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USE OF SYNTHETIC FUELS DERIVED FROM GREEN HYDROGEN AND CO_2 IN HEAVY-DUTY AND LONG-RANGE TRANSPORT: THE CASE OF LATVIA

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Abstract – Decarbonization of the transport sector may be more challenging than it is for the power supply and heating sectors. Green hydrogen, i.e., produced from renewable energy sources, combined with CO_2 captured from flue gases or air can be used to produce synthetic fuels, e.g., dimethyl ether (DME), ammonia, and jet fuel. These synthetic fuels can be used in heavy-duty and long-range transport, i.e., trucks, ships, and airplanes. The research question of this study is: how much green hydrogen and CO_2 is needed to replace fossil fuel in the mentioned transport sectors with synthetic fuels? How much of the power demand for production of the synthetic fuels can be supplied from renewables, i.e., wind and solar power, considering the installed capacities of these technologies, and the excess power that can be used for the hydrolysis process. The case of Latvia for the year 2050 is used for the simulation of scenarios with various mixes of renewable power production. The simulation is done on an hourly basis for the whole year, using EnergyPLAN software as the modeling tool. The results show the total hydrogen and CO_2 demand, the total power demand for hydrolysis of green hydrogen, and the share of the demand that can be covered by renewable power technologies. The results also include the costs of synthetic fuel supply for the considered transport sector. The results are obtained for scenarios of different combinations of installed capacities of wind power plants and solar PVs.

Keywords – EnergyPLAN; hydrolysis, mobility; renewable energy; solar PV; transport; wind power