



Gaining ground in the sands 2013

Ten oil sands obstacles that
are actually opportunities

A year of reaching forward

Another year in the oil sands, another 309 thousand hectares of land sold; another 2,171 wells drilled; another 637 million barrels produced (1.7 million per day), 315 million of which were upgraded in Alberta; and another \$19.9 billion invested.¹ According to the Canadian Energy Research Institute (CERI), companies “brought back to life a greater number of projects in the past year than they cancelled or delayed in the ‘doom’ days of 2008 and 2009.”²

It was, in short, a year of growth. But it was also a year marked by a clear and central theme: access to markets. The Energy Resources Conservation Board (ERCB) estimates that, by 2021, the oil sands will have ramped up production from those 1.7 million barrels per day (bpd) to 3.7 million bpd, with in situ production surpassing mining in 2015.³

While labour issues remain of significant *immediate* concern, unless key transportation and communication challenges are overcome, that new oil will have nowhere to go, whether or not we’ve found or trained enough people to do the work.

Thus it was a significant setback when, in January, the U.S. Government decided to reject the Keystone XL pipeline, which proposes to take an additional 700 thousand bpd from Alberta through Cushing, Oklahoma to refineries on the Gulf Coast. Meanwhile, the fate of the Northern Gateway pipeline, which would take 525 thousand bpd to Kitimat, B.C. for shipment to Asian markets, remains uncertain: environmental assessment hearings began in January, but opposition to the proposal is widespread and vocal.

Some projects seem to have traction. The Seaway pipeline is already delivering from Cushing to the Gulf Coast with an expansion in the works and the Trans Mountain Expansion (TMX) project is under development from Alberta to British Columbia. But the general consensus is that we will be at pipeline capacity by about 2017 if these still-developing projects do not come to completion.

Given these circumstances, producers have also begun exploring the possibilities of shipping product by rail (both east and west), generally recognized as a short-term measure but one that could take advantage of existing infrastructure with relative ease.

All of those plans, however, are dependent on more than the relative price of oil. In general, they assume that a range of other factors and challenges will also be balanced and met – that commodity prices remain at economic levels, that continuously improving environmental performance allows the industry to retain the social license to operate, that projected shortages of skilled labour are overcome and that producers see their volumes increase as forecast.

And also that Canadians from across the country rise to the occasion and engage not only each other but also their political leaders in open and honest debate about the value and opportunity of energy development in this country – indeed, about what kind of country we want to have in a rapidly evolving and frequently volatile global economy. Are we concerned that the ongoing rise of the oil sands is shifting the balance of economic power in the country westward? That the dimmed light of Ontario’s manufacturing sector might be dimmed forever? We believe it’s not only acceptable but also necessary to ask these tough questions.

From a certain perspective, division over the future of oil sands comes down to a sort of debate between means and ends. It’s not just whether Canada should have a national energy strategy or whether we should be striving to be a genuine “energy superpower.” It’s also what role in the energy mix alternative and renewable energy forms should play and the extent to which each and every direct consumer of energy products takes it upon himself or herself to understand the full energy lifecycle.

Among oil sands proponents, there is broad agreement on certain fundamentals, including the need to collaborate, the need to diversify markets (especially to realize full market value for their product) and the need to minimize environmental impacts. Opponents, meanwhile, are unified principally by concern for the global environment and are, typically, less moved by economic arguments – or, when they are, they tend to put the future of competing interests (the fisheries industry in B.C., for instance) above the oil sands.

It’s difficult to argue that one group is right and the other is wrong. What we believe is that, far from each “side” having to do more (or less) to make their positions known, the most direct path forward is one of compromise. When industry, for instance, talks of doing a better job of “getting our story out,” we believe that perspective merely reinforces the dichotomy of *us v them*. Similarly, when environmentalists complain that the effect of oil sands development amounts to “enshrining Canada’s position as a petro-state,”⁴ they, too, are propagating a climate of antagonism.

Sabre rattling of this kind is not especially productive. From our perspective, the most compelling oil sands “story” is one that we tell together. And that requires, more than anything, that each of us acts in good faith.

In the 2012 edition of *Gaining ground in the sands*, we concluded as follows: “If market opportunity is removed or frustrated or the social license to operate is revoked, our ability to plan for an independent, prosperous and sustainable Canadian society falls increasingly

into uncertainty.” As of today, given current uncertainty over Keystone XL, the degree of inter-provincial gamesmanship being played out over Northern Gateway and the level of rancour that so often appears specifically in the energy debate, never before has the future of Canada been quite so uncertain.

It doesn't have to be this way.

In this year's *Gaining ground in the sands*, we look broadly at the question of market access for oil sands and consider 10 individual trends that may be obstacles or opportunities, depending on one's point of view:

1. The national interest
2. Fair market value
3. Productivity
4. The symbiosis of juniors and independents
5. Consumer energy literacy and national unity
6. Maximizing value
7. Pipelines v railcars
8. Ethical oil
9. Collaboration
10. National energy strategy

Our view is that they are both – obstacles we believe we can overcome and opportunities we believe we can seize.

It won't be easy – genuine progress rarely is. But, not only to preserve but also to build our nation, we believe the way forward begins with energy.

Thanks for reading.

Geoff Hill, PhD
Oil & Gas sector leader
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1 The national interest

Whatever our politics, we're all Canadians

As a former U.S. president is known to have remarked,
"It's the economy, stupid."



In their joint "case against the Northern Gateway pipeline and tanker project,"⁵ environmentalist organizations Environmental Defence and Forest Ethics take the following stance: "The federal government and oil lobby have been on an aggressive offensive to try and convince Canadians that the proposed Enbridge Gateway tar sands pipeline across Northern B.C. is in the 'national interest', while smearing those opposed to it – including citizens, environmental groups, First Nations and Municipalities." It's a position taken in direct opposition to Federal Natural Resources Minister Joe Oliver's January 2012 accusation that "radical groups" were trying to "hijack" the regulatory process and "impose" an "ideological agenda" that would block market diversification for oil sands.

