

Assessment of upscaling options for bioenergy

Opdrachtgever	Professor Zuzi Kurt
Gerelateerd project	REMO LAB , HyCARB
Startdatum	Any time
Geschikt voor de opleiding(en)	Engineering BS and masters, Life Sciences BS
Learning Community	REMO

The assignment is open for modification and changes based on the interests and requirements from the education.

Introduction

The Remolab was established as a research facility to develop, improve, and optimize the production of renewable gases and green molecules. One of the interest in the facility is to upgrade biogas. The process of anaerobic fermentation of biomass for the production of biogas is a known and widely applied technique. Biogas, derived from organic waste, holds immense potential as a renewable energy source, but its large-scale adoption requires addressing critical technical challenges. To optimize production, research must focus on identifying high-yield feedstocks and enhancing anaerobic digestion efficiency through advanced pre-treatment methods and process innovations. Additionally, cost-effective upgrading technologies for purifying biogas into biomethane are essential to integrate it into existing natural gas networks. Scalable storage solutions, such as liquefied biogas, and infrastructure adaptations are also needed to enable reliable transport and broader market access. The integration of biogas with other renewables, such as hydrogen systems, and the use of digital technologies and even valorizing the biogas to different products, can further enhance its role in flexible, resilient energy systems.

Beyond energy, the project will delve into creating new markets for biogas byproducts, such as using digestate for nutrient-rich fertilizers or industrial applications, or producing green platform chemicals. Life-cycle assessments will ensure that every step of the valorization process contributes to sustainability, from reducing greenhouse gas emissions to enabling circular economy practices. Analysis for upscaling will be performed via modeling systems with available industrial data. This project not only aligns with global energy transition goals but also opens pathways for future innovations, making biogas a cornerstone of sustainable energy and resource management. Students will engage in cutting-edge research, working at the intersection of energy, environment, and technology to solve real-world challenges and create impactful solutions.



Netherlands is aiming to reach a national goal of 1.1 M cubic meters of biogas production by 2030, but this upscaling comes with problems of obstacles. One of the major obstacle is the fluctuation of the biogas production throughout the year. To solve this problem valorization of biogas technologies needs to be considered.

The projects aims to evaluate the applications of biogas upgrade and its valorization by establishing a Life Cycle Assessment (LCA) Methodology.

The students will gain experience in establishing a LCA to technology and will learn how to interpret the results.

The outline of the project consist of :

- 1.Literature Search → What to expect, what is known? Open LCA Software and how to use it.
- 2 Identification of the processes and every step
- 3 Identifying the system boundaries of every technology
- 4 Establishing inventories for selected technologies and their needs
- 5 LCA and sensitivity analysis
- 6 Integration of the result for upscaling analysis

Research question

Can we propose technological developments to valorize biogas to prepare for the upscaling challenges proposed for 2030?

Initial literature and sources :

<https://link.springer.com/article/10.1007/s10311-022-01468-z>

<https://doi.org/10.1016/j.wasman.2011.12.016>

Algemene informatie

Eindproduct	Adviesrapport en presentatie
Standplaats	ENTRANCE, Zernikelaan 17, Groningen
Betrokken partijen	
Contactpersoon	Zohre Kurt, Lector of Life Sciences and Renewable Energy z.g.kurt@pl.hanze.nl
Begeleiding	
Bijzonderheden	• Active learning attitude: You are willing to gain knowledge in the field of biotechnology and upscaling. • Hands-on Mentality: You are not afraid to roll up your sleeves and are willing to conduct experiments in the laboratory. • Independence and Initiative: You can work independently and take initiative to tackle problems and find solutions. • Team player: You are a good team player and can communicate and collaborate effectively with other team members to achieve shared goals.

Wat zijn we en waar vind je ons?

ENTRANCE is een lerende kennissamenleving, waarbinnen studenten en docent onderzoekers uit verschillende opleidingen, samen met onderzoekers, bedrijven, overheden en maatschappelijke organisaties, werken aan de versnelling van de energietransitie.

ENTRANCE is de plek waar je als student met docenten, onderzoekers, bedrijfsleven, overheden en/of maatschappelijke organisaties samenwerkt aan complexe vraagstukken. Dit doen wij op de volgende locaties:

- Locatie Proeftuin, Zernikelaan 17
- Locatie Energy Academy Europe, Nijenborgh 6.

Wat bieden we?

ENTRANCE biedt jou een multidisciplinaire, inspirerende leer-, werk- en onderzoek omgeving, waarbinnen je de competenties kunt ontwikkelen, die nodig zijn voor het kunnen vormgeven en versnellen van de energietransitie. Ruimte voor samenwerking met lectoren, onderzoekers, docenten en het werkveld. Daarnaast word je begeleid door professionals die deel uitmaken van het ENTRANCE Learning Communities (ELC).

Neem contact met ons op

Ben je geïnteresseerd in de vacature? Heb je vragen of wil je direct solliciteren?

- Jacqueline Joosse, Coördinator ENTRANCE Learning Communities.
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