

### 1   **3.0   SUPPLY AND MARKETS**

2           This section provides oil supply and market information, including:

- 3           • a summary of the Western Canada Sedimentary Basin (“WCSB”) oil supply;
- 4           • supply access at the Hardisty, Alberta hub;
- 5           • an overview of the United States Gulf Coast (“USGC”) market for the Keystone XL
- 6           Pipeline (the “Project” for the Canadian portion); and
- 7           • a summary of the findings of an independent supply and market assessment prepared
- 8           by Purvin & Gertz, Inc. (“PGI”). A copy of the PGI assessment is provided in
- 9           Appendix 3-1.

### 10   **3.1   WCSB Supply Forecast**

11           The primary source of supply for the Keystone XL Pipeline is the Alberta oil sands. The

12           Energy Resources Conservation Board reports that there are 27.5 billion cubic

13           metres (“m<sup>3</sup>”) or 173 billion barrels (“bbl”) of remaining established reserves of bitumen

14           in the Alberta oil sands. There are sufficient bitumen reserves in Alberta to sustain

15           development of new oil sands projects for decades. Several projects currently under

16           construction will add to supply and future export requirements.

17           In late 2008, there were announcements of the delay or cancellation of several proposed

18           upgrader projects, due to both the high development costs in Alberta and the reduced

19           differential between light and heavy crude oil prices. At this time, bitumen projects are

20           more economic to develop than upgraded synthetic crude oil projects. This is expected to

21           increase the supply of heavy crude in the next few years, which emphasizes the need to

22           find new export markets for heavy crude oil. The Keystone XL Pipeline will be in a

23           position to access new markets for crude oil supply, both for increased supply of heavy

24           crude in the short term, and for future supply of light synthetic crude if the economics of

25           upgrading projects in Alberta improve.

1 Several crude supply forecasts are presented in the PGI supply and market assessment  
2 that is discussed in Section 3.4. The Canadian Association of Petroleum Producers  
3 (“CAPP”) published a report in June 2008 titled “Crude Oil Forecast, Markets and  
4 Pipeline Expansions” (“CAPP forecast”). The pipeline planning case in the CAPP  
5 forecast projects that Alberta oil sands production will increase by 345,000 cubic metres  
6 per day (“m<sup>3</sup>/d”) or 2.17 million barrels per day (“bbl/d”) between 2007 and 2017. The  
7 growth in oil sands production is expected to more than offset declining conventional  
8 crude production. The CAPP forecast projects that overall WCSB crude oil supply will  
9 grow by 309,000 m<sup>3</sup>/d or 1.94 million bbl/d over the same period.

10 CAPP prepared an interim WCSB supply forecast update in December 2008. The interim  
11 forecast projects a decline in the growth of light crude oil supply in comparison with the  
12 June 2008 forecast, due to the delay of several projects. However, the interim forecast  
13 continues to show significant growth in heavy crude oil supply and overall oil supply.

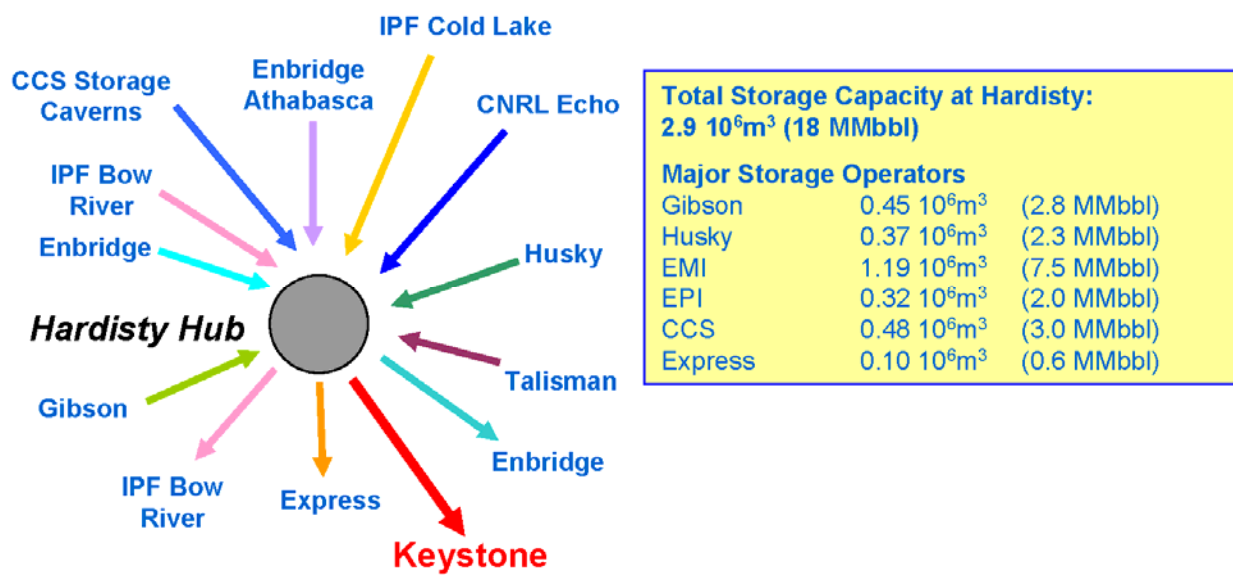
14 TransCanada Keystone Pipeline GP Ltd. (“Keystone”) concludes that this supply growth  
15 will require access to new crude oil markets, underpinning the need for the Keystone XL  
16 Pipeline. As noted in the CAPP forecast, U.S. Petroleum Administration for Defence  
17 District (“PADD”) III is the largest untapped market for western Canadian crude oil  
18 producers. Shippers approached Keystone to provide new capacity to the USGC market  
19 and have confirmed their desire to have the Keystone XL Pipeline completed  
20 expeditiously. Further, shippers have recently reconfirmed to Keystone, their desire for  
21 the Project to continue to proceed, consistent with the currently proposed Project  
22 schedule.

### 23 **3.2 Hardisty Supply Access**

24 Hardisty is a major hub for the western Canadian petroleum industry. It is connected to  
25 pipelines from Edmonton, Cold Lake, Lloydminster and Fort McMurray, Alberta. The

1 total inbound pipeline capacity to Hardisty of approximately 445,000 m<sup>3</sup>/d  
 2 (2.8 million bbl/d) is also supplemented by transportation of petroleum by rail and truck.  
 3 In addition to significant receipt capability, the Hardisty area has a storage capacity of  
 4 approximately 2.9 million m<sup>3</sup> (18 million bbl) (see Figure 3-1). This very liquid trading  
 5 hub will provide the Keystone XL Pipeline with access to a wide variety of light and  
 6 heavy crude supply for shipment to the USGC market.

**Figure 3-1: Hardisty Terminal Area**



7 **3.3 USGC Market Overview and Outlook**

8 The target market for the Keystone XL Pipeline is the USGC, located within PADD III,  
 9 which is the largest refining market in the world. PADD III currently has  
 10 1.34 million m<sup>3</sup>/d (8.4 million bbl/d) of crude refining capacity, mainly in Texas and  
 11 Louisiana. Shippers have committed to Keystone for delivery of 60,400 m<sup>3</sup>/d  
 12 (380,000 bbl/d) to the USGC market.

13 The Keystone XL Pipeline is proposed to terminate in the Nederland, Texas area (near  
 14 Port Arthur, Texas), with a planned extension to Houston, Texas. Existing pipeline

1 connections from the Nederland terminal area can provide access to Houston and Texas  
 2 City, Texas and Lake Charles, Louisiana refineries via other pipelines. The total refining  
 3 market directly accessible to Canadian crude via the Keystone XL Pipeline will be about  
 4 685,000 m<sup>3</sup>/d (4.3 million bbl/d), as shown in Table 3-1.

**Table 3-1: USGC Refining Market Available to the Keystone XL Pipeline**

Refinery	m <sup>3</sup> /d (x 1,000)	bbl/d (x 1,000)
Valero Energy, Port Arthur	45.9	289
Motiva Enterprises, Port Arthur	45.3	285
Motiva Enterprises Expansion, Port Arthur <sup>1</sup>	51.7	325
Total Petrochemicals, Port Arthur	36.9	232
ExxonMobil Corp, Beaumont	55.4	349
<b>Subtotal: Port Arthur Area</b>	<b>235.2</b>	<b>1,480</b>
Valero Energy, Houston	13.2	83
Houston Refining (Lyondell), Houston	43.1	271
Pasedena Refining, Pasedena	15.9	100
Shell Deer Park, Deer Park	52.5	330
ExxonMobil Corp, Baytown	90.1	567
<b>Subtotal: Houston Area</b>	<b>214.8</b>	<b>1,351</b>
BP, Texas City	76.0	478
Marathon Oil, Texas City	12.1	76
Valero Energy, Texas City	31.8	200
<b>Subtotal: Texas City Area</b>	<b>119.9</b>	<b>754</b>
Calcasieu Refining, Lake Charles	8.4	53
CITGO, Lake Charles	68.3	430
ConocoPhillips, Lake Charles	38.0	239
<b>Subtotal: Lake Charles Area</b>	<b>114.7</b>	<b>722</b>
<b>Total Refining Market</b>	<b>684.6</b>	<b>4,307</b>
NOTE:		
<sup>1</sup> This expansion is planned to be complete by 2012.		

