

MEMORANDUM

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U. S. DEPARTMENT OF ENERGY

SUBJECT: COMMENTS ON "THE TAR SANDS ROAD TO CHINA"

DATE: JUNE 22, 2011

The paper by Philip K. Verleger, "The Tar Sands Road to China",² asserts that the Keystone XL pipeline, if approved by the State Department, would not transport Alberta's diluted bitumen (dilbit) to PADD III refineries. Verleger suggests that the dilbit would instead be loaded on to tankers at Port Arthur for delivery to Asian refineries.

This memorandum provides data and analysis about a number of issues raised in the paper by Dr. Verleger. It concludes that PADD III refiners will likely consume additional Canadian oil sands well in excess of what would be provided by the Keystone XL pipeline. It also concludes that exports of Canadian oil sands from Port Arthur are unlikely.

Alternative Routes to Asia

There are three currently-proposed projects that could ship Canadian oil sands to Asia via pipeline to the British Columbia coast. We summarize below the capacities, distances and estimated shipment costs of these three projects as well as a possible rail option to the British Columbia coast and Verleger's "Tar-Sands Road to Asia" (number 5 below).

1. The Enbridge Gateway pipeline from Edmonton to Kitimat
 - a. Capacity: 525,000 bpd initial
 - b. Pipeline distance: 715 miles
 - c. Sea voyage distance: 9872 nautical miles
 - d. Estimated total shipment cost: \$6/bbl
2. The Kinder Morgan TMX Expansion to Vancouver
 - a. Capacity: 400,000 bpd (in two stages)
 - b. Pipeline distance: 725 miles
 - c. Sea voyage distance: 10416 nautical miles

¹ Significant contributions to this memorandum were made by Martin Tallett of EnSys Energy and Systems, Inc., as well as Peter Whitman and Thomas White in the Office of Policy Analysis.

² Phillip P. Verleger, "The Tar Sands Road to China", 2011

- d. Estimated total shipment cost: \$7/bbl
- 3. The Kinder Morgan TMX Northern Leg to Kitimat
 - a. Capacity: 400,000 bpd
 - b. Pipeline distance: 750 miles approx
 - c. Sea voyage distance: 9872 nautical miles
 - d. Estimated total shipment cost: \$6/bbl
- 4. Unit train from Edmonton to Kitimat
 - a. Capacity: Not defined except that a single unit train terminal can process 1 or 2 65,000 barrel trains per day
 - b. Rail distance: 715 miles approx
 - c. Sea voyage distance: 9872 nautical miles
 - d. Estimated total shipment cost: \$8-\$12/bbl³
- 5. "Tar Sands Route to China"
 - a. Capacity: depends on availability via KXL or other pipelines
 - b. Pipeline distance: 1704 miles
 - c. Sea voyage distance: 20,596 nautical miles via Panama, 31,702 via Cape of Good Hope
 - d. Estimated total shipment cost: \$15/bbl

Verleger discounts any Canadian pipeline to British Columbia:

"Northern Gateway, however, faces significant objections from British Columbia residents, as well as First National tribes, over whose reservations the pipeline would pass. Under Canadian law, these objections can prove formidable and they might stop the project in its tracks."

Dr. Verleger's paper makes no mention of the Kinder Morgan alternatives (number 2 and 3 above), nor does it mention possible rail shipments to the British Columbia coast (number 4 above). Nonetheless, Verleger concludes that the Keystone XL pipeline would be the *only* way Canadian oil sands could be shipped to Asia.

How Much Oil Sands would the Keystone XL Pipeline Carry to the Gulf Coast?

Dr. Verleger states that the Keystone XL pipeline would carry 1.1 million barrels/day of Canadian oil sands to the Gulf Coast.⁴ We estimate that Keystone XL would have a capacity of 700 to 830 thousand barrels/day. Of this capacity, 200-250 thousand barrels/day would be devoted to Bakken and Midcontinent crude. This reduces the expected volume of Canadian dilbit to 450-630 thousand barrels/day. TransCanada has already secured contracts for 380 thousand barrels/day, leaving only 70-

³ Preliminary estimate.

⁴ Verleger states "TransCanada has proposed an alternative line. The Keystone XL expansion line would run south from Hardisty, Alberta, to Houston. The proposed line would carry 1.1 million barrels per day." It is possible that Verleger is assuming that the Keystone Base and Extension are carrying Canadian oil sands to the Gulf Coast instead of Wood River/Patoka Illinois. The Keystone XL is the only TransCanada pipeline that would carry oil sands to the Gulf Coast. It should also be noted that TransCanada has indicated that it will not seek a special permit to increase pipeline throughput to 900 thousand barrels/day as previously estimated.

