

## Producers' dilemma II

Managing development in a world of scarcity



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# Foreword

In October, 2007, Deloitte released "Producers' Dilemma: The role of game theory in anticipating industry outcomes." In it, we made the case that the oil sands industry was at something of a cross-road between:

- Unaltered pace of development leading to the pressures of widening infrastructure deficits, upward spiraling costs and substantially increased regulatory constraints; and
- Self-actualized developmental deceleration in the interest of seeing those same pressures ease for all stakeholders.

Along the way, we predicted the Alberta government, which had at the time been conducting a review of its oil and gas royalty regime, would increase its royalty take. That report was met with considerable interest that has continued well into the overall study's second phase, described in the present document. A year later, the game is much the same, though the stakes may be higher. Certainly oil prices have reached levels we've never seen before. But the competitive landscape is effectively unchanged.

We wrote in October that "Each (producer) is faced with a wide range of choices, including whether to proceed with a project, how far up the value chain to process raw bitumen and where to locate value-added processing. Increasingly constrained resource availability and growing concern over environmental impact have added even more complexity to the decision making matrix. Now, producers must also consider whether to put the brakes on future development."

Those statements are as valid today as they were last fall, when oil was closer to \$80 per barrel (bbl). All the pressures at issue during the first phase of this study continue to build, none more substantially than public concern over the environmental impact of oil sands production. Of course, no producer really wants to apply the brakes. But as this document will detail, the situation is such that they may not have to, provided a robust mechanism of collaboration is engaged specifically to manage greenhouse gas (GHG) emissions.

Collaboration enables access to deeper pools of intellect and therefore more knowledge, experience and skills. In a business setting, it also enables access to deeper pools of financial resources with which to make broader investments toward solving bigger problems. As such, collaboration is one of the most effective ways to address challenges that simultaneously affect multiple parties, especially when the situation begins with scarce resources as it does in the oil sands. We understand that individual companies will naturally pursue strategies that maximize their individual chances of success; the objective of Producers' Dilemma has been to show that the best strategy for oil sands development is the one that maximizes the chances of success for everyone.

# The market today

On October 25, 2007, the Alberta government released "The New Royalty Framework." Effective January 2009, provincial coffers should bulge an additional \$1.4 billion per year, depending on the price of oil at any given time. Industry response was largely oppositional and a number of major players announced they were considering pulling a combined \$2 billion in investment from the province.

On April 24, 2008, CIBC World Markets chief economist Jeff Rubin published his "Age of Scarcity" research note, predicting crude oil (which had broken the \$100/bbl mark for the first time in history on January 2) would surpass \$200/bbl by 2012. "Whether we are already at the peak in world oil production remains to be seen," the CIBC report reads, "but it is increasingly clear that the outlook for oil supply signals a period of unprecedented scarcity."

Indeed. Signs of scarcity are clear in terms not only of oil and other commodities' production but also in skilled labour and materials, even food. We watched as crude first rose from \$25/bbl to \$75/bbl and saw the incremental wealth get distributed among governments (in royalties and taxes), suppliers (in higher material costs with greater delivery delays), workers (in higher wages), and citizens (in rising home values). Will the same degree of distribution manifest in the brave new world of \$125/bbl crude? We don't yet know for sure.

## **In other words, scarcity appears to be very much the order of the day.**

For the oil and gas industry, this is both good news and bad. On the up-side, shrinking supplies of oil (or, at least, easy-to-produce oil) yield a net increase in demand and, therefore, in price. When the price of oil is relatively high, projects previously deemed uneconomic to exploit become economic. On the down-side, higher prices not only pose difficult public relations problems for oil companies (such as when executives from several major oil companies were called to testify in late May before a U.S. Senate Judiciary Committee that was exploring skyrocketing prices) but also the more pervasive challenges of higher costs and lower production. It is therefore important to remember that an increase in the price of oil does not lead to an equivalent increase in profit.

Commodity economics, of course, tend to work in cycles. This condition has perhaps never been more pronounced than in our current and bound-to-be-protracted transition from fossil-fuel based energy to renewables, where it is widely assumed the landscape of our energy terrain will eventually emerge utterly transformed.

**That, in any case, is the hope.**

But a key question is one of sustainability. How can industry and government affect the pace of energy development in the near future? Can they do it in a manner that ensures prosperity for future citizens, not only of Alberta and Canada but of the world? Can they in fact get us to that utterly changed terrain, however long it might take?

