Master Thesis in Hydrogen infrastructure for heavy-duty vehicles

Do you want to take part in developing a sustainable future in collaboration with experienced researchers in a professional and friendly environment? We at CIT Renergy are looking for ambitious and driven students who are interested in sustainable development and bridging the gap between research and innovation and industrial transformation. In this work we collaborate with Volvo Group to investigate hydrogen infrastructure required for heavy-duty transport.

Background

To reach the future climate ambitions presented by the European Union there is a need to decarbonize all sectors of society. The transportation sector is expected to achieve this mainly by electrification using both battery electric vehicles and fuel cell vehicles. A recent interview study indicates that 10-20% of sold trucks by 2030 will be based on fuel cells for example.

The TEN-T transport network covers the transportation network within the EU and part of this network includes the demand for hydrogen refuelling infrastructure covering the transport network. One example of a transport route along the TEN-T network in the Nordic context is the route from Oslo to Hamburg. Along this route there are several initiatives aiming to establish new hydrogen refuelling stations such as the EU funded projects Nordic Hydrogen Corridor & Greater4H as well as 13 stations funded by the Swedish Energy Agency (Energimyndigheten) and 39 stations funded by the Swedish EPA (Naturvårdsverket).

The placement of these stations should be matched with the future demand along this route. This could be based on fulfilment of the European Alternative Fuel Infrastructure regulation AFIR (stations should be placed at least every 200 km). The placement could also be decided based on the traffic intensities as well as based on possible synergies with other sectors such as industries, renewable energy production sites etc to provide cost-effective solutions.

This work aims to investigate a suitable placement of hydrogen refuelling infrastructure along the route between Oslo and Hamburg. The thesis work will include a literature review of available traffic data, AFIR regulation and other regulations which can affect the development of the hydrogen refuelling infrastructure, as well as possible actors where synergies can be achieved by co-location. Future scenarios for market penetration of hydrogen fuel cell vehicles will be estimated in discussion with Volvo Group.

This project is carried out as part of a Nordic Energy Research-funded project named “Nordic Hydrogen H2ubs” where hydrogen refueling infrastructure constitute a core focus[1]. CIT Renergy (a subsidiary of Chalmers Industriteknik) will act as supervisors during the work, Volvo Group will provide co-supervision, whereas Maria Grahn (associate professor at Chalmers) will act as examiner of the thesis work.

[1] https://www.nordicenergy.org/programme/nordic-hydrogen-valleys-as-energy-hubs/

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Scope

This diploma work comprises of:

- Mapping existing and planned hydrogen refuelling stations along the route from Oslo to Hamburg
- Investigate future infrastructure need based on AFIR regulation and traffic intensities
- Explore possible synergies by connecting transportation infrastructure, industries with hydrogen demand/production and renewable energy production
- Present an overview of challenges when establishing the infrastructure
- Propose possible solutions to overcome these challenges
- Define possible scenarios for the future demand from the transportation sectors along the route (for example high/low penetration of fuel cell electric trucks)
- Discuss how these scenarios affect the demand for hydrogen infrastructure
- Presenting the findings to internal and possibly external audiences

Your contribution

This work is suitable for students within MSc programmes such as Innovative and Sustainable Chemical Engineering, Sustainable Energy Systems and Innovative Sustainable Energy Engineering and Industrial Ecology but students within other programmes with interest in this topic could also be relevant. We are looking for one/two students. Courses and/or work experience within renewable energy production, hydrogen production technologies and fuel cells are meritorious but not a demand. Swedish is meritorious since it could simplify the literature review, but it is not required.

Want to contribute to a sustainable future? Apply here!

To apply for the thesis project please send us your CV and a short introduction letter (100 -200 words) :
Supervisors: viktor.stenberg@chalmersindustriteknik.se &
pontus.bokinge@chalmersindustriteknik.se at CIT Renergy

If you have any further questions, don't hesitate to reach out to us!

Time plan

The project is planned to be completed during the spring 2024 (20 weeks full-time work).

CIT Renergy - Propelling society to a more energy efficient future

CIT Renergy is a subsidiary company, fully owned by Chalmers Industriteknik, and thus part of the Chalmers family. Our unique and diverse competences allow us to offer our clients energy and resource efficiency solutions within the areas of built environment, society, industry, and indoor climate. For more information have a look at our website (www.citrenergy.se) or our LinkedIn page (https://www.linkedin.com/company/cit-renergy/)