



## Strategies to overcome barriers for cleaner generation technologies in small developing power systems: Sri Lanka case study

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### Abstract

The penetration of cleaner and energy efficient technologies in small power systems such as the one in Sri Lanka has encountered many problems. This has caused major concerns among the policy makers, mainly in the context of the growing need to reduce harmful emissions in the electricity supply industry from the point of view of both local environmental pollution as well as the global warming concerns.

This paper presents the outcome of a study involved in identifying and ranking the barriers to the promotion of cleaner and energy efficient technologies and strategies to overcome these barriers in Sri Lanka. Barriers for renewable energy based systems such as wind and wood fuel fired plants (dendro thermal power) and cleaner technologies such as liquefied natural gas (LNG) fired combined cycle and IGCC (coal) were identified based on a survey. A direct assessment multi-criteria decision making method called Analytic Hierarchy Process (AHP) was used to rank the barriers. The most effective strategies are proposed to address the three major barriers for each of these technologies based on extensive discussions with all the stakeholders in the electricity industry.

It was found that lack of financing instruments, high initial cost and lack of assurance of resource supply or availability are the main barriers for renewable technologies. As for cleaner fuel and technology

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options associated with conventional generation systems, the lack of a clear government policy, uncertainty of fuel supplies and their prices and the reliability of the technologies themselves are the major barriers.

Strategies are identified to overcome the above barriers. Establishment of a proper feed in tariff, geographical diversification of installations and capacity building in commercial banks are suggested for wind power. Investment incentives, streamlining of wood production and research on site identification are proposed for wood fuel fired plants. Also the study suggests delayed implementation, combined planning with other sectors of the economy, incorporating environmental cost in planning and investment incentives as strategies for IGCC and LNG based technologies.

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## 1. Introduction

Despite the technological advances leading to reductions in initial costs, renewable technologies have not penetrated successfully, especially in developing countries like Sri Lanka. Before formulating strategies to promote these renewable sources and other cleaner technologies, it is important to identify the barriers that hinder their penetration.

Renewable energy based electricity generation has unique qualities. For example, about 85% of the production cost of a renewable plant consists of capital cost compared to 50% in a conventional plant. Hence, to promote renewable technologies, a separate analysis from conventional sources is required. Also, the uniqueness of each renewable technology makes it difficult to apply a common renewable policy among all the sources, and the solutions have to be source specific.

Recent publications by Menanteau et al. [4], Meyer and Koefoed [3] and Meyer [2] reveal that feed in tariff (FIT) systems have been successful in terms of renewable capacity addition in Europe and highlight the drawbacks and difficulties in implementing other measures like certificate trading and tender procedures. Also, Enzensberger et al. [1] give a comprehensive list of policy alternatives to promote renewables and the factors to be considered before implementing them. Most of these studies are on countries with developed markets having large power systems. Applying those measures in developing countries needs more care. Studies by Kozloff [6] and Rajsekhar et al. [5] highlight the need to move from supply pull approaches to technology and source specific demand pull measures in promoting renewables in developing countries.

The objective of this study was to rank the barriers to promoting clean and energy efficient technologies in the Sri Lanka power sector. A survey based on the Analytic Hierarchy Process (AHP) was used among all the stakeholders of the power sector. Then the study was to identify, analyze and recommend suitable policies and measures to overcome barriers in promoting certain clean and energy efficient technologies in Sri Lanka power sector.

The technologies selected for the study are wood fuel fired thermal plants (dendro thermal power), wind power, use of liquefied natural gas (LNG) in place of coal fired stations

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