

Ground Source Ventilation and Solar PV Towards a Zero-Carbon House in Riyadh

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Abstract : While renewable energy technology is developing in Saudi Arabia, and the ambitious 2030 vision encourages the shift towards more efficient and clean energy usage. The research on the application of geothermal resources in residential use for the Saudi Arabian context will contribute towards a more sustainable environment. This paper is a part of an ongoing master's thesis, which its main goal is to investigate the possibility of achieving a zero-carbon house in Riyadh by applying a ground-coupled system into a current sustainable house that uses a grid-tied solar system. The current house was built and designed by King Saud University for the 2018 middle east solar decathlon competition. However, it failed to reach zero-carbon operation due to the high cooling demand. This study will redesign and validate the house using Revit and Carriers Hourly Analysis 'HAP' software with the use of ordinary least square 'OLS' regression. After that, a ground source ventilation system will be designed using the 'GCV Tool' to reduce cooling loads. After the application of the ground source system, the new electrical loads will be compared with the current house. Finally, a simple economic analysis that includes the cost of applying a ground source system will be reported. The findings of this study will indicate the possibility and feasibility of reaching a zero-carbon house in Riyadh, Saudi Arabia, using a ground-coupled ventilation system. While cooling in the residential sector is the dominant energy consumer in the Gulf region, this work will certainly help in moving towards using renewable sources to meet those demands. This paper will be limited to highlight the literature review, the methodology of the research, and the expected outcome.

Keywords : renewable energy, zero-carbon houses, sustainable buildings, geothermal energy, solar PV, GCV Tool

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