Offre de stage (Training period opportunity)

Titre court :
(Short title)
Optimisation du couplage énergies renouvelables et stockage dans les marchés d’électricité
Optimization for renewable power plants coupled to battery storage systems in electricity markets

Sujet :
(Subject)
Optimisation de centrales d’énergie renouvelable couplées à dispositifs de stockage par batterie
dans le contexte des marchés d’électricité/
Optimization of renewable energy power plants coupled with battery storage systems in the context of
electricity markets

Mots-clés (Key-words):
Optimisation, Energie, Renouvelables, Batteries, Prévisions / Optimisation, Energy, Renewables, Battery,
Forecasting

Catégorie d’emploi :
(Type of contract)
Etudiant stagiaire
Internship

Dates et durée :
(Duration)
A partir de : dès que possible pour 6 mois
starting from: as soon as possible for 6 months

Niveau et pré-requis :
(Degree & Profile)
Master 2 (ou équivalent BAC+5). Profil recherché : Mathématiques Appliquées / Génie Electrique.
MsC. or MEng. Profile: Applied Mathematics / Génie Electrique.

Lieu de travail :
(Location)
Laboratoire d’accueil :
Centre Procédés Energies Renouvelables et Systèmes énergétiques (PERSEE)
Center for Processes Renewable Energies and Energy Systems
Etablissement de Sophia Antipolis (06 - France)
http://www.persee.minesparis.poly.edu
Groupe de recherche (research group) : ERSEI

Cadre de travail :
(Entity overview)
The Center for Processes Renewable Energies and Energy Systems (PERSEE) is a joint research center MINES-
ParisTech – ARMINES. It is one of the main actors in France in the field of energy. PERSEE, located in Sophia
Antipolis, counts approximately 40 people.

Mission :
(Mission)
Context and challenges
Battery energy storage systems (BESS) take an increasing part in electricity markets and provision of services to the grid.
Renewable Energy Sources (RES) operators consider the installation of BESS on RES production sites as a potential solution for
2 important issues: (1) mitigate the imbalances created by forecasting errors of RES production, and (2) make efficient arbitrage
between market opportunities including intraday markets or balancing ancillary services. Due to the high investment cost
associated with BESS, a key challenge is to maximize the flexibility potential of the BESS over all possible markets, while satisfying
operational constraints of the BESS and integrating the uncertainty on RES production. A real-world case study of a hybrid
RES+BESS system will be provided in the frame of the European Project Smart4RES coordinated by center PERSEE. This case
study constitutes an industrial benchmark for the internship and defines the expected performance indicators.

Objectives
The objective of this internship is to develop a method for the joint optimization of wind production and on-site battery storage
which would permit:
• To simultaneously maximize revenue for the renewable producer and minimize degradation of the battery system
• To test different approaches of multi-objective optimization (stochastic/robust optimization, machine-learning)
• To simulate the expected behavior in real-time on the case study presented above.

A problem-solving and proactive attitude is expected, in order to master existing methods developed at PERSEE and develop new
approaches for the problem at hand.

Methodology
The student will start by an analysis of selected papers in the existing literature and previous related works at PERSEE. Then a
methodology for the optimization of the joint management of RES+BESS will be formulated to derive market trading quantities and
real-time control setpoints. Forecasts of RES production and measurements of the storage system will be available from the case
study. Finally, the methodology will be applied to the available case study to produce trading quantities at market gate closure
times (e.g. from 1 day ahead to a few hours ahead) and control setpoints for RES and BESS at sub-minute resolution.

Expected results
An optimization method described in a scientific report and accompanying code with reproducible results.

Date limite (Deadline):
Deadline for applications: 17th January 2021

Pour postuler :
(How to apply)
Upload CV and motivation letter to https://forms.gle/XYBaS1ethXwK8Rw99
For information please contact: simon.camal@mines-paristech.fr AND georges.kariniotakis@mines-paristech.fr
stating in the subject the text [Internship RES+Storage 2021]

Contacts :
(Contacts)
Responsable(s) du stage :
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Renseignements administratifs :
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