

# ENERGY AUDIT

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THERMAL POWER, COMBINED CYCLE,  
AND COGENERATION PLANTS

Y P Abbi



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# Foreword

The Intergovernmental Panel on Climate Change (IPCC) has identified the energy supply and industry sectors as major sources of greenhouse gas emissions, with the power sector accounting for a large share. As it happens, these sectors are also responsible for large-scale pollution at the local level. There is, therefore, a need worldwide for improving the efficiency of fuel use in thermal power plants not only for environmental reasons but also to enhance energy security, given the fact that supply of fossil fuels to meet the growing demand for power worldwide is facing major constraints right from mining to transportation and handling. However, there is generally a lack of practical knowledge on how existing power plants as well as those that are yet to be established can be subjected to detailed analysis of opportunities for improvement of fuel use in each unit.

This book on *Energy Audit: Thermal Power, Combined Cycle, and Cogeneration Plants* is an extremely insightful and useful publication that would provide those involved in the running of these power plants as well as others who are carrying out energy audits to assess opportunities for improvement of energy efficiency and arrive at the development of focused plans to make efficiency gains possible. A thermal power plant consists of several components where efficiency improvements are generally possible. This includes improvements in the heat rate, reduction in auxiliary power consumption as well as other measures which can only be assessed on the basis of a thorough and detailed energy audit. Most plants operating in India, in particular, are characterized by inefficiencies that deviate from design parameters. The pages of this book explore design concepts of thermal power generation, opportunities for cogeneration and a range of various energy conservation measures, and an evaluation of the economic aspects related to each one of them. In essence, energy audits support the finding that “what gets measured gets managed”. It is only on the basis of a proper energy audit that specific measures can be designed for improving the efficiency of thermal power plants. The application of the knowledge contained in this book, therefore, provides enormous potential and opportunities for improving the efficiency of individual

thermal power plants, which in the aggregate can lead to improvements in efficiency of the sector as a whole. This is, therefore, a publication of enormous practical value, but one that is based on sound knowledge and academic merit.



**R K Pachauri**, PhD  
Director-General, TERI

# Preface

In a thermal power plant based on fossil fuels (coal/natural gas/oil), the cost of fuel contributes about 55%–65% of the cost of generation of electricity (that is, cost/kWh). Fossil fuels are becoming scarcer, leading to the consequent increase in the cost of fuel. This situation is being faced by both developing and developed countries. Thus, utility companies/electricity generators are always under pressure to contain the cost of generation of electricity, and every penny containment or escalation is necessary to remain competitive with other utility companies, and also to avoid criticism of end-users, social groups, and electricity regulators.

Electricity generation efficiency improvement and conservation of energy used for generating equipment and auxiliaries of a power plant are critical steps, which power station operation and maintenance professionals carry out to contain the situation. This involves systematic audit of all energy consuming equipment and systems, and identification of focus areas. This exercise also brings out the financial benefits and emission reductions that the power plant can achieve through improving operating parameters and modifications/changes in some of the equipment.

*Energy Audit: Thermal Power, Combined Cycle, and Cogeneration Plants* brings out the methodology for energy audits and the analysis of data for identifying energy efficiency improvement exercises. This book provides a quick review of the design concepts of thermal power generation and cogeneration plants, and then expounds the methodology for data collection and its analysis/interpretation as per ASME PTC codes.

This book is meant to act as a guide to operation and maintenance engineers and professionals working in energy efficiency improvement of thermal power and cogeneration plants.



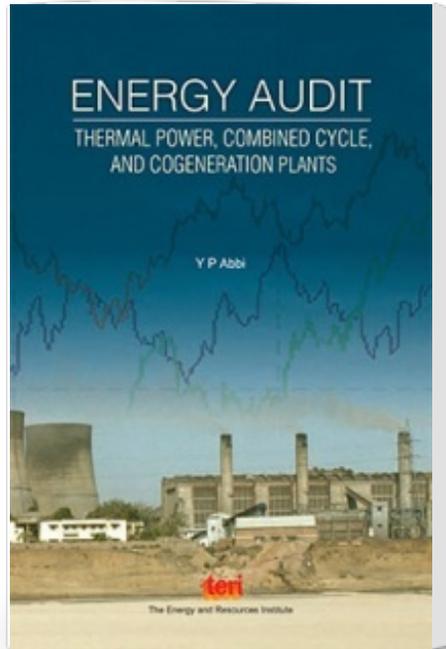
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Lastly, I also thank my wife, Amrit, and daughters, Monica and Alka, who always encouraged me to pen down my experience for the benefit of younger professionals in the power sector, and for the cause of conservation of energy and environment.

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