

EUR24_19- Power Converter Selection Guidelines for Green Hydrogen Production

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Abstract:

Production of green hydrogen by water electrolysis requires an AC to DC power conversion between the grid and the electrolyzers. During this conversion the grid but also the electrolyzer operation can be impacted if the converter technology is not selected properly. Depending on their technology, alkaline or PEM electrolyzers can be sensitive to the current quality of output in terms of DC ripple, regulation dynamics and accuracy. In this paper 3 types of power converters are compared: pure diode rectifier, combination of thyristor and chopper, and an active front end rectifier. The operational constraints of green hydrogen production or maintenance can impose partial load operation, or unbalanced load. Grid codes impose to comply with power quality constraints such as harmonics and power factor. This aspect is often neglected in the designs being presumed easy to solve, but it is key to guarantee the compliancy of the operations to the grid in downgraded mode. Simulations with EMTP-ATP software enable to model transformers, cables and electrolyzers in sufficient details to demonstrate the impacts of such operation. The paper intends to provide guidelines to properly select converters and associated power systems components according to operational constraints.