Definition of a Domain Specific Language for the cosimulation of hydrogen-powered microgrids

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Keywords

Multi-modeling, Co-simulation, Domain Specific Language.

Description

The multi-source multi-carrier microgrids modeling imposes to describe the system as the integration of interacting heterogeneous sub-systems. Its simulation consists in managing the synchronization of heterogeneous simulators as well as the exchange of data between them.

Mecsyco (Multi-agent Environment for Complex SYstem CO-simulation – mecsyco.fr) demonstrated its ability to rigorously tackle such issues, but currently, microgrids experts have to learn computer science skills, formalism integration principles, etc. to be able to design by themselves microgrids models and simulate them. This detracts them from their initial goal, is time consuming, and can potentially introduce severe mistakes.

This thesis proposal aims at proposing concepts and software components (Domain Specific Language and related software tools in connection with mecsyco) tailored for microgrids experts to bridge the gap between conceptual requirements and multi-source multi-carrier microgrids simulation.We suggest the following steps:

1. Build a first prototype of multi-physic of hydrogen-electricity microgrids to identify and characterize key modeling components

2. Propose a description language for the simulation which integrates semantical and syntactical constraints

3. Develop software tools to design simulation

4. Experiments them in the modeling of various microgrids architecture and assess their domain relevance with all the partners of the workpackage.

5. According to feedback we can iterate the process (steps 1 to 4)

Scientific context

This thesis is funded through the LUE ULHyS project which is a ultidisciplinary research programme on Hydrogen and Fuel Cell technologies from innovative materials for PEM-FC to Hydrogen economy and prospective ergonomics (see links below). The PhD student will have to cooperate with the other reseachers involved in it.

Expected candidates

Skills in Electrical Engineering are not required, even if basic knowledge in Smart Grids(Ordinary Differential Equations, basic laws of electric circuits) should be an asset.

The applicant must have a Master Degree in Computer Science (or equivalent because the scientific issues focus on the definition of a Domain Specific Language. and simulation) with an experience (event limited) of research (through interships for example).

Introductory bibliography

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Additional links

ULhYS project webpage : https://www.researchgate.net/project/ULHyS-Hydrogen-and-Fuel-Cell-Science-and-Technologies

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