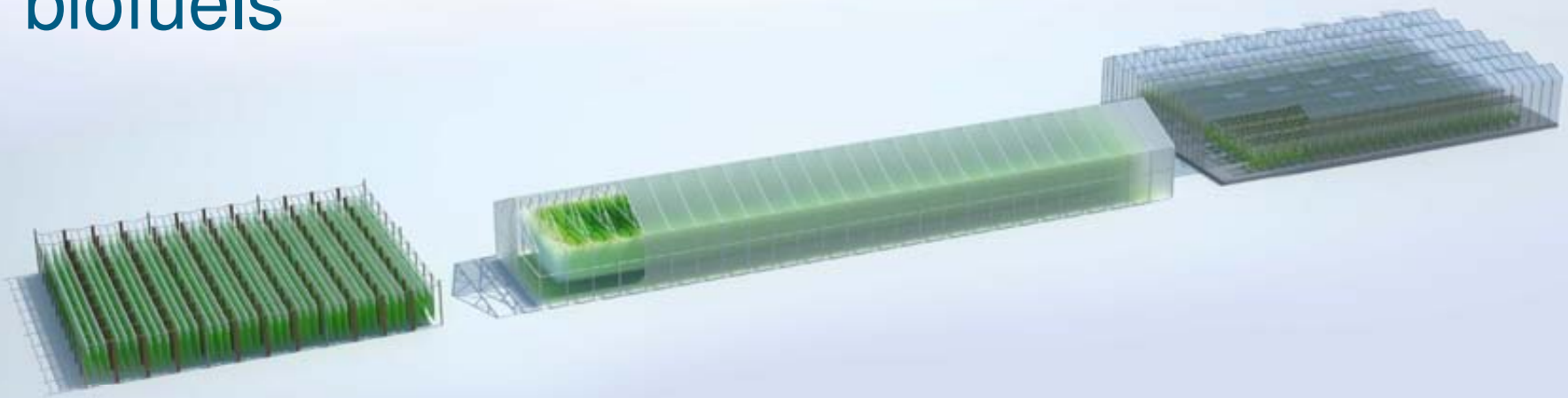
Mitglied der Helmholtz-Gemeinschaft

AUFWIND - Algae to jetfuel

Algae for the production of advanced biofuels



Dr. Dominik Behrendt
algal technologies group
IBG2 – Institute for Plant Sciences

Overview

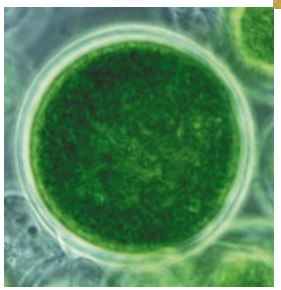
- Introduction
- Algae
- Jetfuel
- AUFWIND

Biofuels

- **1st** generation of biofuels

- **2nd** generation of biofuels

- **3rd** generation of biofuels:
  - phototrophic algae
  - fixation of CO_2



- **4th** generation of biofuels

Advances in biofuels

1st +2nd generation

- Food vs. fuel discussion
- Low ratio of blends
- Stability of engines
- Scalability and sustainability

3rd generation or later

- Similar to fossil fuels
- Direct usage of CO_2
- Less competion for food

Properties of (micro)algae for biofuels

- No lignocellulose
  primarily starch, lipids, proteins
- CO_2 – sequestration
  industry waste as resource
- Whole organism
  no roots, no leaves or wood etc..
- Yielding crude oil
  „green crude“

Algae as biomass producers

- Utilization of sunlight, CO_2 and H_20
- Fast growing, rapid biomass production
- High oil content
  - Increased lipid amounts by starvation
- **Amazing results [in the laboratory]**

Sustainable jetfuel

- No propulsion alternatives to jet-engines
- Great demand of green jetfuel
- Not targeted by 1st and 2nd generation biofuels
- Highly defined product
  - lots of regulations
  - narrow alkane range (8-16 C)
- algae can [partially] meet these requirements

AUFWIND – 3rd generation biofuel

Highest known, phototrophic biomass production: algae

jetfuel:
no alternatives available (next decades)