In Alberta, the focus of the question is invariably on the oil sands. Estimated to hold 173 billion barrels of recoverable oil, the oil sands constitute not only Alberta's but (arguably) Canada's best chance of securing energy superpower status, at least as long as oil remains the fuel of choice of any such power.

For the past few years, however, new exploration projects have managed only to maintain world production rates between 85 and 87 million bbl/d, despite International Energy Agency (IEA) projections that world consumption will rise to 118 million bbl/d by 2030, if not sooner. Meanwhile, oil sands production rates are expected to grow from the present 1.1 million bbl/d to 3.5 million bbl/d by 2020, according to the Canadian Association of Petroleum Producers (CAPP).

**What, then, is a producer to do?**

On the face of it, intensifying production as much as possible would appear to be not only in the best interest of shareholders but of thirsty oil consumers everywhere. But could such an approach have unintended negative consequences? Thus the core value of game theory: it allows us not only to identify and explore the widest possible range of future scenarios but also to predict the behaviour of the various players involved in those scenarios.

**Timeline**

**May 2007**

Deloitte undertakes game theory simulation to examine oil sands sustainability

**October 2007**

Deloitte publishes "Producers' dilemma"

**October 2007**

Alberta government releases "The New Royalty Framework," which calls for increased royalties on selected oil and gas production cases

**January 2008**

Oil makes history at \$100 per barrel

**March 2008**

Deloitte engages representatives from major oil sands companies and the Alberta government to undertake a second round of game theory analysis

**July 2008**

Alberta government announces \$2 billion investment in carbon capture and storage

# Only a game in name

Game theory is a branch of applied mathematics used to predict or understand behaviour in strategic situations and has been applied to the study of behaviours across a wide variety of disciplines, most successfully in economics, business and political science. It is most typically used when each player's success in choosing optimal strategies is affected by the choices of others.

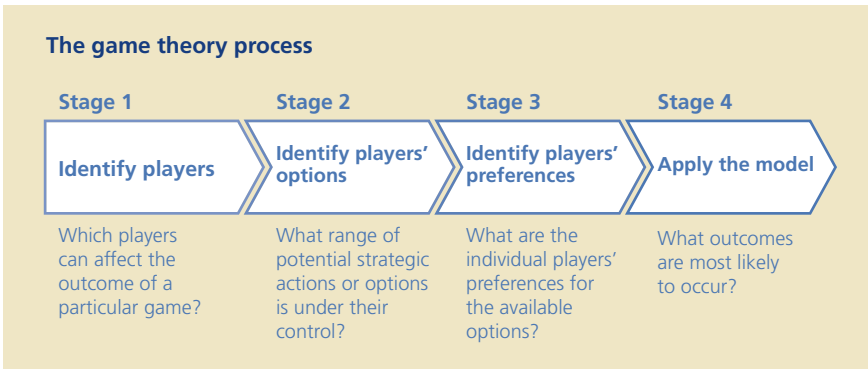
For Producers' Dilemma, Deloitte worked with boutique game theory consultancy Priiva Consulting Corporation to build a model of the various players involved in the sands. Priiva then analyzed all the potential outcomes of that model and made predictions on the behaviour of the various players based on those outcomes, on each player's stated interests and on their capacities for action. Based on Priiva's case history, prediction accuracy rates on outcomes are between 80% and 90%.

In practice, a typical game theory exercise involves a single client who identifies his own strategic options and preferences while also speculating on the options and preferences of all other players in the game (competitors, governments, suppliers, the public). The modeling is then built on the basis of this singular input and results are provided directly to the client.

In the first study, we followed this standard by having a team of Deloitte industry professionals and a few industry friends speculate on likely options and preferences of select oil sands companies and the Alberta government – those players most likely to influence each other as well as final outcomes generally.

This time around, players comprised representatives from actual oil sands companies, each of whom was autonomous in the provision of options and preferences but, again to preserve confidentiality, results were not provided *en masse*; rather, the group of players was simultaneously presented with a consolidated but anonymous set of results and conclusions while each individual was privately presented with his individual results in relation to a confidential aggregate of the remaining players' results.





In general, though, a game theory exercise simply involves a set of players, each of whom introduces different strategic options, different interests and a relative and sometimes unequal measure of influence over the behaviours of the other players.

Once these factors are identified, the model can be analyzed to predict likely or available outcomes. This simulation and analysis process in turn allows companies, governments or any other player involved to walk through all aspects of a particular strategic choice, identify the most desirable achievable outcomes and plot the best course of action to attain them.



