Carbon Tracker Initiative

Oil Sands: Fact Sheets

Focus on future Canadian oil sands projects capex and production

4th November 2014

About Carbon Tracker

The Carbon Tracker Initiative (CTI) is a team of financial specialists making climate risk real in today's financial markets. Our research to date on unburnable carbon and stranded assets has started a new debate on how to align the financial system with the energy transition to a low carbon future.

carbontracker.org

About Energy Transition Advisors

ETA's mission is to research and analyze energy markets in the context of the economic and policy trends that are driving one of the great transitions in history -- the transition away from fossil fuels towards more sustainable sources of energy. ETA is Carbon Tracker's research partner.

et-advisors.com

Find the report at: www.carbontracker.org/report/oilsands

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Key takeaways:

- *Recent oil price volatility shows the importance of stress-testing project economics against a range of price scenarios*

- *Rystad have recently updated their methodology for calculating transport prices, as discussed in an accompanying note. We have therefore updated our look at oil sands project economics in this light*

- *The vast majority (92%) of potential capex on discovery stage oil sands projects in the next decade has high oil price requirements which we would regard as particularly risky*

- *Relative exposure to high cost oil sands development projects varies between companies, but can reach 100% of total company potential capex. We consider this an extremely high stakes gamble*

- *A number of high cost oil sands projects have already been deferred this year, at rather higher prices than currently prevailing. Investors may question why similar projects are going ahead, given continuing cost pressures and an increasingly uncertain pricing outlook*

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Methodology update

A separate paper summarising the evolution of our methodology for analysing Rystad data, particularly in respect to oil sands, is available. In summary:

- CTI/ETA continue to add a $15/bbl contingency premium to the breakeven of all projects in order to reflect the desire for a higher IRR (15%) than the standard Rystad model (10%). This is consistent with Rystad's own approach when conducting a recent analysis for the Norwegian Government.
- CTI/ETA no longer adds a further $15/bbl transport premium to oil sands projects, as Rystad has revised its approach to producing comparable breakevens for this region. Rystad's approach was updated over Summer 2014, to reflect the adjustments needed for transport costs and oil quality.

The data included in this paper was downloaded from the Rystad UCube database in October 2014.

"Update on Oil Sands Methodology", www.carbontracker.org/report/oilsands

Executive Summary

Our May report "Carbon Supply Cost Curves: Evaluating Oil Capital Expenditures" highlighted oil sands as the largest potential destination for capital expenditure on new high cost production.

Our analysis and engagement by investors has prompted a new level of interest in the breakeven prices of oil projects. This has resulted in new information being provided to analysts and our data provider Rystad has updated some projects to reflect this. Specifically on oil sands, Rystad has now further integrated transport costs, removing the need for an additional cost to be added. Given recent updates on oil sands costs and movements in the oil price, we felt it timely to produce a report focusing on the Canadian oil sands sector.

The analysis still indicates that nine out of every ten barrels of potential oil sands production from discovery stage projects require over $95/bbl to provide a 15% IRR, a level we regard as necessary to reflect the risks associated with oil developments, (see accompanying note on methodology). These high cost projects account for potential capital expenditure of $271bn over the next decade.

The near $30 fall in Brent prices over the past several months is an example of how vulnerable future projects could be if oil company planning assumptions do not factor in sufficient contingencies.

Meanwhile, the cost pressures facing the oil industry show few signs of abating, especially for capital intensive projects such as oil sands. Combined with recent price weakness, these pressures shows why oil companies should use some form of contingency before making investment decisions.

Several high cost projects have already been shelved by majors including Shell, Total and Statoil. Shareholders should question why other projects are not following suit if they require similar oil price levels, particularly given that oil prices have dropped significantly since those projects were deferred, and the economic pain that a sustained period of an oil price at around $85 has yet to fully come through the system in terms of financial results.

For example, Goldman Sachs' recent revision of its estimates for Brent crude to $80-85 for 2015 would, if achieved, undermine the economics for those projects that need an oil price over $95 to achieve a minimum level of 15% IRR.

The proportion of each company's total capex earmarked for oil sands projects needing above $95/barrel ranges from 2-3% of total capex on liquids for some majors up to 100% for smaller oil sands players are in this high cost category. For the latter category, rising costs and falling prices - if sustained - could threaten their business models. Operating projects which are only breaking even do little to generate value for shareholders. Companies with limited cash flow and higher leverage lack financial flexibility and might struggle to carry high cost projects for long.

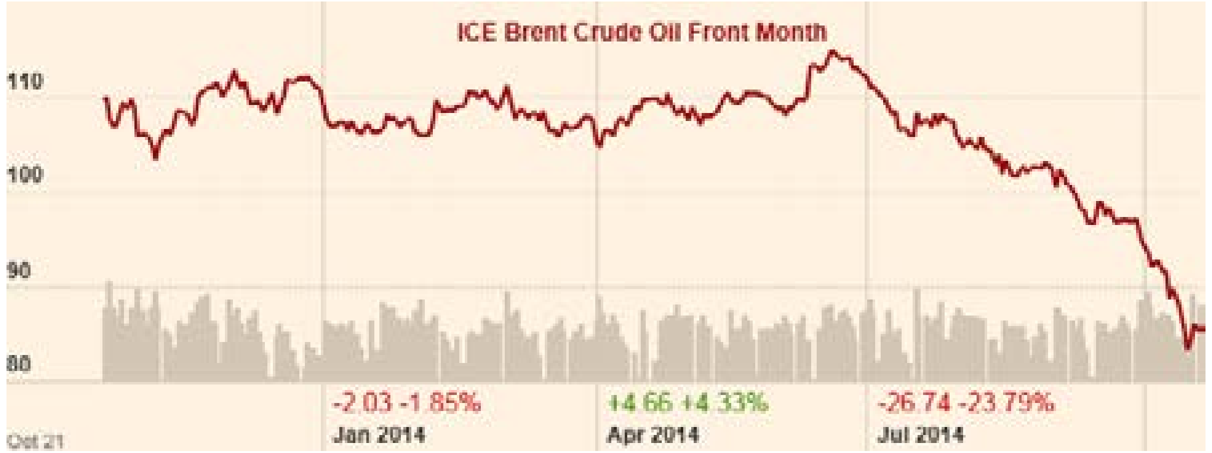
This output identifies the largest projects each company has options on over the next decade which require a market oil price above $95 to be sanctioned, which is $80/bbl break even oil price ("BEOP") with a $15 contingency added to achieve a c.15% IRR and so cover unforeseen risks. This is designed to inform shareholder engagement with companies on whether capital expenditure should be maintained for high cost projects.

