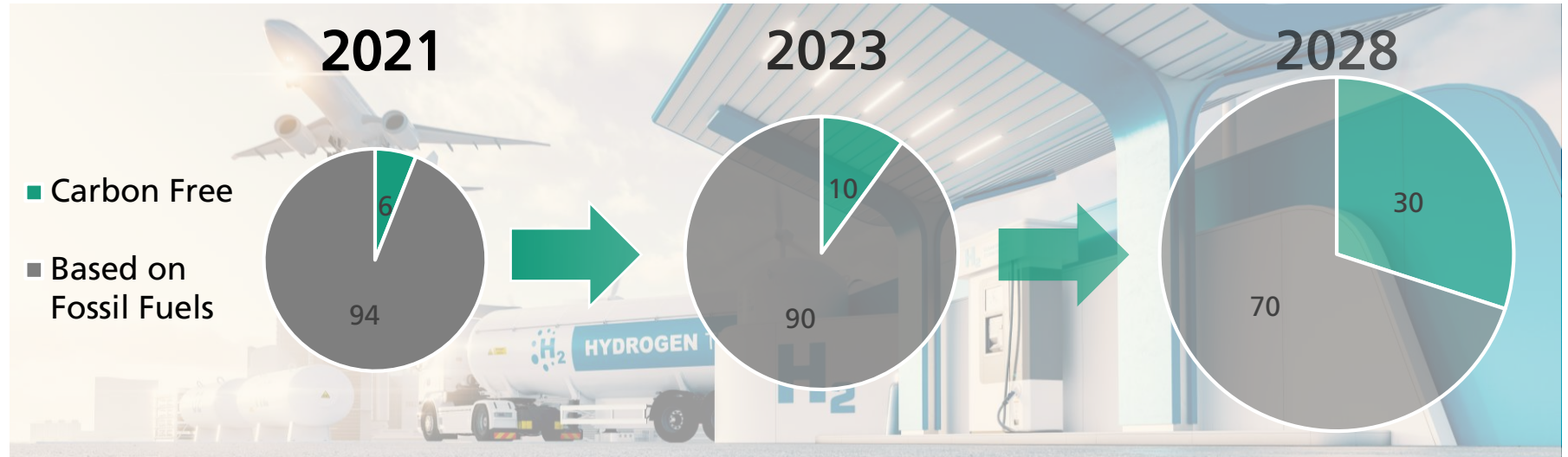


EVALUATING THE MATERIAL AND ENERGY EFFICIENCY OF A MICROBIOLOGICAL PROCESS FOR FERMENTATIVE HYDROGEN PRODUCTION USING INTERDISCIPLINARY PERFORMANCE INDICATORS

ISGC 2022

Natascha Eggers, M.Eng.; Dr.-Ing. Lukas Kerpen; Dr. Fabian Giebner; Prof. Dr.-Ing. Torsten Birth

