Day-Ahead Economic Dispatch for Oil Shale Power Plants in Deregulated Electricity Market

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Abstract

The Estonian electricity sector development has been very rapid during the last years - from the domination of the power monopolies in the regulated market to the electricity trading over the borders in the deregulated market. The deregulated market brings new challenges for power producers that are facing the economic power dispatch problem in the competitive conditions. The traditional economic power dispatch problem considers the minimizing of total thermal cost rate, where only the electric constraints are satisfied in the electric power system under the regulated electricity prices. Deregulation of the electricity market makes it necessary to perform the changes in classical algorithm and develop the new model for finding a good solution in a reasonable period of time.

The objectives of this paper is to elaborate day-ahead economic dispatch model for existing oil-shale-based power plants; implement the proposed algorithm by using different optimization techniques, and estimate the effectiveness of used optimization techniques for solving the economic dispatch problem.

The day-ahead economic dispatch optimization is formulated as a mixed-integer linear programming problem. The proposed algorithm has been implemented in the modeling language GAMS using Cplex mathematical programming solver. The test cases with different properties were carried out for existing generating units using by primal simplex, dual simplex and interior-point optimization techniques. The electricity and thermal power production, generation costs by the components, CPU time, results of the start-up costs calculation, primary energy consumption and emissions amounts are calculated. The outcomes are presented as the calculations of one typical week in winter and summer.

References

Valdma M., Tammoja H., Keel M., 2009. Optimization of Thermal Power Plants Operation. TUT Press, Tallinn.

Keel M., Liik O., Tammoja H., Valdma M., 2005. Optimal planning of generating units in power system considering uncertainty of information. Oil Shale. Vol. 22. No. 2 S, pp. 97-107.

Bisen D., Dubey H., Pandit M., Panigrahi B., 2012. Solution of Large Scale Economic Load Dispatch Problem using Quadratic Programming and GAMS: A Comparative Analysis. Journal of Information and Computing Science. Vol. 7. No. 3, pp. 200-211.

Hillier F., Lieberman G., 2001. Introduction to Operations Research, 7th Edition. ISBN 0072321695, New York.

Wood A., Wollenberg B., 2006. Power Generation Operation and Control, Second Edition. John Wiley & Sons, Inc., New York.

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