But put the two together and you're left with a lot of emotionally charged language and exactly no progress made on an issue that should be approached with all possible reasonableness and restraint.

In our view, it is a serious mistake to generalize one way or the other. We agree that dedicated attention to environmental concerns is critical to responsible oil sands development – in fact, we do risk management and assurance work on public sustainability reporting for oil sands companies and have seen the improving results for ourselves. But we also believe it's long past the time we can all move to the woods and live directly off the land, so to speak, even if we wanted to. Energy has become central to our entire way of life. And not to oversimplify, but it's no mystery why a central feature in the platforms of almost all political campaigns is employment – jobs are not just what people want, they're what we *need*.

But we also need the economic stability of a growing economy to support those jobs.

The situation in Canada is such that economic growth is increasingly restricted by our overwhelming reliance on the U.S. market. We need to diversify. And while that means markets for more than oil, the fact is our oil industry is exceptionally well positioned to diversify and expand. It's also no secret that many of the skills most needed by the energy industry are in short supply in this country, which puts expansion plans at risk.

And that brings us back to employment.

We're working very closely with oil sands producers to enhance their individual workforce management practices and have published multiple strategy recommendations in reports such as this one. In *Gaining ground in the sands 2012*, we argued that overcoming shortfalls in labour supply was the single most immediate challenge facing oil sands producers and we identified a number of areas in particular need of work. We followed that up with *Balancing the people equation*, where we undertook to elaborate specifically on a range of collaborative options that industry, governments, academia and communities should consider to address labour challenges directly.

The course of progress is forward, not back

This isn't just about jobs, though. But just as most Canadians are concerned about finding a job, keeping the one they have or maybe finding a better one, so too should they care about these issues. We can't turn back the clock; we can only endeavour to make it run on time.

Development of the oil sands is in the nation's interest precisely because it enables so much activity throughout the economy:

- \$2.1 trillion in economic benefits, including \$783 billion in taxes to be paid over the next 25 years;
- Approximately 905,000 jobs by 2035 (almost 22,000 in Fort McMurray alone in 2011);

- Some \$5 billion per year in supplies and services spent outside Alberta, with concentrations in B.C., Ontario and Quebec.⁶

Of course, development must be responsible and sustainable, both financially and environmentally: just as producers and other investors expect a return on their financial investments, the public at large expects a return on their investment of the social license to operate.

However, were that license to be revoked, none of that economic activity is going to replace itself. That's why we agree with the Asia Pacific Foundation on this, which notes: "Government revenues generated from the [energy] industry – close to \$22 billion in 2011 – provide indispensable support for the social programs Canadians value."⁷ Thus a key question for opponents: How exactly would you make up the loss?

But we are not advocating a zero sum choice between two worldviews where the oil sands either has free rein or is shut down altogether. We are advocating an alignment of otherwise competing interests to support one interest – our nation.

In other words, we are trying to stand *for* something, not against it. But we never said it would be easy.

2 It's about fair market value

Let's not obscure the issue

The Canadian economy loses millions of dollars every day to the differential at which oil sands trades against WTI. In order to reduce this spread, expanding oil sands production must be able to find its way to the U.S. and/or to Asia and other world markets. Both Keystone XL and Northern Gateway are critical to realizing this goal.

It has been well documented and is, accordingly, well understood that crude oil produced in Western Canada sells at a discount to West Texas Intermediate (WTI), the benchmark for oil sold in North America. According to analysts at CIBC, Edmonton Par will trade at an 8% discount to WTI through 2014. For its part, WTI has also been selling at a discount to other global benchmarks, in particular Brent from the North Sea and the OPEC Basket price. According to the U.S. Energy Information Administration (EIA), the Brent-WTI spread averaged some \$19 per barre in August 2012 and between \$13 and \$19 for the previous five months.⁸

At 1.7 million bpd, that's about \$27 million in lost revenue. Again, every day. If bottlenecks at Cushing, Oklahoma are relieved, as the plan to proceed with the leg of the Keystone XL pipeline between Cushing and the Gulf Coast is likely to do, we expect that loss to decrease to closer to \$10 million.

Trading against Brent is the preferred situation for oil sands, but it's our view that this is most likely to occur only if we are able to end our singular dependence on the U.S. market (which may yet shrink, given rising new production of shale oil) or otherwise dramatically increase the volume of oil

we ship there. To fetch global prices, in other words, we need to be playing on the global field. This will require continued expansion of the pipeline network, optimization of that network and, likely, increasing the use of rail cars in the interim.

Indeed, it is our contention that Canada will prove unable to maximize the economic value of crude oil production if access is not increased either to the West Coast or the U.S., but especially to the West.

Existing pipeline capacity to transport crude from Western Canada to Cushing, Oklahoma is close to equilibrium with supply. It is estimated that full equilibrium will be reached within a couple of years at most, thus further deepening the discount. Keystone XL, if approved in full, will help reduce the spread, as will the reversal of the Houma-Houston line ("Ho-Ho"), a 300 thousand bpd pipe whose reversal will move production from the Eagle Ford, Bakken and Barnett shale regions to the Gulf Coast.

But will they be enough?

Both the Northern Gateway and TMX projects will allow producers increased exposure to Pacific Rim clients. And while some of the crude that makes its way west could be sold to California, the associated debate tends to focus on Asian destinations. The Fraser Institute argues, for instance, that, while the U.S. could conceivably absorb all Canadian crude exports for the foreseeable future, there remains “a significant opportunity cost associated with not developing alternative market relationships in Asia because of the higher prices that appear to be available there.”⁹ That’s before factoring in the political and economic risks of our dependence on a single market.

