

A Real Options Analysis of the Effects of Oil Price Uncertainty and Carbon Taxes on the Optimal Timing of Oil Field Decommissioning

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The issue of oil (and gas) field decommissioning is a topical one in the contemporary energy landscape. For both oil and gas operators and governments, the question of the optimal timing of decommissioning is a critical one because of its significant implications for field economics (i.e. from the operator perspective) as well as taxation (i.e. from the government perspective).

This paper examines how three important sources of oil price uncertainty affect the optimal timing of oil field decommissioning. These are (1) the long-run equilibrium oil price, (2) the speed of reversion of oil prices to the long-run equilibrium price, and (3) the degree of oil price volatility. The levels and trends of these sources of oil price uncertainty encapsulate many of the factors that affect the dynamics of the global oil markets which then ultimately impact the optimal timing of the decommissioning of fields.

The paper finds that lower levels of equilibrium oil prices and speed of reversion to equilibrium prices have the effect of fostering early decommissioning of oil fields. Oil price volatility however has the opposite effect. These findings provide valuable insights into how policymakers may identify windows of opportunity for policy interventions leading to (1) an acceleration of the drive towards sustainable energy transition; and/or (2) the maximisation of economic recovery (MER) from petroleum resources. In respect of the former, the paper notes that there has been a significant shift in the global political economy of the upstream oil and gas sector away from policies providing fiscal support to the sector, to rather, the imposition of new carbon taxes and/or the expansion in the level and/or scope of pre-existing such taxes on the sector. Norway for example recently announced a significant hike on upstream carbon taxes. A carbon tax of about \$250/tCO₂ by 2030 is targeted. This effectively quadrupled the pre-existing level of only \$58/tCO₂. The Canadian federal government has also announced a steep rise in carbon taxes, with a target of about \$135/tCO₂ by 2030 sought. Post COP26 (Glasgow 2021), it is expected that the trend in the imposition of higher carbon taxes would continue.

In addition to the examination of the effects of oil price uncertainty therefore, the paper examines the effects of the imposition of carbon taxes on the optimal timing of oil field decommissioning. It shows that the imposition of these taxes fosters early decommissioning to a significant extent. In the most unfavourable oil price environment and under an aggressive carbon tax regime for example, decommissioning may occur at a very early period in oil field operations, owing to close to 50% of oil reserves being uneconomic to produce. The results highlight the effectiveness of carbon taxes as policy lever in jurisdictions that seek accelerated decarbonisation, climate change mitigation and energy transition goals.

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