World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:17, No:09, 2023

Assessing the Feasibility of Italian Hydrogen Targets with the Open-Source Energy System Optimization Model TEMOA - Italy

Authors : Alessandro Balbo, Gianvito Colucci, Matteo Nicoli, Laura Savoldi

Abstract : Hydrogen is expected to become a game changer in the energy transition, especially enabling sector coupling possibilities and the decarbonization of hard-to-abate end-uses. The Italian National Recovery and Resilience Plan identifies hydrogen as one of the key elements of the ecologic transition to meet international decarbonization objectives, also including it in several pilot projects for the early development in Italy. This matches the European energy strategy, which aims to make hydrogen a leading energy carrier of the future, setting ambitious goals to be accomplished by 2030. The huge efforts needed to achieve the announced targets require to carefully investigate of their feasibility in terms of economic expenditures and technical aspects. In order to quantitatively assess the hydrogen potential within the Italian context and the feasibility of the planned investments and projects, this work uses the TEMOA-Italy energy system model to study pathways to meet the strict objectives above cited. The possible hydrogen development has been studied both in the supply-side and demand-side of the energy system, also including storage options and distribution chains. The assessment comprehends alternative hydrogen production technologies involved in a competition market, reflecting the several possible investments declined by the Italian National Recovery and Resilience Plan to boost the development and spread of this infrastructure, including the sector coupling potential with natural gas through the currently existing infrastructure and CO2 capture for the production of synfuels. On the other hand, the hydrogen end-uses phase covers a wide range of consumption alternatives, from fuel-cell vehicles, for which both road and non-road transport categories are considered, to steel, and chemical industries uses and cogeneration for residential and commercial buildings. The model includes both high and low TRL technologies in order to provide a consistent outcome for the future decades as it does for the present day, and since it is developed through the use of an open-source code instance and database, transparency and accessibility are fully granted.

Keywords : decarbonization, energy system optimization models, hydrogen, open-source modeling, TEMOA
Conference Title : ICHET 2023 : International Conference on Hydrogen Energy and Technologies
Conference Location : Rome, Italy
Conference Dates : September 11-12, 2023