

# RISK MANAGEMENT PROCESS FOR POWER GENERATION PROJECTS IN SRI LANKA

BY

T.A. Wanniarachchi

Supervised By Dr.L.L.Ekanayake , Ph.D

The Dissertation was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfillment of the requirement for the Degree of Master of Business Administration in Project Management.

> Department of Civil Engineering University of Moratuwa

> > 2009

92384



#### Abstract

Risk management helps potential obstacles to be identified and contained early through proper response strategies, thereby minimizing negative impacts on positive aspects on project cost, schedule, scope and quality. Managing potential risks also helps identify opportunities that may enhance the project and have a positive impact on project objectives.

The initial surveys carried out by the author revealed that neither the main power utility in Sri Lanka, the Ceylon Electricity Board nor any of the Independent Power Produces operating in the country either possess or practice any documented, structured Risk Management Process for power generation projects. Therefore, there is a great requirement to develop an appropriate Risk Management Process for Sri Lankan power generation projects.

The main scope of this research is to formulate a Risk Management Process for Power Generation Projects (RMPPGP), taking in to account the current risk management context of the country. In the thesis, the author has proposed an RMPPGP consisting of six sub-process i.e Establishment of the risk management context of the Power Project, Risk identification, Risk analysis, Risk response planning, Risk monitoring & control and Communicate & consult. Comprehensive flow charts for each of these sub-processes and also the required supporting material of the RMPPGP have also been presented for convenient practice.

#### DECLARATION

I certify that except due acknowledgement has been made, the work is that of the author alone, the work has not been submitted previously, in whole in part, to qualify for any other academic award in any institution.

T. A. womin victor T.A.Wanniarachchi January, 2009

Certified by

#### **UOM Verified Signature**

Dr. L.L. Ekanayake , PhD Senior Lecturer Department of Civil Engineering University of Moratuwa



University of Moratuwa, Sri Lanka. Electronic Theses & Dissertations www.lib.mrt.ac.lk

#### ACKNOWLEDGEMENTS

I wish to pay gratitude to my supervisor, Dr. Lesly Ekanayaka, Senior Lecturer in the Department of Civil Engineering, University of Moratuwa for all that he has done for the work presented in this dissertation. I would also like to thank the Senior Lecturers Dr.Asoka Perera and Dr.Chintha Jayasinghe in the Department of Civil Engineering, University of Moratuwa for the guidance given to complete the research in time.

My thanks also go to two senior officers in the Ceylon Electricity Board, Eng. W.J.L.S. Fernando, Project Director Upper Kothmale Hydro Power Project and Eng. D.K.B.S Tilakasena Project Director Trincomalee Coal Power Project for providing me valuable support and encouragement. Invaluable support given by project staff including the Project Director of Puttlam Coal Power Project is highly appreciated. I would like to acknowledge the help given by my colleagues Eng. Saliya Liyanage and Eng. Lakshitha Weerasinghe in proof reading the dissertation.

I would finally like to thank everyone not mentioned above who have contributed to the work with this dissertation that made my work easier.

# TABLE OF CONTENTS

		Declaration. Abstract. Acknowledgements. Table of contents. List of Figures. List of Tables. Acronyms.	i iii iv vi v vi vi
1	1.1 1.2 1.3 1.4 1.5 1.6 1.7	Introduction Background Research question Objective Research justification Research methodology Scope & limitations of the research Structure of the Dissertation.	3 3 3
2	2.1 2.2 2.3	Literature review Introduction to project risk management Importance of risk management in infrastructure projects Review of risk management tools & techniques in infrastructure projects	6 8 10
3	3.1 3.2 3.3	Research Methodology Theses & Dissertations Analysis of risk management tools & techniques used in projects Risk Management Processes and standards available Formulation of Risk Management Process for Power Generation Projects	15 17 24
4	4.1 4.2 4.3 4.4 4.5 4.6	Risk Management Process for Power Generation Projects Establish the risk management context of the power project Risk identification Risk analysis & Evaluation Risk response planning Risk monitoring and control Communication and consult.	37
5	5.1 5.2	Conclusions and recommendation Conclusion Recommendation for future research	57 60
		References	61
		Annexes	
		Annex 01- Risk Breakdown Structure for a power project Annex 02- Risk Identification & Response Plan form Annex 03- Sample Risk Register	63 64 65

# LIST OF FIGURES

Figure 2.1	Methods of Risk Assessment	13
Figure 3.1	Risk Management Model for assessing safety and reliability risks	19
Figure 3.2	Risk Management Process – Department of Defense, USA	20
Figure 3.3	Risk Management Process – IRM (UK)	21
Figure 3.4	Risk Management Process for Project Selection by Burchett	22
Figure 3.5	RMP, Australian / New Zealand Standard AS/NZS 4360:2004	23
Figure 4.1	Risk Management Process for Power Generation Projects (RMPPGP)	26
Figure 4.2	Establish the context	28
Figure 4.3	Risk identification	33
Figure 4.4	Risk analysis and evaluation	38
Figure 4.5	Risk response plan in implementation	43
Figure 4.6	Risk monitoring & control	50
Figure 4.7	Communicate and consult	54

## University of Moratuwa, Sri Lanka.

# Electro LIST OF TABLES ertations

Table 4.1	Risk Probability Ranking	37
Table 4.2	Impact Ratings	39
Table 4.3	Matrix of Risk Exposure	40
Table 4.4	Table of Risk Ranks	40
Table 4.5	Plan for Risk Management Meetings	55

### ACRONYMS

APM	Association for Project Management, UK
BOT	Built Operate and Transfer
С	Constructability
СРМ	Critical Path Method
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
EIA	Environmental Impact Assessment
IRM	Institute of Risk Management, UK
М	Maintainability
NPV	Net Present Value
0	Operability
PMI	Project Management Institute
PERT	Programme Evaluation & Review Technique
PM	Project Manager
PMBOK	Project Management Body of Knowledge ( published by PMI)
RO	Risk Owner ronic Theses & Dissertations
RBM	Risk Breakdown Matrix
RBS	Risk Breakdown Structure
REB	Risk Evaluation Board
RM	Risk Manager
RMP	Risk Management Process
RMPPGP	Risk Management Process for Power Generation Projects
SME	Subject Matter Expert
WBS	