

# **A Design Procedure to Demonstrate Environmental and Economic Benefits of Energy Efficient Buildings**

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## **Abstract**

Energy efficient buildings are a key factor for sustainable development and clean energy progress. The political and global situation across the world has increased the interest of different countries in the development and implementation of renewable energy technologies. The introduction of energy efficient design of buildings will enhance the potential of renewable technologies as an alternative to conventional systems. In terms of its environmental advantages, renewable energy sources have lower emission of greenhouse gases as compared to fossil fuels. The usage of renewable sources has far less adverse environmental impact and lower costs of realization. Keeping all aspects in mind, a design procedure to demonstrate environmental and economic benefits of energy efficient buildings has been presented in this paper. The paper outlines energy management concept through thermo-economic optimization of a residential building located in Faisalabad, Pakistan. The analysis has been carried out in order to optimize the selection and performance of different equipment used in a residential building to lower the overall energy consumption. The scenario has also been dedicated to the reduction of greenhouse gases for sustainable development. The results of this study show that replacement of current equipment and technologies with the proposed units not only reduces fuel consumption but also greenhouse gas emission. The energy shortfall in the country is a major issue which can be overcome by implementation of new green and energy efficient building ideas. Moreover, evaluation of ecological benefits is reported in this research and a cost benefit analysis of the proposed project is presented. The target of energy saving can be achieved with a little increase in initial investment cost but the overall cash flow will be positive after few years of project life. The project is also a service to humanity through the reduction of harmful emissions which is a major cause of global warming.

## **Biographies**

**M. Mujahid Rafique** is a graduate with strong communication and organizational skills; trained as a mechanical engineer and researcher. His scholarly area of research is thermal science with major focus on the development of clean and energy efficient mechanical systems. His main areas of interests are energy conversion and management, desalination, sorption, solar air conditioning, desiccant cooling, heat and mass transfer, and development of renewable energy technologies. His updated research profile can be accessed through: <http://orcid.org/0000-0003-4366-6198>.

**Muhammad Ali Shakir and Qasim Ali's** scholarly area of research is development of energy efficient technologies. Both are lecturer is in Mechanical Engineering Department, University College of Engineering and Technology, University of Sargodha.