5 The refining industry in PADD III has a large coking capacity. As a result, many  
 6 refineries are capable of handling a variety of crude oils, including a significant amount  
 7 of heavy crude oil.

1 Heavy crude runs for the target refineries in Table 3-1 are estimated by PGI at  
2 227,700 m<sup>3</sup>/d (1.43 million bbl/d) for 2007, nearly all of which were imported.  
3 Additionally, light crude runs in 2007 were estimated at 294,000 m<sup>3</sup>/d  
4 (1.85 million bbl/d), of which 248,600 m<sup>3</sup>/d (1.57 million bbl/d) were imported.

5 The Keystone XL Pipeline provides Canadian crude producers and USGC refiners with  
6 an opportunity to supply a portion of the total of 470,500 m<sup>3</sup>/d (2.96 million bbl/d) of  
7 heavy and light crude imports into PADD III. Furthermore, shippers on the Keystone XL  
8 Pipeline have made binding long term commitments to connect Alberta production to the  
9 USGC market.

#### 10 **3.4 Supply and Market Assessment by PGI**

11 Keystone engaged PGI to conduct an independent assessment of the supply and  
12 disposition of Western Canadian crude oil to markets in the U.S., including the Gulf  
13 Coast, and the price impact of connecting Canadian supply to this new market.

14 The PGI assessment considers:

- 15 • Western Canada crude oil supply;
- 16 • the U.S. crude oil market;
- 17 • Canadian crude oil disposition;
- 18 • the US Gulf Coast crude oil market;
- 19 • PADD II crude oil market;
- 20 • Canadian crude oil pricing impact; and
- 21 • pipeline capacity requirements.

1 The key findings of the PGI assessment, a copy of which is provided in Appendix 3-1,  
2 with respect to supply, markets, pricing impact and pipeline capacity, are discussed  
3 below.

#### 4 **3.4.1 Supply**

5 There is a range of Western Canadian crude oil supply forecasts. From 2007 to 2017,  
6 crude supply is forecast to increase by as little as 247,000 m<sup>3</sup>/d (1.55 million bbl/d) in the  
7 lowest case, to as much as 385,000 m<sup>3</sup>/d (2.42 million bbl/d) in the highest case. These  
8 overall forecast increases are the result of growing production from the oil sands.

#### 9 **3.4.2 Markets**

10 The Keystone XL Pipeline's target market, PADD III and specifically the USGC, is the  
11 largest refining market in the world with approximately 1.34 million m<sup>3</sup>/d (8.4 million  
12 bbl/d) of crude capacity, mainly in Texas and Louisiana.

13 The Keystone XL Pipeline will provide pipeline access to approximately 685,000 m<sup>3</sup>/d  
14 (4.3 million bbl/d) of refinery capacity in the Port Arthur, Houston, Texas City and Lake  
15 Charles areas.

16 The large PADD III market currently accesses very little Canadian crude oil. This access  
17 is currently limited to the Pegasus Pipeline, which provides only 10,300 m<sup>3</sup>/d  
18 (65,000 bbl/d) of transportation capacity. Refineries in this market have a large coking  
19 capacity and can run significant amounts of heavy crude, which are similar to Canadian  
20 bitumen blends.

21 The production of crude in the U.S. continues to decline, and imports will increase due to  
22 rising demand by U.S. refineries combined with declining domestic supply. Traditional  
23 supply sources of heavy crude for the USGC, such as Mexico and Venezuela, are

1 declining and some USGC refiners are diversifying their supply sources by obtaining  
2 access to Western Canadian crude.

3 PGI expects that the USGC market could absorb at least an incremental 79,500 m<sup>3</sup>/d  
4 (500,000 bbl/d) of Canadian crude, which represents approximately 12% of the crude  
5 capacity of the refineries in the Port Arthur, Houston, Texas City and Lake Charles areas.

### 6 **3.4.3 Crude Pricing Impact**

7 Existing markets for Canadian heavy crude, principally PADD II, are currently  
8 oversupplied, resulting in price discounting for Canadian heavy crude oil.

9 Access to the USGC via the Keystone XL Pipeline is expected to strengthen Canadian  
10 crude oil pricing in PADD II by removing this oversupply. This is expected to increase  
11 the price of heavy crude to the equivalent cost of imported crude. Similarly, if a surplus  
12 of light synthetic crude develops in PADD II, the Keystone XL Pipeline would provide  
13 an alternate market and therefore help to mitigate a price discount.

14 The resultant increase in the price of heavy crude is estimated to provide an increase in  
15 annual revenue to the Canadian producing industry in 2013 of US \$2 billion to US \$3.9  
16 billion.

### 17 **3.4.4 Pipeline Capacity**

18 Based on the PGI forecast of heavy oil supply growth, it is projected that, without the  
19 Keystone XL Pipeline, heavy crude oil pipeline capacity from Western Canada will be  
20 fully utilized by 2014. Using the supply forecast in the CAPP interim update of  
21 December 2008, PGI concludes that capacity for heavy crude oil will be fully utilized by  
22 2015.

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### 1 **3.4.5 Summary**

2           Keystone has reviewed the PGI assessment and agrees with its conclusions. Shippers on  
3           the Keystone XL Pipeline have contracted for access to the USGC market for their oil  
4           sands production and refining needs. Not only will this directly benefit these shippers, it  
5           will also provide a benefit to all WCSB heavy crude producers by increasing the price  
6           they receive for their crude, as well as providing significant pipeline capacity to an  
7           alternative market.



## **APPENDIX 3-1**

# **SUPPLY AND MARKET ASSESSMENT PURVIN & GERTZ INC**

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**WESTERN CANADIAN CRUDE  
SUPPLY AND MARKETS**

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*Buenos Aires – Calgary – Dubai – Houston  
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February 12, 2009

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#### **ABOUT THIS REPORT**

This report has been prepared for the exclusive benefit of TransCanada Keystone Pipeline GP Ltd. (Keystone) for the purpose of the facilities application to the National Energy Board (NEB) for the Keystone XL Pipeline. Any party other than Keystone and the NEB in possession of the report may not rely upon its conclusions without the written consent of Purvin & Gertz. Possession of the report by third parties does not carry with it the right of publication.

Changes in factors upon which the review is based could affect the results. All results are based on information available at the time of review. In preparing this report and the opinions recorded in this report, Purvin & Gertz relied upon data and information provided by reliable industry sources. Purvin & Gertz does not accept responsibility for errors or inaccuracies in information provided by others. Forecasts are inherently uncertain because of events or combinations of events that cannot reasonably be foreseen including the actions of government, individuals, third parties and competitors.

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1 **INTRODUCTION**

2 TransCanada Keystone Pipeline GP Ltd. (“Keystone”) is planning the Keystone XL  
3 Pipeline project to deliver Canadian crude oil from Hardisty, Alberta to Nederland, Texas near  
4 Port Arthur and Houston, Texas at the U.S. Gulf Coast (“USGC”) by late 2012. The pipeline will  
5 be able to deliver a range of crudes from light to heavy crude. It will provide incremental  
6 capacity to deliver 500,000 barrels per day (“B/D”), or 79.5 thousand cubic metres per day  
7 (“10<sup>3</sup>m<sup>3</sup>/d”) to the USGC. Currently, there are shipper commitments for 380,000 B/D  
8 (60.4 10<sup>3</sup>m<sup>3</sup>/d) for the Keystone XL Pipeline, subject to regulatory approval.

9 Keystone is making a facilities application (the “Application”) to the National Energy  
10 Board (“NEB”) for the Canadian section of its pipeline from Hardisty to the U.S. border.  
11 Keystone retained Purvin & Gertz, Inc. (“Purvin & Gertz” or “PGI”) to provide evidence regarding  
12 Western Canadian crude oil supply and the USGC market to be supplied by the proposed  
13 Keystone XL Pipeline. The topics discussed in this report include Western Canadian crude oil  
14 supply, the U.S. crude oil market, Canadian crude oil disposition, the USGC crude oil market,  
15 the U.S. Midwest crude oil market, Canadian crude oil pricing and pipeline capacity  
16 requirements. The Summary and Conclusions are at the end of the discussion.

