

Stochastic Lagrange Relaxation applied to the Unit Commitment of a Hydro-thermal Power System

Matthias P. Nowak¹ VDI²

Institute of Mathematics
10099 Berlin, Germany
mefju@mathematik.hu-berlin.de
www-iam.mathematik.hu-berlin.de/~mefju
tel: +49-30-20932262
fax: +49-30-20932232

May 8, 1998

The optimization of a hydro-thermal power generation system leads to large scale mixed integer programs [?]. If the power generation system comprises hydro storage plants, then the optimization horizon should cover at least one week due to the load cycle. Since a week is far too long for having an exact forecast of the load the load uncertainty should be included – paid by an increase of the problems dimension.

A solver for this model is to be used in computer aided controlling of such a system, therefore the problems have to be solved in real time (5 minutes), that means by an adapted method. We are using the dual decomposition approach ([?]). The resulting subproblems are solved by a network flow algorithm ([?]) and stochastic dynamic programming ([?],[?]) together with a nonsmooth optimization method ([?]) for the dual problem. Numerical results will be presented.

References

- [1] K.C. Kiwiel. Proximity control in bundle methods for convex nondifferentiable minimization. *Mathematical Programming*, 46:105–122, 1990.

¹Humboldt University Berlin, Institute of Mathematics, 10099 Berlin, Germany

²Verein Deutscher Ingenieure

- [2] P. Kall and S.W. Wallace. *Stochastic Programming*. John Wiley and Sons, 1994.
- [3] M.P. Nowak. A fast descent method for the hydro storage subproblem in power generation. Working Paper 96-109, International Institute for Applied Systems Analysis, October 1996.
- [4] M.P. Nowak and W. Römisch. Optimal power dispatch via multistage stochastic programming. In M. Brøns, M.P. Bendsøe, and M.P. Sørensen, editors, *Progress in Industrial Mathematics*, pages 324–331, 1996.
- [5] W. Römisch and R. Schultz. Decomposition of a multi-stage stochastic program for power dispatch. *ZAMM - Zeitschrift für Angewandte Mathematik und Mechanik*, 76:29–32, 1995.
- [6] S. Takriti, B. Krasenbrink, and L. S.-Y. Wu. Incorporating fuel constraints and electricity spot prices into the stochastic unit commitment problem. IBM Research Report RC 21066(12/29/1997), IBM Research Division, December 1997.