



Master thesis

*Mobile device power management for load flexibility:
frequency dynamics and introduction to software aspects*

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Abstract

Whereas the layout of electrical networks is reconsidering as a smart grid and the part of renewable energy is increasing, behaviours as sustainability, efficiency and reliability become a need for the current economical and energy contexts. The energy and climate policy from current European Union drivers is an incentive even more significant for this field of research whose results are actually expected.

In this context, a better management of power scattered on the grid could emerge as an interesting approach. From the MODEPOMA project, an idea is to manage the energy stored in mobile devices to provide a frequency control as a load aggregator. Among the hierarchy of frequency controls provided to the system as an ancillary service, we focus about the primary reserve whose the purpose is to stop the frequency drop.

This master thesis foremost reminds the frequency dynamics of an uncontrolled power system to highlight the need of frequency controls. We introduce the primary frequency control as primary reserve to prevent the frequency drop and stabilize the system frequency to a steady-state value. By this way, we give some basis and a benchmark for the following.

Then, we introduce the concept of power management of loads by modelling it and determining applied mechanisms. We prove the possibility to ensure the asymptotic stabilization of the system frequency and check its application through numerical simulations. We take a transmission system operator's perspective regarding to the current standards and possible integrations of the power management of loads. We finally introduce software aspects by defining requirements for an IT platform to implement the power management of loads.