

# A Potential Business Model for CCS System in Coal-fired Power Plants: A Case Study of Indonesia

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## 1. Introduction

The International Energy Agency (IEA) forecasts that future growth of electricity generating capacity in Southeast Asia Energy will reach 565 gigawatts (GW) in 2040. Out of this figure, coal power will constitute 40% of the total installed capacity. Indonesia, one of APEC economies in Southeast Asia, is forecasted to add 66 GW of new coal-fired power plants by 2040.

This paper aims to evaluate the financial viability of private sector investment in Indonesian IPPs in coal power plants under three different scenarios: business as usual (BAU), CCS under carbon price policy, and a CO<sub>2</sub> market for Enhanced-Oil-Recovery (EOR).

## 2. Methodology

The financial evaluation in this paper is based on the cash flow analysis of private sector IPPs over the duration of a PPA contract. A hypothetical coal power generator with a capacity of 660 MW to be constructed in South Sumatera is used as the basis of financial analysis in this study.

$$NPV = - \text{Initial investment} + \sum_{t=1}^n \frac{\text{net cash flow}_t}{(1+i)^t} \quad (1)$$

Net present value (NPV) (1) is used to calculate the present monetary value for each scenario of BAU, CCS, and CCS-EOR market to understand the different levels of return on investment.

## 3. Results and Discussion

Financial performance of coal power IPP under BAU scenario in Figure 1 shows that IPP sponsors gain favorable financial returns that are indicated by the net present value of US\$491 million and estimated internal rate of return (IRR) of over 20%.

It appears that the application of a carbon price to a coal power effectively reduces the financial viability of conventional coal power plant without CCS

equipment. When a higher carbon price scenario of US\$ 14.69/ton CO<sub>2</sub> is implemented, the estimated IRR of the coal power IPP is just over the discount rate threshold at 7.75%.

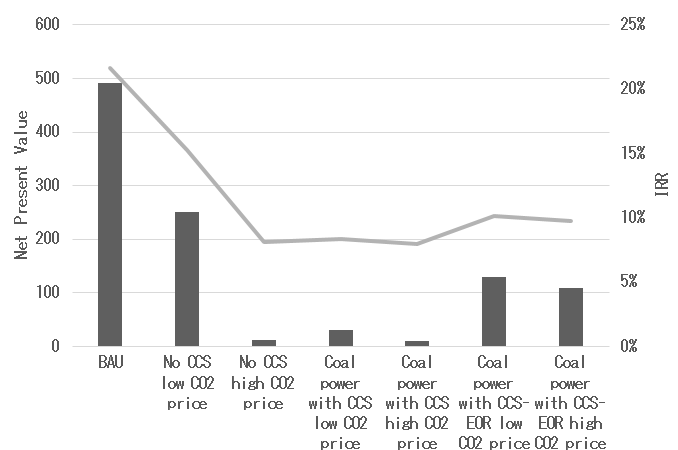


Figure 1: Results of financial analysis for coal-fired power project under different investment scenario

The project cash flow is improved when a CO<sub>2</sub> market is available. In this study, CO<sub>2</sub> utilization for Enhanced Oil Recovery (EOR) creates opportunities for the IPP developer to have higher net present value and expected IRR than those without the availability of a CO<sub>2</sub> market. The revenues from the sales of captured CO<sub>2</sub> partly compensates the capital investment needed to add CO<sub>2</sub> capture equipment and enable the IPP developer to serve its debt service obligation.

## 4. Conclusions

It appears that financial returns on IPP investment for coal power projects will be severely affected if carbon price policy is implemented in the future. The installation of CCS capture in coal power plants will not be financially feasible if a CO<sub>2</sub> market is not available.

It is evident from this study that government support is needed if CCS technology needs be a part of the solution for maintaining investment viability of IPP developers in coal power generators when carbon price policy is introduced in the future.

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