Some companies are already revisiting projects in order to cut both costs and capex so we expect the numbers to continue to be updated. We also anticipate further confirmations that borderline high cost projects have been shelved by the oil majors. We welcome greater transparency about the cost ranges of the portfolio of projects each company has, and the process by which the board approves capital expenditure. Recent oil price developments have demonstrated how important it is to conduct a sensitivity analysis against a range of oil prices.

Contents

1. Introduction

The recent decline in the Brent oil price has caught many by surprise, after a period of relative stability around the $110 mark. With Brent in the mid-eighties at the time of writing, this changes the whole dynamic for regions of marginal production – most notably the oil sands of Alberta.



Source: Financial Times website (21 October 2014)

At the time of writing our global cost curve analysis published in May 2014, there was a debate around whether it was useful to think about $95/bbl as a threshold price for oil. $75/bbl was indicated as a price more consistent with a 2 degree warming reference scenario. We established $95/bbl as a long run equilibrium price based on demand trends in the next 30 years, as discussed in our May research. When the oil price undershoots this it may be cyclical, or indicate an even weaker outlook. This demonstrates the importance of challenging assumptions and stress-testing portfolios against a range of demand and price scenarios.

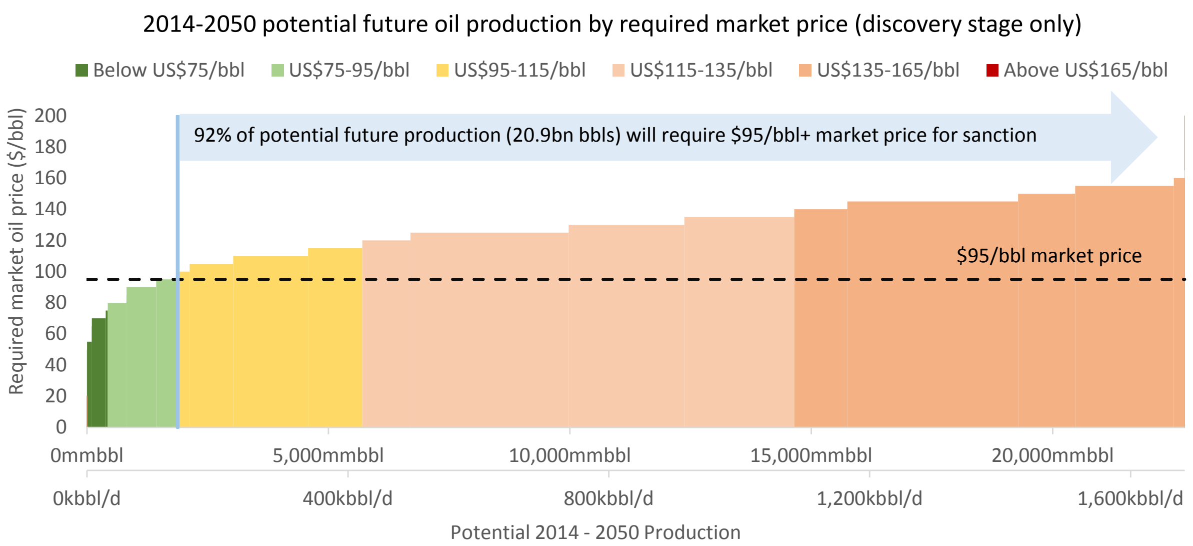
Shareholders now have an opportunity to revisit the issue with companies, to demand transparency on the price ranges major projects requiring investment decisions fall into. Even if companies are not willing to provide specifics, they should be able to indicate which price band projects are in.

2. Focus on future oil sands projects capex and production

Potential production

Looking at potential future production, undeveloped oil sands projects generally seem to be much higher cost than those already in production or development; this point is illustrated by the below chart that focuses on discovery stage projects only.

Figure 1: 2014-2050 potential future oil production by market price required for sanction (including $15 contingency) (mmbbl, average kbbl/d) – discovery stage projects only



Note: Price bands relate to required market price for sanction, including $15/bbl contingency above Rystad base breakeven
Source: Rystad, CTI

As can be seen, fully 92% of potential production requires a market price of $95/bbl for sanction. This amounts to 20.9bn bbls over the period, or 30 years of production at 2013 rates. By 2030, output from these high cost new projects could total 2.0 mmbbl per day, or over 40% of CAPP's overall oil sands production forecast[1]. Virtually all (98%, or 22.3bn bbls) requires a market price of $75/bbl (i.e. consistent with the 2°C scenario). By way of comparison, for all projects (including currently producing and in development projects), 44% of total potential production (31.4bn barrels) over the period 2014-2050 requires $80/bbl to breakeven, equivalent to $95/bbl market price required for sanction. Whilst this is clearly still a very significant proportion to be exposed to the risk of lower prices (like those seen in the market at present), it pales in comparison to the future projects contemplated by oil companies.

Given the current oil price environment, investors will no doubt question the reliance on sustained high prices for this high level of oil sands development. Note that these prices include the $15/bbl contingency we believe is needed for prudent planning, as demonstrated by the $30 fall in oil prices already witnessed in a few months of 2014.

