Adaption of the Electric Energy System for Large-scale Hydrogen Production in Norway

Introduction

- \swarrow Fossil fuels, coal etc. \rightarrow Greenhouse gasses \rightarrow Global warming \rightarrow Decarbonization needed \rightarrow Need for energy transition \rightarrow Renewable and clean energy sources!
- BY Hydrogen is a clean energy carrier and green hydrogen production is essential to meeting decarbonization goals of Norway.
- "Hydrogen pathways 2050" or "ZeroKyst" project is studying hydrogen demand (road map) to be used for national purpose in Norway and to be exported as a product.
- When large-scale hydrogen production systems are installed (electrolyser, fuel-cells, compressors, storage, power electronic components), they will interact with the Norwegian energy system.
 - The challenge: increased power/energy demand.
 - The opportunity: it supports the grid service/flexibility. Ŧ

Primary objective

To address the energy system challenges and look for support possibilities coming from the hydrogen production installations.

Secondary objectives

- Study the need for new renewable energy generation and grids to support new ø hydrogen production installations
- Assessment of the technical ability of hydrogen systems to provide flexibility/grid services to the energy system.
- Techno-economic analysis of the economic benefits of providing grid services versus normal operation
- Evaluation of different energy storage technologies (H2, electrical) for flexibility in production and cost containment.
- To work with actual use cases to assess the local grid constraints and operation modes of the hydrogen systems.



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Related projects: HYDROGENi

B.Sc. in Electrical Engineering

M.Sc. in Power Engineering

Before joining NTNU I was full-time academic staff member at Aksum University and Debre Berhan University, Ethiopia.

research interests include Μv renewable energy, hydrogen systems, distributed generation, electric power engineering, energy efficiency, power quality, and reliability.



Estimated progress of the PhD project:

Just started	< 50 %	> 50 %	Almost done 🕲

Publications (See at the links)

 \rightarrow Google Scholar:

https://scholar.google.com/citations?user=oivfDKYAAAAJ&hl=en

- Research Gate: https://www.researchgate.net/profile/Mikias-Kebede-2
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