## Phase 1 Investigation – the simulation

With the assistance of external industry advisors, Deloitte and Priiva role-played the competitive oil sands field and speculated on what specific companies not only could do, but would be inclined to do, given their development strategies.

The compiled results yielded a database of approximately 33 million outcomes – all the possible scenarios resulting from all different combinations of decisions by all stakeholders. Priiva's subsequent analysis of these outcomes revealed two classes of outcomes or scenarios – what we called "maintain pace" and "maintain peace." All other scenarios were discarded once they were determined to be either unlikely or redundant. The value of this process was further reinforced by our subsequent discussions with industry stakeholders (leading to Phase 2).

Of Phase 1's two core outcomes, maintain pace was considered to be the most likely to occur (known in game theory terms as the "natural outcome") while maintain peace was considered more desirable (known as the "optimal outcome") but difficult to achieve. In tandem, these divergent outcomes literally pose the producers' dilemma.





## Phase 2 Reflection – the game gets real

The process for Phase 2 of the study was much the same as it was for Phase 1 but with one very significant difference – no longer were we role-playing. The real players had agreed to sit at our table.

Certain logistics of the process therefore had to be modified. Fundamentally, this involved acquiring first the players' input needed to establish a fresh slate of possible options and second their thoughts on what their own and other players' interests might be around those various options.

Input was solicited in the form of a survey that was distributed to each of the players who had agreed to participate following the publication of the original Producers' Dilemma report. These players included:

- Canadian Oil Sands Trust
- ConocoPhillips
- EnCana
- Imperial Oil
- Petro-Canada
- Shell
- Suncor Energy
- Total E&P Canada

Additionally, we were joined by a representative from the oil development division of Alberta Energy.

The survey provided both a collection of set options that had been identified in Phase 1 as well as space for each player to add options specific to himself. Strict confidentiality concerning ownership of these options has been maintained throughout the process. (A blank survey is available as 'Appendix A.')

## Producers' dilemma II

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Once sufficient surveys were collected, we consolidated the options and conducted workshops with sub-groups of the players. The consolidated list of options included the following:

Industry and government options		
Industry	Federal government	Alberta government
Status quo	"Green" tax incentive/ disincentive	Heavier regulations on land, air and water
Delay investment	Relax immigration policy	Stricter management of development pace
Divest oil sands assets	GHG cap	Upgrading incentives
Invest in upgraders/ refineries in AB	Carbon capture infrastructure support	Tax bitumen exports
Invest in upgraders/ refineries outside AB		Raise royalties
Acquire another company		Carbon capture infrastructure support

The workshops were designed not only to ensure the players understood the fundamentals of game theory but, more importantly, to provide the option and preference detail necessary to build the game theory model. Again confidentiality was protected: each player was consulted on preferences in private and was given a final opportunity to include any additional options.

At this time, we also asked the players to speculate on the federal government's options and preferences for oil sands development. In future phases, we would look to ensure participation from the federal government itself.

Unlike Phase 1, a new factor was introduced for both industry and government: investment in carbon capture (CC) infrastructure as a means of mitigating the risks posed by greenhouse gases (GHGs). Encouraging in this regard is that the Alberta government's current position, made official over the course of talks in late May 2008 between the premiers of the four western provinces and three territories, is that carbon capture is, as Alberta Premier Ed Stelmach has said, "the quickest, most rapid way of significantly reducing greenhouse gas emissions." While the Quebec-Ontario carbon cap-and-trade scheme announced in June suggests that carbon capture will meet resistance from the rest of Canada, in advance of a July all-premier meeting in Quebec City Alberta went ahead and announced \$2 billion in funding to initiate serious pursuit of the approach. The impact of this announcement is not yet decided.