For its part, the School of Public Policy at the University of Calgary says that new pipeline capacity and more efficient access to international markets could yield “up to \$131 billion to Canada’s GDP between 2016 and 2030 [. . .] over \$27 billion in federal, provincial and municipal tax receipts, along with an estimated 649,000 person-years of employment.”¹⁰

What’s good for the goose

A report by the Natural Resources Defense Council makes the surprising claim (for an environmental organization) that Keystone XL “is likely to both decrease the amount of gasoline produced in U.S. refineries for domestic markets, and increase the cost of producing it, leading to even higher prices at the pump.”¹¹ It’s surprising because, in general, environmental organizations have

been both in favour of higher oil prices as a trigger to spur the development of alternative and renewable energies and against more domestic fossil fuel production.

The fact is it’s true the price paid for oil sands crude will increase. Whether that affects the price at the pump for U.S. drivers, however, isn’t really our concern. Let’s not forget that Canadian drivers already pay more for gasoline than do our American counterparts, and the fact that most of the difference can be attributed to taxes is irrelevant to the matter at hand – that oil sands producers do not receive full market value for their product, which puts a key driver of Canadian prosperity at risk.

Besides, if driving is more privilege than a right, surely the same is true of “low” gasoline prices.

Of course, no one wants to pay more than they have to for anything, but, as the example of the National Energy Program (NEP) shows, free commodity markets tend not only to be more free but also more fair. In any case, there is no silver bullet for this problem. Improving our access to all markets and the realization of fair market value for oil sands crude, both within North America and beyond, will require multiple solutions.

3 Oil sands for productivity

Narrowing the gap

Canada is among the least productive of the OECD nations, and while our oil and gas sector outperforms other countries on this score, productivity in the sector has nevertheless been generally negative. Much of that can be attributed to high levels of investment in recent years, which skews results downward. As the fruits of that investment ripen, productivity gains will be made. But there's work to do, just the same.

Over the past two years, Deloitte has undertaken a considerable amount of research into the “productivity gap” – the growing disparity between productivity (defined as the average value produced per hour worked) in the Canadian and U.S. economies. At basic parity in the early 1980s, today Canadian output per worker is only 86% of American output. Indeed, our research shows that Canada performs in the bottom quartile of OECD nations – with annualized productivity growth of 0.7% from 2001-2009, Canada continues to lag both traditional comparators such as Australia (1.1%) and other small economies like Israel (1.3%) and Austria (1.4%).¹²

Interestingly, however, productivity growth in Canadian mining, oil and gas sectors outperformed their U.S. counterparts by 1.6% between 2000 and 2008 (the most recent years for which there is appropriate data). That said, productivity in these sectors in both countries was still negative (-9.5% in Canada) and, owing to the growth of mining, oil and gas as a component of Canadian GDP (they combine for 10.25%), overall productivity in these sectors remain a drag on the Canada-U.S. productivity gap.¹³

But the situation – at least as far as the oil and gas sector is concerned, if not the overall Canadian economy – is anything but doom and gloom. Indeed, the oil and gas sector is a special case in the productivity equation owing to the unusually long lag times between investment and operation. In particular, although productivity is generally defined as the dollar value of output produced by the average hour of work, in oil and gas especially it is also affected by the price of a unit of output (i.e., the price of oil), the cost of the inputs required to produce that unit (e.g., labour, investment into machinery, etc.) and the number of units produced in an hour.

The simple truth is that, while higher commodity prices improve the price of output, higher investment, operating costs and even lower natural gas prices have created downward pressure.¹⁴ Oil prices, while volatile and subject to the vagaries of the global commodity markets, have been trending upwards for years. The price of Edmonton Par, for instance, has seen a compounded annual growth rate of 11.2% from 2000 to 2011. Meanwhile, capital investment rose 13.5% annually between

2000 and 2007 while operating costs have also climbed, a function of the gradual shift away from conventional oil production in favour of oil sands.

Here's the good news: despite a current net negative for productivity, the situation in oil and gas is that the close to \$100 billion invested in the oil sands over the past decade has driven both innovation and jobs growth. What this means is that the current drag on productivity is simply a short-term phenomenon that can be expected to reverse trajectory in the coming years. There's even a precedent: investments made in the 1990s to develop resources offshore of Newfoundland now pay significant dividends, giving that province the highest productivity growth rates in the country (5.85% from 2000-2010).

Go bold

"Canada's problem," we say in *The future of productivity: Clear choices for a competitive Canada*, "is that while our country is a great place to launch a high-potential business, it's a very tough place to make it grow. Growing companies of all types are most likely to produce strong productivity results – and we don't have nearly enough of these."¹⁵ We go on to make a number of recommendations covering academia, government and business based on our conclusion that productivity growth is principally a function of individual company growth.

For academia, we are principally concerned about the extent to which we have proven adept at commercializing on our research efforts. Where Canadian science and engineering academics are thoroughly competitive in publishing, they are much less so in the development of saleable intellectual property. Universities, we think, should see

themselves as part of a larger system that fosters the commercialization of new ideas and develop a corresponding curriculum that supports productivity growth.

For governments, we recommend encouraging foreign direct investment; improving the responsiveness and flexibility of the immigration system; providing incentives for companies to grow rather than for being small; expanding trade; and fostering fact-based decision-making.

For business, our productivity enhancing recommendations include both national and international expansion; leveraging new capital equipment; investing in talent; creating more clusters; and, finally, not just inventing but regularly *reinventing* themselves. For oil sands companies in particular, focused attention on continuous improvement through the implementation of, for instance, the waste-reduction principles of Lean or the targeted use of analytics tools to enhance everything from workforce planning to safety management will be key to maintaining and even improving the pace of development.

The example of Newfoundland offshore shows that, in order to narrow the productivity gap, we have to ensure that the investments being made today come to fruition. In general, our research in this area proves we are not limited by anything except our attitude.

4 Recipe for success

The innovation of the nimble and the courage to grow

Independents count on the juniors to be innovators; the juniors count on the independents to throw their weight into major projects. It's win-win.

