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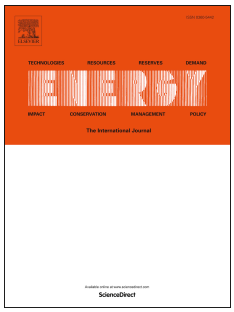

Long-term cost trajectories for biofuels in China projected to 2050

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Long-term cost trajectories for biofuels in China projected to 2050

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Abstract

Biofuels mitigate and offset greenhouse gases. A long-term levelized cost of energy (LCOE) estimation for biofuels in China was carried out, using a novel probabilistic model to analyze the likelihood of biofuels economically outrunning fossil fuels. This model calculated LCOE based on five uncertain input parameters fed into a Monte Carlo simulation, namely, discount rate, firm size, feedstock price, product yield and catalyst/enzyme cost, while key assumptions were used to determine their probability distributions. Model results show that the mean levelized costs of most biofuel technologies will fall below 9500 Chinese Yuan per ton by 2030 and below 9000 Chinese Yuan per ton by 2050; it is highly possible for most biofuel technologies to gain economic feasibility and competitiveness by around 2025–2030 in China. The LCOE reduction of 1.5-generation (1.5G) biofuels is feedstock-driven, while that of 2nd-generation (2G) biofuels is technology-driven. Meanwhile, 1.5G biofuels are more sensitive to crude oil price changes than 2G biofuels, with a drop in crude oil price having a greater effect on 2G biofuels than a rise. On average, every 10% rise in crude oil price accelerates their economic feasibility by 2–3 years, while every 10% drop delays this feasibility by 3–5 years.

Keywords: biofuel, Monte Carlo simulation, uncertainty analysis, levelized cost of energy, renewable energy

1. Introduction

Energy crisis and climate change have created great challenges for human economic development. Our future global economy is likely to consume more energy, especially with the rising energy demands of developing countries, like China. According to the International Energy Agency (IEA), world primary energy demands may be as much as