

Energy risk modelling

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Course : 12 hours - TP : 0 hours

Objectives

The continuous development of electricity markets (creation of day-ahead markets at the end of the 1990s, recent introduction of intraday markets, integration of European electricity markets etc.), deregulation of the industry and the increasing development of renewable energies of an intermittent nature lead to major planning and risk management problems at different scales for energy industry players.

The objective of this course is to introduce students to these new issues in the energy industry, the approaches used, and the mathematical and statistical tools developed to deal with these new challenges. The course is developed in collaboration with EDF and RTE.

Outline

- Functioning of electricity markets, price modelling and energy derivatives
- Energy demand modelling and forecasting
- Estimation and forecasting of wind and solar potential; modelling of renewable production
- Probabilistic Forecasting: Mathematical Framework and Application to Wind Energy
- Economic Framework for Renewable Energy Production
- Case Studies in Renewable Energy Risk Management
- Management of microgrids and smart grids

Bibliography

- Aïd, René. Electricity derivatives. Springer, 2015.
- Mougeot, Mathilde, et al., Forecasting intra day load curves using sparse functional regression. In : Modeling and Stochastic Learning for Forecasting in High Dimensions. Springer, 2015. 161-181.
- Gneiting, Tilmann, and Matthias Katzfuss, Probabilistic forecasting. Annual Review of Statistics and Its Application 1 (2014): 125-151.
- Z. Tan and P. Tankov, Optimal trading policies for wind energy producer, preprint (2016).
- Bensoussan, Alain, and Alexandre Brouste, Cox–Ingersoll–Ross model for wind speed modeling and forecasting. Wind Energy (2015).
- Olivares, Daniel E., et al., Trends in microgrid control. IEEE Transactions on smart grid 5.4 (2014): 1905-1919.