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KEYSTONE XL PIPELINE: NO MATERIAL IMPACT ON US GHG EMISSIONS

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DATE
5 August 2013

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KEY INSIGHTS

In the recent debate surrounding the pending Keystone XL pipeline decision, new questions have been raised about the pipeline's potential impact on greenhouse gas (GHG) emissions. President Barack Obama has indicated that the relative emissions related to increased Canadian oil sands processing in US markets (resulting from the Keystone XL project) are a key criteria for the US Administration's decision. The conclusion of IHS CERA's analysis is that incremental GHG emissions from the pipeline would not be substantial.

- **The Keystone XL decision is also a market share decision between Canada and other imported heavy oil supplies, particularly those from Venezuela.** With or without oil sands supply to the US Gulf Coast (USGC), refiners there would continue to process heavy crude oils, since they are configured to run these grades. The most likely alternative USGC heavy oil supply is Venezuelan crude which is in the same GHG emissions range as oil sands. Consequently, if oil sands were not consumed in the Gulf Coast, there would be little to no change in the overall GHG intensity of the US crude slate.
- **Even if the Keystone XL pipeline does not move forward, we do not expect a material change to oil sands production growth.** Therefore the Keystone decision itself will not have any impact on GHG emissions. Without Keystone, alternatives will be developed including other pipeline projects and crude delivery by rail. Not including Keystone XL, the volume of proposed pipeline capacity exiting western Canada currently totals 3 million barrels per day (mbd). Eighty percent of this proposed capacity connects Alberta with Canada's west and east coasts, and obviously would not involve any US government approval. Even if new pipelines lag oil sands growth, rail will fill the gap, as it is doing today. With more investment, rail economics could approach those of pipeline.

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In the recent debate surrounding the pending Keystone XL pipeline decision, new questions have been raised about the potential impact of the pipeline on

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US greenhouse gas (GHG) emissions. In March of this year, the US State Department's Draft Supplemental Environmental Impact Statement (DSEIS) for Keystone XL concluded the project would have minimal effect on GHG emissions.[1] The State Department's logic was that in the absence of the Keystone XL project, oil sands production would still be moved to market either by alternative pipelines or rail.

However, the debate surrounding the pipeline's impact on US GHG emissions assumed a higher profile with President Barack Obama's June 25 climate address. In the speech, the president pledged not to approve the Keystone XL if the project would "significantly exacerbate the problem of carbon pollution." Following Obama's speech, the Canadian government was quick to point out that the pipe would not add to GHG emissions. Joe Oliver, Canada's minister of natural resources, said, "That's what the US State Department itself had concluded, in a 3,500 page report," adding, "This pipeline has been the most studied pipeline in the history of the world."[2]

The purpose of this Insight is to bring clarity to the question of Keystone XL and its potential GHG implications. IHS CERA's assessment agrees with the US State Department—Keystone XL will not be material to GHG emissions.[3]

Pipeline opponents disagree with State Department

Pipeline opponents argue that by opening up additional US markets for Canadian oil sands, the Keystone XL project would lead to significant incremental US GHG emissions. Their primary dispute with the State Department's analysis centers on the economics of moving oil sands by rail, which is assumed to be the alternative method of transportation if Keystone XL or other pipelines are not constructed. They assert that rail costs are prohibitively high and that in a scenario in which pipelines are not constructed, oil sands growth (and consequently GHG emissions) will stall for lack of market access.

Critics cite the steep crude oil price discounts for Canadian producers in the past year as further evidence that rail is not economic. On average in 2012, the price of heavy oils sands was $27 per barrel lower than a comparable barrel on the US Gulf Coast (USGC), and for short periods the difference was more than $40 per barrel.[4]

However, these deep discounts were not the result of rail costs but rather due to a severe supply and demand imbalance: constraints in the pipeline and refining systems limited flows, resulting in a prolonged period of surplus supply. In fact, growing rail capacity from western Canada has helped to moderate the price discounts faced by Canadian producers by relieving this oversupply. By the end of the first quarter 2013, approximately 150,000 barrels per day (bd) of crude was leaving western Canada by rail (compared with negligible amounts at the start of 2012). Based

