Critical assessment of the P2H scale required for fossil parity of electrolytic hydrogen

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Hydrogen produced from renewable electricity through Power-to-Hydrogen (P2H) can facilitate the integration of high levels of variable renewable electricity into the energy system. An electrolyser is a device that splits water into hydrogen and oxygen using electricity. When electricity is produced from renewable energy sources, the hydrogen becomes a carrier of renewable energy. Electrolysers can help integrate the variable renewable electricity into power systems, as their electricity consumption can be adjusted to follow wind and solar power generation, where hydrogen becomes a source of storage for renewable electricity. Although such hydrogen production technologies (especially alkaline and PEM electrolysers) are still further maturing, we will show in this contribution how fossil parity for electrolytic hydrogen can already be achieved as of today in a number of sectors where hydrogen from renewables stands out as the best-performing option to meet climate targets and comply with local emissions regulations. Moreover, based on state-of-the art CAPEX and OPEX data for electrolysers gathered within the framework of Task 38 of the IEA/TCP, the necessary scale for obtaining such fossil parity can be surprisingly small, on the order of a few MW only. Such small-scale fossil parity has the important advantage of allowing a de-centralised local H_2 production. In that case, renewables can be harvested anywhere, and used directly for the local production and consumption of green, electrolytic hydrogen. This is a significant paradigm shift with respect to the fossil fuels based centralised hydrogen production at refineries, the latter also requiring an additional cost to transport the H_2, both in terms of Euro/kg and CO_2 footprint.

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Prof. dr. ir. Joris Proost holds a Master and PhD in Materials and Process Engineering from Louvain University (KUL), Belgium in 1994 and 1998, respectively. After spending 3 years at Harvard University, he joined the Faculty of Louvain University at Louvain-la-Neuve (UCLouvain) in 2003, where he is a tenured Full Professor since 2009. His current research interests focus on electrochemical process intensification, with a particular interest on developing new reactor and electrode technologies for renewable hydrogen production. Prof. Proost is currently the Belgian representative at the Hydrogen Technology Collaboration Program (TCP) of the International Energy Agency (IEA), for which he is involved as one of the subtask leaders in Task 38 on Power-to-Hydrogen. He was also invited as a participant of the high-level strategic IEA H_2 workshop in February 2019 in Paris, and acted as a Peer Reviewer of the resulting report that has been launched mid-June 2019 at the meeting of the G20 energy ministers in Tokyo.