La Rochelle, 20th May 2022

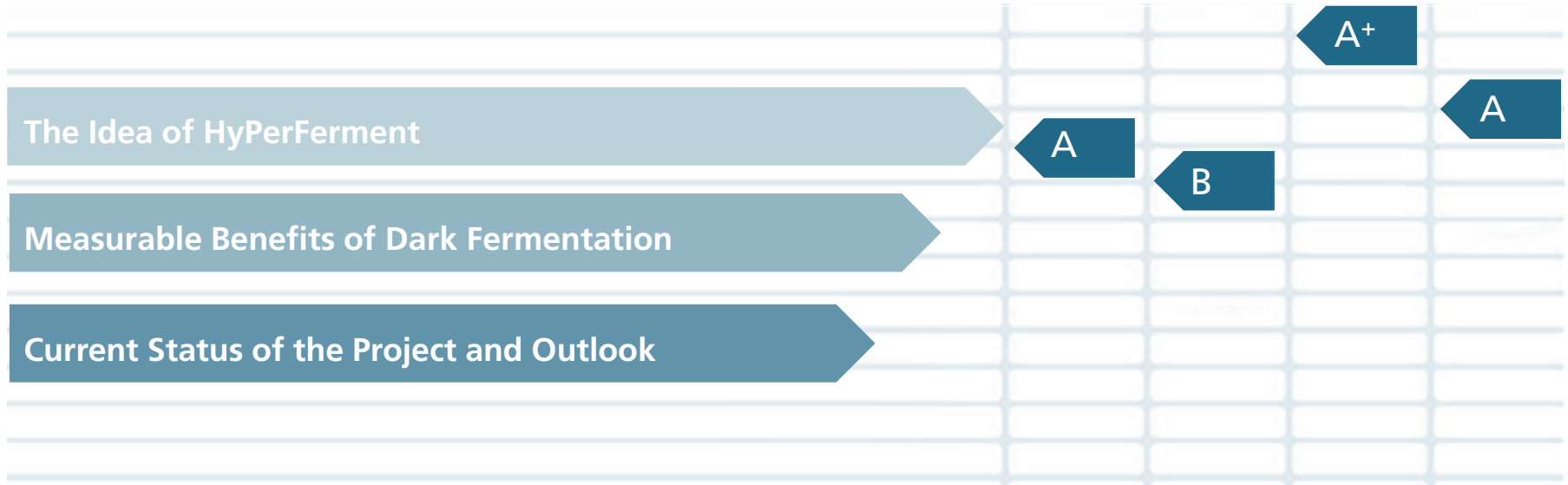


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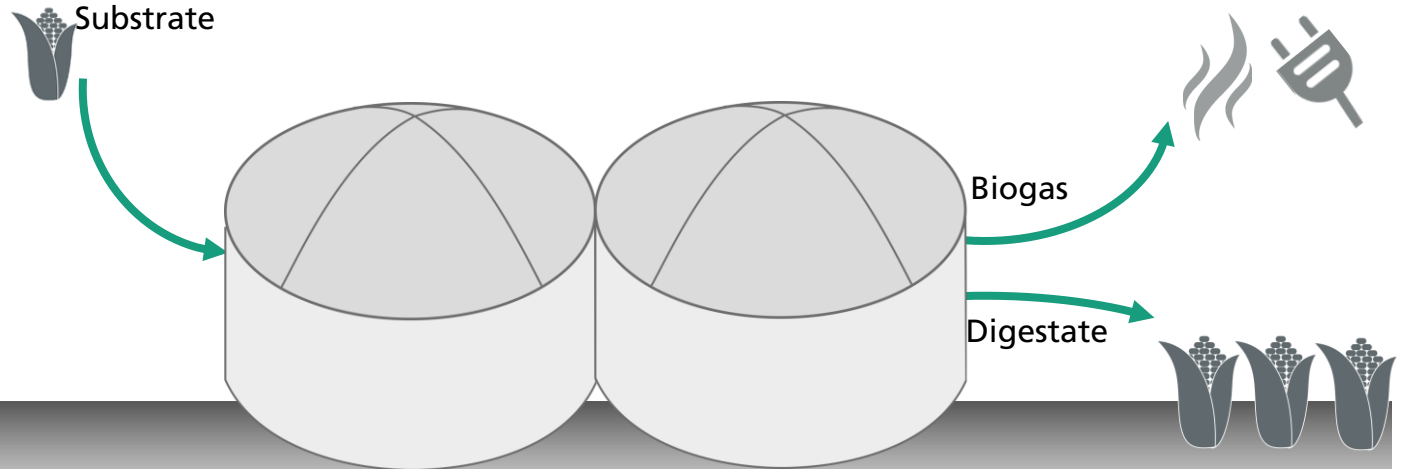
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La Rochelle, 20th May 2022



