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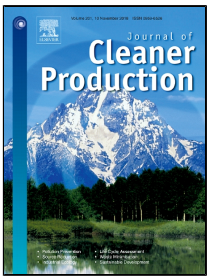

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Investment Strategy of Hydrothermal Geothermal Heating in China under Policy, Technology and Geology Uncertainties

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Abstract:

Geothermal energy has been considered as a new and promising source of clean heating in some areas in China. However, huge initial investment cost and high uncertainties in policy, geology and technology have been seriously hindering its development. Developing effective policies and strategies to attract more investment for geothermal heating is a big challenge for the government. Therefore, a real option model was proposed to find the optimal investment strategy for hydrothermal geothermal heating projects with average well depth of 1350 meters under various uncertainties in policy, technology and geological aspects. Meanwhile, an integrated Thermo-Hydrological Coupling Model was developed to calculate the relationship between geological conditions and the geothermal heating economics. Nine geological scenarios were proposed considering different geothermal gradient and rock permeability and a sensitivity analysis was conducted to investigate the effects of different supporting policies and mechanisms. Based on obtained empirical results, it was concluded that, (i). The real option analysis framework is more applicable in exploring investment strategy of hydrothermal heating projects than discounted cash flow method; (ii). Higher subsidy level has an obvious impact on investment value but very limited impact on timing; (iii). Technology progress and flexible subsidy phase-out mechanism can attract the investment effectively.

Key words: Hydrothermal geothermal heating, uncertain geological conditions, real options, supporting policies