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Exergy and exergoenvironmental assessment of a geothermal heat pump and a wind power turbine hybrid system in Shanghai, China

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Abstract

Geothermal heat pumps are one of the most growing and cost-effective renewable energy technologies based on the temperature difference between the ground and the environment. In the cold seasons, the temperature inside the soil or water is higher than the ambient temperature. Therefore, the heat pump is used to extract the warm temperature of the ground into the house or any other controlled space. In the summer, the air temperature is higher than the temperature of the soil or water. This temperature difference is used again to cool the house or any other environment. This paper examines the energy and exergy assessments of a hybrid system in Shanghai, China, that employs a geothermal heat pump with an economizer for winter heating and a wind turbine to provide clean electricity. The complete set of procedures, as well as every component and every aspect of the hybrid system, have all been carefully examined. The heat pump's coefficient of performance is 3.916, its net power output is 22.03 kW, its overall energy efficiency is 77.2%, and its exergy efficiency is 25.49%.

Keywords: Heat pump, Geothermal, Wind turbine, Economizer, Shanghai