The Idea of HyPerFerment

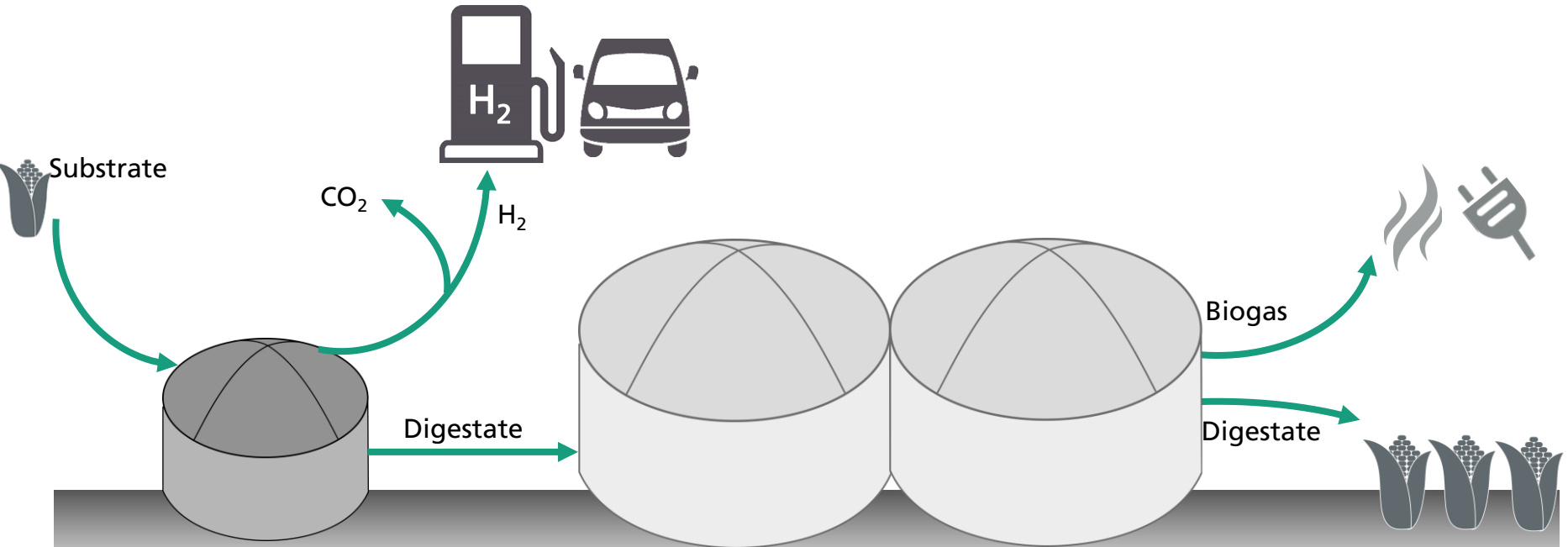
Hydrogen per (via) Fermentation



3

The Idea of HyPerFerment

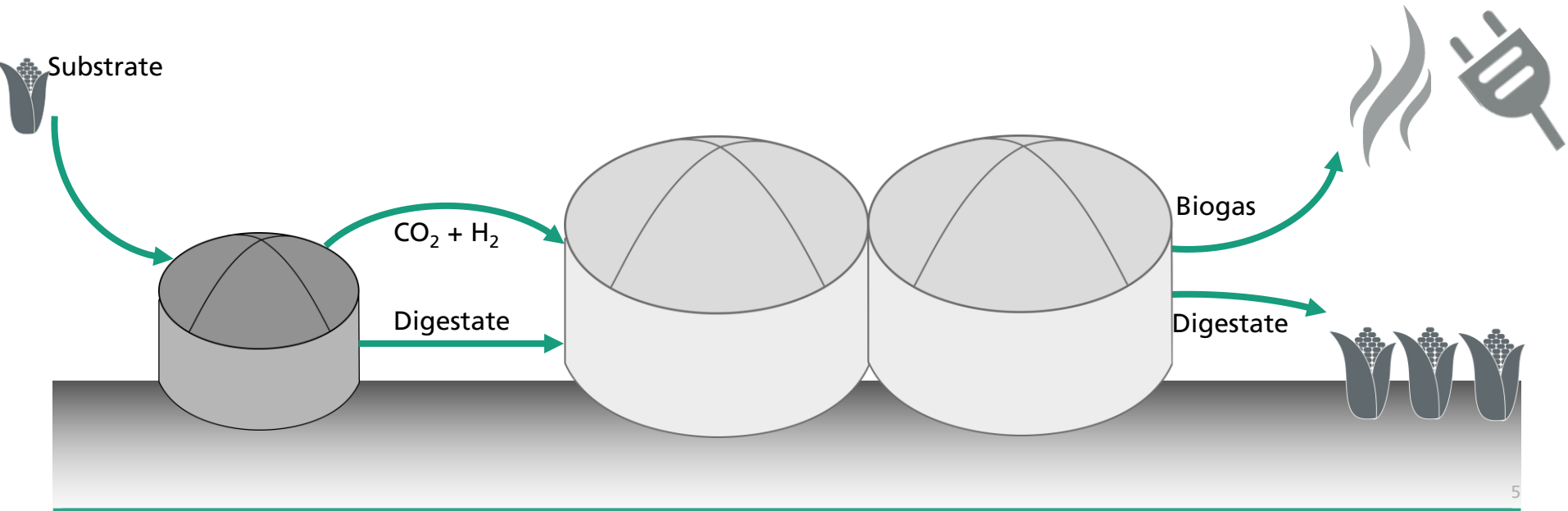
Hydrogen per (via) Fermentation



4

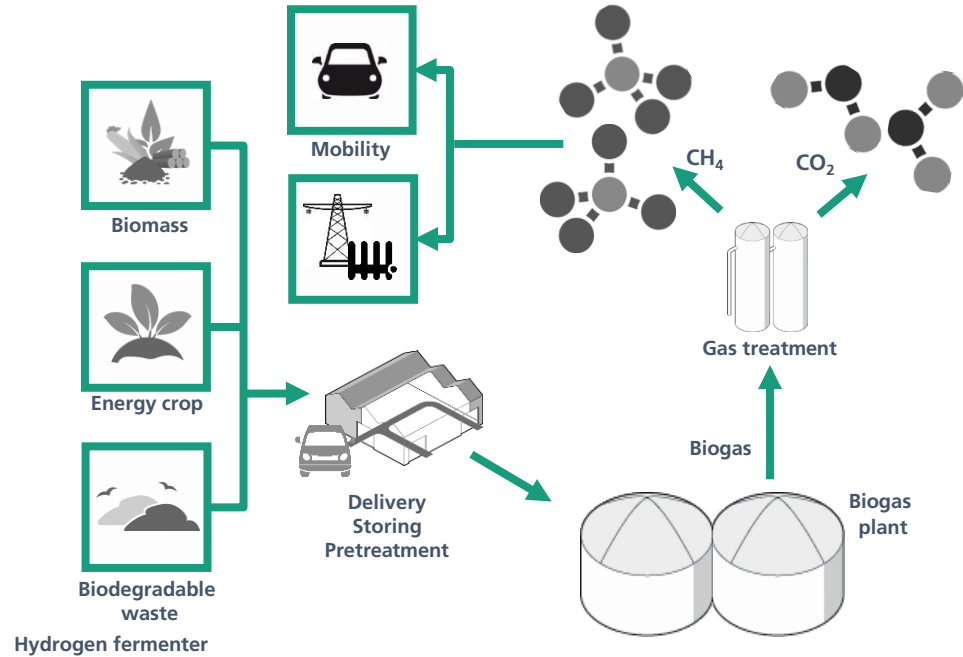
The Idea of HyPerFerment