The central conclusion in our work on the productivity gap is that productivity gains occur irrespective of the relative size of companies or what sector they're in but are a function of whether companies of all sizes and across all sectors are growing. It's actually pretty simple: in Canada, "43% of new jobs come from the fastest growing 4.9% of all firms."¹⁶ That's a problem. Furthermore, Canada, while competitive with other OECD nations in terms of producing fast growing companies under five years old, is not as proficient in sustaining the growth of those companies as they age. Evidence points specifically to risk aversion, low export activity and weak R&D spending as the primary drivers of this deceleration of growth.

To the extent, then, that junior oil sands companies are interested in growth and longevity (as opposed to the more short-term objective of establishing sufficient value to attract a buyer), they are largely dependent on the more established and larger independent companies to take the lead and set the tone. The independents, meanwhile, count on many of the juniors for their nimbleness and their tendency to be innovators.

However, given longstanding and well-publicized challenges, even the large, independent companies may be forgiven for lack of growth. The oil sands sector in particular continues to operate in a climate of uncertainty and volatility, where access to

their one existing market is at risk and questioned at almost every turn; where efforts to reach other, eager markets are stymied by inter-provincial rivalries; and where appropriate environmental legislation continues to lag, frustrating not just environmentalists but the industry itself, which depends for investment decisions on clear rules of engagement.

It's further evidence of an economy that isn't working as well as it could.

Put it this way: relatively small companies can't afford to backstop major infrastructure projects like the Northern Gateway or Keystone XL pipelines. The big guys have to do it, and even if they are driven by their own self-interest, the effect is nevertheless a positive one for the juniors. It's a greater good.

The resources sectors, in particular, depend on this dynamic, where small inventors of niche technologies need, for growth, the scale of deployment only large producers of the resources can provide while both the juniors and the independents need regulatory environments that recognize and encourage investment in research and development. As we noted in *The innovation imperative*, however, the 2012 federal budget sent mixed signals in this area – while cuts in R&D credits will provide only negligible savings to government over the long term, the \$200 million in announced agency funding would continue the "interventionist approach

whereby government attempts to pick winners that many believe is a major reason why Canada lags the world in converting R&D investment into profit.”

One for all

The emergence of Canada’s Oil Sands Innovation Alliance (COSIA) in March 2012 to accelerate the pace of improvement in environmental performance underscored not only the importance to the sector of solving its environmental challenges but also the sector’s increasing appetite for collaborative enterprise. While the members of the Alliance are all major independent operators, we believe the advantages of their union is nevertheless sure to redound to the credit of the entire industry, not to mention the province of Alberta and all of Canada. But even if COSIA hadn’t been formed, in our view, the single greatest opportunity to strengthen the symbiosis between oil sands juniors and independents involves Alberta’s Climate Change and Emissions Management Fund (CCEM).

In 2009, oil sands accounted for 37% of greenhouse gas (GHG) emissions in Alberta. That was a total of 49 megatonnes (Mt) out of 113 across the province’s industrial sectors and followed an average reduction in emissions intensity (i.e., per barrel of oil) of 29% since 1990. Alberta’s Climate Change Strategy calls for industry-wide emissions reductions of 50 Mt by 2020, improving to a total reduction of 200 Mt by 2050. Regulations that took effect in July 2007 require facilities with more than 100 thousand tonnes of annual GHG emissions to reduce the intensity of those emissions by 12%, whether by improving operational performance, buying offset credits

or paying \$15 per tonne above the limit to the CCEM Fund.¹⁷ According to Alberta Environment and Sustainable Resource Development (AESRD), the fund had collected \$257 million as of September 2011 and had committed close to \$126 million in 27 projects covering energy efficiency, renewable energy, clean energy and carbon capture and storage. “Combined,” says AESRD, “these 27 projects are expected to produce a total emissions reduction of 2.3 [Mt] per year or 23 [Mt] over 10 years.”¹⁸

Those reductions, however, are less than half of the 50 Mt Alberta wants to cut by 2020, roughly the same timeframe. In order to continue with the “greening” of existing production and “expanding our use of alternative sources of energy, including wind and solar power, hydrogen and geothermal,” the CCEM will need to continue to grow. While we don’t advocate for anything but a fair, market-based price on carbon, even if the current per-tonne price of \$15 were to rise, we see a clear line leading from that price, through the value and utility of the Fund and on to future benefits for the sector, for the province, for the country and for the world. We invite oil sands leaders to see this line, as well.

Indeed, as we said last year, “oil sands leaders should be working to be understood as real stewards – leaders with interests far bigger and broader than their own.” The CCEM Fund and its ability to support the little guys as well as the big should be treated as a key mechanism for future oil sands innovation and all-around operational improvement.

5

Our own worst enemy

Consumer literacy and national unity

Canadians have to meet the challenges of oil sands production, not the Americans or the Chinese or anyone else. This is our resource, and it should be bringing us together, not driving us apart.

Many teeth were gnashed over the Obama administration's decision not to approve the Keystone XL pipeline. It was a decision made within the context of U.S. domestic politics and the rise of shale oil and gas production, which has finally brought the prospect of U.S. energy independence into clear view.

Fundamentally, the challenges of oil sands production and consumption are no one's but Canada's – indeed, Alberta's – to overcome. As the Senate Standing Committee on Energy, the Environment and Natural Resources declares in its July 2012 report, *Now or Never: Canada Must Act Urgently to Seize its Place in the New Energy World Order*, "Canada can no longer rely on the view that our neighbour to the south will always be a willing buyer of Canadian energy commodities."¹⁹

Canadians are known for compromise, and that is unlikely to change. But most of the needed compromise we see going forward is amongst ourselves, less so with the rest of the world. That's not to say we should be pursuing a swaggering approach to international energy relations, bragging about being an "energy superpower" without actually walking the talk. Indeed, if the definition of an energy superpower is "hav[ing] enough control over its abundant natural resources to be a price setter" while

also being "willing and able to use this power to extend its influence beyond a regional market to a global one," Canada fails the test.²⁰ We can't even build a pipeline between two provinces in order to reach global markets without going through years of internal disagreement, some of it unnecessarily sensational. On the other hand, it seems especially inappropriate to navigate by the sensibilities of some foreign non-profit group or Hollywood celebrity.