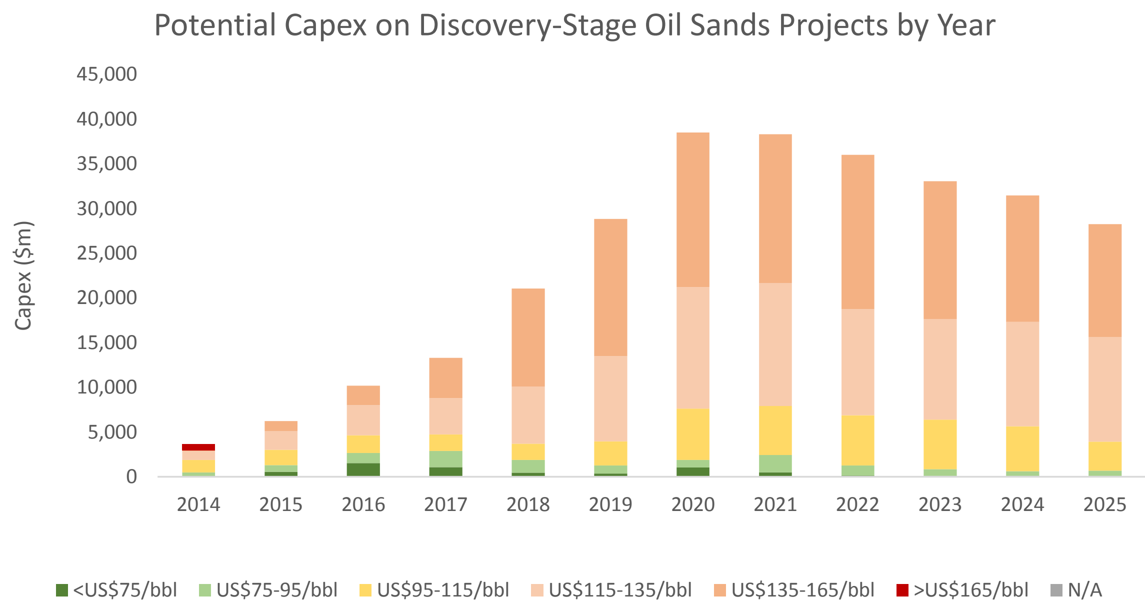
1 CAPP, "Crude Oil Forecast, Markets & Transportation". 2013 production from oil sands was 1.9 mmbbl/d, forecast 2030 production is 4.8 mmbbl/d
http://www.capp.ca/getdoc.aspx?DocId=247759&DT=NTV

Potential capex

Moving from potential production in the period 2014-2050 to potential capex in the nearer term, over the period 2014-2025, a similar pattern emerges.

Over the next decade (again, focusing on discovery stage projects), the picture is one of an environment where it is increasingly difficult to make a commercial return. 94% of potential spend on discovery stage projects will require $95/bbl for sanction; this amounts to $232bn over the next decade on high risk undeveloped projects.

Figure 2: Potential capex on oil sands projects by year ($m) – discovery stage projects only



Note: Price bands relate to required market price for sanction, including $15/bbl contingency above Rystad base breakeven
Source: Rystad, CTI

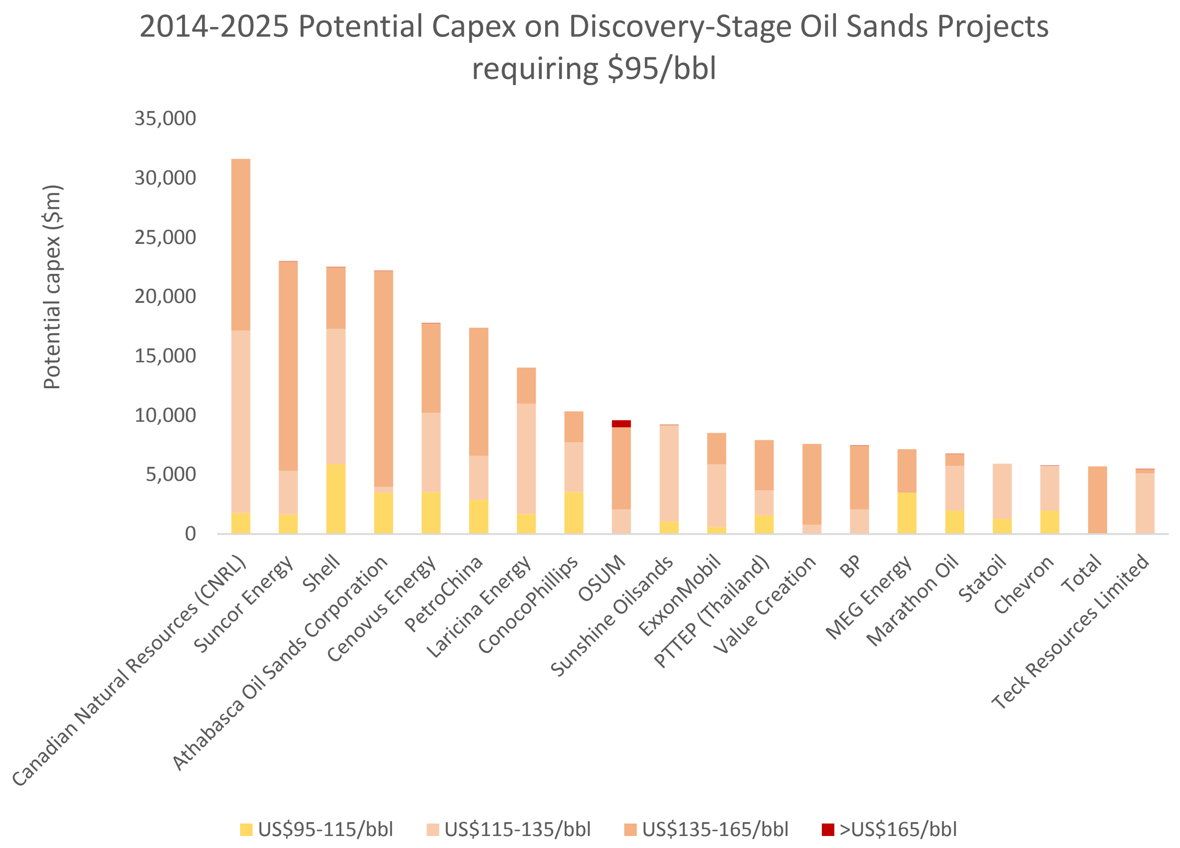
For context, if we extend the analysis to all oil sands assets (i.e. including those producing or in development), projects requiring $80/bbl to breakeven or $95/bbl for approval account for a combined potential capital budget of $364bn, or 66% of total spend on oil sands projects. Projects requiring $60/bbl or more to break even, or $75/bbl to approve, account for a combined potential budget of $505bn, or 92% of total spend on oil sands.

