the intermittent nature of RE causes for a mismatch between energy supply and demand [7], [8] while another problem is curtailment of energy production [13]–[18] The main reason for curtailment is to resolve congestion issues which occurs in the electrical powergrid due to an increase in RE production.

Techno-economic Analysis of On-farm Hydrogen Production and Comparison in Two Continents

Electrolyzer | Renewable Energy |System Integration | Australia and The Netherlands

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The intermittent nature of renewable energy (RE) causes mismatch between energy supply and demand. Another problem is the curtailment of energy production. The potential solution to this problem is to resolve congestion issues which occur in the electrical powergrid due to an increase in RE production. This study will focus on the integration of on-farm hydrogen production from intermittent RE (Figure 1) while comparing scenarios for Australia and The Netherlands.

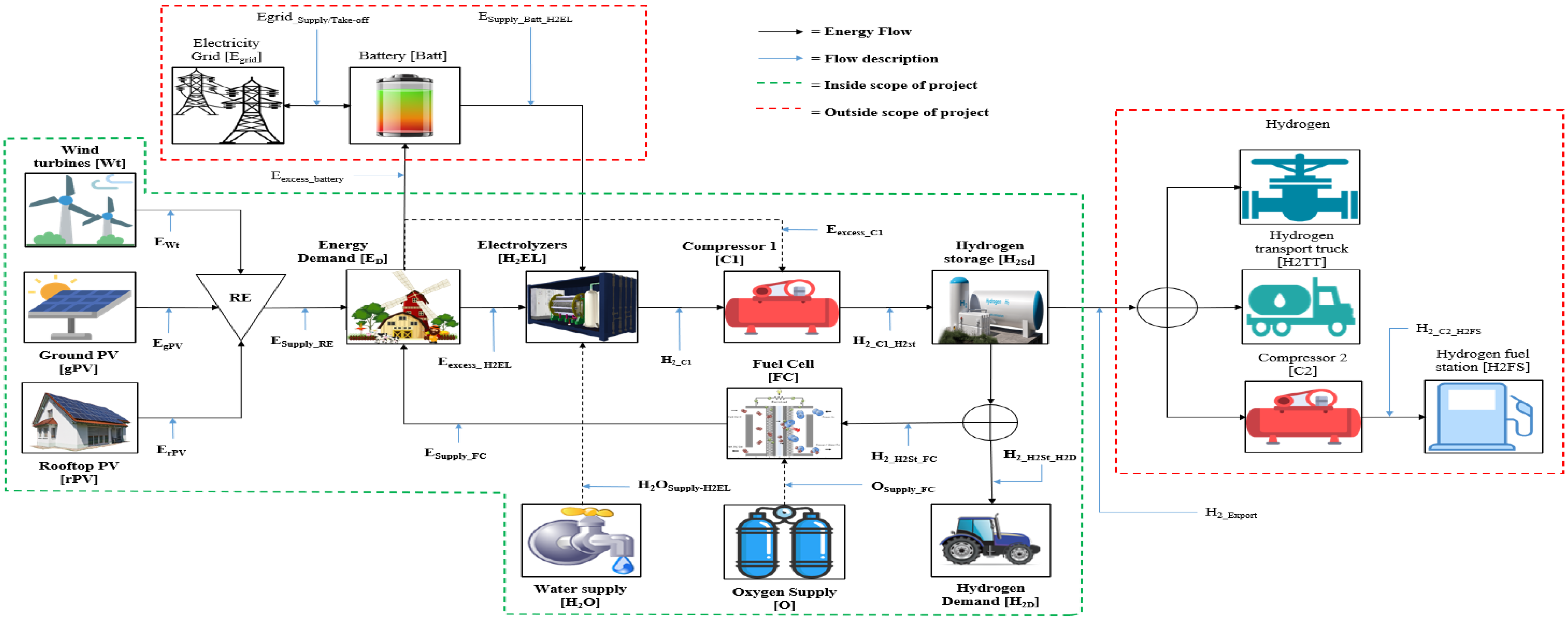

Figure 1: Conceptual energy system for on-farm hydrogen production using intermittent renewable energy (green dotted boundary is limit for this evaluation)

Background

- Australia targets to be net-zero by 2050.
- 82% of electricity is to be generated by renewable sources by 2030.
- Both Australia and The Netherlands are having electricity grid congestion issues due to higher penetration of intermittent renewable energy technologies.
- Hydrogen production could both serve as a solution to grid congestion as well as seasonal storage option for electricity and extra revenue streams for farmers.
- Rooftops and rural agricultural on-farm ground provides potential land for renewable electricity projects such as wind and solar.

Methodology

- Material and Energy Flow Analysis [MEFA] according to Haberl and Weisz (2007) will be utilised.
- Levelized Cost of Hydrogen [LCOH] according to Fan et al., (2022) will be calculated:

$$LCOH = P_t = \frac{COST_{Initial} + \sum_{t=1}^{N} \frac{COST_t}{(1+r)^t}}{\sum_{t=1}^{N} \frac{Q_{ht}}{(1+r)^t}}$$

Where Pt is the price of H_2 in year t.

Aim of Project

The aim of this study is to generate results for system efficiencies, environmental impact, CAPEX, OPEX, and levelized cost of hydrogen for various scenarios based on engineering assumptions. To achieve this, multiple tools will be used such as: energy modelling, data analysis, information from literature and industry contacts and using primary data and secondary data.

FOR FURTHER INFORMATION

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