Chapter 2
Evaluation of the Effectiveness of the Use of Programs in the Design of Power Complexes Based on Renewable Energy Resources

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ABSTRACT

This chapter studies the prospects of energy complexes on the basis of renewable energy sources to supply electricity to the stand-alone consumers in different regions of Myanmar. In order to do that, the territory of Myanmar is divided into regions according to their amount of renewable energy sources. The developed methods are for determining the optimum parameters and operation of the energy complex on the basis of renewable energy sources and the cost-effectiveness of those energy complexes was examined. This was for the purpose of a mathematical formulation of the problem of optimization of the energy complex on the basis of renewable energy sources for autonomous rural consumers of the Republic of Myanmar.

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INTRODUCTION

With the developments of technological progress, the requirements for energy efficiency increases with every year. Practically in all developed countries RES development projects are being developed and implemented. The basic principle of the energy use based on renewable energy is to extract it from the processes constantly occurring in the environment and provide them for technical use. Technical progress has now reached such a level, with which energy generation is determined not only economic expediency, as well as a number of other factors, the most significant of which are environmental, social, and that are associated with human development and energy security. RES has significant advantages in terms of ecology and social significance. RES developed significantly in countries with limited resource base whose energy security is directly depends on the supply of energy (primarily oil and gas). A very complex, but urgent task is the system of optimization of parameters and HES (Hybrid Energy Systems) modes based on renewable energy sources. To create the HES requires special informational, mathematical and software for the feasibility study of projected the HES in the conditions of countries where market relations are only at the stage of their formation. In this regard, for efficient use of the RES resources, selection of the composition of generating installations based on renewable energy sources and their optimal parameters have reliable data on the flow of resources and optimize the energy parameters and operating modes of the HES. According to world experience, the use of only one type of RES in systems power supply of autonomous consumers does not always allow to provide reliable and uninterrupted power supply due to physical features of RES. In this regard, the autonomous consumer of power supply for Myanmar is most efficiently organized by sharing energy sources based on renewable energy sources, in particular, solar, wind and water. For efficient operation of HES as part of power plants based on renewable energy, it is necessary to create software that will allow optimizing the design parameters and operating modes of all HES components according to a given optimality criterion.

BACKGROUND

Currently, one of the biggest problems of the Republic of Myanmar, which is a developing country, is the need to raise the social standard of living of a large rural population, which is largely determined by the level of consumer supply of cheap electricity. In 2017, Myanmar produced 18 billion kWh of electricity, and the demand for electricity amounted to 20 billion kWh (Aung & Shestopalova, 2016). The specific energy consumption per person was only 200 kWh / year (Aung & Shestopalova, 2016). The level of energy consumption in Myanmar is the lowest in comparison with neighboring developing countries. The installed capacity of power plants operating in the Unified Energy System (UES) of Myanmar was 5,390 MW in 2017.

In Myanmar, there is a shortage of electricity in all sectors, including the municipal sector (Hla, 2015). Currently, Myanmar's national electricity grid does not cover the entire territory of the country.

The National Grid (NG) covers only 38% of the country's population. NG does not cover mountain areas due to the high cost of transmission lines. Mountain and remote regions have only local networks of autonomous power supply.

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