# STRATEGIES TO HARNESS THE FULL HYDRO-ELECTRIC POTENTIAL IN SRI LANKA

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**Declaration**

I declare that this is my own work and this dissertation 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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K.M.I.N. Kuruppu Date: 25th June, 2012



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

Prof. H.Y.R. Perera Date: 25th June, 2012

**Abstract**

The existing power generating system in Sri Lanka relies upon a mix of generation from renewable sources, predominantly hydropower, with the balance from fossil fuel sources. While the electricity demand continues to grow at an average rate of 6 ~7% per annum, it is projected that the majority of new electricity demand will be met by large centralized coal fired generation plants.

Sri Lanka's increasing dependence on imported fossil fuels put pressure on the national economy, and it also has caused a heavy burden on the operational costs of the Ceylon Electricity Board. Their impact on the environment is also a concern. Therefore, increasing the hydro electric generation of the country to the optimum possible level is extremely important.

Objectives of this research are to explore the remaining hydro electric potential in the country and to propose strategies to harness this potential on a fast-track basis. Subsequent to this, development of the remaining untapped hydro potential to the optimum possible level and improvement of the output from existing plants were investigated.

In this study, remaining hydro electric potential in the country has been estimated to be around 971 MW, and they have the potential of generating about 3,704 GWh, annually. Financial, information, institutional, technical and policy barriers have been identified as main barriers against their development. Introduction of a new institutional model for project financing and attracting private sector financing through different ownership structures have been identified as main strategies to overcome the financial barriers against large hydro development. Improvement of the public awareness and having a firm national policy on developing the remaining hydro potential have also been identified as feasible strategies to overcome the other barriers. Resolving of evacuation limitations, improvement of research & development capacity, introduction of creative project financing options and streamlining the approval process are among the strategies identified to overcome the main barriers against the small hydro development.

It has also been revealed that additions of about 355 MW of peaking capacity to the existing large hydro plants are feasible and after completing the ongoing renovation works at several power stations, the total hydro capacity would be increased by another 26 MW.

The results of the case study revealed that the generation from Canyon machines could be increased by about 5%, if the maximum efficient operation performance parameters of these machines were considered for their dispatch. Hence, it could be recognized as an effective measure of increasing the generation of existing hydro plants, especially from machines with Francis turbines.

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K.M.I.N. Kuruppu

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| Abbreviation | Description |
|---|---|
| ADF | Average Daily Flow |
| BLT | Build Lease Transfer |
| BOO | Build Own Operate |
| BOOT | Build Own Operate Transfer |
| BOT | Build Operate Transfer |
| CCGT | Combined Cycle Gas Turbine |
| CEB | Ceylon Electricity Board |
| CECB | Central Engineering Consultancy Bureau, Sri Lanka |
| CPS 01 | Unit 01 Machine at Canyon Power Station |
| CPS 02 | Unit 02 Machine at Canyon Power Station |
| EIRR | Economic Internal Rate of Return |
| FIRR | Financial Internal Rate of Return |
| FSL | Full Supply Level |
| ft asl | Feets above mean sea level |
| GSS | Grid Sub Station |
| GWh | Giga Watt Hours |
| IPP | Independent Power Producers |
| ITDG | Intermediate Technology Development Group |
| kWh | Kilo Watt Hours |
| LOI | Letter of Intent |
| m asl | Meters above mean sea level |
| MCM | Million Cubic Meters |
| MOL | Minimum Operating Level |
| MVA | Mega Volt Amperes |
| MW | Mega Watts |
| MWh | Mega Watt Hours |
| NCRE | Non Conventional Renewable Energy |
| N/LAX 01 | Unit 01 Machine at New Laxapana Power Station |
| N/LAX 02 | Unit 02 Machine at New Laxapana Power Station |
| OEM | Original Equipment Manufacturer |

| Abbreviation | Description |
|---|---|
| O/LAX 01 | Unit 01 Machine at Old Laxapana Power Station |
| O/LAX 02 | Unit 02 Machine at Old Laxapana Power Station |
| O/LAX 03 | Unit 03 Machine at Old Laxapana Power Station |
| O/LAX 04 | Unit 04 Machine at Old Laxapana Power Station |
| O/LAX 05 | Unit 05 Machine at Old Laxapana Power Station |
| R&D | Research & Development |
| R&M | Renovation & Modernization |
| RLT | Rehabilitation Lease Transfer |
| ROR | Run-of-River |
| SCC | System Control Center |
| SEA | Sustainable Energy Authority |
| SHP | Small Hydro Power |
| SPPA | Standardised Power Purchase Agreement |
| SPS 01 | Unit 01 Machine at Samanala Power Station |
| SPS 02 | Unit 02 Machine at Samanala Power Station |
| WPS 01 | Unit 01 Machine at Wimalasurendra Power Station |
| WPS 02 | Unit 02 Machine at Wimalasurendra Power Station |

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