250 thousand barrels/day of dilbit capacity that has not found firm contract buyers but could be offered in the spot market.

Impact of the Keystone XL Pipeline on Midwest vs. Gulf Coast Oil Prices

Dr. Verleger points out that Midwest refiners are not willing to pay as much for Canadian oil sands as Gulf Coast refiners. There are two reasons why this is the case. Because of the congestion at Cushing, not enough oil from any in-land source is getting to Gulf Coast refineries. The Cushing congestion will be alleviated in a few years as more pipeline capacity is built from Cushing to Houston. As the congestion is alleviated, the current price distortion of WTI relative to Brent and under-pricing of landlocked crudes will be reduced or eliminated. The second and more important reason Gulf Coast refiners are willing to pay more for dilbit than Midwest refiners reflects differences between Midwest and Gulf Coast refining capacity. Having made investments to process heavier crude imports from Mexico and Venezuela (that are expected to decline, see below), PADD III can more easily process large volumes of dilbit. Thirty percent of the world's coking capacity is in PADD III. While PADD II refineries import and process significant volumes of Canadian oil sands, additional refining upgrades and capacity would be needed to process the projected supply growth of Canadian crudes.

In its National Energy Board filing, TransCanada makes the statements

"Existing markets for Canadian heavy crude, principally PADD II, are currently oversupplied, resulting in price discounting for Canadian heavy crude oil. Access to the USGC via the Keystone XL Pipeline is expected to strengthen Canadian crude oil pricing in PADD II by removing this oversupply. This is expected to increase the price of heavy crude to the equivalent cost of imported crude. Similarly, if a surplus of light synthetic crude develops in PADD II, the Keystone XL Pipeline would provide an alternate market and therefore help to mitigate a price discount."⁵

From this, Verleger concludes:

"TransCanada, acting as a good monopolist, proposes to divert crude from Midwestern refiners so Canadian producers can get a price higher than the competitive prices, that is, oil would be diverted until those refiners have to pay the same prices as Gulf Coast refiners."

Verleger's interpretation of TransCanada's National Energy Board submission stretches beyond what is stated. It is not clear why he uses the term "monopolist" to describe TransCanada's plan to move oil sands that would otherwise be oversupplied in PADD II to PADD III. TransCanada merely recognizes that PADD II is oversupplied with crude, which by definition means the region is not in competitive equilibrium. PADD II is oversupplied because transportation constraints do not allow sufficient shipments of crude out of the region. As Dr. Verleger points out, Midwest refiners used to pay more for oil because oil had to flow north from the Gulf. Now, with Bakken crude, Canadian dilbit and other landlocked supplies, oil needs to flow south. With adequate PADD II to PADD III pipelines, price discounts

⁵ The Keystone XL Pipeline Section 52 Application, Section 3: Supply and Markets, Section 3.4.3, "Crude Pricing Impact"

currently enjoyed by Midwest refiners would diminish. This wouldn't cause a less competitive oil market. Midwest refiners would still enjoy a \$2.00 to \$2.50⁶ transportation cost advantage over Gulf Coast refiners. This is about one-tenth the current discount of WTI compared to Brent (approximately \$20/barrel).⁷ Current transport *constraints* give Midwest refiners a crude price advantage that is not justified by long-term transportation costs. Eliminating those constraints would produce a *more* competitive oil market.

Effect on Midwest Gasoline Prices⁸

Eliminating transportation constraints from Cushing to Houston would not adversely affect Midwest gasoline consumers. While Midwest refiners are currently benefiting from high crude discounts compared to PADD I and PADD III refiners, Midwest gasoline consumers are not benefiting from them. Retail gasoline prices reflect the wholesale price of marginal gasoline supplies. In 2010, marginal gasoline supplies to the Midwest were from PADD III (310 thousand barrels/day) and PADD I (180 thousand barrels/day). With substantial additional volumes of light-sweet and other crudes accessible to Gulf Coast refineries, WTI prices would increase. Brent, Argus and other marker crude prices would decline. Crude costs to PADD I and PADD III refineries would be lower. Gasoline prices in all markets served by PADD I and III refiners would decrease, including the Midwest.

