MATHEMATICAL MODELLING OF HYBRID ENERGY SYSTEMS UNDER NON-STEADY STATE

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Hybrid systems are a combination of elements or properties of several different types of systems, which allow for greater efficiency, flexibility and reliability. Their work is based on the use of synergy between components, in which the strengths of each element are enhanced, and the disadvantages are minimized [1,2]. We consider a hybrid energy system combining several energy sources (traditional and renewable). For estimating efficiency of applying solar power system, usually it is used an economic approach (i.e. an investment analysis). It considers the technical characteristics and economic indicators (such inflation) but does not consider the stochastic nature of weather conditions [3,4].

In this study, queuing theory as an approach of theory of stochastic process is applied for evaluation of efficiency of hybrid energy systems. Previously, a queuing system with two units of devices and switching was proposed as a mathematical model of a system powered by the city electric grid and solar panels. The service blocks describe the sources of electricity, one of which is permanent, and the second is non-permanent (alternative energy). In this paper, an asymptotic analysis method is proposed under the condition of a high intensity of the incoming flow for studying the system in an unsteady mode [5]. The method of asymptotic analysis is applied to study the model under the condition of a high intensity of the arrival process. As a result, the asymptotic non-stationary characteristics are obtained for the system under study.

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