CO-FIRING BIOMASS WITH COAL IN PULVERIZED COAL FIRED BOILERS

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Degree of Master of Science

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Thesis submitted in partial fulfillment of the requirements for the degree

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DECLERATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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DEDICATION

I would like to dedicate this thesis to my mother, father, all teachers who educated me and to my wife.

ACKNOWLEDGEMENT

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ABSTRACT

Power generation using pulverized coal power technology is a very mature and extremely popular technical trend in the global scenario. The first coal fired power plant complex in Sri Lanka, Lakvijaya Power Station employs the same technology. For a country like Sri Lanka, import of coal will cost a lot of foreign exchange since it has no coal reserves within the country. Also, as a nation, it is strategically advantageous to rely on multiple fuels which reduces energy imports in to the country. Biomass co-firing is successfully being demonstrated around the world. There are several co-firing technologies and the pulverized coal fired plants can retrofit the technology very easily. By doing so, there are many benefits that a nation can achieve. The amount of fuel can be conserved while substituting it with a suitable type of available biomass. Hence, a direct nationwide economic benefit can be achieved. Also, with the global climatic changes, the world is currently looking for way to reduce and compensate to green house gas emissions. Biomass co-firing is also beneficial in that manner since a significant amount of fossil fuels will be substituted with carbon neutral biomass. When introducing co-firing technology, there are many other aspects to be considered. They are of technical, economical and social of nature, and hence can impact national economy in various ways. As a nation whose future generation plan is coal dominant, it is vital that Sri Lanka consider this particular concept seriously.

In this thesis, glerecedia is considered as the candidate biomass option which will be mixed with coal to be fired within the same boiler. An extensive analysis is carried out and elaborated in this thesis in regard to technical, economical and other concerns arising when co-firing is introduced to an existing pulverized coal fired installation. As a case study Lakvijaya Power Station Complex is considered. It is concluded that the introduction of direct co-firing techniques and subsequently addressing minor concerns related to it, can be demonstrated in a commercial scale successfully. It is recommended to carry out initial trials up to a co-firing ratio of 5%. This report will focus on the design of co-firing arrangement up to a maximum of 5% as it is the globally established benchmark for direct co-firing strategy.

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Abbreviation	Description
CFR	Co-firing Ratio
BM	Biomass
GCV	Gross Calorific Value
NCV	Net Calorific Value

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