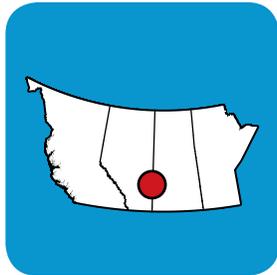


Profitability Variation in Viking Oil Plays

Redwater/Provost/Esther, AB; Doddsland, SK

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The profitability of Viking oil plays is compared using the Sproule Play Metrics module in Canadian Discovery's Catalyst Play Evaluation Platform, which provides an integrated dataset for evaluating plays across the basin.



Play(s)	Viking Marine, Viking Shelf
Fluid(s)	Oil, Gas
Area	Redwater/Provost/Esther, AB; Doddsland, SK
Operator(s)	N/A

Introduction

The general assumption is that EURs increase with time as technology advances, development matures, and efficiencies are gained through the consolidation of land position, facilities and operators. EURs indicate the size of the prize; however, using Viking oil plays as an example ([figure 1](#)), not all opportunities are created equal, and the ability of a project to provide a return on the capital invested is paramount to economic success.

Play Metrics

The analysis of play metrics is fundamental to strategic decision-making in the oil and gas industry. Plays can be evaluated and compared using the Sproule Play Metrics module in Canadian Discovery's Catalyst Play Evaluation Platform. Play Metrics combines Sproule's expert opinion of production profiles and economic parameters with CDL's geological interpretation of the plays in Western Canada.

Each of the major producing formations, or play groups, has been subdivided into detailed plays (herein referred to as plays).

Wells with similar reservoir behaviour are assigned to detailed plays and within each detailed play wells are segregated by performance. Type curves are generated for each performance tier using empirical decline curve analysis, in accordance with industry best practices. EURs are determined by fitting the type curves to production data of individual wells. The economics presented below were forecasted on strip pricing at December 31, 2017 with a 10% discount rate, on a before tax basis.

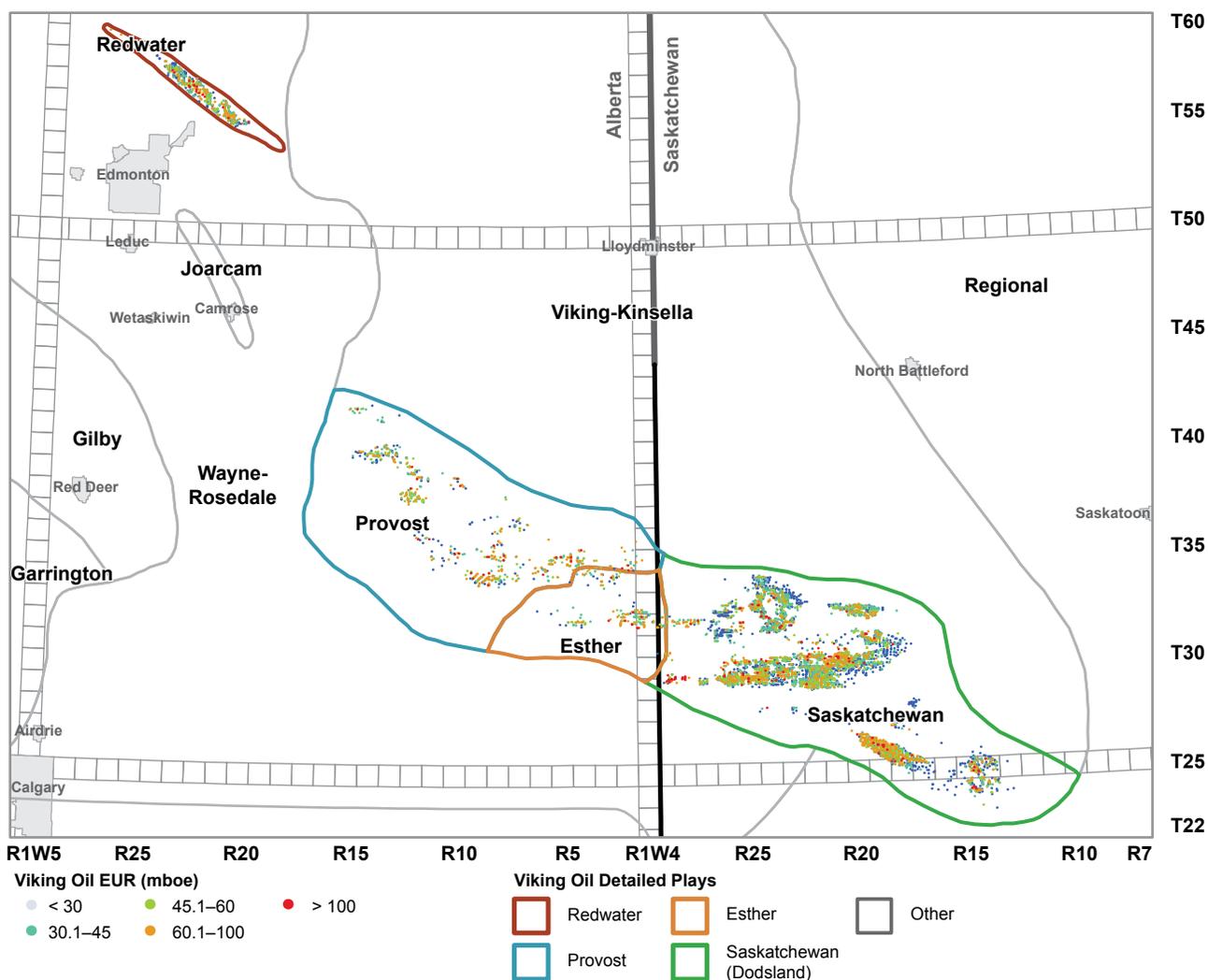
In simple terms, the economics of a project are determined by the relationship between profit and investment. There are a number of economic metrics that can be used to compare projects to one another. The metrics are described in more detail in [appendix 1](#). In the short term, profitability is most sensitive to commodity price since capital