We believe shareholders should be concerned at this potential level of expenditure and should consider whether it is prudent to risk such large amounts of capital on high cost projects that need high oil prices to be commercial.

Company-level potential capex

Focusing again on high cost (requiring at least $95/bbl market price for sanction) discovery stage projects, the companies with the highest exposure to oil sands projects are shown in the below chart. The 20 companies shown are those with potential capex of over $5bn on these projects in the period 2014-2025. In aggregate across the 20, this amounts to a total of $246bn, or 91% of total potential capex on high cost oil sands discoveries in this period and 76% of total potential capex on all oil sands discoveries at all price requirements.

Figure 3: 2014-2025 potential capex ($m) on oil sands projects requiring $95/bbl market price for sanction by company – discovery stage projects only



Note: Price bands relate to required market price for sanction, including $15/bbl contingency above Rystad base breakeven
Source: Rystad, CTI

This potential capex on high cost discovery stage oil sands projects is shown in the below table, with comparison to the companies' overall potential capex on oil projects whether they are oil sands or not (above and below $95/bbl required, and all life-cycle stages).

Figure 4: 2014-2025 potential capex ($m) on discovery stage oil sands projects

Company	Capex on oil sands discoveries requiring >$95/bbl ($m)	Total capex on all projects ($m)	Oil sands discoveries >$95/bbl (% of total capex on all liquids projects)
Canadian Natural Resources (CNRL)	31,619	87,896	36%
Suncor Energy	22,989	67,597	34%
Shell	22,514	322,218	7%
Athabasca Oil Sands Corporation	22,183	34,445	64%
Cenovus Energy	17,765	51,943	34%
PetroChina	17,399	412,024	4%
Laricina Energy	14,027	15,040	93%
ConocoPhillips	10,328	175,270	6%
OSUM	9,596	9,997	96%
Sunshine Oilsands	9,204	10,443	88%
ExxonMobil	8,524	294,017	3%
PTTEP (Thailand)	7,928	16,711	47%
Value Creation	7,590	7,626	100%
BP	7,444	257,506	3%
MEG Energy	7,139	19,767	36%
Marathon Oil	6,745	67,286	10%
Statoil	5,928	212,169	3%
Chevron	5,761	287,433	2%
Total	5,709	203,230	3%
Teck Resources Limited	5,499	8,760	63%

Total top 20	245,891
Others	24,826
Total	270,717

Note: Price bands relate to required market price for sanction, including $15/bbl contingency above Rystad base breakeven. Companies with over 50% of their total potential capex on discovery stage oil sands projects requiring a market price of at least $95/bbl for sanction are highlighted in pink; those with over 30% in yellow.
Source: Rystad, CTI

Many of the companies can be seen to be very significantly leveraged to continued high oil prices and the oil sands development cost environment (as previously, the $95 plus oil price includes a $15 contingency). Some of the above companies are clearly taking on a great deal of risk by pressing ahead with development of these projects, particularly in the context of falling oil prices.

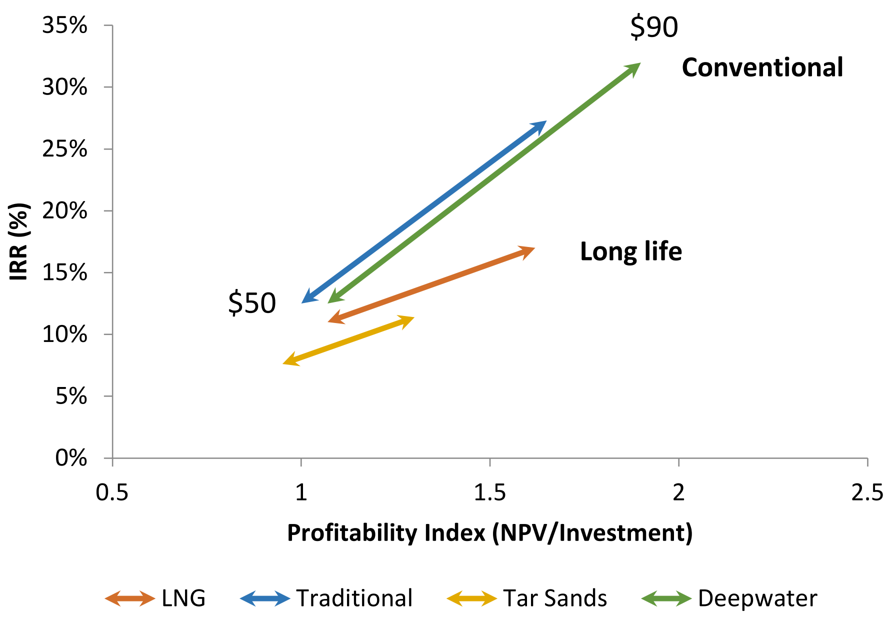
Targeted returns

As discussed in our methodology update Rystad's breakeven prices for projects are calculated on the basis of a 10% IRR. In our analysis, we add a further $15/bbl to represent the contingency that a prudent company will require in order to allow the sanction of a project, which has the effect of raising the targeted IRR slightly to say c.14-15%.