At the conclusion to *Balancing the people equation*, we assert: "industry really does have to continue to make the environmental gains it has promised to make and opponents really do have to inform themselves as best they can of the relevant facts." Nothing has changed in our thinking on that front. Accordingly, we agree in principle with the Senate committee's call for a Canadian Energy Information Agency, even if the formalization of such an agency is only to serve the fairly straightforward task of aggregating and helping to promote awareness of, and collaboration among, the many sources of relevant information that already exist, such as CERI, the Centre for Energy, the Energy Council of Canada (ECC) and the National Energy Board (NEB).

When it comes to understanding, more is more

More to the point, we agree that a more comprehensive approach to energy education and literacy needs to take root in this country, beginning with the public K-12 system. Knowledge is, after all, power, and the best decisions are always those that emerge from good information – whether you’re on the producing or the consuming side of the energy equation.

But information is not enough, which is why we have also recommended (in, for instance, *Gaining ground in the sands 2012*) that industry in particular pay greater attention to evidence-based communications approaches (such as the Canadian Association of Petroleum Producers *Dialogues* initiative, which it should continue) that seek to truly understand the challenges of given contexts rather than rely on too-general mass messaging or accounting of raw facts.

We are interested at least as much in the future of Canada as we are in the future of any one sector. We also believe that more unites us as Canadians than divides us and that the future of Canada matters to us all. If we disagree about the specifics, let’s talk about it.

And then let’s *do* something. We have, after all, done it before.



6 Maximizing value

Getting more gold from the black

One way in which the oil sands can protect its social license to operate is to ensure more value is added to the product before it is shipped to consumers. But is the most advantageous means of adding value a new refinery in British Columbia or more upgrading in Alberta?

When publishing magnate David Black proposed in mid-August 2012 a \$13 billion refinery for Northern B.C. to process the crude oil that would flow through an eventual Northern Gateway pipeline, he took the industry by storm. To say that it was surprising would be an understatement, and the proposal not having any formal support from strategic partners or investors at the time of its announcement speaks to fundamentals in both the global and Canadian refining and upgrading landscapes.

Studies have shown that most of the growth in refining capacity in the next 25 years is likely to be in Asia Pacific. China and India in particular are planning to add refining capacity over the next 10 to 20 years, supported by policy incentives such as duty free crude imports and the creation of special economic zones with significant tax breaks in India and a new pricing regime to guarantee refinery margins at certain crude oil prices in China.

Refinery capacity in China and India is also expected to consolidate and become more economical thanks principally to the larger scale of both recent and planned construction

since the 1990s. Additionally, small existing refineries (below 40 thousand bpd) in China are expected to close or consolidate as they become uneconomic.

More to the point, Asia Pacific's refining capacity, including secondary process additions, will be suitable for oil sands crude. They're *already doing it* and have proven to be more efficient at it, as well. For instance, a global increase of 5.8 million bpd in desulphurization capacity is expected between 2010 and 2015; almost 50% of this new capacity will come from Asia Pacific. Capacity of secondary processes, meanwhile, is being added in Asia Pacific at a faster rate than primary distillation capacity.²¹

But there is still the question of whether it actually makes sense to ship diluted bitumen (dilbit) from Alberta rather than synthetic crude oil (SCO), largely because of the extra pipelines, ships and loading facilities required to return the diluent to Alberta. Some research has indicated that Northern Gateway as currently proposed is "wasteful of \$3 billion dollars in pipeline capital and likely a similar amount if not more needed for the construction of ocean tankers that would not

otherwise be constructed.”²² It also suggests that “the construction of 4 pump stations could be totally eliminated and the number of 5,570 HP pumps could be reduced to 9 from 44. The number of large storage tanks at Kitimat could be reduced to 7 from 14.”²³

Decisions, decisions

Until mid-August, neither the U.S. nor Canada was expected to add significant refining capacity in the next 5 to 10 years. For its part, David Black’s proposal doesn’t change the fact that refining margins are being squeezed due to external pressures, including requirements for the expanded use of biofuels, transport fleet efficiency and carbon emission regimes.

In contrast, capacity expansion in China and India is being supported by policy incentives and favorable tax treatment, as discussed. The one area of capacity growth in North America is in the U.S. mid-west where deep conversion facilities are being installed to leverage Western Canada crude.

The fact is that building additional refinery or upgrading capacity in Western Canada is uneconomic for a number of reasons. First, that Western Canada is not located close to a large market for refined products. Western Canada is also disadvantaged compared to the U.S. Gulf Coast owing to the lower cost to build upgrading or refining infrastructure in the U.S. Gulf Coast than in Western Canada and because refineries in the Gulf are already able to process heavy crudes based on a diet of product from Mexico and Venezuela.

In the heady context of nation building, however, Black’s proposal should not be dismissed outright. Jobs would indeed come with the construction and operation of a new refinery, along with an associated influx of economic activity that could help balance out the level of reward B.C. would receive for taking on the liability of approving Northern Gateway. For that matter, it does not have to be a refinery and it does not have to be in B.C. Make it an upgrader in Alberta, possibly in a joint venture with B.C., and it really starts to make a lot of economic sense. It all depends on how you balance the books. For us, it also comes down to assuming a holistic perspective, beginning with an economic analysis of the social and induced benefits of upgrading and refining investments in both provinces as compared to the U.S. Gulf area or China.

For now, these are merely proposals that could conceivably aid in a significant way with earning the social license to operate. They might be the best ideas economically, independent of specific provincial interests, or they might not. But the country owes it to itself to take them seriously, just the same.

7 Pipes vs rail

All aboard?

Although the oil and gas industry appears to be coming full circle in its product transportation history by returning to rail cars, both the economics and the safety record of rail compared to pipelines makes rail a limited and short-term solution at best.

