

# **A STUDY OF ALTERNATIVE ENERGY OPTIONS TO MINIMISE HOME LOAD IN COAL POWER PLANTS**

N.S. Walpita

(118361E)



University of Moratuwa, Sri Lanka.  
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Degree of Master of Engineering

Department of Mechanical Engineering

University of Moratuwa

Sri Lanka

May 2015

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Nisal Saminda Walpita

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Dissertation submitted in partial fulfillment of the requirements for the degree Master  
of Engineering

Department of Mechanical Engineering

University of Moratuwa  
Sri Lanka

May 2015

## DECLARATION

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The above candidate has carried out research for the Masters Dissertation under my supervision.

Signature of the Supervisor

Date

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## ABSTRACT

Coal fired power plants are one of the main contributors in power generation in the world and it is nearly 40% of global power generation. When considering power generation in Sri Lanka, Puttalam Coal Power Plant is the largest and one and only coal fired power plant. Presently 900 MW is produced by three units of this power plant.

Coal fired power plants consume a considerable amount of energy as the home load. For example, many auxiliary systems such as pumping, cooling, coal handling, compressed air, HVAC and lighting. In the coal fired power plants in Sri Lanka, they account for 90 MW, which results in the supply of only 810 MW to the grid out of the produced 900 MW. The majority of auxiliary systems consist of electric motors as prime movers for pumps, compressors, conveyor belts and coal mills. The electricity generator is coupled with a steam turbine that uses the generated steam in the boilers. This system needs prime movers and that consumes the most amount of electricity, which is generated.

By reducing the home load in an efficient and a strategic manner, the power plant efficiency could be increased and more power can be supplied to the grid. However, the implementation of these changes for a power plant, which has already been constructed and operational, is difficult. Although it is a difficult attempt, it is worthwhile to explore the possibility to implement changes in the existing coal power plants. It could potentially yield positive results and incur savings.

This study has looked into ways to minimise the home load and propose alternative renewable energy options for the coal power plants. The research goes on to develop a method to recommend alternative energy options to address the home load needs of coal power plants. In order to evaluate this method, it has been applied to the Norochcholai power plant and to recommend the most suitable energy option to account for the home load. The results suggest that the developed method provides guidance to practitioners to decide the energy efficiency and renewable energy options to address the home load of coal fired power plants. It is suggested to further develop this method as a computer based software program in the future.

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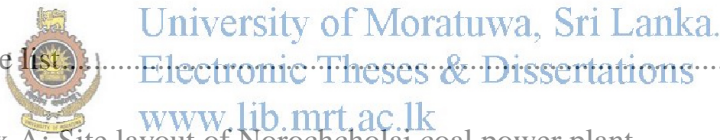
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## LIST OF ABBREVIATIONS

HP	High Pressure
IP	Intermediate Pressure
LP	Low Pressure
HT	High Temperature
LT	Low Temperature
ST	Steam Turbine
TF	Transformer
THA	Thermal Heat Acceptance
TMCR	Turbine Maximum Continuous Rate
BMCR	Boiler Maximum Continuous Rate
CSP	Concentrating Solar Power
BFP	Boiler Feed Pump
EX	Extractions
MPB	Main Power Plock
DCS	Distributed Control System
LHV	Lower Heating Value
NIO	North Indian Ocean
TF	Transformer
WTB	Wind Turbine
PCPP	Puttalam Coal Power Project
EFP	Electric Feed Pump
RE	Reciprocating equipment
CPP	Coal power plant
EES	Engineering Equation Solver



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