

<https://doi.org/10.7250/CONNECT.2023.087>

THE ROLE OF HYDROGEN IN FUTURE CLIMATE-NEUTRAL ECONOMY

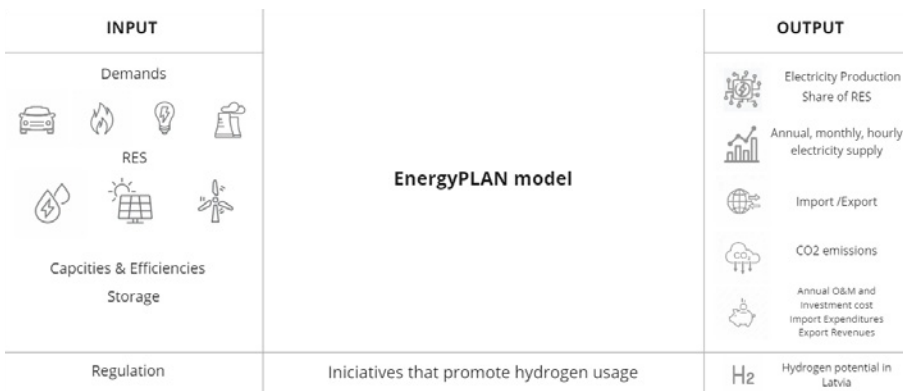
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Abstract – Global annual CO₂ emissions have increased more than 16 times in 2021 compared to 1990 and are expected to keep growing. Renewable energy is a critical way to reduce the impact on the climate. However, renewable energy production's power output does not necessarily match the demand. The intermittent character of renewable electricity generation requires the storage of produced energy. Green hydrogen production via electrolysis is an opportunity to increase the integration of renewable energy sources and move hard-to-decarbonize sectors to climate neutrality. This research aims to assess the potential role of hydrogen in decarbonizing the energy sector in Latvia in the long term. Latvia's energy system is modeled using the input/output deterministic energy system analysis model EnergyPLAN. The model includes all the primary energy demand sectors, energy production, and storage, and allows the analysis of the impact of different strategies on the total costs and emissions of the system by 2050. The results show that the production potential of green hydrogen will increase significantly by 2030, taking into account the existing plans for the installation of 800 MW of wind and solar generating capacity on a national scale. The most significant potential is associated with using hydrogen in the transport sector in vehicles and in producing alternative fuels. Other uses include the decarbonization of the natural gas sector. In these scenarios, it is possible to reduce CO₂ emissions while annual system costs increase.

Keywords – CO₂ emissions; EnergyPLAN; hydrogen; renewable energy sources; RES



An overview of EnergyPLAN and how it was used in this study.