



**Energy Efficiency Improvement and Audit of
Solar, Cooling and Lighting Systems in
Residential Sectors**

(Case Study in Samarra Iraq)

Prepared by:

Ali Ghanim Hamood

Supervised by:

Associate Prof.Dr. Mohammad Zakaria Siam

A Thesis

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Committee Decision

This Thesis (Energy Efficiency Improvement and Audit Solar, Cooling and Lighting Systems in Residential Sectors) was Successfully Defended and Approved on 16/1/2020

Examination Committee

Associate Prof. Dr. Mohammad Zakaria (Supervisor)
Isra University

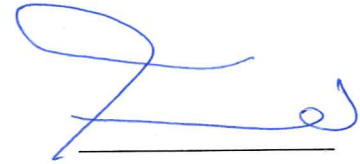
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Dedication

This thesis is dedicated to my father, mother and family members who have been a constant source of motivation, inspiration and support throughout the time since the beginning of my studies. This study is also devoted to my country, Iraq, my second country, Jordan, and all loved ones and friends.

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ABBREVIATIONS

Av	Annwal Value
BL	Baghdad line
CFL	Compact Fluorescent Lamp
COP	Coefficient Of Performance
DSL	Deslat Station line
DL	Dual Technology
EC	Energy Conservation
ECO	Energy Conservation Opportunity
ECM	Energy Conservation Measures
EMS	Energy Management System
FL	Fluorescent
HPS	High Pressure Sodium
HVAC	Heating Ventilating and Air Conditioning
HPS	Samarra Hydroelectric Station
Inc	Incandescent
IQD	Iraq Dinar
IRR	Intrest Rate Retern
SPBP	Simple Pay Back Period
USPWF	Uniform Series Present Worth Factor
LED	Light Emitting Diode
O.H	Operating Hour
WB	West Bank
Pv	Present Value
PW	Present Worth
NPV	Net Present Value

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Abstract

The electricity sector in Iraq suffers from many problems such as high rate of electrical deficit, high transport losses, high electricity prices per kilowatt hour, annual growth and lack of energy management strategies and skills. The case studies are residential houses in Samarra Iraq selected to illustrate the use of energy investment models for each facility. Opportunities for lighting system, compressed air, heating, ventilation, air conditioning, solar energy were identified during energy assessments. Each assessment identifies opportunities for saving electricity and waste, saves costs and identifies expected savings, implementation cost and simple recovery for each opportunity. Homes consume 250,820 kWh of electricity. This paper proposes four investment models to save electricity in the city of Samarra no cost model, low cost model, medium cost model, and high cost model to provide electricity in city. The evaluation of the measurement results showed that the estimated energy saving rate of the zero-cost investment model is 9%, and the low-cost investment model is 7.5. %, the average cost model for investment is 19%, high-cost model investment in Samarra, respectively. The search results can achieve 17% of total energy consumption (equivalent to 42,890 kWh and 428,900 IQD) in homes by applying some energy conservation models to the electrical system and most of the electrical equipment in the facility. And improving the

cooling and conditioning systems prevents the growth of bacteria (*Pseudomonas Aeruginosa*) that live in damp conditions and thus contribute to human respiratory diseases. Finally, the results of this research can be used to assess the impact of electricity conservation models on reducing electricity deficit as a first priority of this research and to make good investment in the commercial and industrial sectors a second priority to promote and support national economic.