Optimization Problem for Age Structure of Power Plants Basic Types

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In this study, the modeling is based on the integral model for the development of the electric power system [1, 2]. The model accounts for division of the generating equipment into certain age groups. Each of these groups has various technical and economic functioning parameters which describe the capacity aging processes. In the vector model [3] generating capacities are divided into three types: thermal power plants, nuclear power plants and hydro power plants respectively. The model includes the balance integral Volterra equation of the first kind with variable upper and lower limits and functional equations, describing the structure of the electricity consumption of different types of power plants. These functional equations closed the system of integral-functional equations. Also, the model includes restrictions-inequalities for the annual total growth of installed capacity.

We consider a search problem for the optimal generating equipment lifetime for a given demand for electricity and minimum total costs of commissioning and operation of capacities. Numerical solution of the optimization problem for various economic options is given. All calculations have been made as applied to the Unified Energy System of Russia.

References

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