costs (drilling, completions and tie-in) tend to lag behind, and be less volatile than, changes in oil and gas prices.

The Play Metrics module is the culmination of Sproule’s expert opinion on the range of values that can be expected for go-forward development. A number of factors are taken into consideration including, but not limited to,

reservoir variability, maturity of development, consolidation of land position and options for delivering product to market. The range of possible outcomes is presented as three scenarios: typical, more favourable and less favourable. The more favourable scenario is intended to represent full scale development on a large, contiguous land base, and/or efficient operators. The less favourable scenario is intended to represent

1 Viking Oil Detailed Plays and Horizontal Well EURs



delineation drilling, small or scattered land bases, or inefficient operators. The typical scenario represents the best estimate.

Viking Oil Detailed Plays

Figures 2a–d show a comparison of the range (typical, more favourable and less favourable scenarios) of net present value (NPV_{10}), profitability index (PI_{10}), payout and capital costs that could be expected going forward for each of the Viking oil plays. The economic predictions assume current completion techniques and are based on the average type curve for each play. The average type curve was chosen by comparing the average of the individual well EURs in each play to the EUR associated with each of the performance tiers within the play. The type curve for the performance tier with the EUR closest to the well average is considered the average type curve for the play (table 1).

Each of the Viking plays exhibits a different degree of variation between the least favourable, typical and most favourable scenarios. This variance can be considered a comparative measure of play maturity and an indication of upside potential. Currently the Viking oil plays are profitable under all three of the economic scenarios based on NPV_{10} and PI_{10} (figure 2a and b).

What is more interesting is the variability, or the spread, of the data within and between the plays. For example, the Redwater play has the lowest PI_{10} overall, but also has the smallest difference between the less favourable and more favourable scenarios with respect to PI_{10} (figure 2b). Therefore, Redwater could be considered the least profitable, but the most predictable of the plays. Provost, on the other hand, has the

most variability between the less favourable and more favourable scenarios, meaning that a more favourable well could be very profitable, but a less favourable well could be barely economic with a relatively long payout (figure 2c).

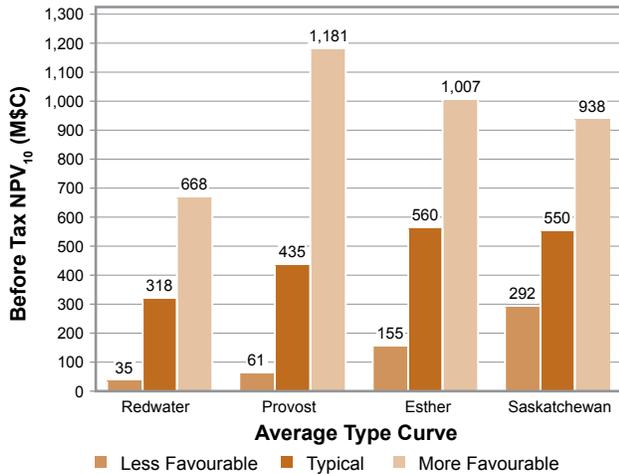
The Esther and Saskatchewan (Doddsland) plays are similar to each other, based on the metrics presented, with Saskatchewan looking more attractive in terms of profitability. However, these two plays are different in that Esther is gassier (table 1). The cost structures of the plays are also different as Esther wells are the most expensive to drill, complete, equip and tie-in, while Saskatchewan wells are the least expensive (figure 2d).