Hydrogen per (via) Fermentation



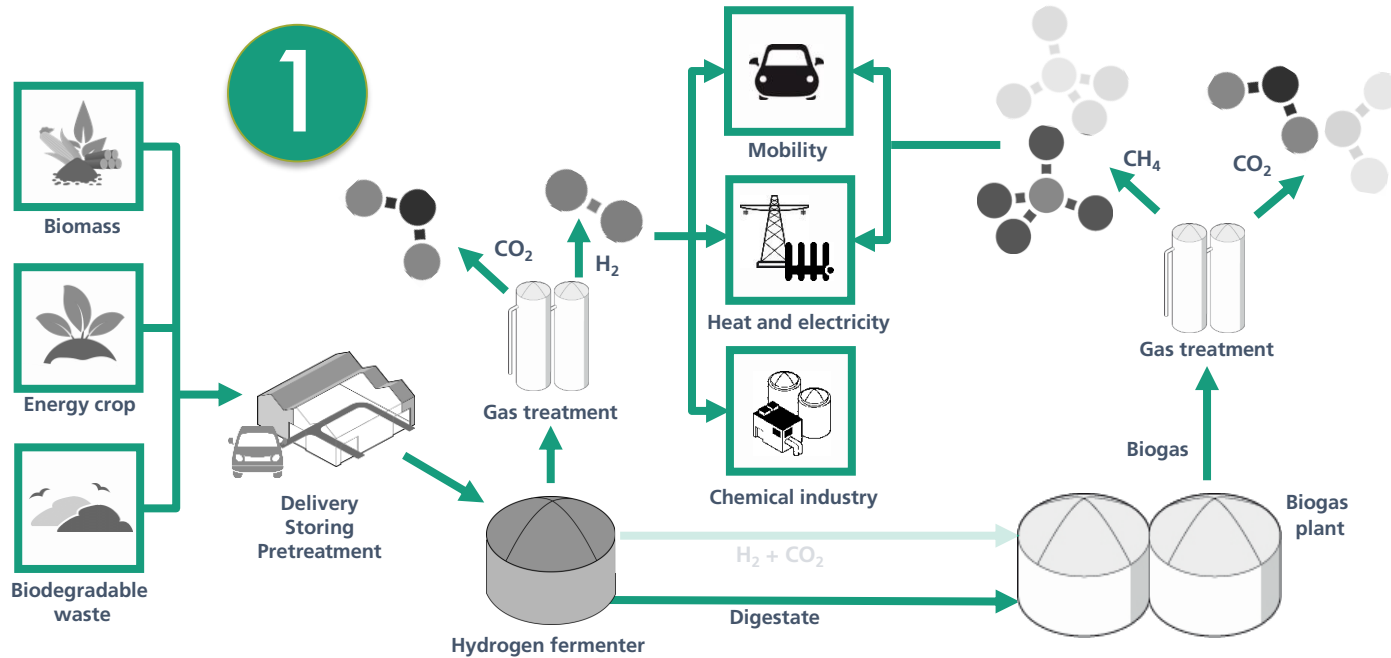
The Idea of HyPerFerment

Two Utilization Pathways



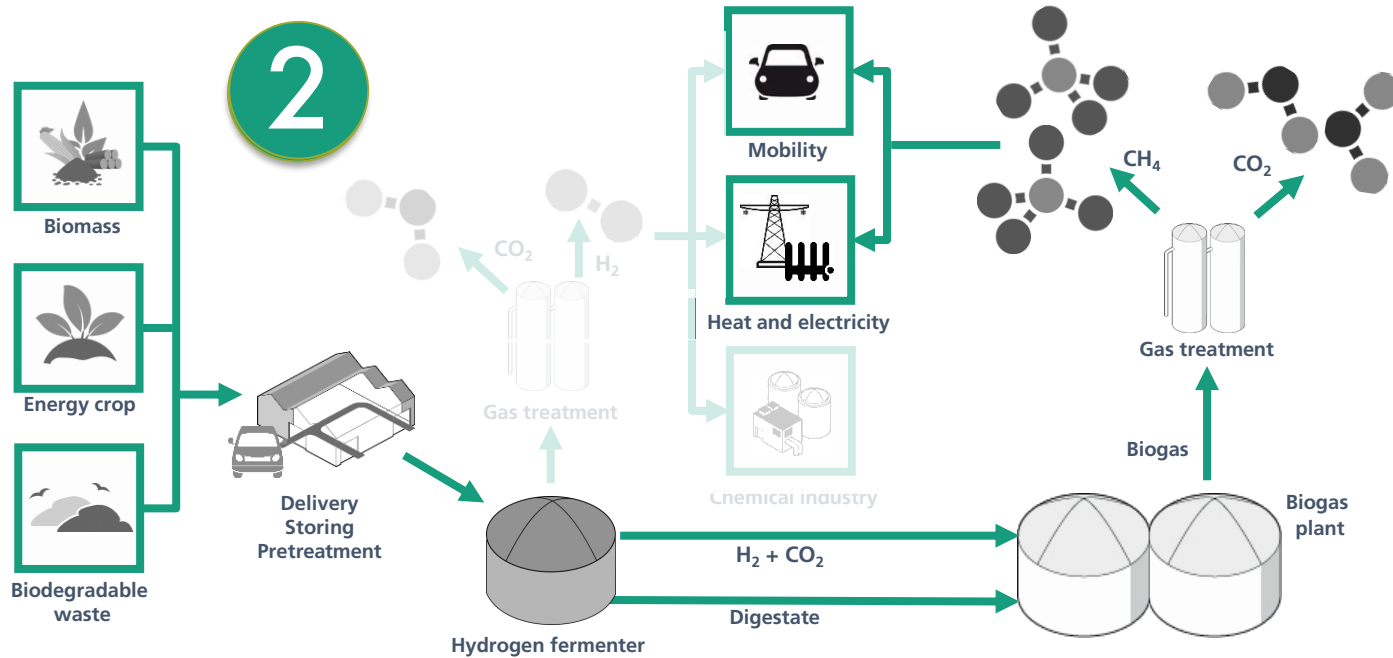
The Idea of HyPerFerment

Two Utilization Pathways



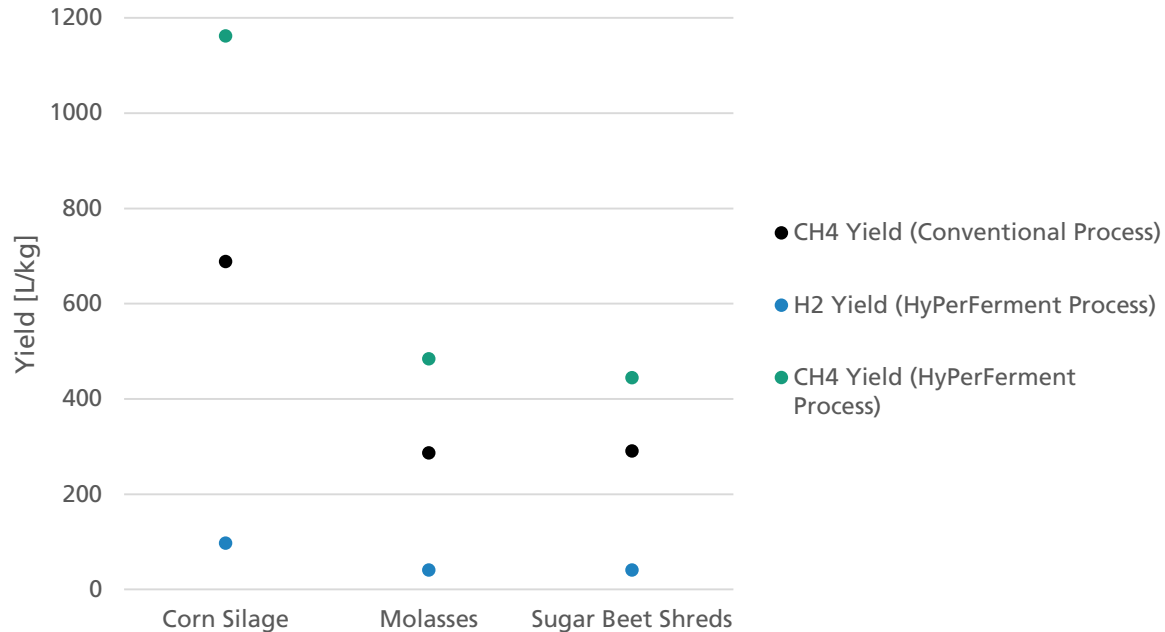
