

Techno-economic evaluation of renewable hydrogen generation strategies for the industrial sector

A. Hiesl; J. Ramsebner; P. Linares Llamas; R. Haas

Abstract-

Renewable hydrogen is considered as one of the key technologies that may be needed to fully decarbonise our economies, providing the high-temperature heat, fuels and feedstock that might not be possible to electrify. Several pilot projects are underway, and some assessments of the economics of green hydrogen have been published. However, most of them have assessed the costs of producing renewable hydrogen in large-scale, grid-connected units. Another option, pointed by many as a robust strategy in the early stages, is to produce hydrogen locally, in “hydrogen valleys”, to serve industrial demand. In this paper, the economics of the different technical configurations and strategies that might be used for this decentralised, variable-demand option are analysed, accounting for the impact that a non-constant operation may cause on the operational efficiency of electrolyzers, and for the potential benefits of local hydrogen storage. Our results show that when hydrogen demand is variable, production costs are higher compared to the constant demand case, due to the higher electrolyser size required. Electricity price optimization plus hydrogen storage can be a valuable option in some cases, although the cost benefit is negligible (about 1%) unless price volatility in the market increases with higher RES shares, or investment costs decrease significantly. Sourcing electricity exclusively from a dedicated renewable power plant can only become competitive if electricity market prices rise as observed recently or triggered by increasing CO₂ prices.

Index Terms- Hydrogen; Industry; Decarbonisation; Renewable energy systems; Storage; Variability; Climate change

Due to copyright restriction we cannot distribute this content on the web. However, clicking on the next link, authors will be able to distribute to you the full version of the paper:

[Request full paper to the authors](#)

If your institution has an electronic subscription to International Journal of Hydrogen Energy, you can download the paper from the journal website:

[Access to the Journal website](#)

Citation:

Haas, R.; Hiesl, A.; Linares, P.; Ramsebner, J. "Techno-economic evaluation of renewable hydrogen generation strategies for the industrial sector", International

