

SERVICE DE METROLOGIE NUCLEAIRE
MATHEMATICAL METHODS FOR ENERGY SYSTEMS

MASTER THESES

Academic year **2021-2022**

*The topics listed below correspond more to **themes** in which master theses can be realized, than to a detailed description of topics. Depending on the interest of the students, more theoretical or instead industry-related topics will be developed. Some of the proposed themes are more convenient for an internship, to be made before the master thesis.*

*The themes proposed are preferably **accessible mainly to students in engineering physics and in electromechanical engineering.***

9. Selection of a representative time series (in collaboration with Engie Laborelec)

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Context: In the important context of the energy and environmental transition, we have at our disposal some tools used for techno-economics simulations. For example, a simulation tool can be used to estimate the financial gain of a photovoltaic installation in presence of a battery and its control. These tools often require time series as input parameters (e.g. expected hourly consumption of a dwelling). This is information being usually not available, it is needed to use a *representative* time series. This time series will be selected among a set of available historical measurements.

Objective: among a large set of time series, how can we select the most representative one for a particular type of study?

Approach: A natural approach would be to consider the n time series as a cluster and select the associated centroid. This leads to the following question: “which distance should be used between the time series”? The selection and/or construction of this distance should be done in function of the tool characteristic which will use these curves. Let us consider for example two types of computation:

- *Estimation and reduction of the peak consumption using a flexible asset.* In this first analysis, a temporal shift of 12h has no impact. So two time series shifted by 12 hours are equivalent.
- *Auto-consumption gain using solar production.* In this second analysis a temporal shift of 12 hours (meaning inverting day and night consumption) is obviously very important