

**TECHNICAL ANALYSIS OF EMPLOYING ON-SITE
HYDROGEN PRODUCTION AND STORAGE
SYSTEMS WITH RENEWABLE ENERGY FOR
TELECOM SITES IN SRI LANKA**

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Degree of Master of Science

Department of Electrical Engineering

University of Moratuwa
Sri Lanka

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Thesis submitted in partial fulfilment of the requirements for the degree Master of
Science in Electrical Engineering

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DECLARATION

I declare that it is indeed my own effort, and this thesis does not incorporate without affirmation any material previously submitted for a degree or Master's at any other college, university or institute of higher learning and to the best of my knowledge, that it does not comprise any material originally published or authored by another individual, except where acknowledgement is context specific.

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Signature of the candidate

(L.W. Dilrukshi)

.....

Date

The above candidate has carried out research for the Masters Thesis under my supervision.

.....

Signature of the supervisor

(Prof. K.T.M. Udayanga Hemapala)

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Date

ABSTRACT

Despite the fact that its technologies have grown at breakneck speed, energy is the lifeblood of the telecommunications industry. The concern is not only about how energy is delivered, but also about supply continuity and cost, all of which are key problems in the industry.

The telecommunications industry has begun to seek for renewable energy alternatives due to the rising cost of fossil fuels and the reliance on fossil fuels for commercial electricity. To overcome the inherent restrictions of renewable energy and maintain an uninterrupted power supply, the hydrogen storage idea was added into the renewable energy conversion system.

A fuel cell-based power system is explicitly modeled and studied in this study under different types of operating situations. The voltage output, current output, H₂ production, feed of air and fuel, pressure regulations, and flow rates must all be controlled in order to be technically feasible. The proposed methodology is valid for a PEMFC (Proton Exchange Membrane Fuel Cell) based power system, and the results are verified using the MATLAB Simulink tool.

Keywords: Technical analysis, fuel cell, Electrolyzer, H₂ storage, PEMFC, renewable energy, solar PV, Battery

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LIST OF ABBREVIATIONS

PEMFC	Proton Exchange Membrane Fuel Cell
AFC	Alkaline Fuel cell
DMFC	Direct Methanol Fuel Cell
PAFC	Phosphoric Acid Fuel Cell
MCFC	Molten Carbonate Fuel Cell
SOFC	Solid Oxide Fuel Cell
PV	Photo Voltaic
SOC	State of Charge
CAN	Controller Area Network
UV	Ultraviolet
PRD	Pressure Relief Devices