

Potential and Techno-Economic Analysis of Hydrogen Production from Portuguese Solid Recovered Fuels

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Abstract : Hydrogen will play a key role in changing the current global energy paradigm, associated with the high use of fossil fuels and the release of greenhouse gases. This work intended to identify and quantify the potential of Solid Recovered Fuels (SRF) existing in Portugal and project the cost of hydrogen, produced through its steam gasification in different scenarios, associated with the size or capacity of the plant and the existence of carbon capture and storage (CCS) systems. Therefore, it was performed a techno-economic analysis simulation using an ASPEN base model, the H2A Hydrogen Production Model Version 3.2018. Regarding the production of SRF, it was possible to verify the annual production of more than 200 thousand tons of SRF in Portugal in 2019. The results of the techno-economic analysis simulations showed that in the scenarios containing a high (200,000 tons/year) and medium (40,000 tons/year) amount of SRF, the cost of hydrogen production was competitive concerning the current prices of hydrogen. The results indicate that scenarios 1 and 2, which use 200,000 tons of SRF per year, have lower hydrogen production values, 1.22 USD/kg H₂ and 1.63 USD/kg H₂, respectively. The cost of producing hydrogen without carbon capture and storage (CCS) systems in an average amount of SRF (40,000 tons/year) was 1.70 USD/kg H₂. In turn, scenarios 5 (without CCS) and 6 (with CCS), which use only 683 tons of SRF from urban sources, have the highest costs, 6.54 USD/kg H₂ and 908.97 USD/kg H₂, respectively. Therefore, it was possible to conclude that there is a huge potential for the use of SRF for the production of hydrogen through steam gasification in Portugal.

Keywords : gasification, hydrogen, solid recovered fuels, techno-economic analysis, waste-to-energy

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