1. "[A]pproval or denial of the proposed Project is unlikely to have a substantial impact on the rate of development in the oil sands…. [if the project is not built] The incremental indirect life-cycle emissions associated with those decreases in oil sands production are estimated to be in the range of 0.07 to 0.83 million metric tons CO_2 equivalent ($MMTCO_2e$) annually," US Department of State, Draft Supplemental Environmental Impact Statement for Keystone XL, March 2013, page ES-15.
2. Source: National Post, June 25, 2012, Retrieved July 31, 2013.
3. IHS analysis is based on the ongoing IHS CERA Oil Sands Dialogue research. Since 2009, the IHS CERA Oil Sands Dialogue has brought together policymakers, industry representatives, academia, nongovernmental organizations, environmental organizations, and other related stakeholders to advance the conversation surrounding Canadian oil sands development. The objective is to enhance understanding of critical factors and questions surrounding industry issues and foster a fact-based discussion through workshops and published reports. For more information or to access past reports, please go to www.ihs.com\oilsandsdialogue.
4. Compares the price of Western Canadian Select at Hardisty, Alberta, with Mexican Maya pricing on the USGC. Maya pricing is the benchmark for heavy crude prices on the USGC, and Venezuelan heavy oils would trade at a similar price.

on continuing oil sands supply growth and the lack of new pipeline capacity through the next few years, we expect rail movements to increase to about 360,000 bd by the end of 2014.

Even considering new capacity from rail, the balance between western Canadian supply and export capacity remains tight. Future price volatility is to be expected. However, in some periods such as the past three months—with the help of new capacity from rail—the system has been relatively balanced, and a barrel of heavy oil sands crude priced on average $17 per barrel lower than the value of similar quality heavy oil traded on the USGC.[1] This indicates that oil sands can grow using rail; it is already happening.

US Gulf Coast heavy oil: Market share issue between Canada and Venezuela

The US Gulf Coast has historically received modest volumes of heavy Canadian oil through a relatively small pipeline connection and rail (combined pipeline and rail have averaged about 130,000 bd in the past few years). However, this year we expect volumes could double from increased rail movements. If constructed, the Keystone XL pipeline would allow about 730,000 bd more of heavy crude to transit from the oil sands to the USGC, increasing the market for Canadian producers.[2]

Currently, the US Midwest is the key consuming region for oil sands products, but it is quickly reaching the saturation point, based on limited refining capacity able to accommodate heavy oil.

By contrast, the Gulf Coast region has a strong appetite for heavy crude—requiring 2.4 million barrels per day (mbd) in 2012. Its refineries are generally configured to optimally process this type of crude given the large scale of the coking capacity already in place. Therefore, with or without oil sands supply to the Gulf Coast, refiners there will continue to process heavy crude oils. (The USGC is the center of gravity for US refining with about half of the nation's total refining capacity).

Today, the majority of heavy supply on the USGC comes from Venezuela (0.8 mbd), followed by Mexico (0.7 mbd); the rest is from smaller suppliers including Colombia and Brazil. If Gulf refiners cannot access Canadian heavy oil, the most likely alternative is Venezuelan supply, which is projected to grow based on ongoing investments (including the Orinoco). Although Mexico has historically been a large supplier of heavy oil, its production has been dropping steadily (declining production has reduced exports; compared with seven years ago, heavy oil shipments to the United States have been cut in half). Therefore, the decision on Keystone XL may ultimately boil down to a determination of oil market share between Canada and Venezuela. Venezuelan heavy oil—and Venezuela—will be the number one beneficiary of a negative decision on Keystone.

The GHG emissions from Venezuelan supply are in the same GHG intensity range as oil sands (see Table 1). Thus, in a scenario in which incremental oil sands production did not reach the US Gulf market, there would be little to no change in the overall GHG intensity of the US crude slate.

1. Compares the average price of Western Canadian Select at Hardisty with Mexican Maya pricing on the USGC for May, June, and July 2013.
2. Total capacity for the Keystone XL pipeline is 830,000 bd. However, 100,000 bd of this capacity will be filled by the Bakken Marketlink project, leaving 730,000 bd of capacity remaining to transport oil sands crudes.

