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Kurzfassung zum Vortrag

Dynamic Electrolysis for Grid Excess and Frequency Control

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The reduction of CO2 emissions is clearly linked with renewable energies (RE). However, due to the volatile character of its power generation there will be an increasing mismatch between generation and demand. The storage of excess production will be essential in the future in order to prevent increasing curtailment of wind and PV installations and to prepare an economic scenario with renewables.
It is very clear that grid extension and demand side management will come prior to energy storage. But the estimated storage demand in a 85 % RE scenario will be in the TWh range.

There are many energy storage technologies. Among the three options for large- scale storage – pumped hydro, compressed air and hydrogen - hydrogen is the only viable approach to address capacities >10 GWh. Enabling component is the electrolyzer technology, converting electrical energy into hydrogen, a multifunctional chemical energy carrier.

Key issue for the integration of renewables into the electrical grid is the stability of the AC-frequency. It
has to be kept constant at any time. Even small deviations (in the range <0.1 Hz) due to mismatch of generation and demand must be prevented. A related mechanism is the so-called `control power´ (`Regelenergie´).
Electrolyzers are discussed to provide control power and to act as energy storage system in those periods when RE production exceeds the current electricity demand. As a basic consequence, the electrolyzers must be very dynamic, they have to show an easy stop/go behavior and slow degradation under these operation conditions. Moreover, pressurized operation is very preferable, leading to a simplified and more economic balance of plant.

PEM electrolyzers (PEM = Polymer Electrolyte Membrane) fulfill these requirements. They are very robust with an extremely high dynamic response. Main task is to scale up the systems, currently available only in the sub-MW class to the 3-digit MW range and to industrialize corresponding manufacturing.
The presentation will address the specific attitudes of PEM electrolyzer technology in future power to gas scenarios and Siemens´ position in corresponding developments.