

Unit Commitment with Load Uncertainty by Joint Chance-Constrained Programming

J.J. Peralta

Dept. of Energy
Andalusian Institute of Technology (IAT)
Málaga, Spain
jjperalta@iat.es

J. Pérez-Ruiz, S. de la Torre

Dept. Electrical Engineering
University of Málaga
Málaga, Spain
jperez@uma.es , storre@uma.es

Abstract— This paper presents an algorithm to solve a unit commitment problem that takes into account the uncertainty in the demand. This uncertainty is included in the optimization problem as a joint chance constraint that bounds the minimum value of the probability to jointly meet the deterministic power balance constraints. The demand is modeled as a multivariate, normally distributed, random variable and the correlation among different time periods is also considered. A deterministic mixed integer programming problem is sequentially solved until it converges to the solution of the chance-constrained optimization problem. Different approaches are presented to update the z-value used to transform the joint chance constraint into a set of deterministic constraints. Results from a realistic size case study are presented and the values obtained for the multivariate normal distribution probability are compared with the ones obtained by using a Monte Carlo simulation procedure.

Index Terms— Unit Commitment, Load Uncertainty, Correlation, Joint Chance-Constrained programming.