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Special Issue of Journal of Sustainable Development of Energy, Water and Environment Systems Dedicated to ICEWES 2018 Conference

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ABSTRACT

This special issue of Journal of Sustainable Development of Energy, Water and Environment Systems contains selected papers contributed to the ICEWES 2018 held in November 13-15, 2018 in Ras Al Khaimah, United Arab Emirates. The American University of Ras Al Khaimah (AURAK) organized the Conference in cooperation with the Arab German Young Academy of Sciences and Humanities (AGYA). The conference was an attempt to address issues in research and developments in the various fields of sustainable energy, water and environment systems. ICEWES 2018 was a fruitful scientific gathering that provided an international forum for researchers.

THE INTERNATIONAL CONFERENCE ON ENERGY, WATER, AND ENVIRONMENTAL SCIENCES (ICEWES)

Renewable energy, in particular photovoltaic panels is promising source for sustainable energy. They serve as a clean source of electricity by converting the radiation coming from the sun to electric energy. However, the amount of energy produced by the photovoltaic panels depends on many variables such as the irradiation and the ambient temperature, which leads to nonlinear characteristics. The system efficiency will be improved by operating the photovoltaic panels at the optimal operating point in the photovoltaic characteristic curve point [1]. The authors of this paper introduce a unique method to improve the efficiency of the photovoltaic panel using Support Vector Machines. The dataset, which is obtained from a real photovoltaic setup in Spain, include temperature, radiation, output current, voltage and power for a period of one year. The results obtained show that the system is capable of accurately driving the photovoltaic panel to produce optimal output power for a given temperature and irradiation levels. Applications of photovoltaics are various [2], the authors of this paper explain a full design and assembly process of a solar car as an effective alternative to the fossil fuel powered car. A solar car is independent of fossil fuels, which eliminate emissions. Comparing to the previous manufactured solar cars which were characterized by expensive, one seat driver and unfeasible, the presented solution in this study develops a commercially feasible version of a solar car. The required electrical power for the car to be able to reach the target speed at 100 km/h was calculated. Three photovoltaic panels of 320 W are parallel connected as a photovoltaic array to charge a lithium ion battery

bank of 48 V and 200 Ah during the day hours. The testing of the implemented car guarantees the successful and flexible design and promises an effective commercial prototype of solar car.

Space heating represents the largest share in the energy demand of the built environment, in temperate and cold climates. Therefore, the use of solar thermal systems to convert solar into thermal energy for space heating, along with domestic hot water production, represents a challenge in these climates where the number of sunshine hours is rather low during the cold seasons. In their experimental performance assessment of vertically installed solar thermal collectors' paper, the authors [3] developed a novel solar thermal collectors with nonrectangular shape (trapeze) and different colors (red, blue, green) in the Renewable Energy Systems and Recycling Research Centre in the Research and Development Institute of the Transilvania University of Brasov, Romania. The purpose of the developed system is to increase the coverage factor, social and architectural acceptance when integrated in buildings facades. The performance results for an entire year (2017) are presented as monthly thermal energy produced by novel trapeze versus commercial rectangular flat plate solar thermal collectors installed on the vertical southern facade of an outdoor testing rig. The specific thermal energy produced by trapeze collectors is 28.7% lower than commercial collector is over the entire year, but this drawback is compensated by higher coverage factor, which can be obtained by using trapeze instead of rectangular solar thermal collectors.

The authors of Parametric Study of a Single Effect Lithium Bromide-Water Absorption Chiller Powered by a Renewable Heat Source [4] investigate the performance of a single-effect absorption chiller utilizing an aqueous lithium bromide solution as the working fluid and driven by hot fluid rejected from either a geothermal power plant or the outlet of a thermal solar collector. Although such chillers are considered low-grade energy refrigeration cycles, the one proposed by authors has an advantage in terms of economy and efficiency. A parametric analysis is performed using Engineering Equation Solver software, it is used to highlight the effect of the heat exchanger size on the coefficient of performance of the chiller. The analysis proved that the proposed device can operate with excellent cooling capacity, reaching 16 kW, and a relatively high coefficient of performance (~ 0.7) while being driven by the low-grade energy. The heat source temperature, solution heat exchanger effectiveness and the size of the absorber are key parameters for the design and operation of absorption chillers. Moreover, increasing the heat source mass flow rate has a significant impact on both cooling capacity and coefficient of performance at low values (< 10 kg/s) and unnoticeable impact at higher values (> 10 kg/s).

Authors [5] present the feasibility analysis of a small-scale low-temperature solar Organic Rankine Cycle power system. The heat transfer fluid for running the Organic Rankine Cycle system is hot water with a temperature of 120 °C provided by an array of evacuated tube solar collectors. The performance of the solar Organic Rankine Cycle system was investigated using two different working fluids over a wide range of the evaporation temperature. Technical and economic indicators such as the required solar collector aperture area, the total heat transfer surface area of the heat exchangers and the volume flow ratio between the outlet and inlet of the expander are among the key parameters used to evaluate the solar Organic Rankine Cycle. The results showed that the solar Organic Rankine Cycle system is able to achieve an overall system efficiency of 6.75% using a relatively low-temperature heat source. The results also showed that the solar Organic Rankine Cycle system requires smaller evacuated tube solar collector and heat exchanger areas when R245fa is used as the working fluid.

A technical and economic analysis were conducted by authors [6] for a farm- fed biogas plant that utilizes cow manure to produce electricity and heat via combined heat and power unit. The produced electricity is fed into grid and the plant utilizes the heat. The economic performance of the proposed biogas plant was evaluated using various economic indicators. The preliminary design and economic feasibility results proved the

profitability of the manure-based biogas systems on wide range of farm sizes. The authors also produced a design for a centralized anaerobic digestion plant depending on Jordan resources.

CONCLUSIONS

This special issue is dedicated to the ICEWES 2018 Conference. The guest editors' believe that the selected scientific papers from the ICEWES 2018 conference will contribute to the knowledge published in the Journal of Sustainable Development of Energy, Water and Environment Systems (JSDEWES), this would be of interest for their readers.

Finally, the guest editors would like to sincerely thank all authors who contributed papers to this special issue of JSDEWES and all reviewers for their efforts and valuable comments in reviewing the papers and advising authors and editors.

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