Conclusion

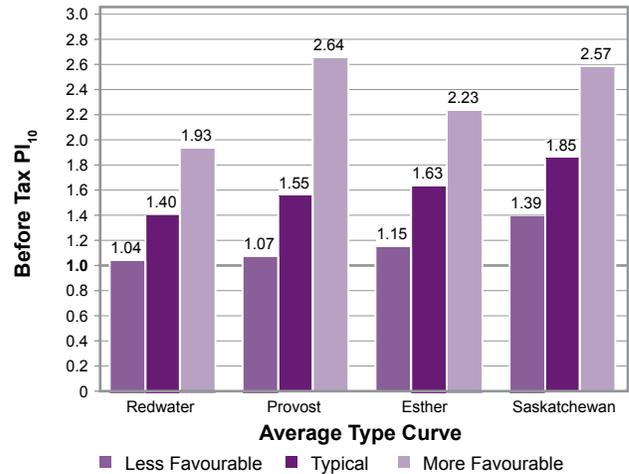
Although the Viking is relatively consistent in terms of depositional environment and geology, there are discernable differences in EURs and profitability within the Viking plays, which draws attention to the fact that the biggest wells are not always the best. Based on this analysis, Saskatchewan has the most attractive economics, which explains why it is the most actively drilled of the plays.

2 Viking Oil Detailed Plays Economics

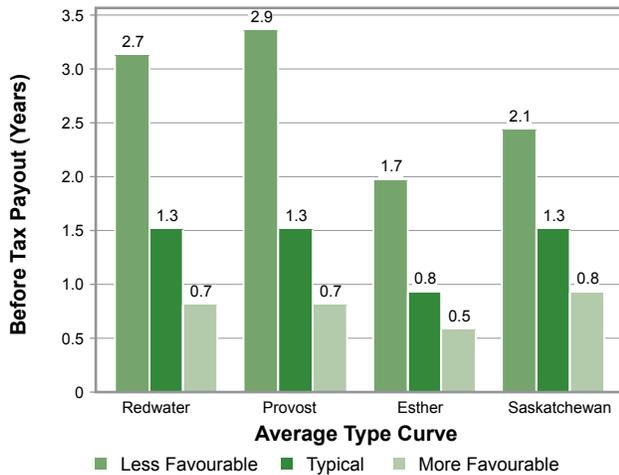
a. Net Present Value (NPV₁₀)



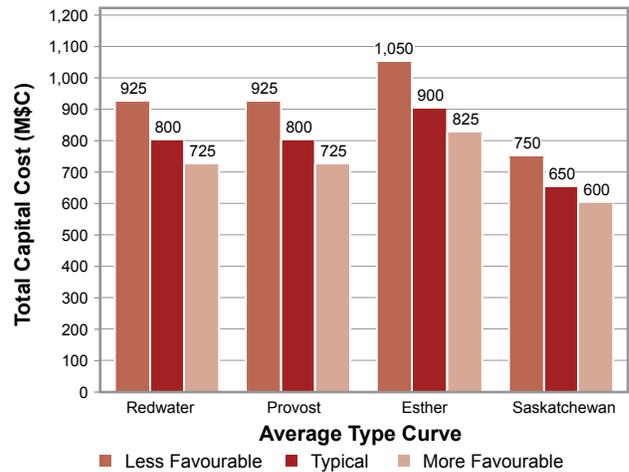
b. Profitability Index (PI₁₀)



c. Payout



d. Total Capital Cost



Sproule Play Metrics, Powered by Catalyst

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Table 1. Viking Oil Detailed Plays Selected Metrics

Area	Redwater	Provost	Esther	Saskatchewan
Average Well EUR (mboe)	44	53	53	44
Average Type Curve	Viking Redwater Oil Tier 5	Viking Provost Oil Tier 4	Viking Esther Oil Tier 4	Viking Saskatchewan Oil Tier 5
EUR Oil (mbbls)	38	40	40	40
EUR Gas (mmcf)	19	100	120	20
EUR (mboe)	41	57	60	43

Sproule Play Metrics, Powered by Catalyst

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Appendix 1: Economic Metrics Definitions

Present Value (PV)

Present value is today's value of future cash flows generated by an investment. To calculate today's value, future cash flows are discounted by an interest rate referred to as the discount rate. A 10% discount rate was used for this article.

Net Present Value (NPV)

Net present value is the present value (PV) minus the initial capital invested.

Profitability Index (PI)

Profitability index is the present value of future cash flows (PV) divided by the initial capital invested. The PI can be discounted or undiscounted, depending on the PV. The PVs in this article are discounted at 10%, therefore the PI is considered discounted at 10%. A PI greater than one indicates an economic project, and the higher the PI, the more attractive the project.

Payout

The payout period is the length of time (years) it takes to recover the initial capital invested.

Break-Even

The break-even point is where revenue is equal to cost, neither a profit nor a loss is incurred, net present value is zero and profitability index is one.

Internal Rate of Return (IRR)

The internal rate of return, or the break-even discount rate, is the discount rate that makes the net present value of future cash flows (NPV) zero.