Whilst the long production lifetimes of oil sands projects are borne in mind, we believe that investors should ask themselves whether these levels represent an adequate return considering the risks that come with the high and increasing costs, and hence high operational gearing of oil sands projects as well as other sector specific issues of route-to-market limitations and the possibility of greenhouse gas regulations. The recent drop in the oil price also serves as a reminder of the shifts in the market which few predict, but can undermine profitability.

Return targets are rarely published by oil sands developers, although guidance is provided occasionally. In a presentation from 2009, Shell showed a chart (recreated below) that indicated the range of internal rates of return for different classes of projects. (Internal rate of return or IRR is the annual discount rate needed deliver a zero net present value). It also shows a "profitability" index which is the ratio between the net present value of the projects cash flows and the net present value of the capital invested.

Figure 5: Shell, Profitability of new projects (2009 presentation)



Source: Shell March 17, 2009 Investor presentation[2]

Although a few years old, the chart makes one point very clearly, a point that we believe is still true today - on average, capital intensive, long-life projects such as tar sands generate materially lower returns (IRRs) than conventional projects. Furthermore, oil sands investments don't just deliver relatively low returns; they have high operational gearing due to high costs, adding greater risk to the portfolio.

As a further example on an individual project level, the Fort Hills project (Suncor 40.8% and operator, Total E&P Canada 39.2%, Teck 20%) has been sanctioned, and Suncor have disclosed that there is a targeted return of 13%[3]. Rystad's analysis suggests that even this may not be achieved, with Brent equivalent prices of $106 and $136/bbl required to make 10% IRR on phase 1 and a debottlenecking phase respectively.

The Fort Hills project itself was previously shelved in 2008 but was revived when Suncor merged with Petro-Canada[4]. Investors may be concerned that the use of cash on a project with such tight economics and associated risk may not be as attractive as simply returning it to shareholders.

3. Key projects/cancellation candidates

"Cancellation candidates"

In the table below we isolate large-scale projects (in this case, those with 2014-2025 potential capex of $2bn or more) that are currently at the discovery stage and require a market price of at least $95/bbl for sanction. Where a project has multiple stages or expansion phases, only those phases caught by the above criteria are shown. In order to avoid any confusion with lower-cost, more advanced project phases, the specific field or expansion phase in question is named. Data is shown based on the October edition of the Rystad UCube database.

2 http://s00.static-shell.com/content/dam/shell/static/investor/downloads/presentations/2009/qatar-presentationspack23112009.pdf
3 http://business.financialpost.com/2013/10/31/suncor-energy-fort-hills/?__lsa=f7aa-12c2
4 http://www.suncor.com/pdf/2013_Fort_Hills.pdf, p5 (assuming a bitumen price of $60.50)

Figure 6: Table of discovery stage projects requiring a market price of >$95/bbl for sanction, with 2014-2025 capex above $2bn

Rank	Project name	Field/Phase(s)	Companies (share of capex)	Project type	2014-2025 capex* *($m)*	Required market price** *($/bbl)*
1	Sunrise, CA	Sunrise phase 2B	BP (50%), Husky Energy (50%)	In-situ	8,624	152
2	West Kirby Phase 1, CA	West Kirby Phase 1	Cenovus Energy (100%)	In-situ	3,686	152
3	Sepiko Kesik, CA	Sepiko Kesik Phase 1, Sepiko Kesik Phase 2	OSUM (100%)	In-situ	2,763	150 - 161
4	Joslyn, CA	Joslyn (Deer Creek) Mine Phase 1 (North), Joslyn (Deer Creek) SAGD Phase 2	Inpex (10%), Oxy (15%), Suncor Energy (37%), Total (38%)	Mining	6,188	147 - >165
5	Advanced Tristar, CA	ATS-1, ATS-2, ATS-3	Value Creation (100%)	In-situ	6,470	145 - 149
6	Surmont Oil Sands project, CA	Surmont MEG Energy, Surmont Phase 3	ConocoPhillips (29%), MEG Energy (41%), Total (29%)	In-situ	8,862	145 - 158
7	Dover West AOSC, CA	Dover West Sands Phase 1 , Dover West Sands Phase 2 , Dover West Sands Phase 3 , Dover West Sands Phase 4 , Dover West Sands Phase 5	Athabasca Oil Sands Corporation (100%)	In-situ	10,965	144 - 154
8	Carmon Creek, CA	Carmon Creek Phase 2	Shell (100%)	In-situ	4,089	138
9	Telephone Lake, CA	Telephone Lake Phase A, Telephone Lake Phase B	Cenovus Energy (100%)	In-situ	3,870	136 - >165
10	Aspen, CA	Aspen	ExxonMobil (70%), Imperial Oil (Public traded part) (30%)	In-situ	3,793	135
11	Dover JV, CA	Dover North Phase 2, Dover South Phase 3, Dover South Phase 4, Dover South Phase 5	Athabasca Oil Sands Corporation (40%), PetroChina (60%)	In-situ	18,003	135 - 153
12	Taiga Project, CA	Taiga/Marie Lake (Cold Lake OSUM) Phase 1, Taiga/Marie Lake (Cold Lake OSUM) Phase 2	OSUM (100%)	In-situ	2,717	135 - >165
13	Frontier, CA	Fontier Phase 4 Equinox, Frontier Phase 1, Frontier Phase 2, Frontier Phase 3	Teck Resources Limited (100%)	Mining	5,102	134 - >165
14	Saleski Laricina, CA	Saleski Laricina Phase 2, Saleski Laricina Phase 3, Saleski Laricina Phase 4	Laricina Energy (60%), OSUM (40%)	In-situ	10,277	130 - 142
15	Gregoire Lake, CA	Gregoire Lake Phase 1, Gregoire Lake Phase 2	Canadian Natural Resources (CNRL) (100%)	In-situ	5,035	128 - 132
16	Kearl, CA	Kearl Phase 3 (Debottleneck)	ExxonMobil (79%), Imperial Oil (Public traded part) (21%)	Mining	6,724	127
17	East McMurray, CA	McMurray East Phase 1	Cenovus Energy (100%)	In-situ	2,478	122
18	Terre de Grace, CA	Terre de Grace Phase 1, Terre de Grace Pilot	BP (75%), Value Creation (25%)	In-situ	4,175	122 - 145
19	Grouse, CA	Grouse	Canadian Natural Resources (CNRL) (100%)	In-situ	4,556	121
20	Narrows Lake, CA	Narrows Lake Phase B, Narrows Lake Phase C	Cenovus Energy (50%), ConocoPhillips (50%)	In-situ	3,852	121 - 131
-	Top discoveries with market price >$95/bbl and capex >$2,000m		-	-	122,226	-
-	Other discoveries with market price >$95/bbl		-	-	148,491	-
-	Total discoveries with market price >$95/bbl		-	-	270,717	-

