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Feasibility Study for Implementation of Geothermal Energy Technology as a Means of Thermal Energy Supply for Medium Size Community Building

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Abstract : Heating systems based on geothermal energy sources are becoming increasingly popular among commercial/community buildings as management of these buildings looks for a more efficient and environmentally friendly way to manage the heating system. The thermal energy supply of most European commercial/community buildings at present is provided mainly by energy extracted from natural gas. In order to reduce greenhouse gas emissions and achieve climate change targets set by the EU, restructuring in the area of thermal energy supply is essential. At present, heating and cooling account for approx... 50% of the EU primary energy supply. Due to its physical characteristics, thermal energy cannot be distributed or exchange over long distances, contrary to electricity and gas energy carriers. Compared to electricity and the gas sectors, heating remains a generally black box, with large unknowns to a researcher and policymaker. Ain literature number of documents address policies for promoting renewable energy technology to facilitate heating for residential/community/commercial buildings and assess the balance between heat supply and heat savings. Ground source heat pump (GSHP) technology has been an extremely attractive alternative to traditional electric and fossil fuel space heating equipment used to supply thermal energy for residential/community/commercial buildings. The main purpose of this paper is to create an algorithm using an analytical approach that could enable a feasibility study regarding the implementation of GSHP technology in community building with existing fossil-fueled heating systems. The main results obtained by the algorithm will enable building management and GSHP system designers to define the optimal size of the system regarding technical, environmental, and economic impacts of the system implementation, including payback period time. In addition, an algorithm is created to be utilized for a feasibility study for many different types of buildings. The algorithm is tested on a building that was built in 1930 and is used as a church located in Cork city. The heating of the building is currently provided by a 105kW gas boiler.

Keywords : GSHP, greenhouse gas emission, low-enthalpy, renewable energy
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