

Open Research Issues for a Sustainable Hydrogen-Economy

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Abstract:

Continuous depletion of the crude oil and gradual increase in the oil price have emphasized the need of a suitable alternative to our century-old oil-based economy. A clean and efficient power supply device based on a renewable energy source has to be available to face this issue. Among the different technological alternatives, fuel cell power generation becomes a more and more interesting and promising solution for both automotive industry and stationary power plants. However, different technological and socio-economics hurdles have still to be overcome before seeing competitive products in these fields.

Among them, different issues must be solved regarding development of specific components (e.g. air compressors, high efficient power electronics, ...), new on-line energy management strategies for fuel cell hybridized systems, efficient state-of-health estimation methodologies, able also to operate in real-time and with limited number of additional physical sensors. Moreover, regarding the increase of the durability and of the reliability of those systems, prognostic algorithms able to estimate the remaining useful lifetime of the fuel cell system under actual operating conditions are requested. Finally, cost reduction and public acceptance are key drivers in the introduction of all new disruptive technologies. The proposed presentation will provide a state-of-art on these different items.

REFERENCES

1. <https://news.cnrs.fr/opinions/energy-hydrogens-great-promise>

About the Keynote Speaker:



Prof. Daniel Hissel (M'03, SM'04) obtained an electrical engineering degree from the *Ecole Nationale Supérieure d'Ingénieurs Electriciens de Grenoble* in 1994. Then, he obtained a PhD from the *Institut National Polytechnique de Toulouse* in 1998. Until 2000, he worked for ALSTOM Company where he was system engineer on electrical and fuel cell buses projects. From 2000 to 2006, he has been an Associate Professor at the *University of Technology Belfort*. Since 2006, he is a Full Professor at the *University of Franche-Comté* and ranked as “Exceptional Class Professor” (highest ranking in France). He was successively the Head of the “Fuel Cell Systems” Research Team of the Laboratory of Electrical Engineering and Systems (until 2008), then he joined the FEMTO-ST (CNRS) Institute and became Head of the “Energy systems modelling” research team. Since 2012, he is the Head of the “Electric Actuators, Hybrid & Fuel Cell Systems” research team in the same Institute and also currently the founding *Director* of the FCLAB Research Federation (CNRS), devoted to Fuel Cell Systems Research and Technology and gathering about 150 researchers. His main research activities are concerning fuel cell systems dedicated to automotive and stationary applications, modelling, non linear control and energy optimization of these systems and fuel cell system diagnostic/prognostic. He was Associate Editor of *IEEE Transactions on Industrial Electronics* between 2004 and 2012 and Associate Editor of *ASME Fuel Cell Science and Technology* between 2006 and 2015. He is also the Chair of the *IEEE VTS French Chapter* and member of the advisory board of the *MEGEVH network*, the French national network on EV and HEV. He has published more than 400 scientific papers in peer-reviewed international journals and/or international conferences. He has been awarded by the *Blondel Medal* in 2017 for his work towards industrialisation of fuel cell systems.