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## 1 WESTERN CANADIAN CRUDE OIL SUPPLY

2 Western Canada has very large oil reserves due mainly to bitumen in oil sands. The  
3 Canadian Association of Petroleum Producers ("CAPP") estimated the remaining established  
4 reserves of conventional crude oil and pentanes plus in Western Canada at 585.8 million cubic  
5 metres (3.68 billion barrels) at December 31, 2006<sup>1</sup>. The Energy Resources Conservation  
6 Board ("ERCB") of Alberta estimated the remaining established reserves of crude bitumen in oil  
7 sands at 27.45 billion cubic metres (172.7 billion barrels) at the end of 2007<sup>2</sup>. At an annual  
8 bitumen production rate of 77 million cubic metres (484 million barrels) in 2007, the crude  
9 bitumen reserves are equivalent to 356 years of production. This figure would fall as bitumen  
10 production increases. Projects and plans are underway to develop the oil sands further and  
11 increase the production of bitumen and synthetic crude oil.

12 As a basis for this discussion, we have used the Purvin & Gertz 2008 forecast for  
13 Western Canadian supply in Table 1 which is provided at the back of this report. This includes  
14 conventional light and heavy crudes as well as synthetic crude oil and bitumen blends from the  
15 oil sands. Overall, the annualized average crude supply is forecast to grow from 2007 to 2013  
16 by approximately 1.03 million B/D ( $164 \times 10^3 \text{m}^3/\text{d}$ ). This is equivalent to 172,000 B/D  
17 ( $27.3 \times 10^3 \text{m}^3/\text{d}$ ) each year. From 2013 to 2020, crude supply is forecast to grow by another  
18 827,000 B/D ( $131 \times 10^3 \text{m}^3/\text{d}$ ), equivalent to an annual growth rate of 118,000 B/D ( $18.8 \times 10^3 \text{m}^3/\text{d}$ ).

19 Supply forecasts are uncertain but are necessary for forward planning of new facilities  
20 such as pipelines. In Figure 1 and Table 2, the Purvin & Gertz forecast is compared with other  
21 crude supply forecasts by CAPP in June 2008<sup>3</sup> and by Enbridge in October 2008<sup>4</sup>. CAPP's

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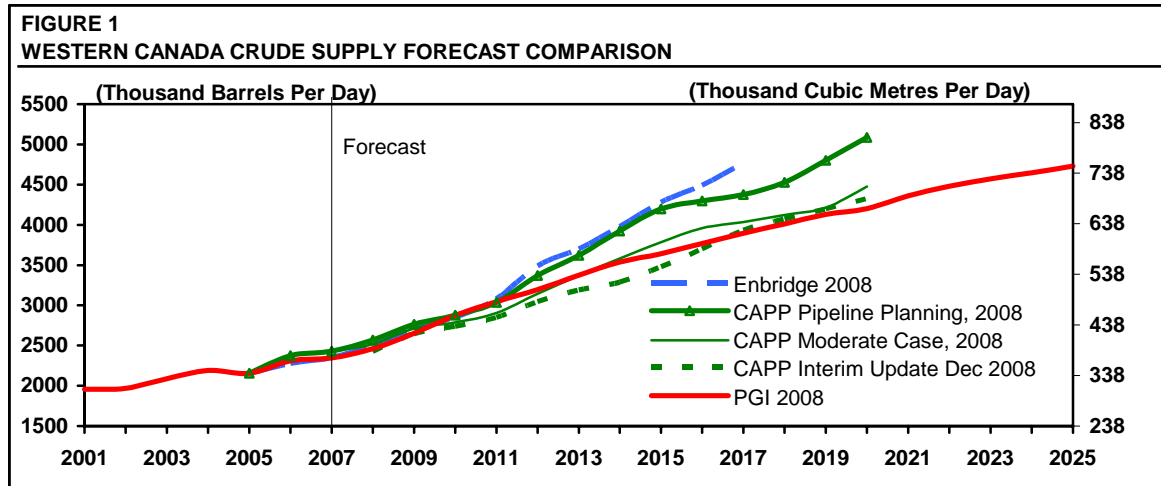
<sup>1</sup> CAPP Statistical Handbook, Section 2, Reserves, November 2007.

<sup>2</sup> ERCB, Alberta's Energy Reserves 2007 and Supply/Demand Outlook 2008-2017, June 2008.

<sup>3</sup> CAPP, Crude Oil Forecast, Markets and Pipeline Expansions, June 2008.



1 June 2008 forecasts include a Pipeline Planning Case and a Moderate Growth Case (the  
 2 “Moderate” case). In December 2008, CAPP prepared a more recent forecast (the “Interim  
 3 Update”)<sup>5</sup> which is also included. The Enbridge and June CAPP forecasts are higher than  
 4 Purvin & Gertz after 2013, although the CAPP Moderate Case is similar. The forecast in  
 5 CAPP’s December Interim Update is lower than Purvin & Gertz until 2016.

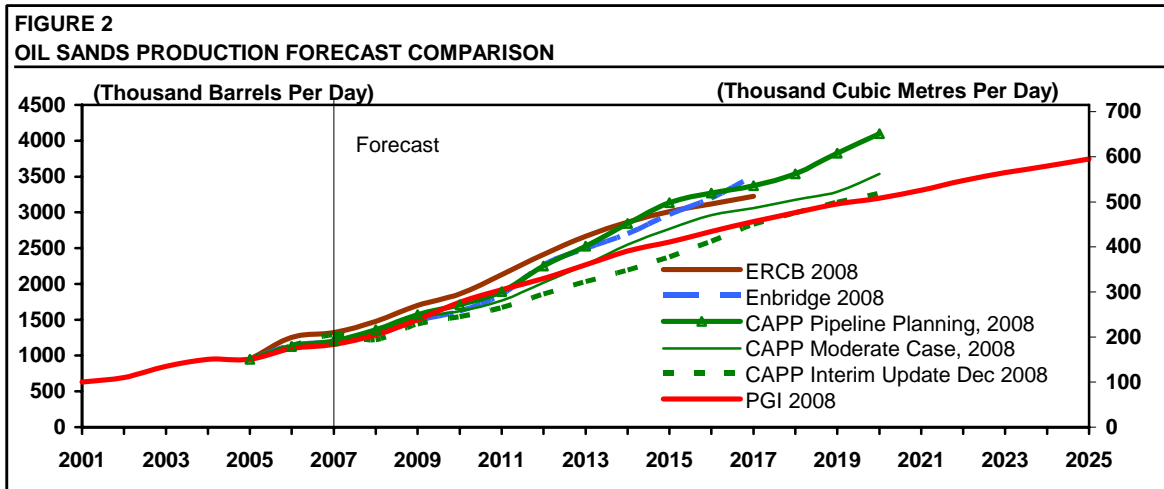


6 The supply in CAPP’s Pipeline Planning Case is approximately 7 percent higher than in  
 7 its Moderate Case in 2013 and it rises to more than 13 percent higher by 2020. The Pipeline  
 8 Planning Case shows higher production and allows for pipeline operational flexibility. Over time,  
 9 there can be planned and unplanned outages by pipelines, refineries and oil producers,  
 10 including oil sands operators supplying bitumen blends or synthetic crude oil, so pipelines need  
 11 additional capacity to sustain annual average throughputs. In a market environment where  
 12 crude production is growing each year, supplies will be greater in the last half of a year  
 13 compared with the first half, so annualized average throughput estimates are inadequate for  
 14 pipeline planning.

<sup>4</sup> Enbridge, Liquids Pipeline Development, Enbridge Day Presentation, October 7 and 8, 2008.

<sup>5</sup> CAPP, Interim Update, 2008-2020 Western Canadian Crude Oil Forecast, December 11, 2008.

1 The forecast growth in Western Canadian supply is due to expected increases in oil  
 2 sands production, both bitumen and synthetic crude from upgrading. Oil sands growth should  
 3 more than offset the continuing declines in conventional crude production. Growth in oil sands  
 4 production is expected from mining as well as in-situ projects. Oil sands production forecasts  
 5 are compared in Figure 2. The 2008 forecast of the ERCB is also included<sup>2</sup>. Compared with the  
 6 other 2008 forecasts, it has the highest outlook for oil sands production through 2014.



<sup>2</sup> ERCB, Alberta's Energy Reserves 2007 and Supply/Demand Outlook 2008-2017, June 2008.

