

ABSTRACT

The energy requirement in India is increasing steadily and this requirement is being met by both conventional and non conventional energy sources. Due to non availability of sufficient resources and a considerable amount of emission of pollutants from conventional sources and the increasing constraints led by the international agreement, it is now felt that renewable energy has to be utilized to greater extent so as to achieve the country goals i.e. green house gases reduction and meeting the energy demand. In India, about 70% of the total renewable power generation is obtained from wind. The theoretical potential of the renewable energy sources is considered in this thesis is 85,000MW which is sufficient to meet the energy deficit of the country presently.

In the earlier work, the forecasting has been done using diffusion models which are mainly used to determine the clean development mechanism potential using renewable sources such as wind, biogas, solar etc. The technology diffusion models for the determination of most appropriate renewable energy based technology which is presently being implemented have not been found in the previous literature survey.

In this work, three different diffusion models are implemented for the determination of most appropriate technology that can be adopted for power generation in the country .The model is also used for forecasting of the renewable power generation up to 2020. The present work shows that the wind energy generation system emerged as the most suitable renewable

source for power generation in the country. In India, the clean development mechanism is considered as a means of technology transfer and sustainable development in developing countries. In the present work it has been found that clean development mechanism will not help in sustainable development in India unless the developed countries come forward and implement it in the developing countries in appropriate time frame viz. up to 2020. In the present work, it has been found that in India there is a potential of reducing green house gases by about 2, 76,534 million metric tonnes of carbon dioxide by 2020 using wind, small hydro, biomass and cogeneration (bagasse) based power generations. Thus the decision taken by the policy makers in India regarding renewable based technology transfer using clean development mechanism is correct in the existing scenario because the commitment as made by the developed nations is not in cohesion with the international agreements. Accordingly most of the clean development mechanism based projects will not be sustained for a longer time unless it is properly and timely funded by Official Development Assistance that depends on GDP of developed nations.

The reliability of different technology diffusion models have been tested using statistical analysis and the correlation between the actual and predicted values has been found. The renewable power as obtained from different diffusion models comes out to be satisfactory and gives value of correlation coefficient between ± 0.7 and ± 1 which corresponds to strong correlation among actual and predicted values.

In this thesis, two case studies have been considered. In one of the case studies it is found that the adoption rate of the battery operated vehicles based

on fuel cells are not much in use in the rural and urban areas of Lucknow, Uttar Pradesh, India. The techno economic analysis of the petrol based two wheelers and battery operated scooters are carried out. The battery operated vehicles have been found suitable for travelling distances more than ten kilometers daily. The causes of low rate of adoption of battery operated vehicles in Lucknow, Uttar Pradesh, India was found to be limited distances of travel, longer charging time and low charge density in the batteries being used in the vehicles. In the other case study, the solar photovoltaic based lighting system in the rural areas of Barabanki has been considered. After implementation of diffusion model for solar home lighting system it has been found that up to 2020 the adoption will remain very low. The causes of low rate of adoption are due to the lack of knowledge of solar photovoltaic technology, low battery life and less cooperation among the users.