A Deterministic Security Constrained Unit Commitment Model

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The unit commitment problem is an important problem that arises in electric power systems (Sen and Kothari 1996; Yamin 2004). It deals essentially with the scheduling of generating units in a power generation plant. The objective in this problem is to determine generation unit schedules typically over a 24 hour period to minimize operating costs while satisfying a set of constraints involving e.g. load balance, down time limits, spinning reserve, CO2 emissions and ramp rate limits.

We show that this model can be formulated as a convex mixed-integer quadratic program, in contrast to other mixed-integer nonlinear models previously published that involve products of binary and continuous variables (Yamin 2004; Niknam, Khodaei et al. 2009) We solve an example problem with 10 units over a 24 hour horizon and compare the performance of the DICOPT, SBB and CPLEX solvers.

References

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