

PROPOSITION DE STAGE / INTERNSHIP PROPOSAL
BATTERY MANAGEMENT UNDER UNCERTAINTY
CERMICS (ÉCOLE DES PONTS), EN COLLABORATION AVEC EDF LAB

Context. An electricity aggregator manages flexible production/consumption facilities such as batteries and participates in various electricity markets. On a given day, it is committed for each time period to load or unload a certain amount of electricity, and to keep a predefined reserve in case extra electricity is required for the stability of the electricity network. These commitments have been taken respectively on the “spot” and the “reserve” markets the day before.

The objective of the aggregator is to fulfill at a minimum cost these commitments by deciding for each time period the quantity of electricity to load or unload by the battery on the electricity network. One of the challenges is that the decision for a time period has to be taken before knowing the level of reserve activation for this period and before the intraday price has been revealed. This project aims at developing methods relying on stochastic and online optimization for solving this problem in an efficient way, while taking into account most technical constraints of the facilities and the network.

Two versions of the problem will be addressed, differing mainly by the level of available information :

- The *stochastic version*, for which information is partially available, e.g., the probability distributions of the activated reserve and the prices is fully or partially known.
- The *online version*, for which no information at all will be available. The motivation for this version is mostly theoretical. In online optimization, this is the type of questions relying on competitive analysis.

Objectifs.

- Modéliser le problème
- Proposer et implémenter des algorithmes pour les deux versions du problèmes
- Calculer une borne d’optimalité pour la version *online* (ratio de compétitivité)

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Profil du stagiaire.

- Niveau d’étude : césure ou dernière année de master en mathématiques appliquées / école d’ingénieur
- Compétences : optimisation, probabilités, recherche opérationnelle, développement informatique
- Informatique : Python

Conditions particulières.

- Ce stage s’inscrit dans le cadre d’un projet de recherche financé par le Programme Gaspard Monge pour l’Optimisation (PGMO).
- Localisation :
 - Laboratoire CERMICS, École des Ponts ParisTech, 6 et 8 avenue Blaise Pascal, Champs sur Marne
 - Déplacements réguliers sur le site d’EDF Lab, 7 bd Gaspard Monge, Palaiseau
- Date de début souhaitée : premier semestre 2024
- Durée proposée : 4-6 mois