UNIVERSITY OF SOUTHERN QUEENSLAND

UTILIZING A MARGINAL ABATEMENT COST CURVE APPROACH TO DEVELOP A LOW GREENHOUSE GAS PLAN: CASE STUDY OF ENERGY MANAGEMENT IN A RURAL REGION (TOOWOOMBA-AUSTRALIA) ACCOUNTING FOR HUMAN BEHAVIOUR

A Dissertation submitted

by:

Ali Ahmed Ali Almihoub
MA (Accounting)

In fulfilment of the requirements for the award of

Doctor of Philosophy
School of Commerce
Faculty of Business, Education, Law & Arts

November, 2013

ABSTRACT

The global warming phenomenon has become an international issue which requires effort to avoid and control the concentration of greenhouse gases (GHGs). At the same time, despite various attempts, developed countries need to put more effort and attention into dealing with this issue. Many studies have been conducted on reducing GHGs globally and nationally. The majority of these studies have focused at a national or sectorial level, particularly in the industrial sector.

This study focuses on stationary energy. There are two main ways to reduce GHGs, particularly CO_2. One is to replace carbon-based fuels with renewables. The other is to reduce consumption. To achieve further GHG emission reductions, improvements to behavioural change regarding the use of energy are an emerging area of research that has significant implications for policy.

One method adopted for reducing GHG is the MACC approach. In recent years, the need for more reductions in emissions with low costs has increased suitable strategies adopted at both an organisation and region level. However, many previous studies have been undertaken with a focus on estimated data. Accordingly, this study seeks to establish to what extent using actual data will help decision makers.

The findings of this research indicate that organisations are seeking a more accurate approach to save energy, reduce emissions, and determine the impact of users' behaviour when using abatement activities. Organisations are planning to use management accounting methods such as MACC when measuring the cost of abatement or reduction in environmental costs for more effective decision-making. This study developed a concept by using actual data in MACC. The design established support for organisations to meet data accuracy needs.

This research provides important insights, particularly in promoting energy saving and emission reduction at the organisation level. The results confirmed the main assumptions and purpose underpinning this research.

CERTIFICATION OF DISSERTATION

I certify that the ideas, analyses and conclusions reported in this thesis are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

_____ ----------
Signature of Candidate Date
Ali Ahmed Ali Almihoub
PhD Student

ENDORSEMENT

_____ ----------
Signature of Supervisor/s Date
Dr. Mafiz Rahman
Principal Supervisor

_____ ----------
Signature of Supervisor/s Date
Dr. Les Bowtell
Associate Supervisor

ACKNOWLEDGEMENTS

All the praises come to Allah SWT, the God, who is compassionate and merciful. I realise that the dissertation could not be completed without help and support from many people such as supervisors, respondents, friends and family. They are the important people in the successful completion of my PhD thesis.

I am greatly indebted to my principal supervisor Dr. Mafiz Rahman for his constructive critiques, comments, suggestions and constant patience and guidance throughout the period of my study. I also wish to thank Dr. Les Bowtell, my associate supervisor, who afforded me constant guidance and substantial encouragement throughout the explanation of this work, particularly in the project related energy case study (Steele Rudd). I really appreciate their support and their patience and guidance. I would like to acknowledge my deepest gratitude to Associate Professor Joseph M Mula, for his guidance, patience, and encouragement throughout my thesis, and for his help in the course of Research Methodology 2 and collection of data—many thanks to Joseph. I also wish to thank Professor. Julie Cotter, faculty research advisor, for her support, constructive feedback and suggestions, especially in the early stages of this work. My gratitude must also go to Dr. Melissa Johnson Morgan. I am also thankful to the Environmental Officers at USQ, particularly Alicia Logan and Dr Dave Povey. Many thanks also to Greta Mula who helped me to increase my English proficiency.

Special thanks should go to Almihoub family members; I would also like to express my deepest gratitude to my parents, my wife Hawaa, my sons Mohamed, Mahmoud Ahmad and Abdurrahman, and my daughters Maha, Muna and Mawadah for their patience and inspiration. I really owe them a great debt as they accompanied me during my studies even though it was not for the whole time.

Lastly, thanks to my country, Libya, for providing this opportunity to study and its endless financial support. I am grateful to all the people and organisations who have contributed in one way or another to this study.

LIST OF ABBREVIATIONS

ABC	Activity Based Costing
BAU	Business as usual
CAC	Command and control
CO_2	Carbon dioxide
CP	Carbon price
CPRS	Carbon Pollution Reduction Scheme
CH_4	Methane
EMA	Environmental Management Accounting
ETPCN	Ecological Transformation Pathways to Carbon Neutrality
ETSs	Emissions trading schemes
GDP	Gross Domestic Product
FC	Fluorocarbon
FCA	Full Cost Assessment
FCEA	Full Cost Environmental Accounting
GHGs	Greenhouse Gases
HFCs	Hydro fluorocarbons
IPCC	Intergovernmental Panel on Climate Change
IPMVP	International Performance Measurement and Verification Protocol
IRR	Internal Rate of Return
LCA	Life Cycle Analysis
LCECA	Life Cycle External Costs Assessment
MACC	Marginal Abatement Cost Curve
MC	Marginal cost
NPV	Net present value
N_2O	Nitrous oxide
NGERA	National Greenhouse and Energy Report Act
NGER	National Energy Reporting Regulations
PCA	Partnership for Climate Action
PP	Payback period
RGGI	Regional Greenhouse Gas Initiative
SF_6	Sulphur hexafluoride
SPC	Shadow Price of Carbon
TCA	Total Cost Accounting

CANDIDATE'S PUBLICATIONS

Almihoub, AAA, Mula, JM & Rahman, MM 2013a, 'Marginal Abatement Cost Curves (MACCs): Important Approaches to Obtain (Firm and Sector) Greenhouse Gases (GHGs) Reduction', *International Journal of Economics and Finance*, vol. 5, no. 5, p. p35.

Almihoub, AAA, Mula, JM & Rahman, M 2013b, 'Are There Effective Accounting Ways to Determining Accurate Accounting Tools and Methods to Reporting Emissions Reduction?', *Journal of Sustainable Development*, vol. 6, no. 4, p. p118.

Almihoub, AAA, Mula, JM & Rahman, MM 2013c, 'Identifying Effective Management Instruments and Human Behavioural Changes to Manage Energy Use and Abate Emissions at Firm Level', *Journal of Sustainable Development*, vol. 6, no. 7, p.p 1-15.

Almihoub, AAA, Mula, JM & Rahman, MM (2012) Utilizing a marginal abatement cost curve approach to develop a low greenhouse gas plan: Case studies of energy management in multiple sectors across a rural region (Toowoomba-Australia), paper presented at Global Accounting, Finance and Economics Conference, 20-21 February 2012 - Venue: Rydges Hotel, 186 Exhibition Street, Melbourne, Australia.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES