

Stochastic dual dynamic programming applied to nonconvex hydrothermal models

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Abstract-

In this paper we apply stochastic dual dynamic programming decomposition to a nonconvex multistage stochastic hydrothermal model where the nonlinear water head effects on production and the nonlinear dependence between the reservoir head and the reservoir volume are modeled. The nonconvex constraints that represent the production function of a hydro plant are approximated by McCormick envelopes. These constraints are split into smaller regions and the McCormick envelopes are used for each region. We use binary variables for this disjunctive programming approach and solve the problem with a decomposition method. We resort to a variant of the L-shaped method for solving the MIP subproblem with binary variables at any stage inside the stochastic dual dynamic programming algorithm. A realistic large-scale case study is presented.

Index Terms- Programming: Stochastic; Integer; Benders decomposition; Lagrangean relaxation; Stochastic Dual Dynamic Programming; Production/scheduling: planning

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