Development of a simulation model for a small scale renewable energy system

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Declaration

I, Martinus Gerhardus de Klerk hereby declare that the dissertation entitled “Simulation model of a small scale renewable energy system” is my own original work and has not already been submitted to any other university or institution for examination.

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Abstract

In this dissertation I present my approach and findings regarding the development of a simulation model for a small scale renewable energy system.

A brief introduction provides the reader with the background as to why there is a need for such a simulation package. The project objectives, research methodology and the research contributions originating from the project is also described.

A literature study was done on all the relevant technologies constituting the renewable energy system as well as the techniques required to model the system. A system breakdown identified the various sub modules as well as how they interface with each other.

The simulation model was tested by using Alexander bay, South Africa, as a case study. The results obtained from the various modules were discussed and found to correlate with what was expected.

Although not contained within the project’s scope, an additional analysis of the effect of the wind data’s resolution on the probable power output of a wind turbine was performed leading to a hypothesis regarding the estimation of a more accurate probable power output extrapolation from data with a coarse resolution.

Keywords: Renewable energy, Wind, Solar, Optimal tilt, Weibull, Resolution analysis
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List of Acronyms

**CSP** Concentrating solar thermal power

**HySA** Hydrogen South Africa

**IDE** Integrated Development Environment

**MLE** Maximum Likelihood Estimation

**NASA** National Aeronautics and Space Administration

**PDF** Probability Density Function

**PEM** Proton Exchange Membrane

**PGM** Platinum Group Metals

**PV** Photovoltaic

**SSE** Surface meteorology and Solar Energy

**VI** Virtual Instrument

**WASA** Wind Atlas of South Africa