The Idea of HyPerFerment

Two Utilization Pathways



Measurable Benefits of Dark Fermentation

Substance Efficiency - Yield

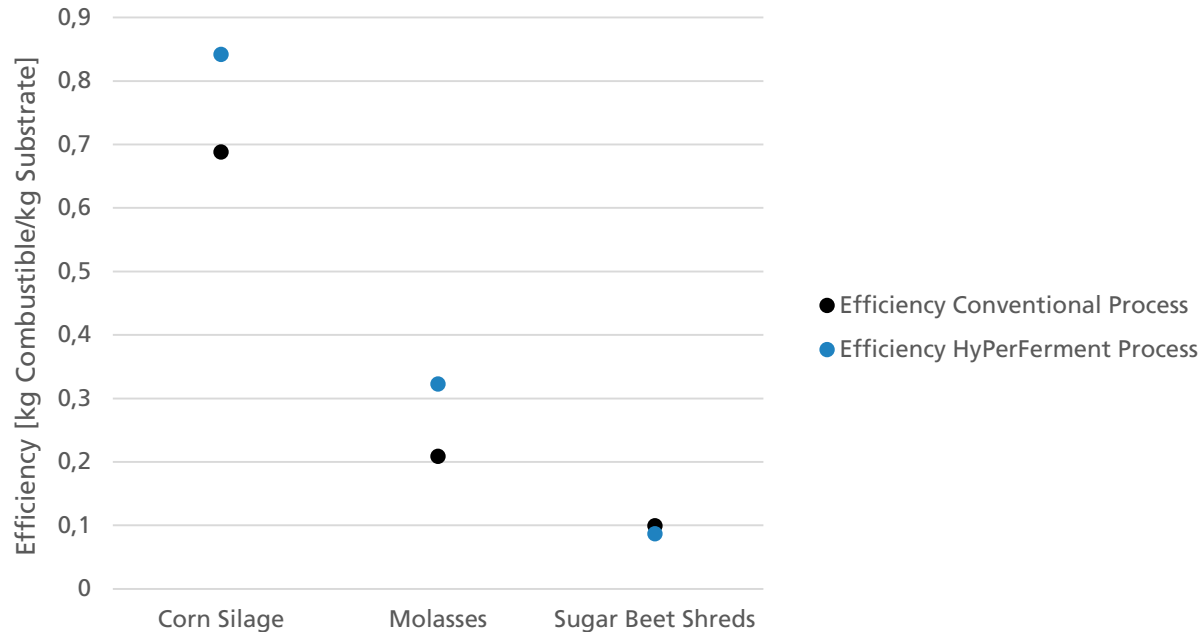


The calculations are based on experimental data provided by MicroPro GmbH.

So far, a series of experiments with 10 