Eliminating Cushing Congestion Benefits Domestic Oil Producers

Verleger emphasizes how the Keystone XL pipeline would reduce transportation constraints for Canadian oil sands. To quote:

“Thus crude reaching the Gulf of Mexico from Canada will compete there with imported crude. On the Gulf Coast, refiners will pay the cost of imported crude for Canadian oil.”

However, the current price disparity between oil at Cushing and oil in Houston is not merely a Canadian oil story. The following chart shows the current sources of oil being delivered to Cushing.

⁶ An estimate based on the tariffs on oil pipelines of similar length.

⁷ Historically WTI has traded at slightly higher prices than Brent since WTI is lighter and sweeter than Brent.

⁸ Dr. Verleger states that Keystone XL pipeline would “extract another \$2 to \$4 billion from U.S. consumers” as a result of increasing the value of currently land-locked oil in the Midwest by increasing its availability to the Gulf Coast.

Figure 1 Sources of Oil into Cushing

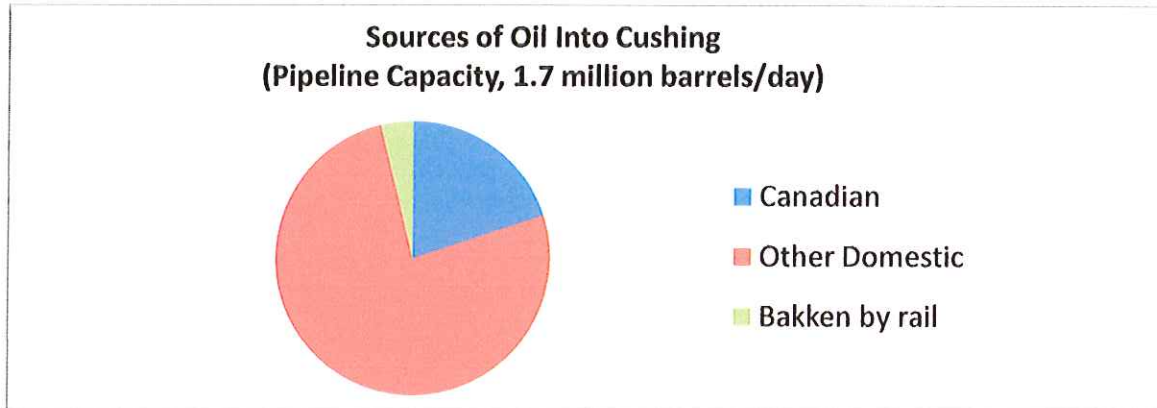
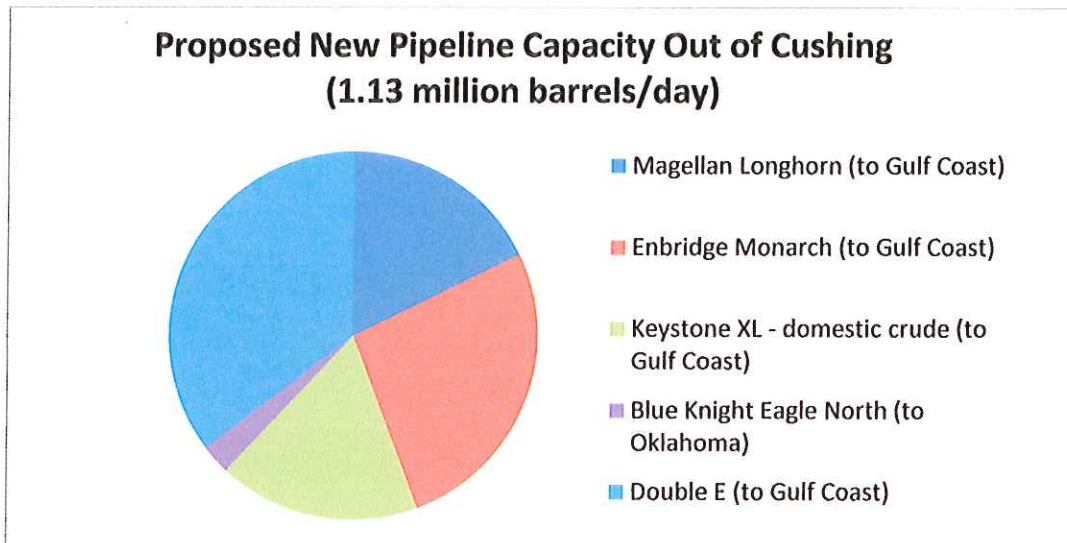


Figure 1 shows that only 21% of oil deliveries to Cushing are from Canada. Consequently, increased transport capacity from Cushing to Houston would enhance the aggregate value of domestic crude oil far more than the aggregate value of Canadian crude oil.