Table 1

Life-cycle GHG emissions of oil sands and Venezuelan crudes compared*

	Well-to-wheels GHG emissions** ($kgCO_2e$ per barrel)	Percent difference from average barrel refined in the United States (2005)
Venezuelan supply: Petrozuata (high) and Bachaquero (low)***	507–585	4–20%
Canadian oil sands heavy oil supply: SAGD SCO (high) and dilbit produced by mining (low)	506–598	4–23%

Source: IHS CERA.
Note: $kgCO_2e$ = kilograms of carbon dioxide equivalent; CSS = cyclic steam stimulation.
*See Table 2, page 23 IHS CERA Special Report *Oil Sands Greenhouse Gasses, and US Oil Supply: Getting the Numbers Right – 2012 Update*, November 2012. Reported values all assume a wide boundary for measuring GHG emissions and are consistent with the 2005 average crude baseline used in the current DSEIS. Wide boundary includes all emissions beyond the facility site including those from producing natural gas used at the oil production facilities and from electricity generated offsite.
**Well-to-wheels GHG emissions include all emissions associated with crude oil production and use, including extracting, refining, transporting, and ultimately consuming the fuel in a vehicle. Depending on the crude oil, 70–80% of the well-to-wheels emissions occur when gasoline is combusted in a vehicle. The absolute GHG emissions resulting from engine combustion of gasoline or diesel are independent of the type of crude used to refine the fuel.
***In addition to these to crudes, IHS CERA also has an estimate for Zuta Sweet crude from Venezuela, which is within this range at 547 $kgCO_2e$ per barrel, or 15% higher than the average barrel refined in the United States (2005). Although there are other heavy oil imports from Venezuela, there are no GHG intensity estimates for them. Generating estimates for Venezuelan crudes is a challenge due to a lack of data.

Keystone XL is not the only option for moving oil sands

In the absence of Keystone XL, we would expect similar volumes of heavy Canadian oil sands to be produced. Industry would turn to alternative pipeline projects and rail for oil sands transportation. Even if new pipeline capacity does not keep pace with supply growth, rail movements can continue to grow. Given sufficient investment, our view is that the economics for moving heavy oil sands crude by rail could improve further, even approaching pipeline economics. Consequently, even without the Keystone XL pipeline, we believe that oil sands production would grow at a similar rate. Therefore GHG emissions will be unaffected by the fate of Keystone XL.

If Keystone XL were denied: Alternative pipelines are likely

With such a large amount of oil sands pipeline capacity being advanced—and moving in all directions west, east, and south—it is reasonable to expect that eventually new pipelines will become available. Not including Keystone XL, the volume of proposed pipelines totals 3 mbd; 80% of this capacity connects the oil sands with Canada's west and east coasts and obviously does not require any US government approval.1 To put the potential capacity in perspective, we expect western Canadian supply growth between 2013 and 2020 will be about half of this volume.

The importance of new market access is not lost on the Canadian government. Following the president's delay of the Keystone XL pipeline decision in early 2012, Prime Minister Stephen

1. West coast options include the Northern Gateway (0.5 mbd) and Trans Mountain Expansion pipelines (0.5 mbd); east coast options include Energy East (1.1 mbd) and line 9 reversal (0.3 mbd). South options transit though the United States and include various expansions to increase the capacity and reach of the Enbridge mainline (0.5 mbd).

Harper declared, "Canada will continue to work to diversify its energy exports." [1]An important step toward this goal was made recently with the announcement of the Energy East pipeline project. If approved, it would connect 1.1 mbd of supply from Alberta with eastern Canada. Shortly after the project announcement, Canadian Natural Resources Minister Joe Olivier commented that Ottawa "welcomes the prospect of transporting Canadian crude oil from western Canada to consumers and refineries in eastern Canada and ultimately to new markets abroad."[2]

Oil sands bitumen: A unique case for rail economics

Even if pipeline capacity lags oil sands growth, we expect that rail will be an ongoing and economic part of the transportation puzzle. For heavy oil sands crude specifically, in a scenario in which pipeline access was severely restricted, we would expect greater investments to make rail economics even more efficient, approaching those of pipelines.

