POTENTIAL OF GENERATING POWER OUT OF RICE HUSK

AND

ITS FINANCIAL VIABILITY

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DECLARATION

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not been accepted for any degree, and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

Due to intense fossil fuel dependency on energy generation in the world, cost of energy has a greater bearing on the price of fossil fuels. Most of the countries in the world are suffering due to this and Sri Lanka is no exception. It is in this context, promotion of biomass as a renewable source is so vital to the country. Even though biomass plays a greater role as a source of primary energy in the country, its contribution towards power generation is negligible. Rice being the staple food of the country as well as the crop with highest land area under cultivation, rice husk produced in paddy processing was found to have a significant potential in power generation. Currently, rice husk has not been identified as promising source of energy for electricity production in the country. Hence, the purpose of this research was to investigate the possibility of using rice husk as a viable source of power generation in the country thereby releasing part of the burden on country's fuel bill.

Annual paddy production of the country remains slightly above 4 million metric tons with 800,000 metric tons of rice husk being produced as a byproduct in paddy processing. If assumed total rice husk production is tapped for energy generation, total energy potential comes to around 2,176 pJ per annum at the conversion rate of 20%. Since significant portion of this energy is currently being harnessed for thermal applications, potential for electricity generation out of rice husk is restricted somewhat. However, the findings of this research shows that still 30% of rice husk produced in the country is available for exploitation in power generation with a potential of about 180GWh per annum. Greater portion of this electrical energy can be tapped in the districts of Ampara, Polonnaruwa, Anuradhapura and Kurunegala because of higher paddy production and milling capacities in these districts. However, the scale of power generation is limited to 1MW to 2MW maximum plant capacities for above districts while small scale plants of the order of 40kW showing better financial viability under ***Net Metering Scheme*** currently in force.

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Most difficult part of this exercise was the collection of data related to rice mills and rice husk produced in the district of Polonnaruwa. My special thanks in this regard should go to Miss. Hemali Amaradiwakara, Area Engineer, CEB, Minneriya and her meter readers for collecting above data while executing their duties in meter reading. In this endeavour, the role of rice millers cannot be forgotten as their information was very valuable in this research.

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CONTENTS

List of Figures

Chapter 6

List of Tables

List of Abbreviations

CEB	: Ceylon Electricity Board
CHP	: Combine heat and power
CV	: Calorific value
EIRR	: Equity internal rate of return
FAO	: Food and Agriculture Organization
GHG	: Green house gases
HARTI	: Hector Kobbekaduwa Agrarian Research and Training Institute
HHV	: Higher heating value
HPR	: Husk to paddy ratio
IRR	: Internal rate of return
LHV	: Lower heating value
NCRE	: Non conventional renewable energy
NERD	: National Engineering Research and Development Centre
O&M	: Operation and maintenance
ORC	: Organic Rankine cycle
PIRR	: Project internal rate of return
PUCSL	: Public utilities commission of Sri Lanka
RH	: Rice husk
SPPA	: Standardized power purchase agreement
TOE	: Tons of oil equivalent

List of Appendices.