POTENTIAL OF COOL THERMAL STORAGE FOR AN AIR CONDITIONING SYSTEM IN A RECORDS REPOSITORY BUILDING

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Degree of Master of Science in Building Services Engineering

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DECLARATION

The research work submitted in this dissertation is of my own investigation except where otherwise stated.

This dissertation has not been accepted for any degree and not concurrently submitted for any degree in a university or any other institution.

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I endorse the declaration by the candidate.

Prof. R. Attalage.

ABSTRACT

In Heating, Ventilation and Air Conditioning (HVAC), Cool Thermal Storage (CTS), is a popular demand side management technology for shifting electrical demand for cooling from peak time to off peak time periods in most of the countries in the world. However this technique is so far not successfully implemented for building air conditioning systems in Sri Lanka. This research study shows how CTS is used to reduce life cycle cost of air conditioning system for Record Repository Building (RRB) in Sri Lanka using CTS under "General Purpose Tariff" applicable for commercial buildings and "Industrial time of day tariff" applicable for industries and hotels in Sri Lanka.

TRACE 700 software[3] is used to carry out a computer simulation for modeling of the air conditioning system of RRB for CTS for different scenarios such as partial storage, full storage etc against the base case of air conditioning system without CTS under "General Purpose Tariff" and "Industrial time of day Tariff".

It has been found that incorporation of partial ice thermal storage for air conditioning system of RRB the cooling capacity of chiller plants for the building can be reduced by 25% and thereby initial cost of air conditioning equipment including ice storage tanks could be reduce by 11% and maintenance cost including ice storage tanks by 8%.

Further it has been found that the annual operating cost of air conditioning system incorporated with both partial and full CTS for RRB will be lesser than the annual operating cost of air conditioning system without CTS under General Purpose Tariff (Rate G.P-2) [16&17] as well as Industrial Time of Day Tariff (Two Part)- (Rate I-2 (T.D.2)) [16&17].

The life cycle cost for 20 years of both partial and full CTS for RRB will also be lesser than the operating cost of air conditioning system without CTS under General Purpose Tariff (Rate G.P-2) [16&17] as well as Industrial Time of Day Tariff (Two Part)- (Rate I-2 (T.D.2)) [16&17].

The payback period for air conditioning system incorporated with full CTS for RRB is 8 to 9 years under General Purpose Tariff (Rate G.P-2) [16&17] and 3 to 4 years under Industrial Time of Day Tariff (Two Part) - (Rate I-2 (T.D.2)).[16&17]

Key Words: Cool Thermal Storage (CTS), Record Repository Building (RRB), General Purpose Tariff (Rate G.P-2) [16&17] Industrial Time of Day Tariff (Two Part) - (Rate I-2 (T.D.2)) [16&17].

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LIST OF ABBREVIATIONS

CTS	Cool Thermal Storage
RRB	Records Repository Building
CEB	Ceylon Electricity Board
CECB	Central Engineering Consultancy Bureau
G.P. - 2	CEB General Purpose Tariff for each individual point of supply delivered and metered at 400/230 Volts nominal and where the contract demand exceeds 42 kVA
I-2 (T.D.2)	CEB Industrial Time of Day Tariff (Two Part) for each individual point of supply delivered and metered at 400/230 Volts nominal and where the contract demand exceeds 42 kVA
ASHRAE	American society of Heating, Refrigeration and Air conditioning Engineers
TRACE 700	Trane Air conditioning Economics Software developed by Trane Air Conditioning Company, United States of America
TR	Tons of Refrigeration

LIST OF APPENDICIES