# Implications of the dilemma

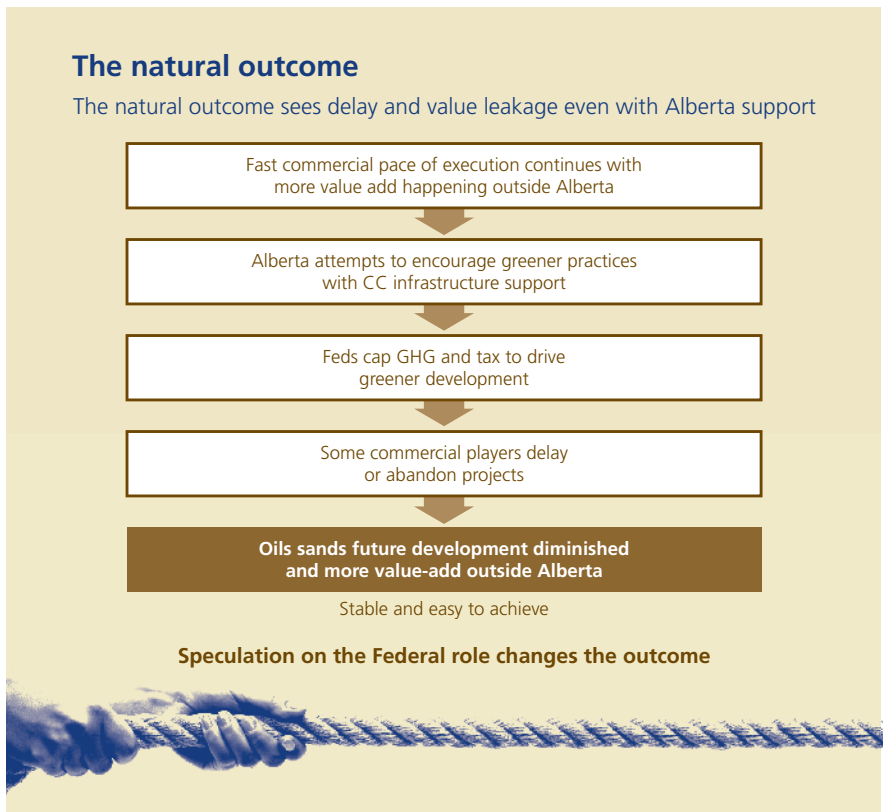
The dilemma for oil sands producers as articulated in Phase 1 was literally whether to proceed with unaltered development plans (maintain pace) or to delay projects in the hope that pressures will ease if other producers scale back as well (maintain peace).

Phase 2's revisited dilemma is similar in that two central but divergent outcomes are revealed, outcomes that closely resemble the maintain pace and maintain peace configurations from Phase 1. However, in Phase 2, maintaining peace is not simply a matter of reducing pace but also of investing specifically in carbon capture infrastructure.

The competitive dynamics, however, are little changed:

1. Status quo continues to rule
2. Players continue to be relatively insensitive to the decisions of competitors
3. Power continues to be relatively well balanced
4. Governments not only remain able to change the rules, they also remain reluctant to do so

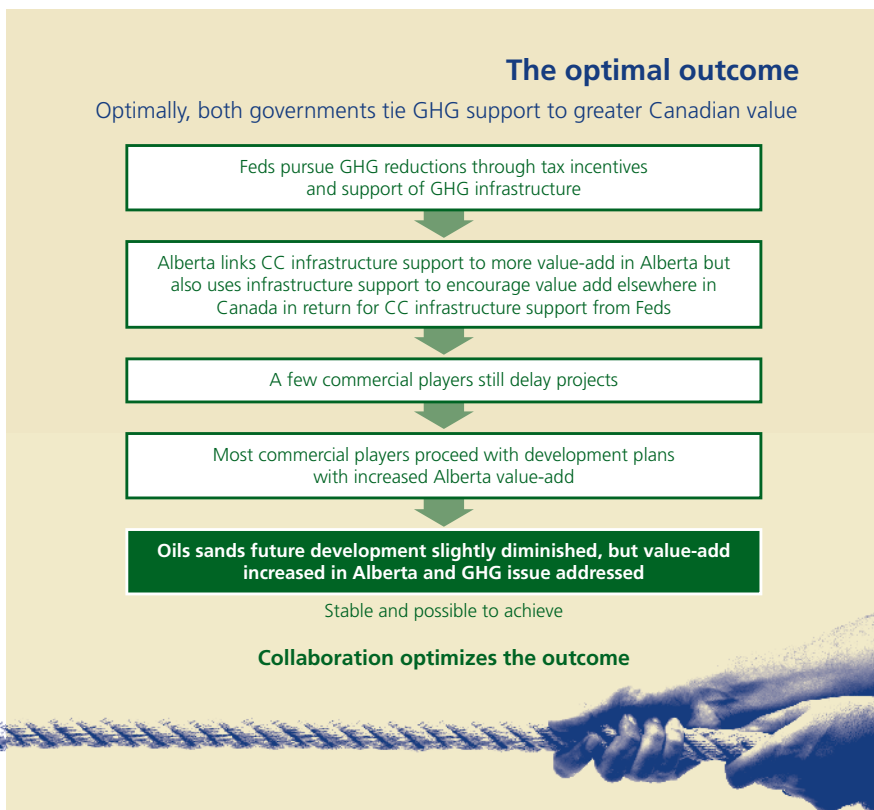
The natural outcome revealed in Phase 1 persists, leading eventually to a "collectively unsustainable state" where "resource availability becomes problematic."



