CEE Power Event

Enhancing the role of distribution networks for unleashing their full potential

4. May 2017

DTU Risø Campus - Building 112, Niels Bohr Auditorium

Frederiksborgvej 399, 4000 Roskilde

In connection with Katarina Knezovic PhD defence (Active integration of electric vehicles in the distribution network – theory, modelling and practice), the internationally recognized academics Professor Mario Paolone, EPFL (Ecole Polytechnique Federale de Lausanne), Switzerland and Professor Magnus Korpås, NTNU (Norwegian University of Science and Technology), Norway will visit CEE-DTU Risø Campus and give talks on selected topics.

PROGRAMME

10:00 ***Welcome***
Researcher Mattia Marinelli, DTU, Denmark

10:05 ***The Augmented Relaxed Optimal Power Flow: an Exact Convex Formulation of the OPF for Radial Distribution Networks***
Professor Mario Paolone, EPFL, Switzerland

11:00 ***Optimization of demand side flexibility: Presentation of recent research results***
Professor Magnus Korpås, NTNU, Norway

11:55 ***Final discussions***

The event is open for everyone, but please send an email to Anne Due (atdue@elektro.dtu.dk) so we will know how many will attend the event.

DTU Electrical Engineering
Department of Electrical Engineering

Mario Paolone, Ph.D.

Mario Paolone received the M.Sc. (Hons.) and Ph.D. degrees in electrical engineering from the University of Bologna, Bologna, Italy, in 1998 and 2002, respectively. In 2005, he was an Assistant Professor in power systems at the University of Bologna, where he was with the Power Systems Laboratory until 2011. He is currently an Associate Professor at the Swiss Federal Institute of Technology of Lausanne and chair of the Distributed Electrical Systems Laboratory. He is author or coauthor of more than 200 scientific papers published in reviewed journals and international conferences. His research interests include real-time monitoring and operation of active power distribution networks, integration of distributed energy storage into power grids, power systems protections and power systems transients.

The Augmented Relaxed Optimal Power Flow: an Exact Convex Formulation of the OPF for Radial Distribution Networks

Abstract

The recent literature has discussed the use of the relaxed Second Order Cone Programming (SOCP) to formulate Optimal Power Flow problems (OPF) for radial power grids. However, if the shunt parameters of the lines, composing the power grid, are considered the proposed methods do not provide sufficient conditions that can be verified ex-ante for the exactness of the optimal solutions. Additionally, the same formulations have not correctly accounted for the lines' ampacity constraint. Similar to the inclusion of upper voltage-magnitude limit, the SOCP relaxation faces difficulties when the ampacity constraints of the lines are binding. In order to overcome these limitations, the seminar illustrates a convex formulation of the OPF problem applied to radial power grids for which the AC-OPF equations, including the transverse parameters, are considered. In the method illustrated in the seminar, we augment the formulation with a new set of more conservative constraints to limit the lines' current together with the nodal voltage-magnitudes. Sufficient conditions are provided to ensure the feasibility and optimality of the proposed OPF solution. Furthermore, the proofs of the exactness of the SOCP relaxation can be formally given and verified. Using standard power grids, we show that these conditions are mild and hold for real distribution networks. An application example related to the scenario-based optimal planning of distributed energy storage systems is provided.

Magnus Korpås, Ph.D.

Magnus Korpås received the M.Sc. degree in theoretical physics and the Ph.D. degree in electrical engineering from the Norwegian University of Science and Technology (NTNU) in 1998 and 2004, respectively. He was former Research Director of the Energy Systems Department at SINTEF Energy Research. He is now professor within electric power systems at NTNU. His main research activities and interests are within energy system planning, energy storage optimization and market integration of renewables.

Optimization of demand side flexibility: Presentation of recent research results

Abstract

This presentation will give an overview of recent findings from research projects on demand side management and EV integration conducted at NTNU in Norway. Two new PhD projects on the subject has recently been defended: "Impact of Zero Energy Buildings on the Power System - A study of load profiles, demand side management and system investments" by Karen B. Lindberg and "Techno-economic models in Smart Grids - Demand side flexibility optimization for bidding and scheduling problems" by Stig Ø. Ottesen. The presentation will give a summary of key findings from these PhDs and directions for future research. Especial emphasize will be given on the formulation of the scheduling and investment decision problems for distributed flexible resources, including EVS, battery storage and link to heat supply.