

Name of the Scholar: **Mohd. Arif**

Name of the Supervisor: **Prof. M. Emran Khan**

Name of the Co-Supervisor: **Prof. Avinash Chandra, CES, IIT, Delhi**

Department: **Mechanical Engineering Department,
Faculty of Engineering and Technology,
Jamia Millia Islamia, New Delhi.**

Title of the Thesis: **Total Life Cycle Analysis of Renewable Energy System:
Energy and Environmental Aspects.**

ABSTRACT

This thesis deals with the energetic study and environmental mitigation potential assessments of Renewable Energy Sources (RES) of India. In particular, the biogas system, solar cooker, solar water heater, stand alone photovoltaic (SAPV) and wind energy converter (WEC) have been analysed in detailed. Results of a detailed study on major RES of Indian rural areas are presented. Energy analysis of various biogas plant models has been carried out and results are compared. MATLAB software is used for evaluating the hourly total incidence radiation on solar cooker to estimate cooking time and results are compared with Kandpal model. Life cycle analysis of solar water heating system of 100 litre per day capacity has been performed to estimate energy yield ratio and energy payback period. Energy production factor predicts the overall performance of solar water heating system which varies from 0.3 to 0.45 for different Indian stations. In economic analysis, annualised uniform cost also has been evaluated for life time basis for 15, 20 and 25 years of Indian cities. It has been found that the cost of power generated is Rs. 6.34 / kWh, Rs. 5.68 and Rs. 5.26 for life cycle of 30, 40 and 50 years respectively), carbon credit earned and return on capital by the SAPV system for Indian climatic condition will be cheaper than the cost of power generated by conventional systems. Energy yield ratio of 1.5 MW wind energy convertor (WEC) varies from 9.59 to 31.11

for coastal, near coastal and inland Indian cities. If renewable energy systems are installed only in 20% of rural areas, the total carbon credit earned by system is Rs. 16018 crores meanwhile for Rameswaram, Bamanbore and Sultanpet Indian sites, carbon credit earned by 1.5MW WEC varies from Rs. 9858532 to Rs. 32221320 as per Kyoto Protocol.