

Impacts of intermittency on low-temperature electrolysis technologies

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Abstract

Low-temperature electrolysis technologies have garnered significant attention as a promising pathway for clean and sustainable hydrogen production. However, their practical implementation to have renewable hydrogen RED II compliant according to European directives involves intermittent power conditions. This is due to the variable nature of renewable energy sources, while current electrolyzers are designed to operate under constant load. Exploring the relationship between fluctuating power sources and their impact on electrolysis systems is therefore a key issue for optimizing system performance, facilitating grid integration, and reducing fossil fuel dependence. Despite the rising importance of addressing intermittency issues, the current literature has brought to light the lack of quantitative studies, especially at industrial operation scales. As a result, this work strives to provide an in-depth literature review on the main performance indicators of alkaline and PEM electrolysis technologies and at all levels of system operation, from year 2000 to 2023. This literature review underscores the need for further research to enhance the understanding of these impacts depending on the type of intermittency, technology etc. Increasing knowledge in this field is a first step towards the improvement of electrolysis systems dedicated to intermittent operation from both design and operation point of view.

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