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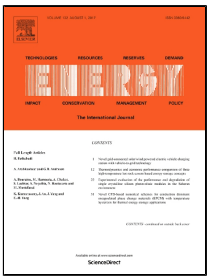

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Peak shaving operation of hydro-thermal-nuclear plants serving multiple power grids by linear programming

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Abstract: With the rapid economic development in recent years, the peak load demands of China are experiencing a booming period. As a regional power grid with the maximum electrical load in the world, the East China Power Grid (ECPG) is in charge of coordinating simultaneously the power generation of its own power plants to several subordinate provincial power grids. However, due to unreasonable power structure, there is a lack of flexible energy to quickly respond the peak loads of multiple power grids, which has brought a new real challenge for the dispatching center of most regional power grids in China. Hence, to meet the practical requirement of peak shaving operation in China, a novel linear programming optimization model is proposed in this paper to find out the optimal quarter-hourly generation allocation plan while satisfying a group of complex constraints. In this model, the objective is to minimize the summation of peak-valley difference of the residual load series by subtracting the total allocated generation from the original load of each power grid. This model is used to solve the day-head peak operation of 14 hydro-thermal-nuclear plants serving multiple power grids in ECPG. The results from different cases show that compared with the current method used in practical engineering, the proposed model is capable of providing results with smoother remaining load series for each power grid. Thus, this method proves to be effective technique to provide scientific decision support for large-scale generation allocation of plants serving multiple interconnected power grids in China.

Keywords: Peak shaving operation; hydro-thermal-nuclear system; linear programming; multiple interconnected power grids