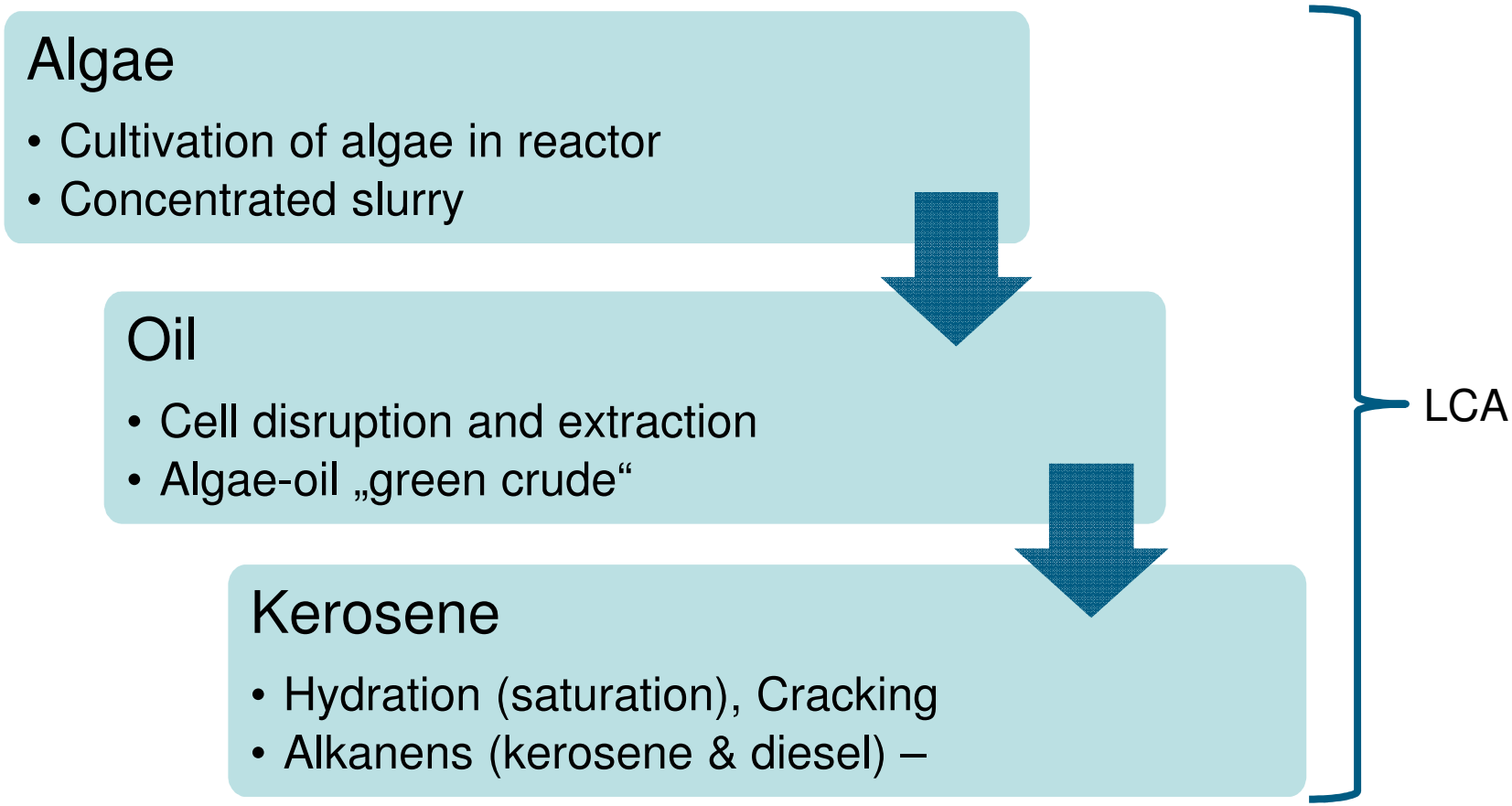
Production

Application

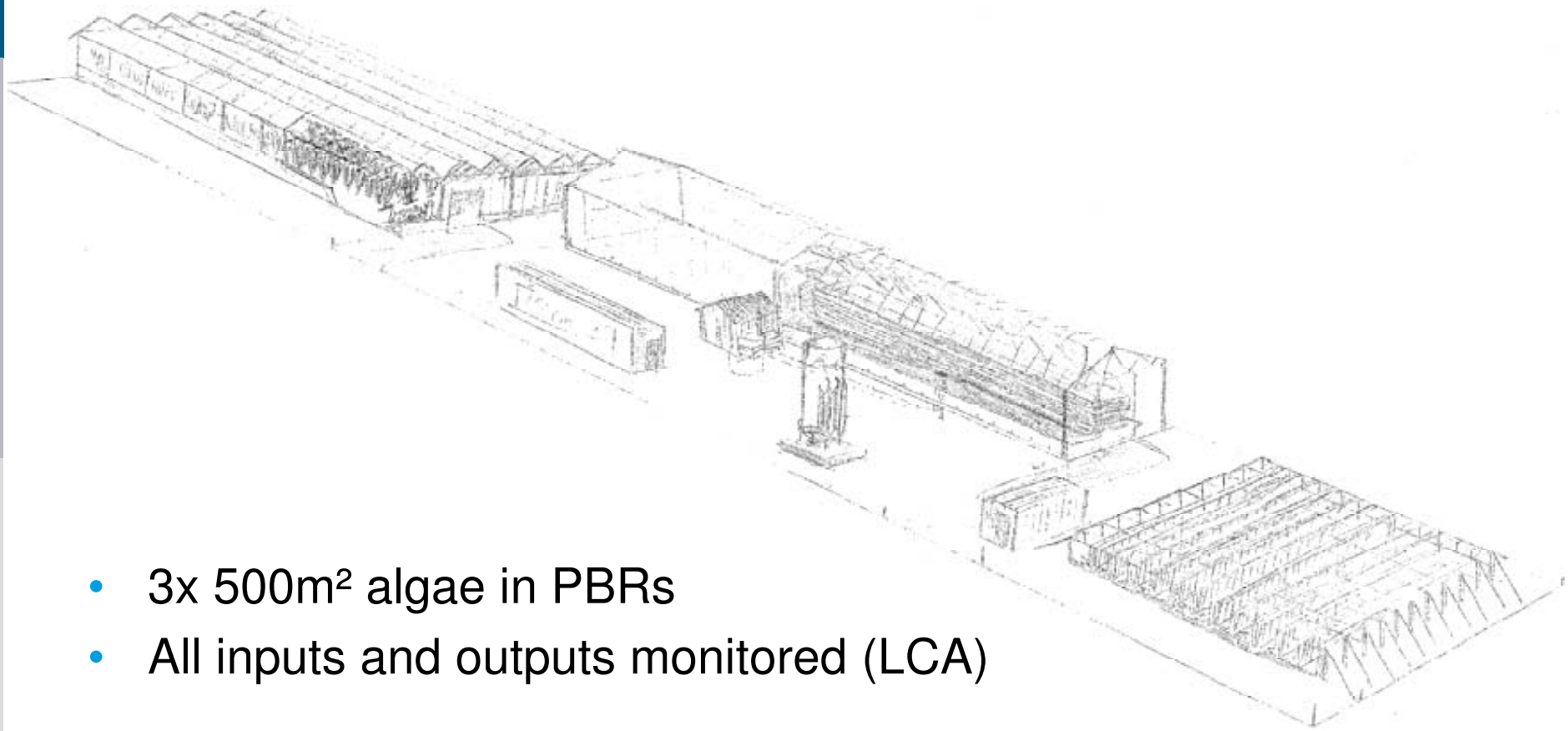
AUFWIND – the project

- 12 partners
  covering plant scientists, engineers to aviation industry
- Budget of 7.7 M €
  06/2013-11/2015
- Investigate „state of the art“ algae bf production
  In a larger than laboratory scale

Algae to jetfuel



Algae Science CENTer - ASCENT



- 3x 500m² algae in PBRs
- All inputs and outputs monitored (LCA)

AUFWIND – AlgenScienceCenter

JÜLICH
FORSCHUNGSZENTRUM

AUFWIND

JÜLICH
FORSCHUNGSZENTRUM

AUFWIND – challenges

- Reproducible and stable production of algae is a challenge
- Extraction of oil from wet micro-algae is a challenge
- For further processing, the extracted oilt must meet certain criteria
- Bio oil ages

AUFWIND – outlook

- Increase oil yield
- Run all three reactors at the same time, with the same algal spezies
- Quicker extraction of bulk biomass
- Catalysator stability during refining of the oil
- LCA

The AUFWIND Team

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Mitglied der Helmholtz-Gemeinschaft

Our Team at IBG2 - Jülich