEN Corporate Identity (logo, picture with plane and fixed green colour). It also includes the previously used infographic showing the “Circle of KEROGREEN”, from CO_2, water and renewable electricity to green kerosene in 12 steps. This leaflet has been submitted to the coordinator for review and to all project partners for approval for dissemination and use. The leaflet was available on the Final Event, which was held on the 27th of September 2022 at KIT. It is also available from the project website.

2 Leaflet for stakeholders

The purpose of the Leaflet is to promote and to inform stakeholders about the results achieved in the project. Therefore, besides the description of the ‘Circle of KEROGREEN’, the main achievements and key figures are presented. The Leaflet also identifies the challenges yet to overcome and the invitation to stakeholders to join and/or contribute to take green kerosene to the next level.

The main stakeholder identified are:

- Policymakers
- Investors
- EU/National projects in related topics
- Aviation Industry, including those represented by members of the Advisory Board
- Chemical Industry, including those represented by members of the Advisory Board
- Energy companies
- (Public) utility companies

Each partner will be able to print the Leaflet and disseminate it as often as required.

3 Annex

PARTNERS

DIFFER

KIT Karlsruher Institut für Technologie

vito

Cerpotech

HYGEAR

INERATEC

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FUNDING

KEROGREEN received funding from the European Union's Horizon 2020 Research and Innovation Programme.

Grant agreement no: 763909
Period: April 2018 to September 2022

KEROGREEN MAKING GREEN KEROSENE OUT OF CO_2, WATER, AND RENEWABLE ELECTRICITY

We integrated the individual, separate processes...

... and installed it into a shipping container!

Now, will you fly with us...

... to the next level of technology readiness?

THE CIRCLE OF KEROGREEN

Step 1: The 12 steps to produce kerosene cost a lot of energy. To produce green kerosene, the energy source has to be renewable. Good sources are solar energy and wind energy.

Step 2: CO_2 feedstock is to be (re-)captured from ambient air for the fuel cycle to become CO_2 neutral

Step 3: The energy from step 1 drives a so called RF source, a kind of microwave-oven.

Step 4: A plasma reactor uses the microwave radiation and splits CO_2 in CO and O_2. This so called plasmolysis has been proven at small scale by DIFFER.

Step 5: To remove the oxygen (O_2) VITO and Cerpotech produced oxygen permeable membranes. DIFFER demonstrated that oxygen is removed from the mixture. CO and CO_2 go to the next step.

Step 6: In the CO purifier, made by HyGear, undesired gases are removed to supply clean CO for the next step.

Step 7: The integrated water-gas shift and CO_2-removal is built by KIT. CO and H_2 go to step 8.

Step 8: The Fischer-Tropsch synthesis by INERATEC is a collection of chemical reactions that converts a mixture of carbon monoxide and hydrogen into liquid hydrocarbons, mainly alkanes, a source for e.g. clean diesel fuel, Kerosene and wax.

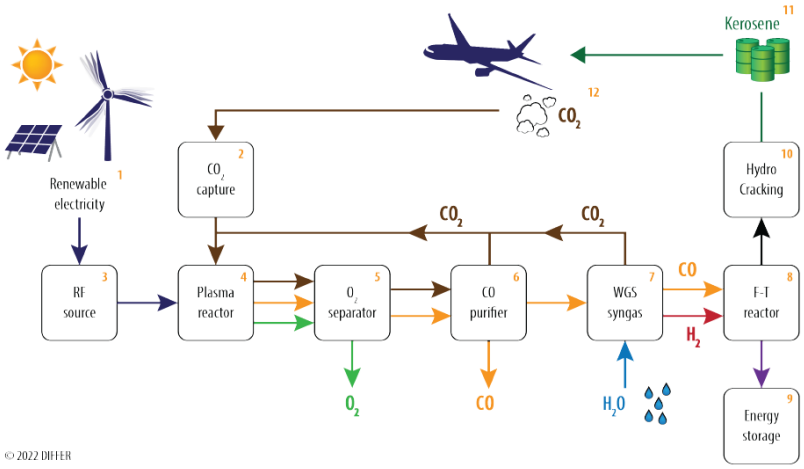
Step 9: An excess fraction e.g., molecules that do not fit to the Kerosene specification could be stored for later use (or as CO2 storage).

Step 10: The molecules which have passed the hydrocracking step (by KIT) and fit to the Kerosene blend, a mixture of carbonmolecules with 8 to 14 carbonatoms, are sent to final upgrading for aviation.

Step 11: Kerosene can be stored in barrels and tanks.

Step 12: The kerosene is used by a plane. The plane produces CO_2 and H_20. The CO_2 can be captured and used again. And the circle is closed.

FROM CO_2, WATER, AND RENEWABLE ELECTRICITY TO GREEN KEROSENE IN 12 STEPS



Main achievements

- Individual elements have been demonstrated at lab-scale
- The elements have been integrated in a container sized system

Key figures

Plasma Reactor (step 4)

- Up to 0.7 kg CO/h production rate
- Typical energy cost: 0.12 kWh/kg CO

CO purification (step 6)

- Up to 98% purity (on single step)
- Up to 95% CO yield

Fischer-Tropsch & Hydrocracking modules (steps 8 +10)

- In-line recycling (and cleaning) of residual wax
- Wax conversion > 50%
- Required isomer content of > 30% for kerosene obtained

Challenges

- To scale up the oxygen separator (step 5) to system level
- To produce 0.1 kg/h kerosene with a fully integrated system

What's next?

- We would love to get into contact with investors, policymakers, companies and airports
- Do you take green kerosene with us to the next level?