While a resurgence of interest in using rail cars to ship bitumen either East or West effectively completes a circle in the history of oil transportation, given current constraints and hurdles to pipeline expansion or new development, the prospect is proving to have some economic merit. But only in the short-term.

Let's consider.

Transportation via pipeline is significantly cheaper than rail. Cost estimates of \$6-8 per barrel by rail compare to only \$3-6 by pipeline from Edmonton to the west coast of Canada.²⁴ Pipelines have greater volume capacity than rail and require neither additional loading and unloading infrastructure nor additional storage capacity. Rail also requires large volumes of traffic to transport bulk loads, which may be an issue in already congested areas. Despite the frequency with which they have been in the news for spills in the past year, pipelines nevertheless have lower environmental and safety risks and impacts than rail, not the least being noise and level-crossing accidents owing to rail's adjacency to communities.

Rail, much more so than pipelines, has finite capacity. This means, among other things, that petroleum would have to compete with other sectors, especially those whose products are completely dependent on the rail option (e.g. grain, coal and other minerals and ores). Finally, rail service struggles to meet the ratability requirement for refiners.

However, we believe that rail does pose a potential interim solution for crude or bitumen and diluent transportation, especially as a means to handle supply fluctuations, for the following reasons. Firstly, that there is a shorter lead time to establish rail routes, assuming carriage availability and existing handling infrastructure. Secondly, that the regulatory barriers and timeframes associated with rail are shorter than for pipelines. For example, regulatory hearings on Northern Gateway commenced in January 2012 and are not expected to be complete until December, 2013. And that's before the three-year construction process. Meanwhile, one Eastern refiner is already transporting feedstock crude from Western Canada by rail.

In addition to these principal benefits, rail offers a number of specific advantages over pipelines:

- Preserves product specifications (compared to pipelines where quality can degrade in transit)
- Does not require long term commitments from shippers except at volume
- Enables transportation of bitumen in heated railcars, rather than the need to blend with diluent
- Can boast faster transport times than pipelines (~10x faster)

But the long-term cost, ultimately, will prove prohibitive. According to the CAPP²⁵, one rail provider estimates that an addition of 20,000 railcars to its fleet, at an average \$100K per car, would allow them to ship 2.6 million barrels per day to the West Coast – a little more than the projected increase in production over the next ten years. That’s \$2B before even accounting for labour costs and other factors, such as the per-barrel rates noted earlier and the need to erect appropriate terminal facilities. Less, certainly, than Northern Gateway’s \$5.5B price tag, but, all things considered, arguably no more realistic.

One way or the other

No option is perfect and, anyway, the world, as actor Paul Provenza once put it, “is not made of Nerf. It has sharp edges and you will get cut, but not too deep if you’re careful.” There is, in other words, an element of risk in everything we do, and a certain volume of oil is going to go west, almost certainly more than what already does. Companies trying to decide where to place their bets will benefit from investment in advanced economic modeling and analysis and should be paying especially careful attention to demand forecasts for products that already depend on rail because they simply cannot be shipped via pipe, such as potash, coal and grain.

In the final analysis, rail is at best an interim solution to oil sands transportation capacity constraints. To maximize the resource’s potential, we are simply going to need more pipelines.



8 Ethics of oil and opposition

Means and ends

Except for the fact that we are market constrained, Canada is an oil importer's dream. If only we could believe it ourselves.

The notion that oil produced in Canada is more "ethical" than oil produced in many other regions of the world seems to have caught on – in principle if not in exact terminology. The argument goes like this: all things considered, it is both wrongheaded and frivolous to focus negative attention on the oil sands sector – a sector that is continuously trying to respond to its critics in good faith – when there are so many oil-related grievances in the world that go almost completely unchecked.

A key pillar in the argument is that the sands receive as much negative attention as they do because they are located in a jurisdiction that not only tolerates dissent but welcomes it. In other words, while the rights of anti-oil sands groups to express their views and act on their convictions (within legally-defined limits) are perfectly legitimate, those actions have consequences just the same. And the principal consequence is that oil not sourced here will be sourced elsewhere, possibly from a region with a poor track record of observing the full range of human rights and environmental considerations that are part and parcel of any political economy.

To believe otherwise would seem to buy into the false notion arguably borne out of the early days of oil exploration where people like John D. Rockefeller intentionally and aggressively set out to create the monopoly that became Standard Oil prior to its dissolution in 1911 on anti-trust charges.

And that notion is this: oilmen are *de facto* "bad" people.



Move ahead

The discomfiting case seems to be that, more than one hundred years later, the grievances of the Standard Oil era seem hardly to have abated, despite clear and effective progress on pretty much every relevant front. Maybe it's because of the 24-hour news cycle and the rise of social media, which effectively gives everyone a platform to raise their voice on any issue and join the efforts of environmental organizations and other well-coordinated and professional opposition.

The exception, of course, being those places where state censorship stifles all meaningful dissent or where economic standards are too weak to enable access to modern technologies in large numbers. And that's the point of the ethical oil argument – it's a call for perspective, to remind those of us who thrive in industrialized economies that we take a great many things for granted, because we can.

Just the same, none of us should be resting on our laurels. In industry's case, where most attention is focused, investment in analytical tools and other methodologies to evaluate carbon footprint, timely and transparent reporting on all facets of operational performance and ongoing dialogue with communities and other stakeholders will all continue to be critical to ensuring that Canada oil remains ethical.

The fact is it's really a case of degree as well as kind. And, on both scores, Canada comes out ahead. We have to keep it that way.

9 Collaboration

The way forward is together

Collaborating effectively, especially in a competitive environment, is fraught with complications and is prone to false starts. To help optimize results, we've developed a handy seven-step process.

We continue to believe fully in the power of collaboration, which we've been talking about in a serious way since at least 2008 when we published *Producers Dilemma II: Managing development in a world of scarcity*. The central conclusion of that study, which was based on game theory and benefited from the direct involvement of industry and the Alberta government to explore questions of sustainability in oil sands production, was that collaboration would optimize an outcome that seemed otherwise destined to lead to diminishing oil sands development with more value addition occurring outside the province.

