



A CONCEPTUAL DESIGN FOR A TOWER TYPE CONCENTRATING SOLAR POWER PLANT NEAR HAMBANTOTA

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in partial fulfillment of the requirements for the
Degree of Master of Science

By

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Abstract

In this study the basics of a central receiver type solar thermal power plant including a thermal storage are studied. Further, the technical feasibility of a central receiver type solar thermal power plant near Hambantota is investigated. The requirement of a power plant and the size of the plant are determined. The availability of solar resources in the area and the best area to locate a solar thermal power plant is also studied. The other required resources such as water, lands, proximity to transmission lines are taken into consideration.

Further the impact on the environment and the possible measures to mitigate such impacts are examined.

In addition, the technical features of a central receiver type power plant are studied and a conceptual design for such a power plant has been developed. In the conceptual design, the total required number of heliostats or reflectors, the heliostat field layout, the receiver size, the thermal storage size and the tower height have been determined.

Finally, the economic feasibility of the plant is checked considering the available soft loan facilities which can be obtained from international development banks such as Global Environmental Facility (GEF), World Bank and Japan International Cooperation Agency (JICA). The economic benefits from the Carbon credit program have also been taken into account. Finally, it is concluded that certain cost reductions and economic conditions are required for the project to be viable.

DECLARATION

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

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

UOM Verified Signature

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List of Abbreviations

Term	Definition or Clarification
ADB	Asian Development Bank
BOI	Board of Investment
CPV	Concentrating Photovoltaic
CSP	Concentrating Solar Power
CST	Concentrating Solar Thermal
DNI	Direct Normal Irradiance
GEF	Global Environmental Fund
HTF	Heat Transfer Fluid
IPP	Independent Power Producer
IRR	Internal Rate of Return
JICA	Japan International Cooperation Agency
kJ	Kilo Joules
kWe	Kilo Watts (electrical energy)
kWh	Kilo Watt Hours
kWt	Kilo Watts (thermal energy)
LCOE	Levelized Cost of Energy
LFR	Linear Fresnel Reflector
m	meters
MJ	Mega Joules
MVA	Mega Volt Amperes
MWh	Mega Watt Hours
NREL	National Renewable Energy Laboratory
PPA	Power Purchase Agreement
PV	Photovoltaic
USD	United States Dollars
°C	Celsius