RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

Field: Energy, Processes

Subfield: Electrical engineering, applied mathematics, smart grid

Title: Dynamic Line Rating: risk and impact on investment planning

ParisTech School: MINES ParisTech | PSL

Advisor(s) Name: Andrea Michiorri,
Advisor(s) Email: andrea.michiorri@mines-paristech.fr
Research group/Lab: PERSEE
Lab location: Sophia Antipolis
(Lab/Advisor website): http://www.mines-paristech.eu/Research-valorization/Fields-of-Research/Energy-and-processes/PERSEE-Centre-for-processes-renewable-energies-and-energy-systems/

Short description of possible research topics for a PhD:
Context: Dynamic line rating (DLR) is a technology able to modify in real time the current carrying capacity of power system components such as overhead lines, power transformers and electric cables. It has the potential to reduce network charges, but several challenges needs to be addressed before its implementation.
Objectives: This thesis is focused on two points: 1) to develop a methodology to safely determine DLR to be applied. 2) To study the impact of the application of DLR on investment planning, both for the network (network reinforcements) and for network users (reduced connection cost).
Methodology: The focus will be kept on overhead lines, but transformers and electric cables can be investigated as well. For point 1) several approaches will be considered and/or combined: a) the use of historical data, weather reanalysis and climate projections to create a DLR climatology, b) the use of daily probabilistic forecasts, c) a risk-based approach. For point 2) simulations will be carried out on well-defined use cases comparing the benefits and drawbacks of the application of DLR. Examples are: a) retarding network reinforcements following load or renewable production increase, b) reducing renewable's connection cost.;

Required background of the student: Electrical engineering (power systems)

A list of 5 (max.) representative publications of the group:
1. Andrea Michiorri, Huu-Minh Nguyen, et al., "Forecasting for dynamic line rating", Renewable and Sustainable Energy Reviews, 2015/12/31, Vol 52, pp 1713-1730
2. Andrea Michiorri, Philip C Taylor, "Forecasting real-time ratings for electricity distribution networks using weather forecast data", Electricity Distribution-Part 1, 2009. CIRED 2009. 20th International Conference and Exhibition on
3. Romain Dupin, Andrea Michiorri, Georges Kariniotakis, "Dynamic Line Rating Forecasting and Evaluation", EWEA Technology Workshop, Wind Power Forecasting 2015