In our view, that was also going to lead to a diminishing quality of life, generally, for all Canadians.

Nor was it a simple qualitative inference; rather, it arose from the application of complex mathematics to the stated preferences and strategic considerations of the study's participants. We are, clearly, in favour of and committed to oil sands development, but the *Producers' Dilemma* study and others we have completed since also demonstrate that we are equally committed to the responsible and sustainable progress of that development.

And, frankly, so are industry and both the provincial and federal governments. None of us can afford not to be. The real challenge, of course, is how to do it – how to work together in a fundamentally competitive environment to everyone's mutual benefit.

As it happens, we have a view on that, as well.

First articulated in a paper we published late in 2011 called *Cooptimization: Optimizing collaboration in a competitive environment*, we believe that, while collaboration cannot solve every challenge, for those that it can, "a combination of common purpose, significant effort and executive support at higher levels" will be required. In particular, we hold that the benefits of collaboration can most readily be had in cost reduction efforts, especially with regards to logistics, R&D and business processes.

More specifically, we have developed the seven-step process described below not simply to enable effective collaboration but to *optimize* the collaborative effort – improving it with the best and *most efficient* possible results for all involved. The process is presented in a sequence such that each step must be taken prior to the next if the overall effort is to have optimal success.

1. **Alignment around a common need or prize**, where the recognition of a need is “pressing, significant and likely obvious to at least more than one person in more than one organization.”
2. Identification and involvement of **invested champions**, at least within the organizations considering the collaboration but possibly also in third-party solution providers. These individuals are “most often unsatisfied with the status quo and tend to believe that doing things the same old way will get the same old results.”
3. A **window of opportunity** that brings the common need or prize into sharp relief must also be present. For industry, this might be market related or it might result from a regulatory directive like Directive 74, which led to the formation of the Oil Sands Tailings Consortium (OSTC).
4. A **sense of urgency and importance** is critical, regardless of how wide the window is open, especially since we tend to “prioritize what will get done on the basis of importance (i.e., size of the prize) and urgency (i.e., now or never).”



Many excuses *not* to collaborate have been put forth. Here are the four most common:

- Help unwanted** One or another (or both/all) potential collaborator believes its processes and systems are comparatively much more advanced, such that collaboration would be seen as a step backward for the one but a large step forward for the others.
- The vault** Believing that your organization has expertized all the high-value opportunities and that you have proprietary knowledge that must be protected.
- Me first** Opting for total control over the setting of priorities and timing available more fully through inter-stakeholder collaboration within the organization.
- Been there, done that** Have tried collaborating before (e.g., “Facilitating Megaproject Excellence”) but did not net a satisfying return on investment.

From *Cooptimization: Optimizing collaboration in a competitive environment* (Deloitte, 2011)

5. Once these four steps have been taken, **top-level executive support** will then need to be secured, which would come in the form of “a charter, objectives, resources and a commitment to remove barriers [see sidebar] and challenge the organization to be successful.”

6. **Compatible values** then become the make-or-break condition. Achieving traction on best practices and maintaining high standards is most effectively accomplished when the cultures of participating organizations are similar.

7. Finally, collaborating organizations will need a **transparent method for dealing with proprietary matters**. Only if both (or all) organizations are at roughly the same starting point in terms of their existing investment in the issue can this step be dispensed with. Either way, however, we believe “the best intentions of champions, their senior executives, or the implementation team itself will be thwarted and the [. . .] initiative will simply fail if [proprietary] matters are not addressed, documented, and enforced.”

In addition to these ideas, see our report *Balancing the people equation* for recommendations on specific ways collaboration can be better leveraged to solve the challenges of skilled labour shortage. It’s safe to say we genuinely believe in this approach.

Oh my, Canada

The research in our *Future of productivity* studies shows that only 23.3% of well-established Canadian companies are likely to collaborate with public institutions such as universities or government agencies, the second-lowest ranking in the OECD (Australia is last).²⁶ More than anything, and combined with Canada’s lack of leadership in private sector investment in R&D, this gets at the heart of why Canada is recognized for being an excellent place to start a business but a difficult place to grow one: we just don’t invest as much as other countries in growth and innovation. Of course, we could change that – but, like so much else, it would mean changing it together.

Sounds good on paper, doesn’t it?
Why not in action?

10 National energy strategy

Has the time come?

Discussion today of implementing a “national energy strategy” is not a repeat of the Trudeau-era National Energy Program, nor should it be. It’s time to move on from the fears and resentments of the past and focus on the future.

Talk in Alberta of a Canadian national energy strategy invariably leads to discussion, often resentful, of the Trudeau-era NEP, which endeavoured to increase both Canadian control and Canadian ownership of the energy industry and to protect Canadians from surging oil prices. Federal tactics to accomplish these goals amounted to price controls and federal taxes on oil and gas production.

The program was rife with unintended consequences that effectively decimated an enormous amount of capital in Alberta (estimates range between \$50 and \$100 billion) and led, directly or indirectly, to a bankruptcy increase in the province of some 150% after the program took effect.²⁷

It’s little surprise, then, that the current debate should lead to concerns over a repeat of history. But it seems to us that practically no one who is considering this issue seriously will have forgotten the mistakes of the past.

Especially notable is that arguably *the* leading voice for such a strategy is the current premier of Alberta itself, Allison Redford, who called in November 2011 for an “integrated” discussion on the “use of energy.” She was rebuked by many of her counterparts across the country for the remarks (mostly on the basis that they were too vague). The most recent and very public inter-provincial disagreements over Northern Gateway are just the latest in this ongoing saga.



We are encouraged that the leader of the one province that was most affected by the NEP is standing up for what would be a project that brings the country together rather than drives it apart. Especially considering the resentment and suspicion about such endeavours that continues to lurk in the hearts and minds of many of her constituents.

What if it *could* build a nation?