This scenario would see the fast commercial pace of development continue with more value-add (upgraded and/or refined product) occurring outside Alberta. Alberta then attempts to encourage greener practices with support for carbon capture infrastructure while the federal government caps GHGs and introduces tax measures to drive greener development. Finally, some commercial players delay or abandon projects and future development of the oil sands diminishes with more value-add outside Alberta.

A fundamentally similar result persists also in the nature of Phase 2's optimal outcome: industry and government must collaborate in order to avoid eventual collapse.

In this case, maintaining peace would traverse the following trajectory: The federal government pursues GHG reductions through tax measures and support of GHG infrastructure. Alberta links carbon capture infrastructure support to more value-add in Alberta while using that support as a bargaining chip to encourage value-add elsewhere in Canada in return for support from the federal government. Some commercial players delay projects but most proceed with development plans with increased Alberta value-add, leading to slightly diminished oil sands development but increased value-add in Alberta and the GHG issue addressed.



# Looking back on the road ahead

As before, it has been our aim to furnish the government and industry not with a precise set of solutions to their challenges but with a greater understanding of the complex and dynamic environment in which they operate – an environment that would appear to grow more complex and more dynamic with each passing day.

In his 2005 study of the dissolution of ancient societies, *Collapse: How societies choose to fail or succeed*, noted biogeographer Jared Diamond concludes that the only one of about five key factors leading societies either to success or failure is the society's response to its problems, whatever they might be. "A society's responses," writes Diamond, "depend on its political, economic and social institutions and on its cultural values. Those institutions and values affect whether the society solves (or even tries to solve) its problems."

Producers' Dilemma advocates a collaborative response to the challenges currently faced in oil sands development. The world will continue to need more energy and the oil sands truly are critical to meeting that need, but as we move inexorably toward more resource scarcity, we'll also need a coordinated strategy around resource management. In the absence of collaboration, who will lose and who will win? Will the more difficult but desirable outcome of collaboration prevail? Will the players get together and solve the problem or will only the fittest survive, leaving the others as targets for acquisition?



There is no doubt that public concern over the oil sands has increased, that pressures continue to mount rather than abate and that, in a world of finite resources (of all kinds), we are bound to our natural limits. Technological solutions to environmental challenges aren't yet perfect but they're improving; alternative energy solutions to diminishing petroleum reserves aren't yet perfect but they're improving. **Progress, in other words, is real.**

Speaking to the value of the game theory exercise, one of the Phase 2 players said, "It's always good to be presented with a rigorous consideration of strategic possibilities. And it would be even more compelling if the end result was also a task-based plan."

We, too, are interested in precisely that and plans are being developed to move Producers' Dilemma beyond the domain of study and into action. Having looked broadly at the situation, we see opportunities for additional game theory applications to address other areas pressed with scarcity of resources, such as workforce planning and supply chain management.

In the meantime, the most effective way to resolve the producers' dilemma would appear to be seeing it not as a binary choice between theoretically incompatible developmental paths but as a unification of the two: pace can be maintained, but only if peace is equally maintained.

**Whatever's actually next will be time's tale to tell.**

# Appendix A

## Producers' Dilemma phase 2 pre-workshop survey

### Part 1 Players and options

For the various levels of government and your company, please think about the various strategic options available. An option is an important action that can be taken by that player.

#### Q1a What 3–5 main options might the Federal government still consider?

- Status quo
- Implement a tax incentive or disincentive system for green development
- Relax immigration policy universally
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_

#### Q1b What 3–5 main options might the Alberta government still consider?

- Status quo
- Heavier regulations on land, water and air management
- Provide investment incentives
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_

#### Q1c Given what the Alberta and Federal governments have done, and might do, what 3–5 main options might your company consider?

- Status quo
- Delay investment
- Sell off oil sands assets
- Invest in upgraders/refineries in Alberta
- Invest in upgraders/refineries outside Alberta
- Acquire another company
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_



**Part 2 Worst, expected and best outcomes**

For the next 3 questions, imagine we are 5-10 years in the future. What will that future look like? While the prices of oil and natural gas are obviously important to the issue at hand, please focus your responses on the factors on which the industry players under consideration can have significant impact.

**Q2a Briefly describe (in 10 bullet points or fewer) the worst outcome for the oil sands industry that is reasonably possible.**

**Q2b What do you actually expect to happen?**

**Q2c What is the best outcome?**

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