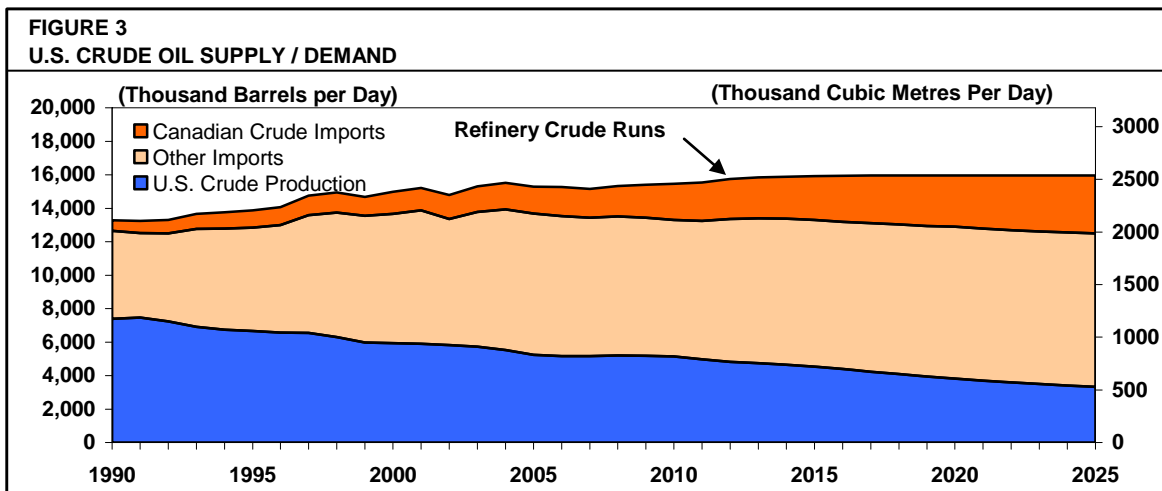
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1 **U.S. CRUDE OIL MARKET**

2 The U.S. refining industry has a combined crude capacity of approximately  
 3 17.6 million B/D, or 2.8 million cubic metres per day (“10<sup>6</sup>m<sup>3</sup>/d”). In 2007, refinery crude runs  
 4 were approximately 15.1 million B/D (2.4 10<sup>6</sup>m<sup>3</sup>/d). As shown in Figure 3, crude runs have been  
 5 slowly rising. In the outlook from the Purvin & Gertz 2008 forecast, U.S. refinery crude runs are  
 6 forecast to continue to rise modestly by more than 700,000 B/D (111 10<sup>3</sup>m<sup>3</sup>/d) by 2013.

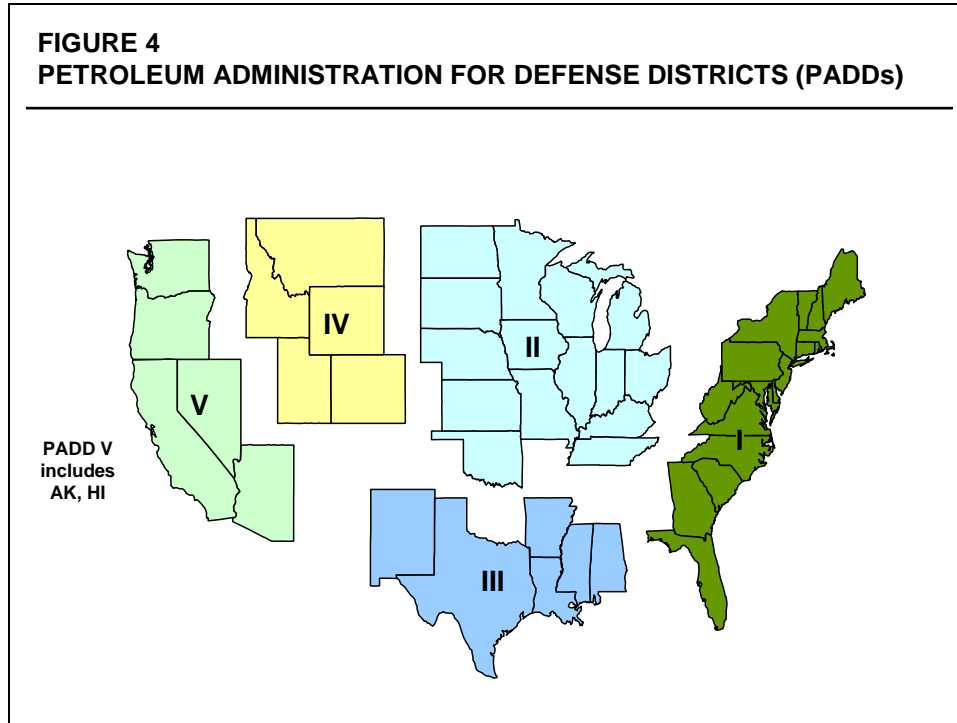
7 The production of crude in the U.S. has been falling. In 2007, U.S. crude production was  
 8 approximately 5.1 million B/D (811 10<sup>3</sup>m<sup>3</sup>/d). Further production declines are expected.

9 With U.S. crude production at 34 percent of refinery crude runs in 2007, crude imports to  
 10 the U.S. reached 10.0 million B/D (1.6 10<sup>6</sup>m<sup>3</sup>/d). U.S. imports have been rising and further  
 11 increases are expected due mainly to falling domestic production, as shown in Figure 3.



12 Crude oil imports to the U.S. include Canadian crude. Due to its rising production and  
 13 exports, Canada has become the largest single source of imported crude to the U.S., with  
 14 approximately 1.9 million B/D (302 10<sup>3</sup>m<sup>3</sup>/d) in 2007, including East Coast crude. Canadian  
 15 crude exports to the U.S. are expected to rise with growing production, assuming pipeline  
 16 capacity continues to grow.

1 Canadian crude reaches many refining markets within the U.S. The U.S. is divided into  
2 five regions known as Petroleum Administration for Defense Districts (“PADDs”). These are  
3 shown on the map in Figure 4. PADD I is the East Coast; PADD II is the Midwest; PADD III is  
4 mostly the Gulf Coast; PADD IV is the Rocky Mountain region; and PADD V is the West Coast,  
5 including Alaska and Hawaii.



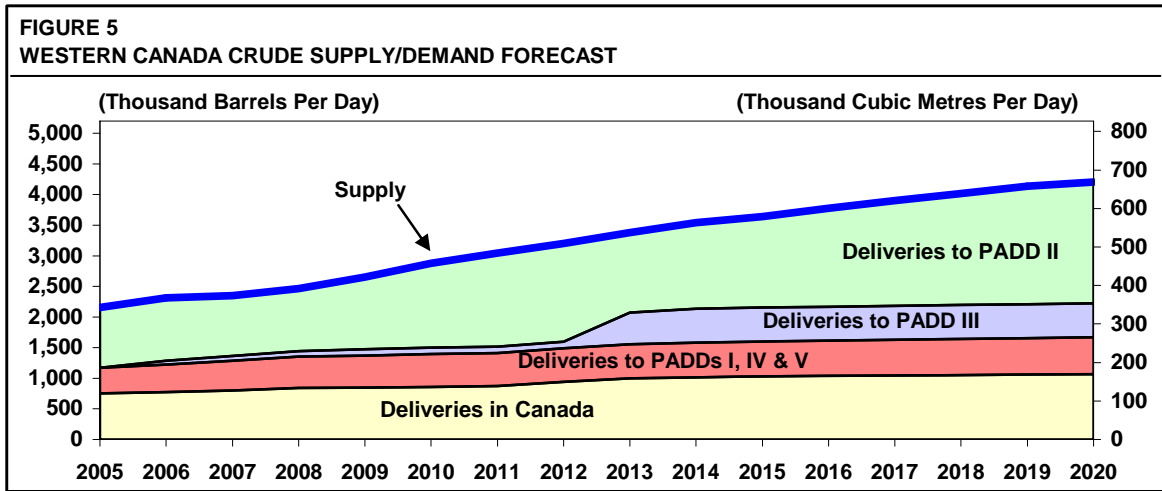
## 1 **CANADIAN CRUDE OIL DISPOSITION**

2           The disposition forecast for Western Canadian crude is shown in Table 1. This includes  
3 deliveries to the Texas Panhandle and the USGC within PADD III. The USGC deliveries include  
4 Keystone XL Pipeline shipments of 380,000 B/D ( $60.4 \times 10^3 \text{m}^3/\text{d}$ ) starting in 2013. Within  
5 PADD III, some of the Canadian crude is now being supplied to the Texas Panhandle via  
6 Cushing, Oklahoma, so is not available to the USGC. WRB Refining (formerly ConocoPhillips)  
7 is using Canadian heavy crude at its Borger, Texas refinery and has plans for a project to use  
8 more Canadian crude by 2013<sup>6</sup>. The existing Pegasus pipeline, owned by Mobil Pipeline, was  
9 reversed in 2006 to supply up to 65,000 B/D ( $10.3 \times 10^3 \text{m}^3/\text{d}$ ) of Canadian crude to the USGC. In  
10 this report, it is assumed to operate permanently although its initial commitments were for five  
11 years (until early 2011) and it could shut down after Keystone XL Pipeline commences  
12 operations.

13           In addition, Table 1 and Figure 5 show Purvin & Gertz' 2008 disposition forecast for  
14 Canada and U.S. PADDs I, IV and V. Deliveries in Canada are to refineries in Western Canada  
15 and Ontario and the forecast allows for higher deliveries to Ontario, assuming the replacement  
16 of imports. Deliveries to PADDs I and IV are needed to meet local refinery demand. Deliveries  
17 to PADD V have been mostly to Washington state refineries. Overall, deliveries to these  
18 markets are forecast to rise.