Figure 2 shows the currently proposed pipeline projects from Cushing. Taken together they could increase Cushing exports by 1.13 million barrels/day of which 1.10 million barrels/day would go south to the Gulf Coast. These projects would reduce or eliminate the current distortion of Midwest vs. Gulf Coast oil prices caused by transportation constraints.

Figure 2 Proposed Pipeline Projects Out of Cushing⁹



⁹ Proposed and likely projects as of May 2011. Estimates for Enbridge Monarch include the upper limit of expandable capacity. The estimates for Keystone XL include only the estimated domestic crude shipments to the Gulf Coast (200 thousand barrels/day). If the estimate for Enbridge Monarch is taken at its initial capacity, the total additional capacity would be 0.98 million barrels per day.

Canadian Oil Would Still Be Shipped to the Gulf Coast without the Keystone XL Pipeline

If the Keystone XL pipeline is not approved, another pipeline proposal to ship oil sands from PADD II to PADD III would likely emerge that would not require a new U.S./Canadian crossing.¹⁰ Additional Canadian oil sands can be supplied to PADD II via the Enbridge Mainline, Alberta Clipper, Keystone, and Keystone Extension. Taken together, these pipelines would allow Canadian oil sands imports to increase by 1 million barrels per day without the Keystone XL pipeline (2015). Surplus capacity to import Canadian oil sands is not expected to be exhausted until about 2020. If the Keystone XL pipeline is built, surplus capacity from existing projects would not be exhausted until at least 2025.

As substantial capacity is available to bring more Canadian oil sands into PADD II without the Keystone XL pipeline, a domestic pipeline from PADD II to PADD III could ship as much Canadian oil sands to Houston as the Keystone XL. This alternative PADD II to PADD III pipeline would only require permits from affected Midwestern and Gulf Coast region states.

To summarize, the current distortion of Midwest and Gulf Coast oil prices caused by the Cushing congestion will be alleviated whether or not the President approves or disapproves the Keystone XL pipeline permit application. In addition, if the Keystone XL pipeline is not constructed, more oil sands would still be delivered to Houston via increased PADD II to PADD III capacity.

The Jones Act¹¹

Verleger claims that the Jones Act would prevent waterborne shipments to a variety of Gulf Coast refineries. This fails to account for 1) a network of crude oil pipelines along the Gulf Coast, 2) the option to build a pipeline connection from the Keystone XL to the LOOP (thus connecting Keystone XL oil to a pipeline network serving many Gulf Coast refineries) and 3) the likelihood of swaps among refineries that would make physical transport of oil sands unnecessary. Lastly, should some marine shipments be made, there currently exists an excess of Jones Act barge capacity in the Gulf.¹²

Would Canadian Crude Be Exported from the Gulf?

Verleger states:

“The completion of the Keystone XL pipeline would create a surplus in the U.S. Gulf. This surplus would require some oil to move from the Gulf to other markets unless existing importers vacate the market. As noted below, existing importers are not expected to concede market share to Canada. Instead, some Canadian oil will need to be exported from the Gulf. At this point, Asia would be clearing the market.”

¹⁰ EnSys Energy, *Keystone XL Assessment*, December 23, 2010, p. 28

¹¹ The Jones Act (Section 27 of the Merchant Marine Act of 1920, P.L. 66-261) requires that all goods transported by water between U.S. ports be carried in U.S.-flag ships, constructed in the United States, owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents.

¹² U.S. Department of Transportation Maritime Administration, *Coastal Tank Vessel Market Snapshot, 2009*, June 2010, p. 9.

Would 450-630 thousand barrels/day of additional dilbit shipments create a surplus in the U.S. Gulf? We can answer this question by looking at current oil imports into PADD III, evaluating whether the most important suppliers will be able to maintain these supplies and consider whether any declining supplies would best be replaced with dilbit.

