Master project, 2016-17

— *Application of new energy management methodology in smart-grids using a socio-technical approach*

L2EP supervisor: Arnaud DAVIGNY, Christophe SAUDEMONT (HEI/L2EP) Other institution supervisors: Benoit DURILLON (HEI/L2EP), Vincent COURTECUISSE (SEOLIS)

Contact: arnaud.davigny@yncrea.fr, Hautes Etudes d'Ingénieur, 13 rue de Toul – BP 41290 – 59014 Lille cedex, office no. T314

Problematic and context

The challenges raised by new energy technologies, clean energy sources and energy efficiency led us to reconsider the way we manage energy in electricity networks and the way the stakeholder are involved. To address these questions, the focus should therefore not solely be on the technical side, but consider also the sociological and economic issues related to the development of these new energy solutions, particularly the conditions of acceptance and integration of these advances by users.

This is why this project combines two research teams, one in Engineering Sciences, the other one in Humanities and Social Sciences, to treat in the same work, modeling of the acceptance and the involvement of consumers and electricity producers for a multi-actors energy strategy supervision. The strong scientific challenge of this project lies in the interweaving of different scientific disciplines to cover a large project with high social impact, to which the questions are usually treated in independent ways.

Objective

The objective of the ModAICSS project is the development of energy management strategies, including the behavior of the different actors of future Smart-grids, in order to reach, with the best performance, the expected objectives in terms of energy efficiency, cost, acceptability by different actors, ... etc.

In the framework of this project, a new energy management methodology has been developed and should now be tested with available real data of a confined zone given by the local grid system operator GEREDIS. This methodology involves 4 steps: 1. Description of the stakeholders using available socio-economic data. 2. Correlation between the given population and the theoretical profiles. 3. Conversion of the profiles into predefined mathematical functions. 4. Use of these functions in the networks management system.

Work steps

. Review of regulations and policies on self-consumption;
. Process the consumption data to obtain profiles or tendencies.
. Correlate with local available socio-economic data.
. Study of the local flexibilities (EV, hot water tank, heater, …), depending on local parameters and constraints (distance from work, temperatures, …)
. Apply the theoretical modeled profiles to the observed profiles.
. Simulate several scenarios over a year : with different profiles models, various economic models, and various engagement models (by changing the options of the flexibilities).
. Calculate the necessary indicators to evaluate the gains, the impacts, and highlight the advantages of a shared energy management system.
. Conclude on the different models/options/hypothesis.
. Depending on time/available data : Study of other cases.