Cardium Oil Play Metrics
Wapiti–Lochend, AB
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Cardium oil plays are compared based on EURs and economic parameters using the Sproule Play Metrics module in Canadian Discovery’s Catalyst Play Evaluation Platform.

Play(s) | Cardium Deep Basin, Cardium Pembina Shoreface
Fluid(s) | Oil
Area | Wapiti–Lochend, AB
Operator(s) | N/A

Introduction
Strategic decision-making in the oil and gas industry is based on the analysis of play metrics. 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 trusted interpretation of the plays in Western Canada.

The Sproule Play Metrics module contains estimated ultimate recovery (EUR), capital and operating cost, cash flow, net present value (NPV), payout, rate of return (IRR) and profitability index (PI) information for each of the major producing formations. Each formation, or play group, has been subdivided into detailed plays (herein referred to as plays).

The following comparative analysis of the Cardium oil plays is one example of how these data can be used to make decisions.

Theory and Methodology
The distinction between reservoir behaviour and reservoir performance is key to the methodology. Reservoir behaviour is determined by rock and fluid properties, such as permeability, relative permeability, temperature, pressure and fluid type, and can be largely characterized by the decline exponent (shape of the curve). Reservoir performance, however, is influenced by other factors including local variations in reservoir quality and completion design, which is largely a function of the operator.

Wells with similar reservoir behaviour are assigned to detailed plays. Within each detailed play, the wells are segregated based on performance, and 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.
Economics are forecast on strip pricing at December 31, 2017, with a 10% discount rate, on a before tax basis. Basic economic definitions are provided in appendix 1.

**Cardium Oil Detailed Plays**

*Figure 1* shows EURs for the wells in the Cardium oil plays. How do these plays compare to one another? Sproule Play Metrics includes multiple performance tiers, or type curves, for each.
detailed play and options for typical, more favourable and less favourable scenarios. In order to provide a comparative analysis, the following is based on the average type curve for each play, the typical outcome scenario, and current completion techniques. As such, readers may find these numbers different than their own; however, the comparative value of the analysis is valid.

Figure 2 shows net present value (NPV$_{10}$) plotted against profitability index (PI$_{10}$) sized by EUR for each oil play group in the Sproule dataset across the WCSB. As expected, value increases with profitability, but there is considerable variation amongst and within formations. It is also worth noting that the relationship between EUR and profitability is not so straightforward.

Focusing on the Cardium, figure 3 shows the correlation between NPV$_{10}$ and PI$_{10}$ and the relative magnitude of EUR based on typical parameters for each oil play. Ferrier has the highest EUR and is the most profitable play. However, not all the plays are profitable under current economic conditions and higher EUR does not always equate to greater profitability. The NPV$_{10}$ and PI$_{10}$ numbers used in figure 3, along with the total capital costs (drill, complete and tie-in) and payouts are shown in figures 4a–d. Ferrier is the highest cost play (figure 4b), but also has the highest PI$_{10}$ (figure 4a), the highest NPV$_{10}$ (figure 4c) and the shortest payout (figure 4d).
Conclusion

Which is the best play? That depends! There is no single determining factor, and different corporate objectives or goals will dictate which metrics are more important to individual companies. In this case, the highest EURs can be expected at Ferrier, along with the most attractive economics based on \( \text{PI}_{10} \), \( \text{NPV}_{10} \) and payout.
a. Profitability Index ($PI_{10}$)

b. Total Capital Cost

c. Net Present Value ($NPV_{10}$)

d. Payout

Sproule Play Metrics, Powered by Catalyst © Canadian Discovery Ltd.


Selected References


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.