

Final Thesis**Scenario-Based Analysis of CO₂ and Heat Supply for Greenhouses
Using Oxyfuel Combustion**

Contents:

Biogenic CO₂ is needed as a carbon carrier in power-to-X applications and for CO₂ fertilization in greenhouses. In order to replace the predominantly "fossil" CO₂, the OxyGreenCO₂ research project is investigating the provision of "green" CO₂ from biogenic solid fuels using oxyfuel combustion. The CO₂ can be separated from the flue gas using a partial condenser. The waste heat and condensation heat from oxyfuel combustion can also be used to heat greenhouses. The oxygen required for oxyfuel combustion is produced as a by-product of water electrolysis.

To evaluate the economic viability and the interplay between the greenhouse's CO₂ and heat requirements and the electricity-price-dependent supply of oxygen from electrolysis, additional scenarios will be examined based on an existing simulation model. Possible scenarios include a self-sufficient solution for the greenhouse operator, as well as a comparison of oxygen supply from electrolysis versus an air separation plant. In addition, various CO₂ transport methods will be evaluated, and the extent to which oxygen from electrolysis will be available for oxyfuel applications in the future will be examined.

Tasks:

- Literature research on the topics of CO₂ transport, oxygen availability from electrolysis, decentralised methanol production
- Further development of an existing simulation model to analyze additional scenarios and, if necessary, integrate an optimizer
- Evaluation of defined scenarios in terms of economic viability, etc.
- Written documentation of the work, presentation of the results

Requirements:

- Structured and independent working style
- Independent familiarization with python and the library PyPSA
- Working language: German or English

Start: September/October 2026

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