**Table 2 Oil Imports into PADD III (Selected Countries)
Thousand Barrels Per Day as of March 11, 2011**

All Countries	5,097
Saudi Arabia	706
Nigeria	518
Canada	117
Mexico	1,170
Venezuela	901
Others	1,685

Note that the largest source of PADD III imports is Mexico (1.1 million barrels/day). However, Mexican oil imports to the United States have been in decline. As shown in Figure 3, between 2006 and 2010, imports from Mexico have declined by 0.5 million barrels/day from a previous peak of 1.6 million barrels per day. There is every reason to expect this trend to continue. The Mexican Cantarell field is experiencing declines (dropping from 2.1 million barrels/day in 2004 to less than 1 million barrels/day by 2009¹³). The prospects do not look promising to offset losses of Cantarell with oil from other major Mexican fields such as Chicotepec Basin (poor permeability) and Ku-Maloob-Zaap (poor oil quality). Oil imports from Mexico (PADD III's largest foreign supplier) are declining and are expected to decline further. According to the International Energy Agency's *2010 Medium Term Oil and Gas Report*, Mexican production is expected to decline by 500 thousand barrels per day between 2010 and 2015.¹⁴

Figure 3 Annual U.S. Oil Imports from Mexico



Source: U.S. Energy Information Administration

¹³ Energy Information Administration, <http://www.eia.gov/emeu/cabs/Mexico/pdf.pdf>

¹⁴ International Energy Agency, *Mid Term Oil and Gas Markets, 2010*, p. 130

Venezuela is the second largest supplier of PADD III imports. Verleger believes that Venezuela will “work hard to maintain its arrangements with buyers due to the unique characteristics of its crude” and places great stress on the fact that certain refiners have contracts to purchase Venezuelan crude. However, as shown in Figure 4, Venezuelan oil supplies to the U.S. are in decline. Venezuela is increasing its focus on markets in Cuba, China, and other non-Japanese Asian countries. Venezuelan production is expected to increase but their exports to Asia will also increase, especially as the Panama Canal is expanded to allow larger tankers. Taken together, U.S. imports of crude oil from Mexico and Venezuela are about 1 million barrels/day lower than their previous peak levels. With an expected decline of Mexican crude production of 500 thousand barrels per day and the likelihood of increased exports of Venezuelan crude to Asia, current heavy oil imports to PADD III are likely to decrease by a significant amount within the next five years.

Figure 4 Annual U.S. Oil Imports from Venezuela

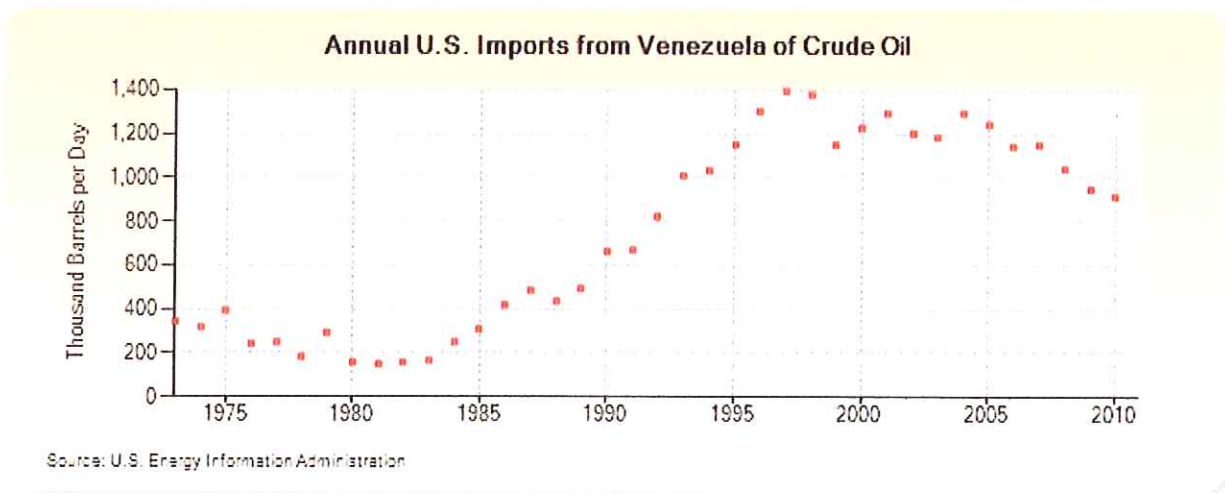


Figure 4 also offers a useful commentary on Verleger’s claim that, in 1987, Saudi Arabia aggressively priced its crude to prevent Venezuela from gaining a foothold in the U.S. market. Looking at Figure 4, this could not have been a very successful strategy since Venezuelan imports to the U.S. steadily increased from about 400 thousand barrels/day in 1986 to 1.4 million barrels per day 10 years later.

