Electrical Energy, Operational-Other Problems

Mathematical models

The short term maximum profit optimization problem in the electricity markets does not explicitly consider the gas portfolio optimization problem in a unified, integrated way. The Combinated Cycle Gas Turbine (CCGT) are nowadays the more flexible source of electrical energy and therefore one of the most used fossil fuel based one. As observed elsewhere, splitting a problem in more separated ones, is a classic approach to manage huge interdependent complex problems in a divide et impera way. However the increasing dynamics of the gas market in several countries, and between them, offers opportunities to extract more value from considering both problems as a whole especially on the short time horizon.

Modeling and algorithmic considerations:

From the modelling standpoint, the gas-and-power short term optimization problem can be seen as a - classic - short term electricity maximum profit where, however, the costs of gas varies depending on the complex exercise of the clauses of the underlying gas portfolio, instead of being constant, (see ToP and balancing markets sections). This from an algorithmic point of view calls for Benders-like approach within a bilevel modelling scheme. As in many other problems, uncertainty is present, and some stochastic or robust ingredients may be considered. The overall problem, even for a medium sized producer, is a large scale, mixed integer, problem possibly with uncertain ingredients.

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