

Introduction

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About myself

- I am Farhana and I am 26 years old
- I am from Bangladesh  a country situated in Asia
- I completed Bachelor's in mechanical engineering from Bangladesh in 2019 and started master's in RAMS engineering in 2020
- After completing Autumn 2020 semester online from Bangladesh, I moved to Trondheim in 2021
- While studying master's, I worked as a learning assistant in TPK4185:Industrial Systems Design course in spring 2022
- The title of my master's thesis is 'Monitoring approaches for safe road transport of hydrogen'
- I started my PhD in April 2023, and my research topic is '**reliability and resilience of green hydrogen production process**' which is a part of HYDROGENi project.
- My supervisor is Professor Yiliu Liu and co supervisor is Marta Bucelli, she is working as a research scientist in SINTEF.

HYDROGENi project

HYDROGENi (FME - Centre for Environment-friendly Energy Research) was launched in 2022 to spearhead research and innovations needed to fulfil the 2030 and 2050 visions of the Norwegian hydrogen roadmap. This will focus on unique research and innovations in the hydrogen value chain to strengthen society's competence and capacity in hydrogen science engineering. There are four distinct research areas (RA) within the centre,

- Cost-effective and scalable production – RA1
- Transport and storage – RA2
- End-use technologies – RA3
- Safety and material integrity – RA4

This PhD will contribute to RA4 by investigating reliability and resilience of green hydrogen production process.

Green hydrogen production

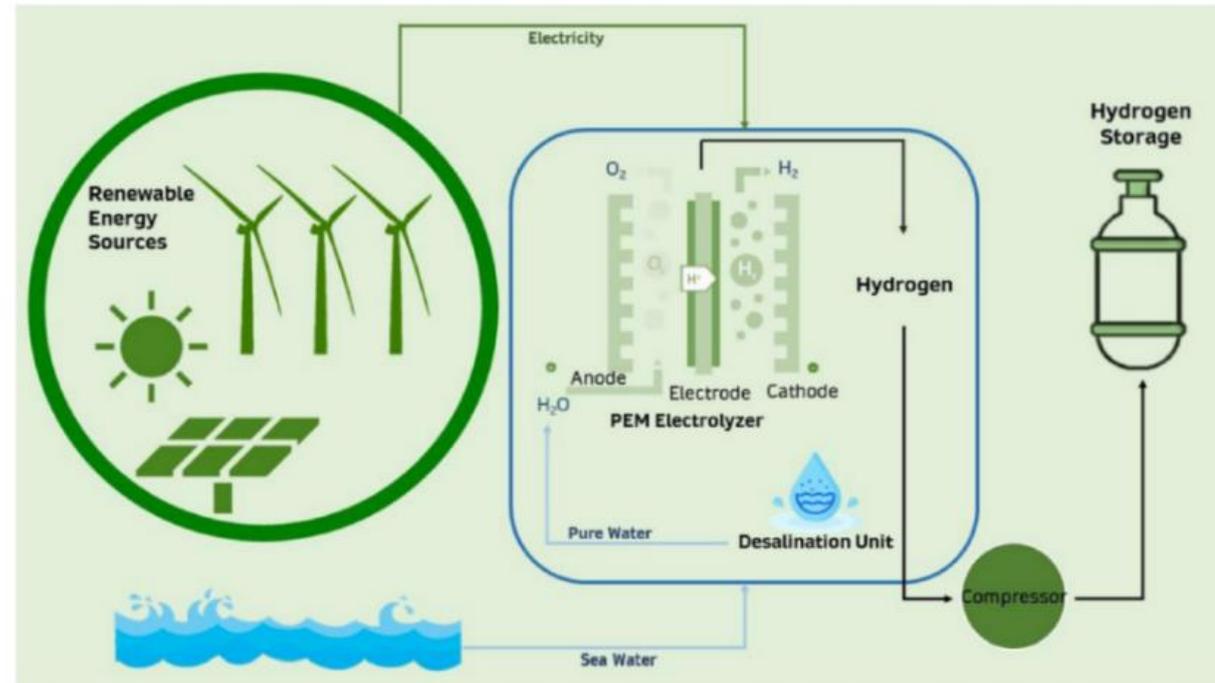


Figure 2: Schematic of a green hydrogen production plant (Tleubergenova et al., 2023)

Objectives

This Ph.D. project will focus on assessing reliability of the production process, with particular interest in the degradation mechanism of an electrolyzer. The result of the research work will also contain framework of applying resilience engineering (RE) approach in the hydrogen production field. To realize these main objectives, following tasks are identified:

- A systematic and holistic view of the cutting-edge electrolyzer systems from failure mode, causes and effect perspective.
- Development of methods and algorithms for analyzing the degradation of an individual electrolyzer and the impact of prognostics and health management (PHM)
- Development of a framework for developing tailor-made RE approaches for an electrolyzer system with multiple units and complex structure

Delimitation

- The focus will be on the electrolyzers rather than considering all the sub-systems (power source, compressors, hydrogen storage etc.) in a green hydrogen production plant
- Only failure due to degradation will be studied further
- Investigating on adopting RE approach for an electrolyzer system will only be limited to qualitative study

Reference

- Tleubergenova, A., Abuov, Y., Danenova, S., Khoyashov, N., Togay, A., & Lee, W. (2023). Resource assessment for green hydrogen production in Kazakhstan. *International Journal of Hydrogen Energy*.
<https://doi.org/10.1016/j.ijhydene.2023.01.113>

THANK YOU!