

***IS IT WORTH TO INVEST? -AN EVALUATION OF CTL-CCS  
PROJECT IN CHINA BASED ON REAL OPTIONS***

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**Abstract**

China's consumption of liquid fuels as well as the dependence on foreign oil has increased considerably in recent years. Alternative liquid fuel technologies like coal to liquid (CTL) are attracting attentions. However, facing uncertainties of energy price and carbon price as well as policy fluctuations and potential CO<sub>2</sub> utilizations, evaluations of CTL project becomes a complex question. In this context, we develop a sequential investment real options decision model of a typical CTL-CCS project in China with the flexibility in investment timing and operation. As an application, the model is used to evaluate Shenhua direct coal liquefaction (DCL) project with CCS retrofits option. Four scenarios and sensitivities of key parameters are discussed. The results show that under current market and policy conditions the CTL project is economically infeasible but the option to delay is of huge value. A high level of carbon price or carbon tax is necessary to make the CCS retrofit economically feasible despite relatively lower capture costs, while the captured CO<sub>2</sub> could be better utilized for Enhanced Oil Recovery (EOR). We suggest the government to exempt fuel tax for enhancing the economic viability of CTL companies, especially in the current condition of low oil price.

**Keywords:** Coal to liquid; Real options theory; CCS; Operation flexibility; Sequential investment