

CO₂ COST INTEGRATION IN OIL PRODUCTION INVESTMENT DECISION: CHALLENGES & OPPORTUNITIES FOR OIL COMPANIES

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Overview

Since the development of oil & gas production activities, several financial and investment business models have been proposed, constructed and used by oil companies. Unfortunately, not enough attention has been paid to carbon dioxide emissions associated to production. Neither capital nor operating expenditures take into account the emission externalities related to oil & gas production or downstream usage.

In the meantime, carbon pricing schemes are being implemented in various parts of the world so as to internalize the negative impact of emissions associated with CO₂-emitting activities.

Our study aims at assessing up to what CO₂ price, investment in oil production remains profitable if carbon emissions are internalized into their cost structure on a specific oil field. Then, we attempt to show how sensitive would be our results based on various price scenarios. Finally, we try to assess the impact of different contractual regimes on our profitability analysis.

Methods

Most of the existing literature assessing the impact of CO₂ price on profitability is mainly focused on the power generation (Georgakellos 2009) or only the downstream side of the oil business (Castelo Branco et al. 2011). Many other analysis have also been realized by non-academic entities, such as utilities and energy companies (CDP 2013).

Nevertheless, Campanale & Leggett (2013) highlighted the risk of a *carbon bubble* growing in the oil & gas industry, affirming that CO₂ cost integration will impact the profitability of upstream projects. Moreover, Boskovic & Leach (2014) have already done a modeling effort for Canadian unconventional resources, in which they measure the effectiveness of CO₂ cost integration over oil sands projects profitability. We also address these hypothesis by constructing an investment decision making model for a specific oil field under concession contract.

But in our approach we focus on modelling (investment decision) an oil field under several oil price scenarios, from the most pessimistic (50\$/bbl) up to the most optimistic (120\$/bbl) level viewed from oil companies' perspective. Thereafter, CO₂ price parameter is integrated into the model and its impact over the cash-flow structure is analyzed. We then run the model for various CO₂-price scenarios so as to perform a sensitivity analysis over the project profitability.

Finally, our investment model went through various contractual frameworks apart from concession. *Production Sharing Contract* and *Service Contract* structures are also analyzed in order to find the most optimal contractual framework under which the CO₂ emissions could be further reduced.

Results

The result shows us that CO₂ cost integration into investment decision models in the oil industry can considerably influence the profitability of the projects. Whatever the contractual framework, this impact is observable on the key

financial indicators of the investment project (Return-on-Investment, Cash-Flows, Break-even, ENPV, ...). Low oil prices combined with high CO₂ price in the market could easily bring the profitability of projects in negative.

Conclusions

A well-structured CO₂ quota/taxation policy can secure the producers in terms of return on investment even under pessimistic oil price scenarios. This means that the “environmental-friendly” way of production is tightly correlated with a solid and reliable CO₂ pricing mechanism in parallel, giving a proper stability and visibility to oil & gas companies.

Further research in this area and more optimal proposals for CO₂ market design (carbon credit trading) would be a next step. Second, this model could be performed on various types of projects so as to reevaluate the position of different oil fields on the global supply curve.

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