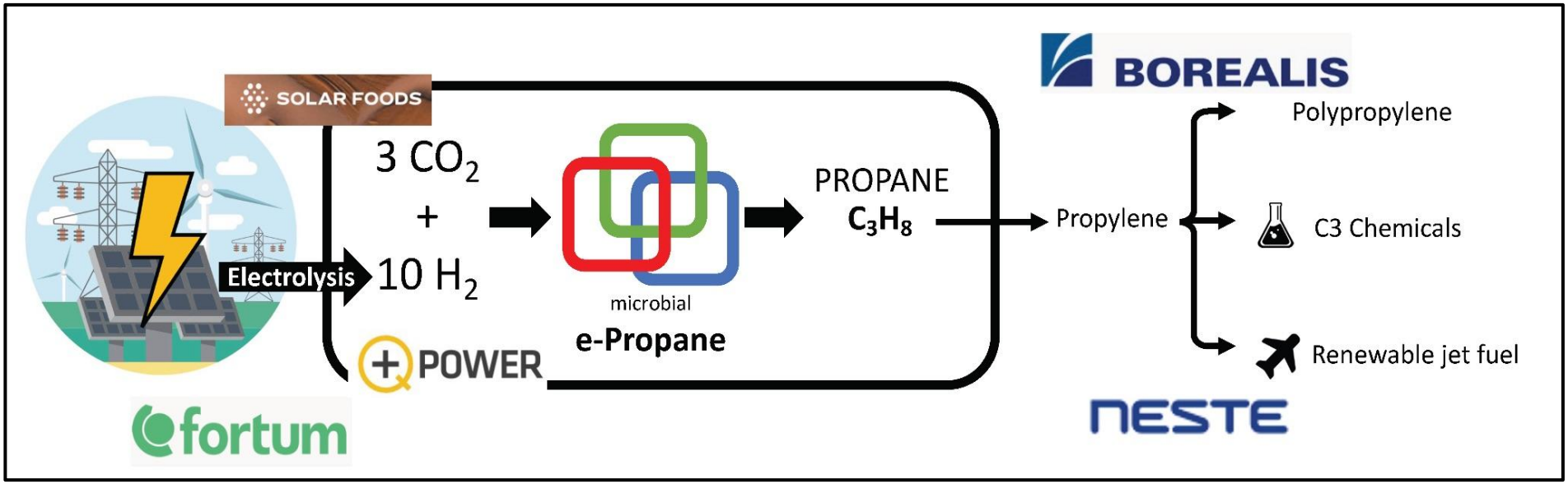
e-Propane

Proof of concept for a direct **CO_2-to-propane** conversion via genetically engineered microbes, and assessing requirements for its implementation in bioreactors and the economic competitiveness

Innovation:



Academic:
- Silvan Scheller (Coordinator, Aalto University)
- Paula Jouhten (Aalto University)
- Rofice Dickson (Aalto University)
- Marika Kokko (Tampere University)

Industry:
- Borealis
- Neste
- Fortum
- Q-power
- Solar Foods

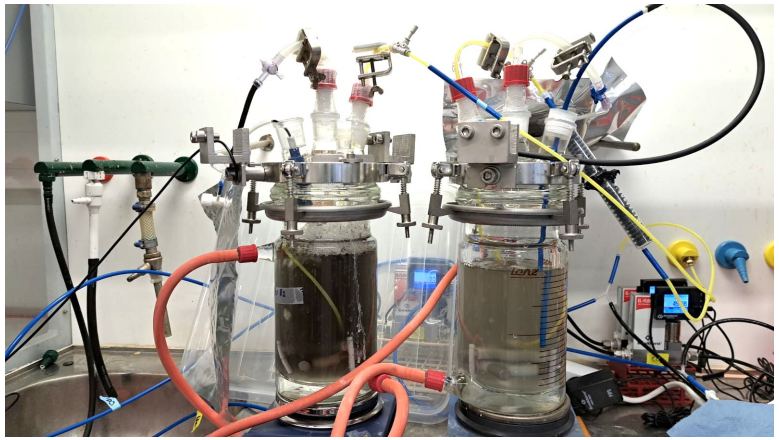
https://www.aalto.fi/en/department-of-bioproducts-and-biosystems/biochemistry

e-Propane: Preliminary Results

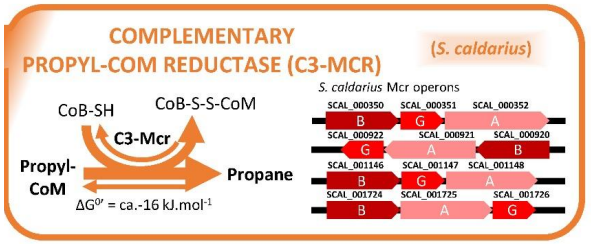
Engineered pathway inside GMO microbes:

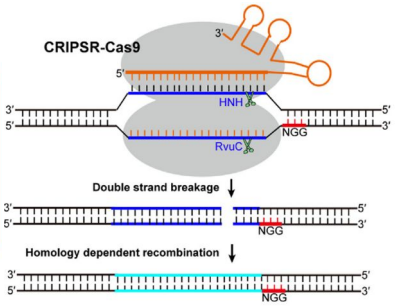
4 CO_2 → 2 acetate → butyrate → CO_2 + propyl-S-CoM —(C3-MCR)→ **propane**

Cultivation of *M. maripaludis*
(can be genetically engineered)



Insertion of mcr-genes
(responsible for propane production)





Bioreactors at Tampere University:

- Biomass growth and methane enhanced by optimizing mixing
- H_2 conversion to CH_4 has been up to 35% but will be further optimized, by using gas recirculation

Genetic modifications at Aalto University:

- Propane-oxidizing microbe (*S. caldarius*) cultured at Aalto
- DNA extracted and mcr genes amplified
- Gene integration via CRISPR-Cas9
- Activity testing ongoing