

# Valuation Geothermal Power Project: An Application of Real Options

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## Overview

The energy sector contributes 41 percent of total greenhouse gas (GHG) emission, which one of the options to reduce GHG emission from this sector is the deployment of renewable energy. Geothermal, as a renewable energy source, could support the decarbonising of the power sector, particularly by offsetting the existing base-load electricity generation. However, geothermal power faces the main hurdles to develop that is an exploration risk in upstream development which drives a less favourable investment to steer this renewable power. Currently, the option values are not adequately reflected in the way geothermal are appraised. A real options framework may provide a comprehensive analysis of options relating to the exploration. The result shows that there is a significant yielding value for the project. The options value for the geothermal project provided a substantial basis for investors to involve in this renewable energy development. The results enhanced the current framework of advanced real options for assessing the geothermal development project which takes into account the uncertainty and risks on the initial steps of the project development. A broader application of the real options may steer the geothermal energy development investment that may contribute to the cleaner energy sector.

## Methods

Real options valuation (Quantitative method) using case study in Indonesia

## Results

The real options framework for geothermal power development provides a comprehensive assessment of the project development phase. The lead time of the project development is seven years from the project initiation until the first revenue coming from the produced electricity. Moreover, the ROA provide addition value added from the result of the DSF. The case study revealed the additional value of \$243.64 million from the compound model. There is 25% probability that the project might be dropped or abandoned during the exploration stage.

## Conclusions

The real options framework for geothermal power development could be developed by incorporating all of the risk and uncertainty along the project lifetime. The ROF provides a comprehensive assessment particularly for the project development phase. Moreover, the ROA provide addition value added from the result of the DSF. The case study revealed the additional value from the compound model.

There are several possible follow up from the methodology in this paper. The calculation has not included the implication of feed-in tariff policy and its implication on the project financial model. In addition, the project is designed only for the medium-big capacity of binary cycle power plant. Since Indonesia has many scattered small size geothermal potential, further real options valuation could be conducted.

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