# Deregulated electricity markets with thermal losses and production bounds: models and variational reformulation

Didier Aussel [1] Michal Cervinka [2] Matthieu Marechal [3]

**Abstract**

A multi-leader-common-follower game formulation has been recently used by many authors to model deregulated electricity markets. In our work, we first propose a model for the case of electricity market with thermal losses on transmission and with production bounds, a situation for which we emphasize several formulations based on different types of revenue functions of producers. Focusing on a problem of one particular producer, we provide and justify an MPCC reformulation of the producer's problem. Applying the generalized differential calculus, the so-called M-stationarity conditions are derived for the reformulated electricity market model. Finally, verification of suitable constraint qualification that can be used to obtain first order necessary optimality conditions for the respective MPCCs are discussed.

## References

[1] Červinka, M., Matonoha, C., Outrata, J.V., On the computation of relaxed pessimistic solutions to MPECs, Optimization Methods and Software 28(1) (2013), 186–206.

[2] Dempe, S., Dutta, J., Is bilevel programming a special case of a mathematical program with complementarity constraints?, Math. Program. A 131(1-2) (2012), 37–48.

[3] Aussel, A., Cervinka, M.& Marechal, M., *Deregulated electricity markets with thermal losses and production bounds: models and optimality conditions*, RAIRO (2015), 24 pp. [to appear]

[1]Laboratoire PROMES, UPR CNRS 8521, University of Perpignan, Perpignan, France. Email: aussel@univ-perp.fr

[2]The Czech Academy of Sciences, Institute of Information Theory and Automation, Prague, Czech Republic, email : cervinka@utia.cas.cz

[3]Centro de Modelamiento Matematico, Santiago, Chile, email : mmarechal@dim.uchile.cl