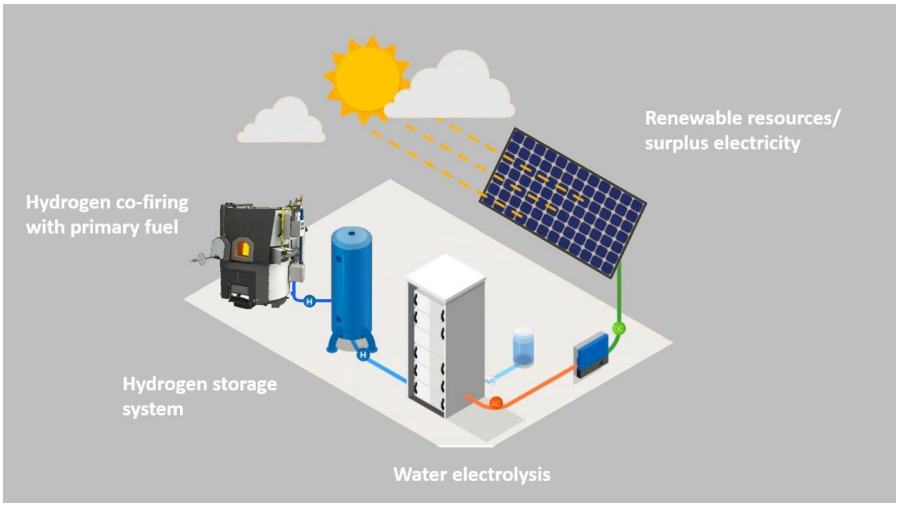
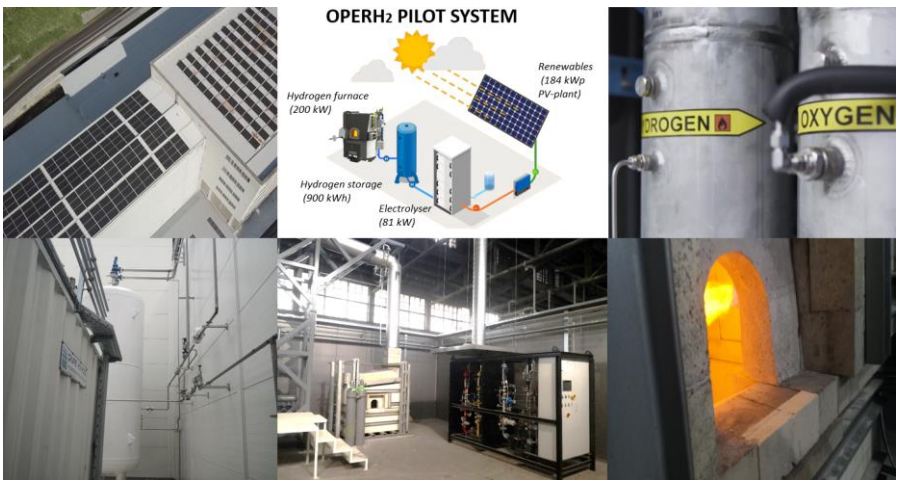
Glass production transition to renewable fuels

Carbon dioxide emissions are one of the pressing issues for energy-intensive industries. Although hydrogen energy processes are comparatively more expensive at the moment, a gradual improvement in benefits can be expected within 5-7 years and, consequently, increased interest in such solutions in energy-intensive industries.

In 2017 Steklarna Hrastnik, a glass manufacturer from Slovenia, started a project for optimisation of energy conversion to replace the share of fossil fuels used for industrial glass melting with hydrogen (OPERH2). Project introduced renewable energy sources (use of solar cells), the production and storage of green hydrogen gas, and the partial addition of the latter to the natural gas feed to make a further first step towards renewability. The system was successfully commissioned in 2020, and experimental results showed a remarkable potential for energy flexibility of melting glass with hydrogen-natural gas fuel mixtures. Demonstration envisaging the full fuel ramping from the non-renewable natural gas to hydrogen, simultaneously considering the flexibility of operation, the quality of product and the profitability of manufacturing. The system components were checked at small-scale industrial demonstration of 200 kg /day capacity (TRL 7).

After testing the technology at pilot scale Steklarna Hrastnik aims to qualify and implement hydrogen melting at industrial scale (TRL 9) in near feature. The technology will be implemented to the existing oxyfuel furnace built in 2020 at Steklarna Hrastnik' s site in Hrastnik (Slovenia) with a nameplate capacity of 120 tonnes per day, where hydrogen fuel will on average replace 50 vol% of primary fuel, resulting in approx. 20% lower GHG emission from the fuel.





Key components of small-scale demonstration:

- Photovoltaic plant – 184 kWp (178 MWhs annually)
- Electrolyser (alkaline) – 81 kWp (16 Nm3/h hydrogen and 8 Nm3 /h oxygen)
- Hydrogen storage (at 30bar) – 300 Nm3 of H2 (900 kWh)
- Small glass furnace – 200 kW (up to 100% H2 in the fuel)
- Hydrogen-Natural gas/Oxygen-Air burner (200kW)

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