

PSO Technique Based Low Carbon Economic Load Dispatching

Parveen¹ and Rohit Kumar Gupta²

M.Tech Scholar, Department of Electrical Engineering¹

Assistant Professor, Department of Electrical Engineering²

School of Engineering & Technology, Soldha, Bahadurgarh, Haryana, India

Abstract: Carbon emission characteristics of all kinds of power units are analyzed against the background of the low carbon economy. This paper introduces carbon trading in the dispatching model, gives full consideration to the benefit or cost of carbon emission and introduces carbon emission in the dispatching model as a decision variable so as to achieve the unity of the economy and the environmental protection of the dispatching model. A low carbon economic dispatching model is established based on multiple objectives, such as the lowest thermal power generation cost, the lowest carbon trading cost and the lowest carbon capture power plant operation cost. Load equalization, output constraint of power unit, ramping constraint, spinning reserve constraint and carbon capture efficiency constraint should be taken into account in terms of constraint conditions. The model is solved by the particle swarm optimization based on dynamic exchange and density distance. The fact that the introduction of carbon trading can effectively reduce the level of carbon emission and increase the acceptance level of wind power is highlighted through the comparison of the results of three models' computational examples. With the carbon trading mechanism, carbon capture power plants with new technologies are able to give full play to the advantage of reducing carbon emission and wind curtailment so as to promote the development of the energy conservation and emission reduction technology and reduce the total cost of the dispatching system. The dispatching unit contains a carbon capture power plant, a thermal power unit and a wind power plant. The establishment of the model takes fully into account the unity of the economy and the environmental protection of the dispatching model. The multi-objective model is solved with the particle swarm optimization based on dynamic exchange and density distance. It can be concluded from the comparison of three dispatching models that the introduction of carbon trading and carbon capture power plant can effectively reduce carbon emission of the dispatching model. The carbon capture power plant can effectively reduce carbon emission and wind curtailment of wind power and increase the level of wind power acceptance.

Keywords: Economic Dispatching, Load Equalization, Particle Swarm Optimization

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