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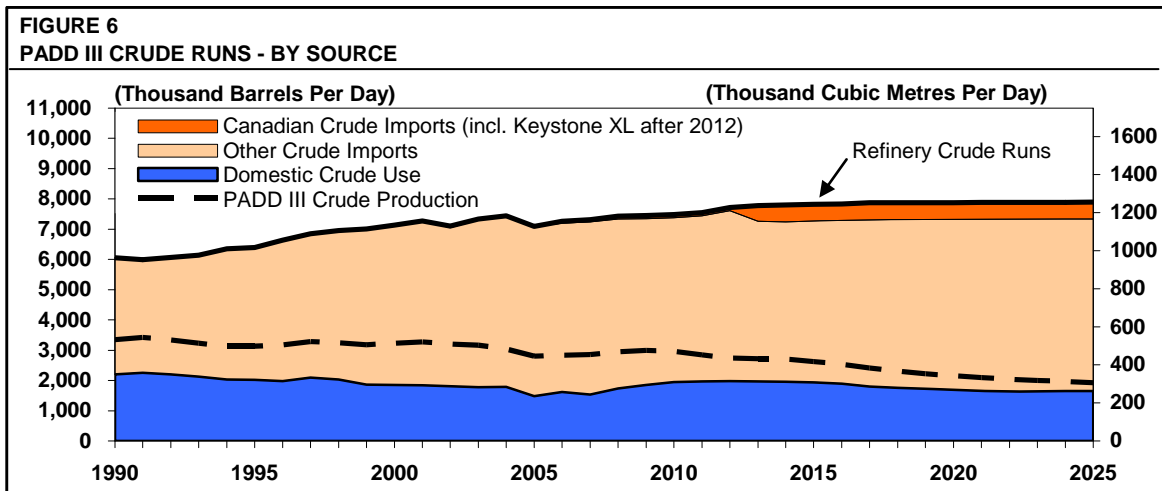
<sup>6</sup> EnCana website: Downstream/Borger, October 2007.



1            Table 1 and Figure 5 show the remaining volume of Canadian crude available for  
 2 PADD II which is the largest market for Western Canadian crude. Canadian crude deliveries to  
 3 PADD II are forecast to increase throughout the forecast period except for 2013, the year in  
 4 which Keystone XL Pipeline comes onstream.

1 **U.S. GULF COAST CRUDE OIL MARKET**

2 The Keystone XL Pipeline is intended to deliver Canadian crude to the USGC in  
 3 PADD III which includes states from New Mexico to Mississippi. PADD III has the largest  
 4 refining system in the world with approximately 8.4 million B/D ( $1.3 \times 10^6 \text{m}^3/\text{d}$ ) of crude capacity,  
 5 mainly at the USGC in Texas and Louisiana. The refineries are listed in Table 3 with their  
 6 current crude capacities. As shown in Figure 6, refinery crude runs have increased and reached  
 7 approximately 7.3 million B/D ( $1.16 \times 10^6 \text{m}^3/\text{d}$ ) in 2007. Crude runs in PADD III are projected by  
 8 Purvin & Gertz to grow by over 500,000 B/D ( $79.5 \times 10^3 \text{m}^3/\text{d}$ ) by 2020. The PADD III refineries  
 9 run crude to produce refined products which are consumed in PADD III and other PADDs. Large  
 10 volumes of refined products are shipped by pipeline to PADDs I and II. Future refinery crude  
 11 runs will depend on U.S. demand for refined products and product trade and could be higher or  
 12 lower than forecast.



13 PADD III crude production was approximately 2.8 million B/D ( $450 \times 10^3 \text{m}^3/\text{d}$ ) in 2007.  
 14 Production declines have been limited in recent years as growth in offshore Gulf of Mexico  
 15 production has nearly offset the decline in onshore production. However, PADD III crude  
 16 production is expected to decline in the long term.

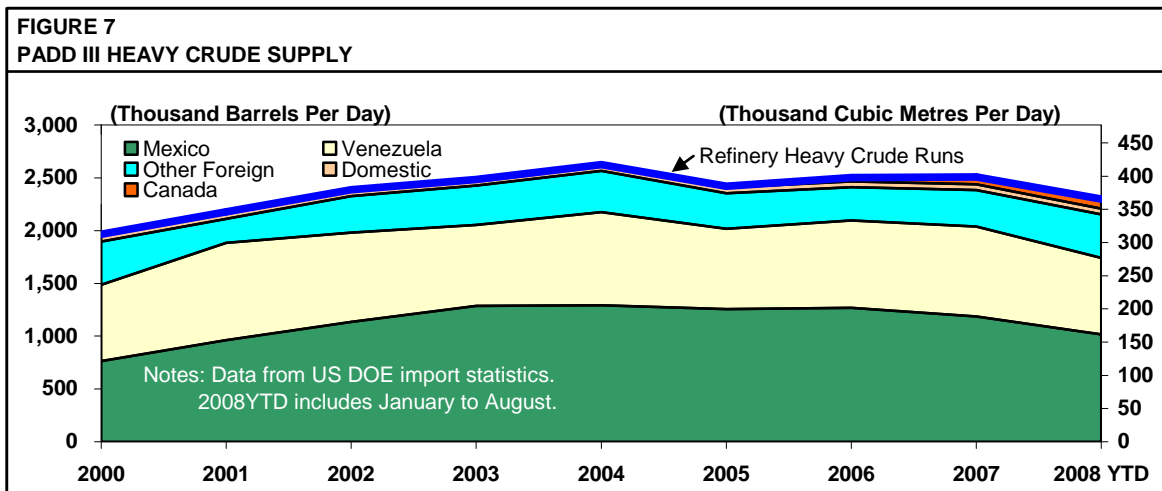


1           The use of domestic crude production by PADD III refineries is forecast to remain near  
2 current levels. Approximately 1.5 million B/D ( $238 \times 10^3 \text{m}^3/\text{d}$ ) of the PADD III production, or 53  
3 percent, was used by PADD III refineries in 2007. The remaining 1.3 million B/D ( $207 \times 10^3 \text{m}^3/\text{d}$ )  
4 of production was shipped by pipelines to refineries in other PADDs, mostly PADD II. PADD III  
5 crude transfers to PADD II are expected to decline as PADD II uses more Canadian crude  
6 leaving a higher proportion of the indigenous crude in PADD III.

7           Most of the crude used in PADD III is imported. Imports have grown to 5.6 million B/D  
8 ( $892 \times 10^3 \text{m}^3/\text{d}$ ) in 2007 or 77 percent of crude demand. Imports are forecast to decline initially  
9 before 2010 as more of the domestic PADD III crude production is used in PADD III, and then to  
10 increase by over 600,000 B/D ( $95.4 \times 10^3 \text{m}^3/\text{d}$ ) by 2020.

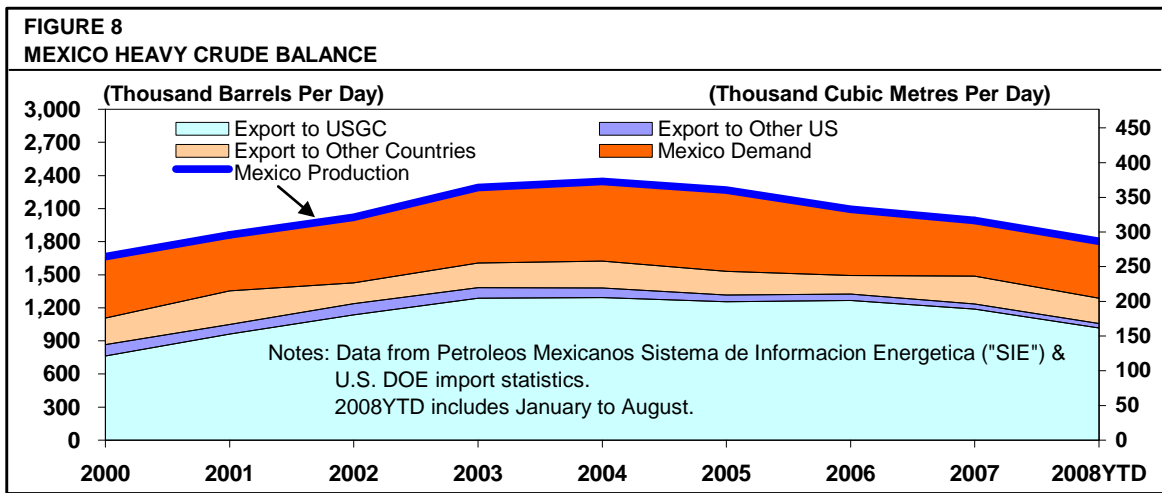
11           The refining industry in PADD III uses a wide variety of crudes including light sweet,  
12 medium sour, heavy sour, high acid heavy sweet, and others such as synthetic crudes from  
13 Venezuela. Many of the refineries have large coking capacity, so they can run significant  
14 amounts of heavy crudes which generally have an API gravity below 28.