parallel tests each has been carried out. The results are currently being validated in new tests.

Measurable Benefits of Dark Fermentation

Substance Efficiency – Substrate Utilization Rate



The calculations are based on experimental data provided by MicroPro GmbH.

So far, a series of experiments with 10 parallel tests each has been carried out. The results are currently being validated in new tests.

Current Status of the Project and Outlook

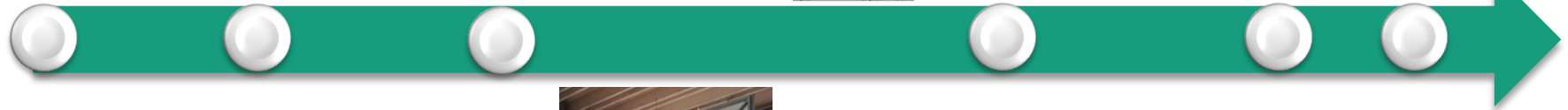
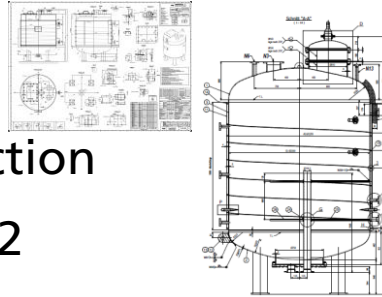
Demonstration Plant