** company share of capex requiring $95/bbl+ shown only*
*** market price required for sanction includes $15/bbl contingency on top of project breakeven price*

Source: Rystad, CTI

Given the risk profile of such potentially high cost projects, it may be that management should consider deferring projects, returning additional capital to shareholders instead. We note that there have already been a number of deferrals/cancellations of oil sands projects during 2014.

Project deferrals

The oil sands projects that have been confirmed to be deferred in 2014 to date, along with the companies involved (* denotes operator) are listed below.

It is important to note that these deferrals/cancellations took place before the recent fall in oil prices. We suspect that there will be more to come if oil prices remain significantly below previous levels.

1) ***Pierre River (Shell* 60%, Chevron 20%, Marathon 20%)***

Pierre River was the first oil sands project to be postponed this year, with Shell announcing in February that it would be postponed indefinitely[5]. A bitumen mining project, it was previously anticipated to have a maximum capacity of 200,000 barrels of oil per day ("bopd"). With a required market price above $165/bbl in Rystad's data, Rystad have assumed that it will not go ahead and we have not included it in the above table.

2) ***Joslyn (Total* 38.25%, Suncor Energy 36.75%, Inpex 10%, Oxy 15%)***

The Joslyn project was delayed indefinitely in May 2014, due to rising industry costs.[6] Total had previously planned to expand planned capacity from 100k bopd to 150-160k bopd in order to improve the per-barrel economics[7]. Like Pierre River, Joslyn North was to be a mining project. Given Joslyn's potential capex of $6.2bn and required market price for sanction ranging from $147/bbl to above $165/bbl, our research based on the Rystad database confirms it as a suitable project to be deferred. The capital requirements and the potential for cost inflation for two overlapping projects (Total are also developing the Fort Hills project) may have contributed to Joslyn North's cancellation.

3) ***Kai Kos Denseh - Corner (Statoil* 100%)***

The 40,000 bopd Corner project was deferred by Statoil in September 2014, for a minimum of 3 years[8]. Due to the project's high capex requirements and high market price required for sanction, we believe that is a prudent choice. The Corner and Corner Expansion phases could have incurred a potential capex budget of $5.9bn over 2014-2025, and would have required market prices of $110-128/bbl for sanction based on Rystad data.

As well as the issue of rising costs, Statoil also explicitly cited "limited pipeline access" as a contributory factor behind the decision, with the negative implications for crude prices in Canada affecting margins. Furthermore, Corner is notable as being the first thermal in-situ project to be postponed. This production technique is generally considered lower cost than mining, for example being much less labour-intensive, and is already in use by Statoil in Canada.

Statoil owns a further lease on the Kai Kos Denseh area, Leismer, which produced first oil in January 2011. The project remains in production and has an operating capacity of 20,000 bopd.

The Voyageur upgrader project (Suncor 51%, Total 49%) was also cancelled in March 2013[9], with $3.5bn spent[10].

In addition to the above projects, it has been rumoured in the media that the Northern Lights project (Total* 50%, Sinopec Group 50%) will be deferred or sold[11]. With a market price of $158/bbl required for sanction, it has been assumed not to go ahead in Rystad's analysis, and accordingly isn't shown in the table above. We would consider a deferral decision as sensible given the high risk of wasting shareholders' capital.

4. Company exposure to high cost projects

The projects identified in Rystad as being potential new developments (currently at the discovery stage) between now and 2025 requiring a market price of $95/bbl are summarised for each company in the table below.

5 http://business.financialpost.com/2014/02/12/shell-halts-work-on-pierre-river-oil-sands-mine-in-northern-alberta/?__lsa=f7aa-12c2
6 http://www.theglobeandmail.com/report-on-business/joslyn/article18914681/
7 http://business.financialpost.com/2013/11/07/total-sa-seeking-to-upsize-flagship-joslyn-oil-sands-mine-in-alberta/?__lsa=f7aa-12c2
8 http://www.statoil.com/en/NewsAndMedia/News/2014/Pages/25Sept_CornerPostponement.aspx
10 http://www.albertaoilmagazine.com/2014/03/economic-ruins-suncor-voyageur/
11 http://business.financialpost.com/2014/07/09/sinopec-may-back-away-from-northern-lights-oil-sands-lease-source/?__lsa=f7aa-12c2

