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

(Case Study in Samarra Iraq)

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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

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I'm Ali Ghanim, authorize Isra University to supply copies of my thesis to libraries or establishments or individuals on request, according to Isra University regulations.
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.
Praise be to God, and thanks and blessings and peace be upon our master Muhammad, and upon his family and companions, and grant him a lot. I would like to express my deepest gratitude and appreciation to the research supervisors, Dr. Muhammad Zakaria Siam, the Department of Electrical Engineering and Dr. Yaseen Yousef Al-Husban, the Department of Renewable Energy Engineering at the University of Isra, at the level of their distinguished knowledge, their ongoing understanding, encouragement, personal direction and leadership to a wonderful area of research. I thank them for their great patience and excellent technical advice in writing and presenting research.

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<tr>
<td>Av</td>
<td>Annual Value</td>
</tr>
<tr>
<td>BL</td>
<td>Baghdad line</td>
</tr>
<tr>
<td>CFL</td>
<td>Compact Fluorescent Lamp</td>
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<tr>
<td>COP</td>
<td>Coefficient Of Performance</td>
</tr>
<tr>
<td>DSL</td>
<td>Deslat Station line</td>
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<td>DL</td>
<td>Dual Technology</td>
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</tr>
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<td>Energy Management System</td>
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<tr>
<td>FL</td>
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<tr>
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<td>High Pressure Sodium</td>
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<tr>
<td>HVAC</td>
<td>Heating Ventilating and Air Conditioning</td>
</tr>
<tr>
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<td>Samarra Hydroelectric Station</td>
</tr>
<tr>
<td>Inc</td>
<td>Incandescent</td>
</tr>
<tr>
<td>IQD</td>
<td>Iraq Dinar</td>
</tr>
<tr>
<td>IRR</td>
<td>Interest Rate Return</td>
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<tr>
<td>SPBP</td>
<td>Simple Pay Back Period</td>
</tr>
<tr>
<td>USPWF</td>
<td>Uniform Series Present Worth Factor</td>
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<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>O.H</td>
<td>Operating Hour</td>
</tr>
<tr>
<td>WB</td>
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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.