HyPerFerment

KickOff
Oct 2020

Preconstruction
Apr 2022


Start Fermentation
June 2022



Nov 2021

Long Term Fermentation

30 L reactor: 100 L/d

pilot plant: 250 km/d 



May 2022

On-Site Construction

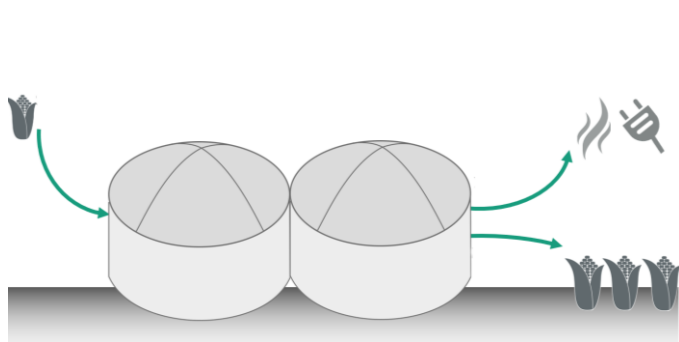


Nov 2022

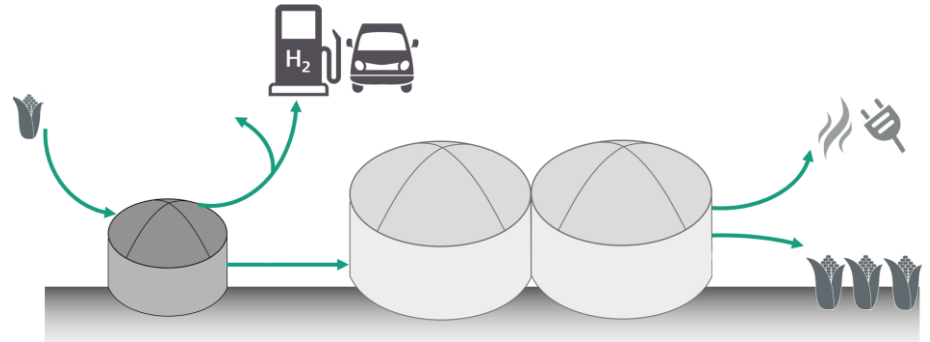
Reliable Results

Current Status of the Project and Outlook

Challenges - Efficiency Evaluation

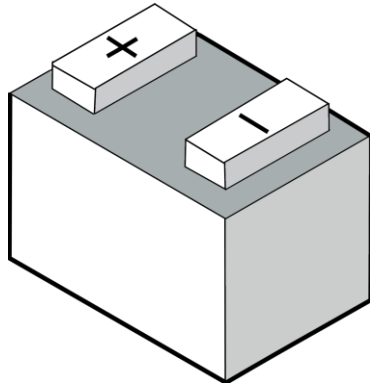


VS.

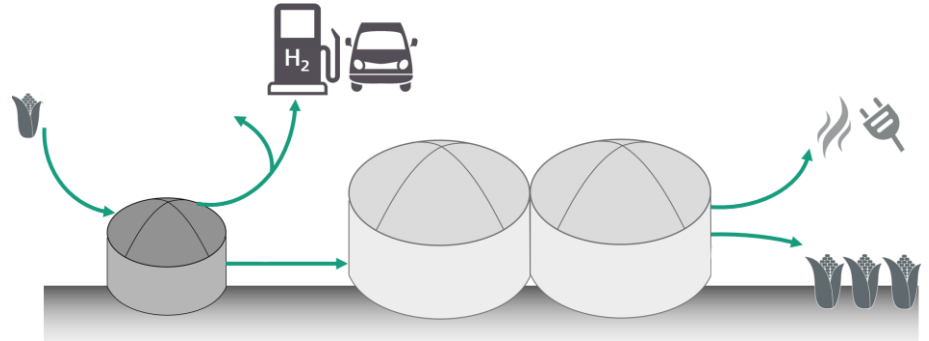


Current Status of the Project and Outlook

Challenges - Efficiency Evaluation



VS.

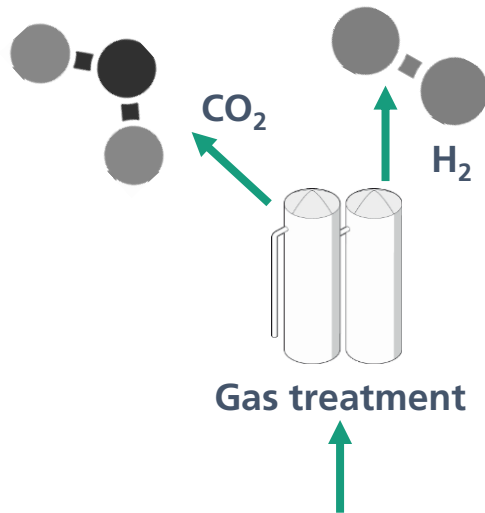


- Efficiency evaluation based on simulation
 - Model defines limit of optimizability
 - Allows comparison of different hydrogen production technologies

Current Status of the Project and Outlook

Challenges - Hydrogen Separation

- Different technologies available:



Pressure swing adsorption
Vacuum swing adsorption
Flow-through metal hydride
Etc.

Uneconomical at a small scale

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Fraunhofer Institute for Factory Operation and Automation IFF

<https://www.iff.fraunhofer.de/en.html>

Natascha Eggers (M.Eng.)

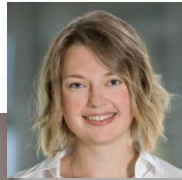
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