



HIGH ENGINEERING SCHOOL OF LILLE

Master project, 2016-2017

— *Advanced control of power converters associated with renewable generation sources* —

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Context

This topic is part of the cooperation between IT COIMBRA and HEI with a strong link between 2 laboratories CRISTAL and L2EP. The subject concerns the design and advanced control of power converters in a multi-source photovoltaic and wind system with hybrid storage batteries / supercapacitors for isolated sites.

Objective

The trainee will be in charge of the modeling and control of the DC-DC and DC-AC converters of the installation: a precise model of each converter used (inverter, chopper) will be developed. A study of the robustness (strong variations of the internal parameters) will validate the closed loop control of each converter.

The control laws will be developed under Matlab / Simulink and implemented on a DSPACE digital control card.

Work steps/Methodology

As part of this project, the candidate have to:

- present a state of the art of hybrid production system architectures and related commands. The advantages and limitations of each configuration will be described to justify the choices set for the study.
- present a state-of-the-art of DC-DC and DC-AC power converters in particular associated with photovoltaic solar hybrid systems with storage.
- propose innovative configurations of DC-DC, DC-AC converters (eg resonant converters) associated with the sources.
- define the chosen architecture: it must be efficient, inexpensive and not cumbersome.
- model the whole system. The models of sources, converters and storage units will be detailed.
- ensure the control and energy management of the system. The algorithms of maximization of the power produced by the sources (MPPT) will be defined. Different commands will then be synthesized, for each converter of the monitored modules. Indeed, the usual controls will be presented for the photovoltaic generator and the wind turbine, to serve as witnesses during the tests. More innovative controls such as fuzzy logic with possibility of diagnosis will then be proposed. Each proposed command will be tested under Matlab / Simulink using the simulators; the results will then be presented and analysed.

Key word

- Power converters
- Design; Modeling; Optimization
- Renewable sources applications.

References

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