

**EFFICIENCY IMPROVEMENTS TO THE
HYDRO POWER PLANTS IN THE
LAXAPANA COMPLEX**

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Degree of Master of Science

Department of Electrical Engineering

University of Moratuwa
Sri Lanka

April 2014

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Dissertation submitted in partial fulfillment of the requirements for the degree Master
of Science

Department of Electrical Engineering

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April 2014

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

Signature of the supervisor:

Date:

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Department of Electrical Engineering
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ACKNOWLEDGEMENT

I have taken great efforts in this project to do a realistic and meaningful work. However, it would not have been possible without the kind support and help of many individuals and the organization, Ceylon Electricity Board. I would like to extend my sincere thanks to all of them.

I take this opportunity to express my profound gratitude and deep regards to my supervisor Eng. W.D. Anura S. Wijayapala for his exemplary guidance, monitoring and constant encouragement throughout this research.

I am highly indebted to Mr Anura Herath, Chief engineer of the Laxapana generating station for providing the necessary data and information regarding the project.

I also take this opportunity to express a deep sense of gratitude to Mr. Erosh Fernando, Civil Engineer of the Laxapana complex, Mr. Tilan Fernando, Mechanical Engineer of the Laxapana Power Station and Mr Keerthi Samarasinghe, Station Engineer of the Samanala Power Station for giving me a great support by providing me necessary data to complete this project.



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Lastly, I thank, Almighty God, my parents, wife and my closest friends for their constant encouragement without which this project would not have been possible.

Rangika Jayawardene

ABSTRACT

Efficiency Improvements to the Hydro Power Plants in the Laxapana Complex

The main objective of this research is to present effective efficiency improvements to the hydropower plants in the Laxapana Complex. At present, electricity consumption in Sri Lanka is being increased at a rate of about seven percent. Hence, improving the efficiency in an existing hydropower complex will lead to an increase in the electricity generation capacity of the National Grid using the same waters of the existing schemes.

In this research, observed key areas are techno-economically analyzed with the view of efficiency improvement. All the areas introduced are important when they are viewed as total energy improvement projects. However, In order to implement a project, it should be viable. Hence, in this report, certain areas are discussed, and only viable modifications are presented as efficiency improvement projects.

In this study, efficiency improvement to the Old Laxapana power station through a new generator design, capacity improvement to the Laxapana pond in order to minimize annual water spilling, new generator installation to the Samanala Power Station and leakage analysis of the New Laxapana tunnel have been proposed. For the analysis, past data and the findings of certain researches have been used.

The study of the Old Laxapana Power Station was carried out focusing on the Old Laxapana Stage-II generators. From the cost-benefit analysis, a simple payback period of four years was observed. Next, from the cost-benefit analysis of the capacity improvement of the Laxapana pond, a payback period of 14.3 years found, and it was accepted considering the lifetime of the dam proposed. After that, a seven-year simple payback period was observed by proposing a 13.6 MW-generator for the Samanala Power Station as capacity improvement. Finally, the tunnel leakage analysis for the New Laxapana power station was carried out, obtaining 6.5-year simple payback period, and, hence, it was recommended to implement the repair during the rehabilitation.

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LIST OF ABBREVIATIONS

cusec	Cubic feet per second
CEB	Ceylon Electricity Board
ft	feet
kWh	Kilo Watt hour(s)
GWh	Giga Watt hour(s)
LKR	Sri Lankan rupees
MASL	Meters above sea level
MCL	Mean sea level
MCM	Million cubic feet
MIV	Main Inlet Valve
MOL	Minimum Operating Level
MW	Mega Watt(s)
MWh	Mega Watt hour(s)
NL	New Laxapana
NLPS	New Laxapana Power Station
OL	Old Laxapana
OLPS	Old Laxapana Power Station
ONAF	Oil natural air forced
PS	Power Station
SPP	Simple payback period
USD	United States Dollars



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