Verleger’s overall view that oil exporting countries will find it necessary to maintain U.S. oil markets is also inconsistent with trends in the world oil market. The International Energy Agency expects that increases in OPEC production will not keep up with increases in oil demand and non-OPEC investment will be needed to meet new demand, especially in nonconventional oil.¹⁵ Middle Eastern producers will not have any trouble finding takers for their crude. Even if, as Verleger claims, Saudi Arabia makes price concessions to maintain 700 thousand barrels per day of exports to PADD III, PADD III refiners import between 5-6 million barrels/day of crude oil. PADD III crude imports from its largest suppliers (1.2

¹⁵ International Energy Agency, *2010 World Energy Outlook*

million barrels/day from Mexico and 0.9 million barrels/day from Venezuela) are declining. Several PADD III refineries are configured to process oil from Mexico and Venezuela.¹⁶ With these supplies in decline, there is a significant market opportunity for competitively-priced Canadian dilbit to offset lost heavy oil supplies. There is no reason to believe, as Verleger asserts, that PADD III refiners would not use the Canadian oil shipped in the Keystone XL pipeline (450-630 thousand barrels/day). As mentioned above, TransCanada has already secured contracts for 380 thousand barrels/day, leaving only 70-250 thousand barrels/day of Keystone XL capacity that has not yet found buyers. The Gulf Coast appetite for Canadian oil sands in PADD III will be much higher than can be supplied by just the Keystone XL pipeline. Refinery modeling analysis shows that PADD III imports of Canadian oil sands could rise to 1.8 million barrels per day by 2030 (using a modeling scenario that assumes no additional oil sands pipelines to the British Columbia coast).¹⁷

Summary and Conclusions

Without a surplus of heavy oil in PADD III, there would be no economic incentive to ship Canadian oil sands to Asia via Port Arthur. Dilbit is more suited to many PADD III refineries than more expensive oil from other sources. Many of these refineries rely on declining supplies of Mexican and Venezuelan heavy crudes (2.1 million barrels/day). They would be natural customers for increased supplies of Canadian dilbit. Shipments of Keystone XL oil sands that are not under contract would be quite small (70-250 thousand barrels/day), especially when compared to the potential PADD III market for dilbit (as high as 1.8 million barrels/day by 2030). Consequently, it is not likely that refiners would import more oil from other sources in order to replace dilbit that is already in Port Arthur.¹⁸

We also expect that the Cushing congestion will be reduced or eliminated whether or not the Keystone XL pipeline is constructed. There are several proposed pipeline projects to move oil south to Houston (1.1 million barrels per day¹⁹). These projects, whether or not they include the Keystone XL pipeline, would reduce the crude price discounts now enjoyed by Midwest refiners. Nonetheless, these pipeline projects would not increase gasoline prices to Midwest consumers.

¹⁶ Venezuelan crude tends to be low gravity (18-20), high TAN and relatively low sulfur. Maya is low gravity (around 22), high sulfur and low TAN. Dilbit is moderate sulfur, moderate TAN and low gravity (around 20)

¹⁷ EnSys Energy, *Keystone XL Assessment*, December 23, 2010, The 1.8 million barrels per day estimate is from a scenario that assumes the EIA Annual Energy Outlook Reference Case U.S. oil demand, completion of the Keystone XL pipeline, completion a PADD II to PADD III pipeline and no new pipelines from Alberta to British Columbia (i.e., Enbridge Gateway pipeline, Kinder Morgan TMX expansion or TMX Northern Leg). Scenarios that assume completion of one or more of these pipelines to the Canadian Pacific Coast show less use of Canadian oil sands in PADD III and increased PADD III imports from other countries.

¹⁸ It should also be noted that the Keystone XL-Port Arthur-China route would have higher shipping costs to Asia than any alternative route through British Columbia, including rail shipments from Alberta to Kitimat (pp. 1-2).

¹⁹ As shown in Figure 2, current proposed or likely projects would ship 1.1 million barrels/day of oil from Cushing to Houston. While the Keystone XL pipeline is counted among these projects, we only include the estimated 200 thousand barrels/day of domestic oil that would otherwise stay in PADD II, not shipments of Canadian oil.