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A review of energy models

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Abstract

Energy is a vital input for social and economic development of any nation. With increasing agricultural and industrial activities in the country, the demand for energy is also increasing. Formulation of an energy model will help in the proper allocation of widely available renewable energy sources such as solar, wind, bioenergy and small hydropower in meeting the future energy demand in India. During the last decade several new concepts of energy planning and management such as decentralized planning, energy conservation through improved technologies, waste recycling, integrated energy planning, introduction of renewable energy sources and energy forecasting have emerged. In this paper an attempt has been made to understand and review the various emerging issues related to the energy modeling. The different types of models such as energy planning models, energy supply–demand models, forecasting models, renewable energy models, emission reduction models, optimization models have been reviewed and presented. Also, models based on neural network and fuzzy theory have been reviewed and discussed. The review paper on energy modeling will help the energy planners, researchers and policy makers widely.

Keywords: Energy models; Forecasting model; Optimization model; Fuzzy logic; Neural networks

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1. Introduction

In most of the developing countries, the energy problems to be addressed are countering the high dependence on traditional sources of energy which supply more than 90% of total energy used causing rapid deforestation, decreasing soil fertility, etc. Thus a large amount of information is required to describe their relationships, and several tools are necessary to analyze different issues and to achieve a variety of results that are needed for the planning process. Apart from the phenomenal growth in population, the marvels of modern technology have enhanced the aspirations of the people for an improved quality of life. One of the indices of improved quality of life is the per capita energy consumption, which has been rising steadily for the last few decades. The net result of this has been that the demand for energy has multiplied manifold and it can be no longer satisfied by the traditional inefficient energy technology using a few local resources only. Before the oil crunch of seventies, the planners and politicians of the Third world countries had envisioned energizing the rural areas on lines similar to developed countries. They had hoped that energy models could be developed for the efficient energy planning, forecasting and optimization of energy sources. The experience in India over the past decade has shown that decentralized energy technologies based on local resources can be viable alternatives to many commercial sources of energy in diverse energy end-uses. Models have become standard tools in energy planning. In recent years, considerable efforts have