Proposition de recherche doctorale

**Optimizing electricity distribution during crisis time periods in a smart grid environment**

**Mots clés :**
- Directeur de thèse : DANIEL KOFMAN
- Co-encadrant(s) : 
- Unité de recherche : Laboratoire Traitement et Communication de l'Information
- Ecole doctorale : École Doctorale Informatique, Télécommunications, Électronique de Paris
- Domaine scientifique principal: Divers

**Résumé du projet de recherche (Langue 1)**

General context The service model of utilities, and in particular electric companies, has been very stable during decades. It is characterized by a high robustness but a lack of flexibility, which becomes evident in case of crisis: most often, in cases where the demand exceeds the production capacity, rolling blackouts are a common practice. The evolution of the user needs tends to impose new service models. As an example, one can cite the fact that the evolution of usages introduces the concept of critical loads for residential users – typically the load generated by a medical appliance that enable elders staying longer at home. The thesis will focus on the evolution of service models and related future electrical network architectures and optimization systems. Future architectures will be based on smart meters and smart breakers, allowing a dynamic evolution of the maximum energy provided to each user. In addition, it is supposed that an Internet of Things like solution is deployed at the clients’ site providing if/when necessary with the control of individual appliances. Different solutions will be analyzed, from the static one were the electric company just decide to change in case of crisis the maximum amount of power provided to each client to the more dynamic case where a smart system at home will require dynamically power per individual appliance, where different levels of critically are considered for those appliances. Storage and dynamic pricing are tools that will be introduced to further optimize the overall system and introduce a fine granularity at the control system. The analysis will be carried out for the existing infrastructure and also for advanced smart grid solution with local generation and new distribution network topologies. Targets of the thesis 1- Define a general architecture for the control of individual clients, leveraging the potential of smart meters and of the Internet of things paradigm in a smart grid environment 2- Propose and evaluate an autonomic control system targeting a flexible distribution of available power in case of crisis 3- Analyze quantitatively the pertinence of deploying energy storage devices and of using dynamic pricing in case of crisis. 4- Conclude with a set of recommendations regarding future smart grid control planes.