

**Analysis and Optimization of Hybrid Renewable Energy
System**

By

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This thesis proposes an optimum selection for hybrid renewable energy system. Develop Graphic User Interface (GUI) MATLAB package to obtain an optimum solution for hybrid renewable energy system. The GUI MATLAB package is available for change any data of the system such as photovoltaic module, wind turbine, cost parameters, weather conditions and load profile.

In this thesis, two methods of optimization are used for sizing the hybrid energy system; the linear optimization algorithm and the evolutionary optimization algorithm. Linear optimization algorithm is designed to obtain optimum size of a proposed PV-wind- Diesel generator hybrid energy system with and without battery storage. Furthermore, three type's operation cases are considered. Case 1; the objective function is to minimize Annualized Cost of System (ACS) and the constraint is the Loss of Power Supply Probability (LPSP). Case 2; the objective function is to minimize ACS and the constraint is Correlation coefficient (CC) and Inequality Coefficient (IC). Case 3; the objective function is to minimize ACS and the constraint is CC, IC and LPSP.

The region of optimum solution of sizing PV-wind turbine- diesel generator hybrid energy system with and without battery storage is developed. Determination one of optimum solution to the load profile is developed according to the objective function (minimum annualized system cost) and the constraints (LPSP, CC and IC) using GUI MATLAB package. Genetic algorithm tool box is used to determine one optimum solution to the load profile is developed according to; the objective function is minimizing ACS and the constraint is CC, IC and LPSP. The results of the linear optimization algorithm are compared with the results of the evolutionary optimization algorithm.

A Control strategy between the components of the Hybrid System with battery storage system is developed. The power for load demand and all resources continuously are monitored and controlled by controlling energy management. Power energy management arrange the operation time for each component of the system to prevent the interrupted power to the load demand.