1 In 2007, heavy crude runs were approximately 2.5 million B/D (397 10<sup>3</sup>m<sup>3</sup>/d) or  
 2 34 percent of total crude runs. Nearly all of the heavy crude used in PADD III is imported.  
 3 Heavy crude runs fell from 2004 to 2007 due to reduced supply of heavy crude, especially from  
 4 Mexico, as shown in Figure 7. In the first eight months of 2008, heavy crude supplies from  
 5 Mexico and Venezuela fell another 300,000 B/D (31.8 10<sup>3</sup>m<sup>3</sup>/d) approximately. Heavy crude  
 6 imports from other countries increased, but there was a net reduction in heavy crude use of  
 7 approximately 200,000 B/D (31.8 10<sup>3</sup>m<sup>3</sup>/d). Some of the increased heavy crude was heavy  
 8 sweet, high acid crude from Brazil and Angola. However, heavy sweet crudes are less desirable  
 9 than heavy sour crudes for refineries which are designed for conventional heavy crudes similar  
 10 to Canadian bitumen blends.



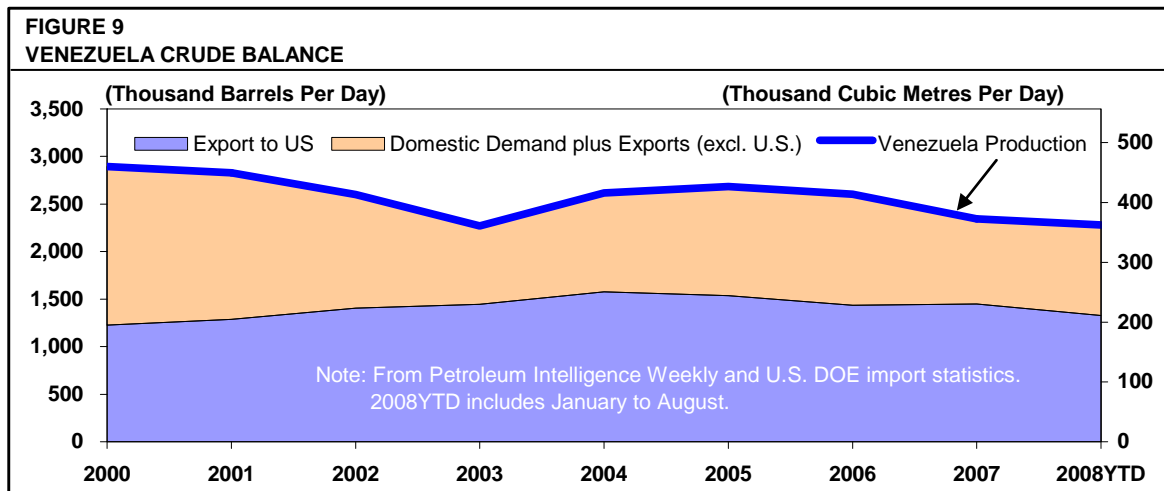
11 Most of the heavy crude is used by refineries which employ coking technology to  
 12 upgrade heavy vacuum residual oil. Based on the U.S. Department of Energy (“DOE”)/Energy  
 13 Information Administration (“EIA”), Petroleum Supply Monthly statistics, coker feed fell in the first  
 14 eight months of 2008 to 1.078 million B/D (171 10<sup>3</sup>m<sup>3</sup>/d) from 1.152 million B/D (183 10<sup>3</sup>m<sup>3</sup>/d) in  
 15 2007, a drop of more than 6 percent. This is consistent with a reduced supply of heavy  
 16 feedstock.

1 The production of heavy crude from Mexico has been falling as shown in Figure 8.  
 2 USGC refinery crude runs of Mexican heavy crude have fallen by around 250,000 B/D  
 3 ( $39.7 \times 10^3 \text{m}^3/\text{d}$ ) since 2006 due to falling production. In particular, production from the offshore  
 4 Cantarell field which produces most of the Maya heavy crude is falling rapidly. With limited  
 5 restoration plans in sight, it appears that production from Mexico will continue to decline for  
 6 several years. The International Energy Agency ("IEA") forecasts a decline in total crude  
 7 production from Mexico of 1.1 million B/D ( $175 \times 10^3 \text{m}^3/\text{d}$ ) between 2007 and 2015.<sup>7</sup>



<sup>7</sup> IEA, World Energy Outlook, 2008, page 267, Table 11-3.

1 Most of Venezuela's crude production is heavy crude. Over half of the production is  
 2 exported to the U.S. Venezuela's total crude production increased between 2003 and 2005 but  
 3 most of the incremental production was sold to markets outside of the U.S. as shown in  
 4 Figure 9. Since the Venezuela refinery crude capacity<sup>8</sup> is approximately 1.3 million B/D  
 5 ( $204 \times 10^3 \text{m}^3/\text{d}$ ), and crude use outside of the U.S. has been less than this since 2002,  
 6 Venezuela's exports to markets other than the U.S. have been relatively small. Since 2005,  
 7 Venezuelan crude production has fallen, so refinery use in the U.S. and the other markets has  
 8 also fallen. Venezuela has large reserves of heavy oil, but future supply will likely depend on  
 9 commercial, market and political strategies which may oppose supplying U.S. refineries and  
 10 favour exports to other markets.



11 Although traditional supplies of heavy crude have been falling, the USGC refineries as a  
 12 group are increasing their capability to use more heavy crude, by adding coking capacity. For  
 13 example, Motiva, a joint venture of Saudi Aramco and Shell, has commenced a large expansion  
 14 project at Port Arthur<sup>9</sup> with 325,000 B/D ( $51.7 \times 10^3 \text{m}^3/\text{d}$ ) of new crude capacity and 95,000 B/D

<sup>8</sup> Oil and Gas Journal, 2007 Worldwide Refining Survey, December 24, 2007.

<sup>9</sup> Shell website, Major Projects and Oil & Gas Journal Worldwide Construction Update, November 19, 2007.

1 (15.1 10<sup>3</sup>m<sup>3</sup>/d) of new coking capacity for a 2011 startup; with coking capacity at 29 percent of  
2 crude capacity, this should allow more heavy crude runs. Marathon has a project at Garyville,  
3 Louisiana<sup>10</sup>, with a 180,000 B/D (28.6 10<sup>3</sup>m<sup>3</sup>/d) crude expansion and a 44,000 B/D (7.0 10<sup>3</sup>m<sup>3</sup>/d)  
4 coker which are under construction and scheduled for startup in late 2009. Total is building a  
5 50,000 B/D (7.9 10<sup>3</sup>m<sup>3</sup>/d) coker<sup>11</sup> at its 232,000 B/D (36.9 10<sup>3</sup>m<sup>3</sup>/d) Port Arthur refinery for  
6 startup in 2011. Smaller coker expansions are underway at Hunt, Tuscaloosa, Alabama<sup>12</sup>;  
7 Valero, St. Charles, Louisiana<sup>13</sup>; Flint Hills, Corpus Christi, Texas<sup>14</sup>, for startup in 2010.

8 In light of declining crude supplies from Mexico and Venezuela, some USGC refiners are  
9 attempting to diversify their sources by accessing Western Canadian supplies. For example,  
10 subject to regulatory approval, Valero Energy has agreed to participate as a prospective shipper  
11 on the Keystone XL Pipeline to Port Arthur, and has secured heavy crude oil from several  
12 Canadian oil producers<sup>15</sup>. Valero operates three coking refineries in the area around Houston  
13 and expects to be one of the largest recipients of heavy crude from the Keystone XL Pipeline.  
14 Canadian Natural Resources Limited ("CNRL") has committed 120,000 B/D (19.1 10<sup>3</sup>m<sup>3</sup>/d) to the  
15 Keystone XL Pipeline project, if approved, and also has agreed to supply 100,000 B/D  
16 (15.9 10<sup>3</sup>m<sup>3</sup>/d) of heavy crude to an unnamed, USGC refiner<sup>16</sup>.

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<sup>10</sup> Marathon Press Release, November 7, 2006.

<sup>11</sup> Total website, Downstream 2006 and Downstream Segment 2007.

<sup>12</sup> Argus Petroleum Coke, Page 5, February 7, 2007.

<sup>13</sup> Valero Presentation, Lehman Brothers Energy/Power Conference, September 4, 2008.

<sup>14</sup> Flint Hills, Oil & Gas Journal Worldwide Construction Update, November 19, 2007.

<sup>15</sup> Valero News Release, July 16, 2008.

<sup>16</sup> CNRL 2008 Second Quarter Results, August 7, 2008.

