GENIUS : GEneric diagNosis InstrUments for SOFC Systems

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VTT	: VTT Technical Research Center (Finland)
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EBZ	: EBZ Fuel Cell Development & Distribution (Germany)
TOPSOE	: Topsoe Fuel Cell (Denmark)
HTC	: HT Ceramix (Switzerland)
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Abstract

The state of health of any SOFC system is currently difficult to evaluate, which makes it difficult to respond to a fault or degradation with the appropriate counter measure, to ensure the required reliability level. Therefore, the GENIUS project (https://genius.eifer.kit.edu/) aims to develop a “GENERIC” tool that would only use process values (normal measurements and system control input parameters) and that would be based on a validated diagnostic algorithm. Such an algorithm would use a “GENERIC” approach so that all SOFC developers could use and implement it in their respective systems according to their specific constraints.

To guarantee the “GENERIC” character of the tool, stacks and systems from four different manufacturers will be tested using commonly defined test plan that will be based on the “Design Of Experiment” method. Three different types of models will be evaluated in parallel by four different academic institutions in order to define the optimal tool for fault detection and degradation identification. This will be done taking into account both “on board” diagnostic and "off-line" diagnostic requirements. The diagnosis would generate a set of indicators able to quantify either the drift or the difference of the actual status with respect to nominal or expected performance. A diagnostic hardware integrating the best algorithm will be developed and validated in two different SOFC systems. Finally, physical parameters and interactions will be correlated with degradation mechanisms. This correlation will allow the definition of either counter measures (in case of fault or degradation) or of a more optimal operation point. This will make it possible to reduce maintenance to yearly intervals. It may also help reach a target of tens of thousands hours for stack or system operation lifetime.