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High Performance PEM Electrolyser for Cost-effective Grid Balancing Applications

HPEM2GAS-Deliverable report

D4.4 Validation of PEM electrolysis stack under steady-state and realistic dynamic operating conditions

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Publishable summary

Next generation water electrolysis stacks should contribute to improving the dynamic behaviour of the system in terms of rapid start-up, fast response, wider load and temperature ranges. These improvements will support an appropriate grid-balancing service and thus address the steep increase of intermittent renewables interfaced to the grid. The HPEM2GAS project is focusing on the development of advanced stacks and cost-effective systems optimised for grid management with a final six month field testing assessment under industrially relevant power to gas applications.

One of the technical objectives of HPEM2GAS is the designing, developing and building of a compact PEM water electrolyser stack prototype, with 75 cells of industrial applicable dimensions (415 cm^2 active area), implementing low-cost coated titanium cell components and advanced bipolar plates with a cost-effective, durable, flow-field free design. Another of the objectives is to develop advanced membrane electrode assemblies (MEAs) for PEM water electrolysis with ultra-low PGM loading (<0.5 mg_{PGM}/cm^2 MEA), a high performance (nominal operation of 1.8 V/cell @ 3 A/cm^2 and 2.0 V at 4.5 A/cm^2 under transient operation) and low degradation (<5 µV/h/cell). Progress towards these objectives has been reported on in previous deliverable reports (D4.3 report covering stack manufacturing and D4.2 and D4.5 reports covering MEA development). This report summaries the work covering the testing of the advanced MEA, in combination with the stack prototype, in verification units under realistic operating conditions to validate the prototype stack with respect to the project objectives.