Although moving crude oil by rail is generally more expensive than by pipeline, oil sands heavy oil could be an exception. What makes oil sands unique is the need for diluent. In its natural form, bitumen is the consistency of peanut butter—too thick for pipelines. Prior to pipelining, the bitumen is thinned by adding light hydrocarbons (typically natural gas condensates). The resulting mixture (called diluted bitumen, or dilbit) is about 70% bitumen and 30% diluents. This is how bitumen is transported today, whether by pipeline or rail.[3]

However, unlike pipelines, rail cars do not necessarily require diluent for moving oil sands. With the appropriate investment, they can transport pure bitumen, using heat to thin the bitumen during railcar loading and unloading.

By railing pure bitumen (instead of dilbit in a pipeline or rail car) oil sands producers can avoid some expense—specifically cost for the diluent—plus there would be fewer barrels to transport (compared with dilbit, shipping pure bitumen decreases the total volume moved by 30%). These savings offset some of the extra costs associated with rail transport. Assuming sufficient scale and investment, our view is that producer netbacks from the USGC for transporting pure bitumen by rail would be comparable to about $6 lower than for moving with pipeline (for each bitumen barrel produced). This compares favorably with netbacks for railing dilbit to the USGC, which would be in the range of $10 to $15 lower than pipeline for each barrel of bitumen produced.[4] Assuming the comparative economics between pipeline and rail were in this range ($6 per barrel or less), over the longer term, we would expect oil sands growth would not be affected, even if rail is an ongoing component of the transportation options for oil sands.[5]

1. Source Bloomberg retrieved August 2, 2013.
2. Source: CTV http://www.ctvnews.ca/business/transcanada-going-ahead-with-energy-east-line-between-alberta-and-n-b-1.1393327 retrieved August 2, 2013.
3. Dilbit moved by rail sometimes has slightly less diluent, between 20 and 25%.
4. Netbacks are calculated by subtracting cost of diluent and transport from revenue for each barrel of bitumen produced. Netbacks are appropriate for this comparison because the transportation costs cannot be directly compared since each case requires a different volume of total product moved. Relative pipeline economics assume a pipeline to the US Gulf Coast exists with tolls in the $7.50–9.00 per barrel range.
5. IHS CERA oil price outlook is that Brent crude will average $92 per barrel between 2013 and 2020 (constant 2011 dollars). Meanwhile, over the same time period, we expect oil sands steam-assisted gravity drainage projects to require a $65–85 per barrel Brent price for continued investment. Hence, even if oil sands break-evens were to increase by $6 per barrel owing to the use of rail, oil sands would continue to grow.

Moving to pure bitumen by rail if pipelines are constrained

Pure bitumen rail movements today are not happening because the necessary infrastructure for shipping pure bitumen does not exist. Moving pure bitumen requires specialized equipment in Alberta, such as heated tanks connected by heated pipelines, modifications to rail on-loading facilities, heated rail cars, and units for removing diluent (diluent is added to the bitumen in the extraction and processing steps, this needs to be removed before shipping pure bitumen). In the USGC specialized rail off-loading facilities are also needed. The advantage today of moving dilbit, rather than pure bitumen, by rail is that it does not require as much unique rail infrastructure as pure bitumen. However, by moving dilbit by railcar, producers are making part of the investment needed for supporting pure bitumen movements.

The rationale, so far, for not investing in the pure bitumen transport option is that most oil sands producers are assuming that sufficient pipeline capacity will become available in a few years. In order to receive a payback on building pure bitumen railing infrastructure, producers must anticipate its use over a longer time frame—perhaps five years. However, if producers anticipate that new pipeline capacity will not keep pace with oil sands growth, we expect that they will make investments in more efficient rail transport, including equipment for moving pure bitumen. These investments would narrow the gap between the economics of transporting oil sands by pipeline and by rail. ■