The devil is, as ever, in the details. From our perspective, a new and viable national energy strategy would have nothing to do with price fixing. Nor would it revolve around the oil sands, fundamentally recognizing the broad richness of Canada's resource endowment and the regional concentrations of particular resources (e.g., natural gas in B.C., oil sands in Alberta, uranium in Saskatchewan, hydro-electric power in Quebec) while also accommodating such decidedly non-regional matters as the smart grid; solar, wind and geothermal energy; conservation efforts; and taxation regimes.

Maybe it would pursue opportunities to improve energy diversity and independence by encouraging investment in the infrastructure needed to make broader use of all the newly available natural gas – in vehicles, for instance.

It would almost certainly require resolution of the evident uncertainty of whether we are trying to be (or even want to be) a "superpower" or possibly a "superstore." An effective national (call it *pan-Canadian*) energy strategy would also be consultative and, yes, "integrated" in that it would leave no one out of the consultation. It would mostly, and simply, seek to articulate clear thinking around how all stakeholders can contribute to better innovation, education and both environmental and tax policy. It wouldn't necessarily be enshrined in law.

Confederation imbues Canadian provinces with a significant degree of power, and while the last thing we recommend is anything like a planned economy, we recognize that there's at least something to be said for the nimbleness and resolve that such economies often demonstrate. In terms of the legacy of the NEP, our view is that it really is time to move on. Yes, we should remember the past so that we don't repeat our mistakes, but let's not continue to mire this issue in analysis paralysis, dredging up the past principally because we still feel old wounds. That was a different time, in some ways a different place. The world is much more interconnected today, for one.

Mightn't Canada be more interconnected, as well?

Where
else to go?

In the binary terms of *yes or no* and *black or white*, we know infinitely more about what is most likely to happen if we continue to pursue oil sands development with fully developed attention on critical challenges than if we just stop pursuing it altogether, as those most opposed to development advocate.

The significance of oil to the basic workings of industrial civilization cannot be overstated. And whether this fact alone is the source of untold distress in our communities, the reality is we are indeed all members of a national community that has grown as strong and diverse as it has in large part because of oil.

Just like every other country with a developed economy.

That isn't to promote an attitude of ignoring alternatives to fossil fuels – which are, ultimately, on a human scale, finite – or not striving, at heart, for total elimination of environmental disruption. Impossible, perhaps, but it's like studying not just to pass the test but to get an A. And the worst failure is not to try at all.

For us, it's ultimately not about being against something, it's about being *for* something. Responsibly, respectfully and in good faith.

These are, to be sure, the most complex of challenges. In our view, the constructive argument is really over *how* to develop the oil sands (ideally in the context of nationwide impact while fully recognizing provincial and aboriginal ownership rights), not whether or not to develop them at all.

Let's keep talking.

Endnotes

1. Government of Alberta. *Energy Annual Report 2011-2012*. www.energy.alberta.ca/Org/Publications/AR2012.pdf. Accessed 08/22/12
2. Canadian Energy Research Institute. Study 128. "Canadian Oil Sands Supply Costs and Development Projects (2011-2045). March 2012.
3. Energy Resources Conservation Board. ST-98 2012. "Alberta's Energy Reserves 2011 and Supply/Demand Outlook 2012-2021"
4. Environmental Defence. "Our Nation, Their Interest." <http://environmentaldefence.ca/reports/our-nation-their-interest>. Accessed 07/09/2012
5. Ibid.
6. Canadian Energy Research Institute. Study 124. *Economic Impacts of New Oil Sands Projects in Alberta (2010-2035)*. May 2011.
7. Asia Pacific Foundation. *Securing Canada's Energy Future: Report of the Canada-Asia Energy Futures Task Force*. June 2012.
8. U.S. Energy Information Administration. "This week in petroleum." Sept. 12, 2012. <http://www.cmegroup.com/education/files/ed172-today-in-petroleum-2012-09-12.pdf>. Accessed 09/19/12
9. Angevine, Gerry and Vanadis Oviedo. "Ensuring Canadian Access to Oil Markets in the Asia-Pacific Region." Fraser Institute. *Studies in Energy Policy*. July 2012.
10. Moore, Michal C. et al. "Catching the Brass Ring: Oil Market Diversification Potential for Canada." University of Calgary School of Public Policy. December 2011.
11. Swift, Anthony. "Keystone XL: A Tar Sands Pipeline to Increase Oil Prices." Natural Resources Defense Council. 2012.
12. Deloitte. *The future of productivity: Clear choices for a competitive Canada*.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
17. Government of Alberta. *Alberta's 2008 Climate Change Strategy: Responsibility. Leadership. Action*. January 2008.
18. Alberta Environment and Sustainable Resource Development. <http://environment.alberta.ca/02486.html>. Accessed 08/22/12
19. Standing Committee on Energy, the Environment and Natural Resources. 2012. *Now or Never: Canada Must Act Urgently to Seize its Place in the New Energy World Order*.
20. Hester, Annette. 2007. Canada as the "Emerging Energy Superpower": Testing the Case. A paper prepared for the Canadian Defence and Foreign Affairs Institute
21. "Statistical Review of World Energy". BP. June 2012; "World Oil Outlook". OPEC. 2011; "Asian Refining Industry – New Paradigm". Hydrocarbon Asia. Jan-March 2011.
22. "Hutton, Jim. "Northern Gateway Project – Concerns with Exporting Bitumen Offshore."
23. Ibid.
24. Vanderklippe, Nathan. "Why rail is moving more crude these days." *Globe & Mail*. October 25, 2011. <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/why-rail-is-moving-more-crude-these-days/article4200236/>. Accessed 08/15/12
25. CAPP, *Market Access through Canada's West Coast for Natural Gas & Crude Oil*. November 2011.
26. Science, Technology and Innovation Council of Canada (2008). State of the Nation.
27. Statistics Canada. "National and Regional Trends in Business Bankruptcies, 1980 to 2005" October 2006. p.12 Figure 4-2 Incidence of bankruptcies – Prairie provinces, 1980 to 2005.

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