



**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY**

**THE EVALUATION OF A PV-BATTERIES AND INVERTER POWER SYSTEM
CONNECTED TO A GRID - SOLUTIONS FOR EMERGING SUSTAINABLE ENERGY
IN IRAQ**

Alaa Liaq Hashem Al-Mosawi*, Muhanad Hamed Mosa, Mushtaq Ismael

*Department of Mechanical Engineering, College of Engineering, Al-Qadisyah University, Al-Qadisyah,
Iraq

*Department of Mechanical Engineering, College of Engineering, Al-Qadisyah University, Al-Qadisyah,
Iraq

3, Department of Mechanical Engineering, College of Engineering, Thi-Qar University, Thi-Qar, Iraq

ABSTRACT

The impact of modern life requirements and climate change issues was a global interest that demand the instalments of different renewable energy components. The up-to-date IEA energy statistics shows that over-all energy-related CO₂ emissions reached their utmost global level at 30.5 gigatonnes (GtCO₂) in 2010, a 5% increasing from 2009. Because fossil fuels is a dominated power generation on the global measure, 2010 indicated another record in CO₂ emissions from electricity generation at 11.8 GtCO₂. In Iraq, because the shortage in electrical power plants, the national electricity grid was supported by a diesel generator units which are connected with grid and working as a secondary power plant, or an off-grid private units and distributed locally in the Iraqi cities. The results, more greenhouse-gas (GHG) emissions are growing. The integration of photovoltaic systems with buildings distributed worldwide to reduce fuel consumption and to minimize atmospheric pollution. In view of this, solar PV–Battery system promises lot of opportunities to cover part of the energy that supplied by grid directly or through diesel generators. The aim of this paper is to analyse solar radiation data of Baghdad city, to assess the possibility of hybrid PV–battery-inverter power systems to meet the load requirements of a typical domestic building annual electrical energy demand of 20.271 kWh/day. Baghdad city is located with longitude 44° 4' and latitude 33° 3'. The monthly average daily global solar radiation about 5.52 kWh/m²/day. The HOMER software used to realise the system evaluation. The simulation examines a hybrid system composed of 1,1.5,2 and 2.5 kWp capacity PV system together with 0,1, and 2 batteries storage and 1,1.5, 2 and 2.5kW inverter, the renewable energy fraction is 20, 29, 37, and 44%. The simulation indicates that, when we used a system with 2-2.5 kW PV module, the renewable fraction is increasing to (37%-44%), this increasing the COE value, which will be (0.12-0.144)US\$/kWh.

KEYWORDS: PV, Battery storage, Solar radiation, Green building, Microgeneration.

INTRODUCTION

The effect of modern civilization requirements and climate change issues was crucial on a global interesting on installing different renewable energy components. The up-to-date IEA energy statistics shows that over-all energy-related CO₂ emissions reached their utmost global level at 30.5 gigatonnes (GtCO₂) in 2010, a 5% increase from 2009. As fossil fuels still dominate power generation on the global measure, 2010 indicate another record in CO₂ emissions from electricity generation at 11.8 GtCO₂, [1]. In Iraq, because the shortage in electrical power plants, the national electricity grid was supported by a diesel generator units which are connected with grid and work as a secondary power plant, or an off-grid private units and distributed locally in the all Iraqi cities. The fossil fuels are the main fuel supplied for 92% from the total working power plant, the results more greenhouse-gas (GHG) emissions, [2].

The nature of the climate of Iraq can be represented in a two typical seasons, short and cold winter and long, hot and dry summer with short periods of the moderate months. The daily temperature variation is very limited and causes to accumulate heat in the buildings of heavy mass, [3]. The use of cooling systems, in hot climate, is increased. In Iraq, with more than 6 million new residential building unit in 2020, the rapid growth in building sectors become the largest