## 1           **Refineries Supplied By Keystone XL Pipeline**

2           The proposed Keystone XL Pipeline would deliver up to 500,000 B/D ( $79.5 \times 10^3 \text{m}^3/\text{d}$ ) of  
3 heavy and light Canadian crudes to terminals near Nederland and Houston. From these  
4 terminals, crude could be delivered on other pipelines to many refineries. There are 15  
5 refineries which would have access to Canadian crudes delivered on the Keystone XL Pipeline.  
6 These are listed as Group 1 refineries in Table 3. They are situated near Port Arthur and  
7 Houston as well as Texas City and Lake Charles, Louisiana. Their combined crude capacity is  
8 4.0 million B/D ( $633 \times 10^3 \text{m}^3/\text{d}$ ), or nearly half of total PADD III refining capacity, and this is larger  
9 than the entire PADD II market. With the Motiva refinery expansion, the combined crude  
10 capacity will increase to 4.3 million B/D ( $685 \times 10^3 \text{m}^3/\text{d}$ ). Purvin & Gertz estimates of the refinery  
11 crude runs for Group 1 are shown by type and source in Table 4 for 2007. Heavy crude use at  
12 these refineries is estimated at 1.4 million B/D ( $228 \times 10^3 \text{m}^3/\text{d}$ ), nearly all of which was imported.  
13 Light crude runs in 2007 are estimated at 1.85 million B/D ( $294 \times 10^3 \text{m}^3/\text{d}$ ) of which light sweet  
14 crude was 784,000 B/D ( $125 \times 10^3 \text{m}^3/\text{d}$ ) and light sour crude was 1.07 million B/D ( $169 \times 10^3 \text{m}^3/\text{d}$ ).  
15 The majority of the light crude (85 percent) was imported; imports are estimated at 661,000 B/D  
16 ( $105 \times 10^3 \text{m}^3/\text{d}$ ) for light sweet crude and 904,000 B/D ( $144 \times 10^3 \text{m}^3/\text{d}$ ) for light sour crude.

17           The refining area to be supplied by the Keystone XL Pipeline is shown in Figure 10,  
18 which shows the 15 Group 1 refineries and some of the major crude pipelines serving the  
19 refineries in the area as well as the proposed Keystone XL Pipeline to Nederland and Houston.  
20 There are many other crude pipelines and inter-connections within the four refining centres that  
21 are not shown.



1           The four Port Arthur area refineries have a combined crude capacity of 1.16 million B/D  
2 (184 10<sup>3</sup>m<sup>3</sup>/d), which will increase to 1.48 million B/D (235 10<sup>3</sup>m<sup>3</sup>/d) after the Motiva refinery  
3 expansion. The three refineries in the vicinity of Lake Charles, Louisiana have a combined  
4 crude capacity of 722,000 B/D (115 10<sup>3</sup>m<sup>3</sup>/d) and Canadian crude delivered on the Keystone XL  
5 Pipeline would have to be supplied from the Port Arthur area on a CITGO pipeline from Sour  
6 Lake, Texas or a DOE line from Nederland, Texas.

7           The five Houston area refineries have a combined crude capacity of 1.35 million B/D  
8 (215 10<sup>3</sup>m<sup>3</sup>/d). Crude oil can be transported to the Houston area on a Shell pipeline from the  
9 Nederland area, and to Baytown, Texas (near Houston) on an ExxonMobil pipeline from Sour  
10 Lake. The three Texas City area refineries have a combined crude capacity of 754,000 B/D  
11 (120 10<sup>3</sup>m<sup>3</sup>/d). Canadian crude delivered on the Keystone XL Pipeline would have to be  
12 supplied to Texas City from the Houston area via existing pipelines such as the BP pipeline.

13           The Keystone XL Pipeline would be able to deliver light crude as well as heavy crude. In  
14 total, all the PADD III refineries used approximately 2.5 million B/D (402 10<sup>3</sup>m<sup>3</sup>/d) of light sweet  
15 crude including 1.57 million B/D (249 10<sup>3</sup>m<sup>3</sup>/d) of imports in 2007. The Group 1 refineries used  
16 only 784,000 B/D (125 10<sup>3</sup>m<sup>3</sup>/d) of light sweet crude. If there are low delivery volumes from the  
17 Keystone XL Pipeline, light sweet synthetic crude would compete with conventional light sweet  
18 crude. However, if synthetic crude deliveries are as high as 500,000 B/D (79.5 10<sup>3</sup>m<sup>3</sup>/d),  
19 synthetic crude would likely have to compete with conventional light sour crudes.

20           Purvin & Gertz expects that, if the Keystone XL Pipeline is constructed, the USGC  
21 market can absorb an incremental 500,000 B/D (79.5 10<sup>3</sup>m<sup>3</sup>/d) of Canadian crude, which  
22 represents around 12 percent of the crude capacity of the Group 1 refineries. The refinery crude  
23 capacity is expanding by another 325,000 B/D (51.7 10<sup>3</sup>m<sup>3</sup>/d) to 4.3 million B/D (684 10<sup>3</sup>m<sup>3</sup>/d) by  
24 2011. Shipper commitments on the Keystone XL Pipeline are for 380,000 B/D (60.4 10<sup>3</sup>m<sup>3</sup>/d).  
25 Based on the import volumes in PADD III, the Canadian crude imports could be heavy crude or  
26 a combination of heavy and light synthetic crudes delivered on the Keystone XL Pipeline,  
27 assuming adequate distribution connections at the USGC.



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## 1 PADD II CRUDE OIL MARKET

2 The availability of Western Canadian crude oil to PADD II is part of the supply and  
3 disposition forecast in Table 1. In 2007, PADD II received approximately 1.1 million B/D  
4 ( $179 \cdot 10^3 \text{m}^3/\text{d}$ ) of Canadian crude which was nearly 50 percent of the Western Canadian supply.  
5 As Canadian supplies grow, deliveries of Canadian crude to PADD II are also forecast to grow.  
6 Synthetic crude runs in PADD II should increase from relatively low levels. The use of Canadian  
7 bitumen blends should also increase in PADD II due to the current construction of several new  
8 coker projects at PADD II refineries; these projects include BP at Whiting, Indiana<sup>17</sup>; Marathon  
9 at Detroit, Michigan<sup>18</sup>; WRB Refining at Wood River, Illinois<sup>19</sup>; and Sinclair at Tulsa,  
10 Oklahoma<sup>20</sup>.

11 PADD II encompasses 15 states in the Midwest from the Canadian border, south to  
12 Oklahoma and east-west between the Dakotas and Ohio. PADD II is a large market for crude oil  
13 with 27 refineries having a combined crude capacity of 3.7 million B/D ( $588 \cdot 10^3 \text{m}^3/\text{d}$ ). Total  
14 crude runs in 2007 were around 3.2 million B/D ( $513 \cdot 10^3 \text{m}^3/\text{d}$ ). Refinery runs of Canadian crude  
15 have increased to around one third of total runs and are expected to rise with increased  
16 Canadian supplies. The PADD II refineries also use U.S. domestic crudes produced mainly in  
17 PADD II, Texas and Louisiana, and they import crudes via pipelines from the USGC. As  
18 Canadian production grows, Figure 11, developed by Purvin & Gertz, shows that Canadian  
19 crudes are expected to displace some of the U.S. domestic crudes from PADD II as well as  
20 other imports which are delivered from the USGC. The Canadian crude supply to PADD II in the

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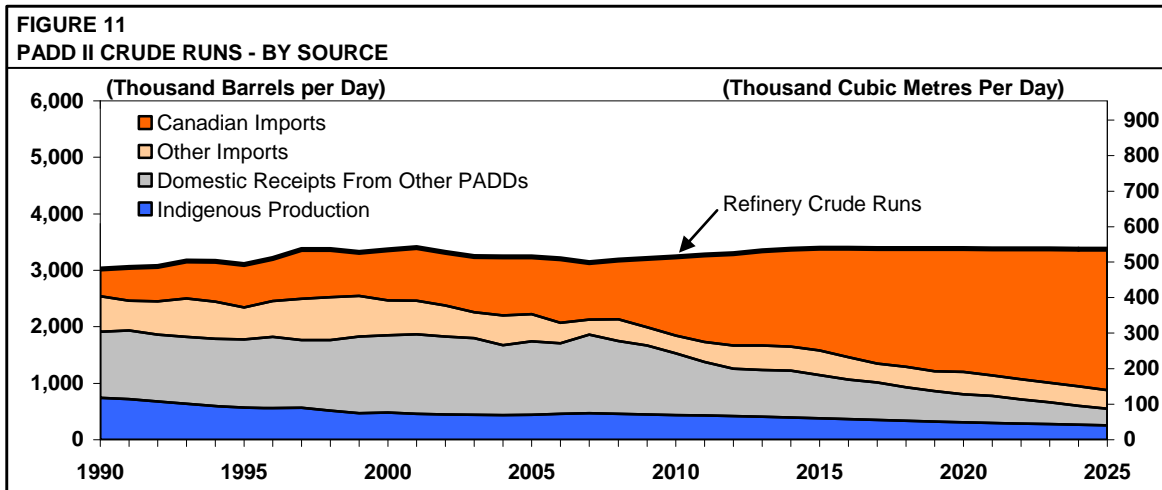
<sup>17</sup> BP Press Release, September 20, 2006.

<sup>18</sup> Marathon 2007 Annual Report.

