SYSTEMS PLANNING IN THE RURAL ENERGY SECTOR

by

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C E R T I F I C A T E

This is to certify that the thesis entitled*, "PLANNING AND MANAGEMENT OF RURAL ENERGY SYSTEMS" which is being submitted by Mr.C.Subhash to the Indian Institute of Technology, Delhi for the award of the Degree of Doctor of Philosophy, is a record of bonafide research work carried out by him. He has worked under our supervision and has fulfilled the requirements for the submission of this thesis, which has attained the standard required for a Ph.D. degree of this Institute. The results presented in this thesis have not been submitted elsewhere for the award of any other degree or diploma.

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* As suggested by the External Examiner, the thesis title has been changed to "SYSTEMS PLANNING IN THE RURAL ENERGY SECTOR".

To

R.S.,P.S.S., & J.R.

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ABSTRACT

Systems thinking is holistic in nature and provides scope for integration of various techniques for analyzing large and complex systems. One of the prime perceived needs is to develop a viable and optimal perspective plan for a region such as the Fatehpur village-cluster in the Nainital district of U.P. from a basis of field survey studies.

Both quantitative and qualitative systems analysis techniques are required to investigate viable policy options in the context of rural energy systems at a micro-level with implications for macro policy planning.

It becomes imperative to study the emerging national scenarios also since the policy at the micro-level is directly influenced by the decisions at the macro-level. The research investigations reported in the thesis are therefore at both the levels, viz. (i) macro-level, and (ii) the micro-level of a village-cluster.

While the qualitative technique of Delphi study finds application in Energy Technology Characterizations for India, the secondary energy supply scenarios for India and the select rural village-clusters have been developed through the quantitative trend extrapolation technique. Also, the quantitative technique of Kalman filtering has been used to formulate and simulate a stochastic dynamic model of three sector energy-economy system of India. Energy-economy planning perspectives for the Fatehpur village-cluster are based on Leontief's input-output (I/O) framework at the level of six major sectors, viz. agriculture, livestock, industry, forestry, commerce and household.

Mixed integer programming technique has been successfully used for optimizing I/O coefficients for the horizon year as well as developing an integrated optimal energy plan for the Fatehpur village-cluster. Load forecasting and load scheduling has been attempted for the end-use of household cooking based on the concept of unit committment using a simple "merit order" approach.

Qualitative systems analysis techniques such as Idea Engineering, Fuzzy Sets, Delphi Study, Harva Method and Metagame Analysis find applications in the context of energy futures research investigations pertaining to the Fatehpur Village-cluster. The issues of policy implications and associated management strategy for implementation have been addressed in the context of perspective planning for energy for the selected region.

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