# Looking for an equilibrium on long-term electricity market under network constraints

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## Abstract

We study an oligopolistic model which describes long-term electricity market considering generating capacity expansion under network constraints. Participants of the market are represented by generating companies and we are looking for the Nash-Cournot equilibrium.
Each company owns different plants at different nodes of the network. Company strategy is year energy production. Consumers are modeled by a linear year inverse demand function and we explain what ideas were used for constructing this function. Total year generation consists of season working days and weekends generation. If we exclude the network constraints then the model is just an example of the potential game and is reduced to an ordinary convex quadratic optimization problem though of big dimension. Then we check whether it is possible to realize the obtained solution within the previously given network constraints. If not, we suggest to use a bilevel optimization approach which in general can be reduced to an implicitly given global optimization problem. For solving the latter problem an optimization metodology with nonlinear support functions can be used. Finally we present computational results performed on a part of central energy system of Russia and make some conclusions.