Company	Project Name	Phase	Company share of 2014-2025 capex ($m)	Required market price for sanction ($/bbl)
Athabasca Oil Sands Corporation	Dover JV, CA	Dover North Phase 2, Dover South Phase 3, Dover South Phase 4, Dover South Phase 5	$7,201	135 - 153
Athabasca Oil Sands Corporation	Dover West AOSC, CA	Dover West Sands Phase 1 , Dover West Sands Phase 2 , Dover West Sands Phase 3 , Dover West Sands Phase 4 , Dover West Sands Phase 5	$10,965	144 - 154
Athabasca Oil Sands Corporation	Hangingstone AOSC, CA	Hangingstone AOSC Phase 2, Hangingstone AOSC Phase 3	$3,500	108 - 157
Athabasca Oil Sands Corporation	**TOTAL ALL PROJECTS**	-	**$21,666**	**108 - 157**
BP	Sunrise, CA	Sunrise phase 2B	$4,312	152
BP	Terre de Grace, CA	Terre de Grace Phase 1, Terre de Grace Pilot	$3,131	122 - 145
BP	**TOTAL ALL PROJECTS**	-	**$7,443**	**122 - 152**
Canadian Natural Resources (CNRL)	Birch Mountain, CA	Birch Mountain Phase 1, Birch Mountain Phase 2	$5,790	120 - 127
Canadian Natural Resources (CNRL)	Gregoire Lake, CA	Gregoire Lake Phase 1, Gregoire Lake Phase 2	$5,035	128 - 132
Canadian Natural Resources (CNRL)	Grouse, CA	Grouse	$4,556	121
Canadian Natural Resources (CNRL)	Horizon Oil Sands Project, CA	Horizon Phase 2A, Horizon Phase 4, Horizon Phase 5	$11,558	113 - 165
Canadian Natural Resources (CNRL)	Kirby CNR, CA	Kirby North CNR Phase 2, Kirby South CNR Phase 2	$4,680	112 - 145
Canadian Natural Resources (CNRL)	**TOTAL ALL PROJECTS**	-	**$31,619**	**112 - 165**
Canadian Oil Sands	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$1,243	107 - 165
Canadian Oil Sands	**TOTAL ALL PROJECTS**	-	**$1,243**	**107 - 165**
Cenovus Energy	Christina Lake, CA	Christina Lake Cenovus Energy ConocoPhilips Phase H, Christina Lake Cenovus Energy ConocoPhillips Optimization (Phases C,D,E)	$2,698	98 - 115
Cenovus Energy	East McMurray, CA	McMurray East Phase 1	$2,478	122
Cenovus Energy	Foster Creek, CA	Foster Creek Phase H, Foster Creek Phase J	$3,107	107
Cenovus Energy	Narrows Lake, CA	Narrows Lake Phase B, Narrows Lake Phase C	$1,926	121 - 131
Cenovus Energy	Telephone Lake, CA	Telephone Lake Phase A, Telephone Lake Phase B	$3,870	136 - >165
Cenovus Energy	West Kirby Phase 1, CA	West Kirby Phase 1	$3,686	152
Cenovus Energy	**TOTAL ALL PROJECTS**	-	**$17,765**	**98 - >165**
Chevron	Athabasca Oil Sands Project, CA	Jackpine Extension, Jackpine Phase 1B, Muskeg River Mine Expansion and Debottlenecking	$5,761	104 - 123
Chevron	**TOTAL ALL PROJECTS**	-	**$5,761**	**104 - 123**
CNOOC	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$245	107 - 165
CNOOC	**TOTAL ALL PROJECTS**	-	**$245**	**107 - 165**
ConocoPhillips	Christina Lake, CA	Christina Lake Cenovus Energy ConocoPhilips Phase H, Christina Lake Cenovus Energy ConocoPhillips Optimization (Phases C,D,E)	$2,698	98 - 115
ConocoPhillips	Foster Creek, CA	Foster Creek Phase H, Foster Creek Phase J	$3,107	107
ConocoPhillips	Narrows Lake, CA	Narrows Lake Phase B, Narrows Lake Phase C	$1,926	121 - 131
ConocoPhillips	Surmont Oil Sands project, CA	Surmont Phase 3	$2,597	158
ConocoPhillips	**TOTAL ALL PROJECTS**	-	**$10,328**	**98 - 158**
ExxonMobil	Aspen, CA	Aspen	$2,640	135
ExxonMobil	Kearl, CA	Kearl Phase 3 (Debottleneck)	$5,292	127
ExxonMobil	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$592	107 - 165
ExxonMobil	**TOTAL ALL PROJECTS**	-	**$8,524**	**107 - 165**
Gulfport Energy	May River (Whitesands), CA	May River Phase 1 & 2, May River Phase 3-4-5	$574	120 - >165
Gulfport Energy	**TOTAL ALL PROJECTS**	-	**$574**	**120 - >165**
Husky Energy	Sunrise, CA	Sunrise phase 2B	$4,312	152
Husky Energy	**TOTAL ALL PROJECTS**	-	**$4,312**	**152**
Imperial Oil (Public traded part)	Aspen, CA	Aspen	$1,153	135
Imperial Oil (Public traded part)	Kearl, CA	Kearl Phase 3 (Debottleneck)	$1,432	127
Imperial Oil (Public traded part)	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$254	107 - 165
Imperial Oil (Public traded part)	**TOTAL ALL PROJECTS**	-	**$2,839**	**107 - 165**
Inpex	Joslyn, CA	Joslyn (Deer Creek) Mine Phase 1 (North), Joslyn (Deer Creek) SAGD Phase 2	$619	147 - >165
Inpex	**TOTAL ALL PROJECTS**	-	**$619**	**147 - >165**
JX Nippon Oil and Gas	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$169	107 - 165
JX Nippon Oil and Gas	**TOTAL ALL PROJECTS**	-	**$169**	**107 - 165**
Laricina Energy	Germain, CA	Germain Phase 2, Germain Phase 3, Germain Phase 4	$7,858	114 - 128
Laricina Energy	Saleski Laricina, CA	Saleski Laricina Phase 2, Saleski Laricina Phase 3, Saleski Laricina Phase 4	$6,166	130 - 142
Laricina Energy	**TOTAL ALL PROJECTS**	-	**$14,024**	**114 - 142**

