Green Hydrogen Demonstration Unit : Key lessons learned after a first test period - Summary

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A New Hydrogen production facility has been acquired and installed in ENIT, at the premises of the LAMOED. This acquisition has been done thanks to the support of The Tunisian–Bavarian Green Hydrogen Hub . It includes a water purification, two electrolysers AEM of 2.4 kW capacity each, a water purification, a hydrogen drying module, a 800 liters storage capacity at 45 Bars (~2.5 kg H_2) and a 4 kW fuel cell system, enabling green hydrogen production for research, training, and demonstration activities.

The unit includes a water purification system (activated carbon, particle filtration, RO, and ion-exchange filters) to produce ultrapure water with conductivity <0.1 µS/cm. Hydrogen produced is routed through a drying unit before entering storage or being supplied to the fuel cell through 2 pressure reduction stages. Safety is ensured by automatic venting lines, blowers, safety valves, and gas-relief chimneys. The electrical cabinet serves as the system's control hub, linking power supply, instrumentation, and SCADA monitoring.

During the reporting period (June to October), several operational trials were conducted. Both electrolyzers functioned reliably, with an average production rate of 509 NL/h of pure hydrogen each. Since the entire system is linked to a local network and is connected online, it does sometimes get disconnected due to network issues. Some occurrences where only while Electrolyzer 2 intermittently went offline, requiring further investigation. Example data from July 2025 demonstrated stable hydrogen production over two hours, with expected behavior of dryer pressures and heater/fan cycles considering the relatively important ambient temperature and humidity of that period. On October 31, EL1 was temporarily taken out of service due to an electrolyte-replacement warning.

The fuel cell experienced recurring errors early in the operation period, primarily Stack1MinCellUndervoltage, correlated with high ambient temperatures (≥24–30°C). After improving climate control to maintain the facility near 20°C, fault occurrence dropped significantly, and fuel cell performance stabilized, including a confirmed continuous run of over two hours without errors. Further assessment is needed to verify whether earlier thermal stress caused any degradation.

Overall, the facility is now functional, generating green hydrogen and electricity while identifying operational constraints. Key next steps include replacing EL1 electrolyte, diagnosing effects of local heat and humidity on electrolyser health and possible degradation, evaluating fuel cell stack health, and continuing system optimization to support academic and research activities.