STAND-ALONE HYBRID ENERGY SYSTEM FOR A REMOTE FISHING ISLAND

Battalangunduwa Island, Sri Lanka

By

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Declaration of the Candidate and the supervisor

I declare that this is my own work and this thesis 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 this 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 carried out this research for his Master degree under my supervision.

Dr. A.G.T. Sugathapala Date:

This is dedicated to

my parents,

my lovely wife Arosha and

my little princess Rehansa

for their love, endless support and

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Content

Notations

AC	Alternating Current
COE	Cost of Energy
DC	Direct Current
DG	Diesel generator
DHI	Diffuse Horizontal Irradiance
DNI	Direct Normal Irradiance
GHI	Global Horizontal Irradiance
kVA	kilovolt Ampere
kWh	kilowatt hour
LPG	Liquid Petroleum Gases
NASA	National Aeronautics and Space Administration
NCRF	Non-Conventional Renewable Energy
NPC	Net Present Cost
NREL	National Renewable Energy Laboratory
PV	Photo voltaic
R & D	Research and development
RES	Renewable Energy Sources
RO	Reverse Osmosis
SEA	Sustainable Energy Authority
TNPC	Total Net Present Cost
UN	United Nations
UNDP	United Nations Development Program
US	United States
USA	United States of America
USAID	United States Agency for International Development
WTG	Wind turbine generator

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ABSTRACT

A detailed study on present and future energy demand, resource availability and technology options were studied to propose an optimum system to cater for the basic energy requirements of a remote fishing island, 'Battalangunduwa' in the North-Western coast of Sri Lanka. The aim of this project is to supply basic energy requirements to the people living in the island. At first, energy related issues such as, limited electricity supply to the island for household use, low price for fish production due to non-availability of ice at a reasonable rate and drinking water issues as well as health issues were identified. Further, the electricity demand to provide basic energy requirements for the existing residents was calculated as 327 kWh/day. Then to supply the energy demand, utilizing renewable energy sources such as wind and solar along with diesel generators in a hybrid system was developed by a modelling using a computer software (HOMER).The optimum option indicates that the share of annual energy generation from wind, solar and diesel generators are 85 %, 6 % and 9 % respectively without ice plants and 83 %, 0 % and 17 % respectively with ice plants. Economic evaluation was also carried out to find the viability of the system proposed and it is concluded that the project is technically feasible, environmental friendly, economically viable and also contributes to the socio economic development of the island community.