Source: Rystad, CTI

Company	Project Name	Phase	Company share of 2014-2025 capex ($m)	Required market price for sanction ($/bbl)
Marathon Oil	Athabasca Oil Sands Project, CA	Jackpine Extension, Jackpine Phase 1B, Muskeg River Mine Expansion and Debottlenecking	$5,761	104 - 123
Marathon Oil	**TOTAL ALL PROJECTS**	-	**$5,761**	**104 - 123**
MEG Energy	Christina Lake Regional project, CA	Christina Lake MEG Phase 3C	$3,472	102
MEG Energy	Surmont Oil Sands project, CA	Surmont MEG Energy	$3,668	145
MEG Energy	**TOTAL ALL PROJECTS**	-	**$7,139**	**102 - 145**
Murphy Oil	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$169	107 - 165
Murphy Oil	**TOTAL ALL PROJECTS**	-	**$169**	**107 - 165**
OSUM	Saleski Laricina, CA	Saleski Laricina Phase 2, Saleski Laricina Phase 3, Saleski Laricina Phase 4	$4,111	130 - 142
OSUM	Sepiko Kesik, CA	Sepiko Kesik Phase 1, Sepiko Kesik Phase 2	$2,763	150 - 161
OSUM	Taiga Project, CA	Taiga/Marie Lake (Cold Lake OSUM) Phase 1, Taiga/Marie Lake (Cold Lake OSUM) Phase 2	$2,717	135 - >165
OSUM	**TOTAL ALL PROJECTS**	-	**$9,590**	**130 - >165**
Other partner(s) CA	May River (Whitesands), CA	May River Phase 1 & 2, May River Phase 3-4-5	$1,722	120 - >165
Other partner(s) CA	**TOTAL ALL PROJECTS**	-	**$1,722**	**120 - >165**
Oxy	Joslyn, CA	Joslyn (Deer Creek) Mine Phase 1 (North), Joslyn (Deer Creek) SAGD Phase 2	$928	147 - >165
Oxy	**TOTAL ALL PROJECTS**	-	**$928**	**147 - >165**
Paramount Resources	Hoole, CA	Hoole Phase 2_Cavalier Energy, Hoole Phase 3_Cavalier Energy	$2,948	114 - 127
Paramount Resources	**TOTAL ALL PROJECTS**	-	**$2,948**	**114 - 127**
PetroChina	Dover JV, CA	Dover North Phase 2, Dover South Phase 3, Dover South Phase 4, Dover South Phase 5	$10,802	135 - 153
PetroChina	MacKay River, CA	MacKay River Phase 2_Petrochina, MacKay River Phase 3_Petrochina	$6,597	98 - 119
PetroChina	**TOTAL ALL PROJECTS**	-	**$17,399**	**98 - 153**
PTTEP (Thailand)	Kai Kos Dehseh, CA	Kai Kos Dehseh North Hangingstone, Kai Kos Dehseh South Leismer, Kai Kos Dehseh Thornbury, Kai Kos Dehseh West Thornbury	$7,928	106 - 144
PTTEP (Thailand)	**TOTAL ALL PROJECTS**	-	**$7,928**	**106 - 144**
Shell	Athabasca Oil Sands Project, CA	Jackpine Extension, Jackpine Phase 1B, Muskeg River Mine Expansion and Debottlenecking	$17,282	104 - 123
Shell	Carmon Creek, CA	Carmon Creek Phase 2	$4,089	138
Shell	**TOTAL ALL PROJECTS**	-	**$21,370**	**104 - 138**
Sinopec Group (parent)	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$306	107 - 165
Sinopec Group (parent)	**TOTAL ALL PROJECTS**	-	**$306**	**107 - 165**
Statoil	Kai Kos Dehseh, CA	Kai Kos Dehseh Corner Expansion, Kai Kos Dehseh Corner	$5,928	110 - 129
Statoil	**TOTAL ALL PROJECTS**	-	**$5,928**	**110 - 129**
Suncor Energy	Firebag, CA	Firebag Phase 5, Firebag Phase 6, Firebag Stages 3-6 Debottleneck	$15,855	101 - 142
Suncor Energy	Joslyn, CA	Joslyn (Deer Creek) Mine Phase 1 (North), Joslyn (Deer Creek) SAGD Phase 2	$2,274	147 - >165
Suncor Energy	MacKay River, CA	MacKay River Phase 2	$3,679	115
Suncor Energy	Syncrude Mildred Lake Oil Mining, CA	Syncrude Mildred Lake and Aurora Stage 3 Debottlenecking, Syncrude Stage 4 (Aurora South)	$406	107 - 165
Suncor Energy	**TOTAL ALL PROJECTS**	-	**$22,213**	**101 - >165**
Sunshine Oilsands	Sunshine Thickwood, CA	Sunshine Thickwood Phase A1, Sunshine Thickwood Phase A2, Sunshine Thickwood Phase B	$5,735	95 - 124
Sunshine Oilsands	West Ells, CA	West Ells Phase A3, West Ells Phase B, West Ells Phase C	$2,595	121 - 139
Sunshine Oilsands	**TOTAL ALL PROJECTS**	-	**$8,331**	**95 - 139**
Teck Resources Limited	Frontier, CA	Fontier Phase 4 Equinox, Frontier Phase 1, Frontier Phase 2, Frontier Phase 3	$5,102	134 - >165
Teck Resources Limited	**TOTAL ALL PROJECTS**	-	**$5,102**	**134 - >165**
Total	Joslyn, CA	Joslyn (Deer Creek) Mine Phase 1 (North), Joslyn (Deer Creek) SAGD Phase 2	$2,367	147 - >165
Total	Surmont Oil Sands project, CA	Surmont Phase 3	$2,597	158
Total	**TOTAL ALL PROJECTS**	-	**$4,964**	**147 - >165**
Value Creation	Advanced Tristar, CA	ATS-1, ATS-2, ATS-3	$6,470	145 - 149
Value Creation	Terre de Grace, CA	Terre de Grace Phase 1, Terre de Grace Pilot	$1,044	122 - 145
Value Creation	**TOTAL ALL PROJECTS**	-	**$7,514**	**122 - 149**

Source: Rystad, CTI

Carbon Tracker Initiative

For further information about the Carbon Tracker Initiative please visit our website: www.carbontracker.org

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