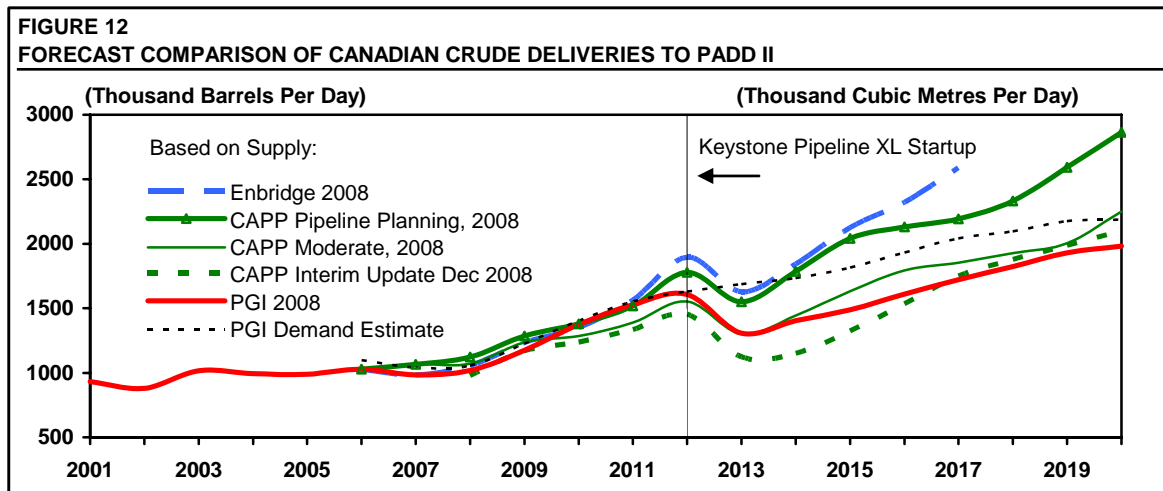
<sup>19</sup> EnCana 2007 Annual Report.

<sup>20</sup> Foster Wheeler Corporation News Release, September 11, 2006.

1 figure is estimated without deducting deliveries to the USGC via the Keystone XL Pipeline. The  
 2 Canadian crude will likely continue to replace more of the domestic crudes and imports in  
 3 northern PADD II as refineries add residual conversion capacity. In addition, more Canadian  
 4 crude will likely move further south as pipelines expand within PADD II.



5 The volume of Canadian crude available for PADD II depends on the overall supply of  
 6 Western Canadian crude. Several supply scenarios are considered in Table 2. Based on the  
 7 Purvin & Gertz supply forecast, the Canadian crude available for PADD II would decrease in  
 8 2013 following the startup of Keystone XL Pipeline, but it would increase each year thereafter.  
 9 Under the CAPP Interim Update supply forecast, crude for PADD II in 2013 would be similar to  
 10 the forecast level for 2009, and would increase to the 2011 forecast level by 2015. The CAPP  
 11 Moderate supply forecast is similar to the Purvin & Gertz forecast, so supply to PADD II would  
 12 grow to a slightly higher level using this forecast. The CAPP Pipeline Planning supply forecast  
 13 and the Enbridge supply forecast would provide the most crude to PADD II. Using these  
 14 forecasts, deliveries to PADD II in 2013 would exceed 2010 forecast deliveries. The forecasts of  
 15 deliveries to PADD II, which are based on the supply forecasts, are compared in Figure 12.



1 The figure also shows Purvin & Gertz' 2008 forecast of demand for Canadian crude in  
 2 PADD II, consistent with Figure 11. In Figure 12, the demand is higher than the Purvin & Gertz  
 3 forecast of deliveries because the latter calculates the availability for PADD II after deducting the  
 4 Keystone XL Pipeline committed deliveries from the supply. With lower Canadian deliveries,  
 5 PADD II refineries would need more domestic crude or other imports to sustain crude runs.

6 With higher Canadian crude deliveries based on CAPP's Pipeline Planning case or the  
 7 Enbridge supply forecast, the deliveries would exceed the Purvin & Gertz demand forecast.  
 8 This would satisfy additional refinery demand, if any, or require that more Canadian crude be  
 9 directed to other markets. Potential refinery demand for Canadian crudes in PADD II may be  
 10 higher than forecast, depending on the crude types available, since some PADD II refiners are  
 11 developing projects to use more Canadian crude. If other markets are needed for additional  
 12 crude supply, more pipeline capacity from Canada to those markets may also be needed.

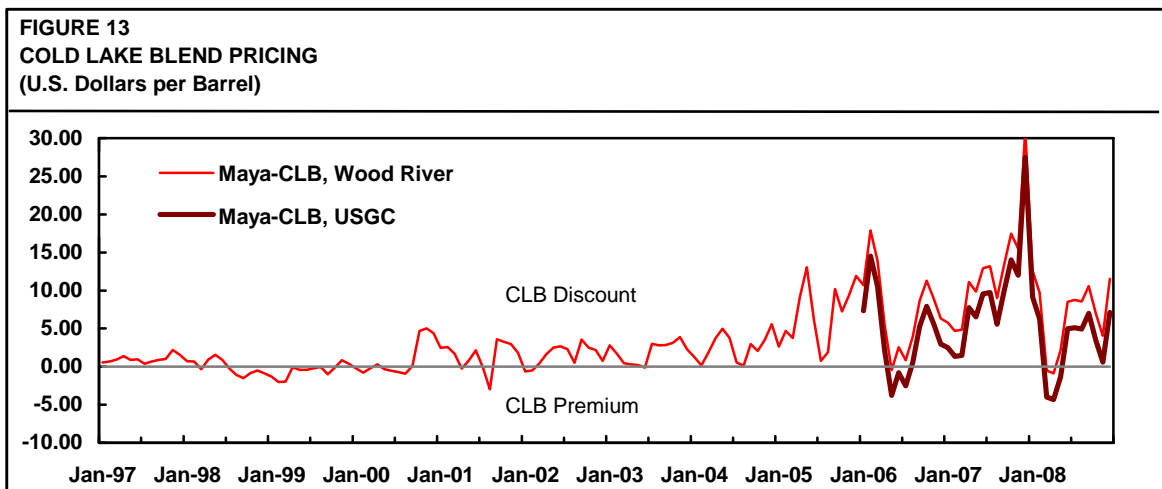
13 The volume of Canadian crude available for PADD II also depends on the volumes  
 14 delivered elsewhere. The deliveries to other markets could change from the forecast in Table 1.  
 15 The volume delivered to the USGC would increase by another 120,000 B/D ( $19.1 \times 10^3 \text{ m}^3/\text{d}$ ) by  
 16 2014 if Keystone XL Pipeline delivers at 500,000 B/D ( $79.5 \times 10^3 \text{ m}^3/\text{d}$ ). This would decrease the  
 17 availability in PADD II as shown in Table 2. On this basis, with the Keystone XL Pipeline at  
 18 capacity and Pegasus Pipeline continuing to operate, the deliveries of Canadian crudes to  
 19 PADD II in 2015 would be about the same as the 2010 deliveries using the Purvin & Gertz

1 supply forecast, but higher than the 2010 deliveries using the June CAPP and Enbridge supply  
2 forecasts. Based on the CAPP Interim Update forecast, the deliveries of Canadian crude to  
3 PADD II in 2015 would be approximately the same as the 2009 forecast deliveries. All the  
4 supply scenarios lead to forecasts of growing deliveries to PADD II after 2013.

## 1 CANADIAN CRUDE OIL PRICING

2 Limited volumes of Canadian heavy crude has been delivered to the USGC on the  
 3 Pegasus pipeline since early 2006. However, the price of Canadian heavy crude has been  
 4 discounted at the USGC. Delivery of a large volume of Canadian crude on the Keystone XL  
 5 Pipeline to the large USGC market is expected to strengthen the price of Canadian heavy crude  
 6 at the USGC and in Alberta for reasons discussed below in this section.

7 Figure 13 compares the delivered price of Canadian Cold Lake bitumen blend (“CLB”,  
 8 also known generally as “DilBit”) against the price of Mexican Maya heavy crude at the USGC<sup>21</sup>.  
 9 The figure indicates a USGC discount on DilBit most of the time since 2006 as these crudes are  
 10 similar in quality and have nearly equivalent values to refiners. This price discount suggests that  
 11 the supply of Canadian heavy crudes has exceeded demand in their main markets north of the  
 12 USGC. Up until 2000, the DilBit price was stronger and was equivalent to the Maya price  
 13 around Wood River in the Midwest (as shown in the figure); DilBit was a “price taker” in the  
 14 Midwest versus other crudes since supply did not exceed demand and other imports were  
 15 needed.



<sup>21</sup> The prices and costs in this discussion are in U.S. dollars unless noted otherwise.

1           The Keystone XL Pipeline to the large USGC market would expand the market for  
2 Canadian heavy crudes and increase demand. This should allow the price of Canadian heavy  
3 crude to increase at least as far as USGC parity with Maya. The price for Canadian heavy crude  
4 could increase further if the Keystone XL Pipeline causes the available supply in the Midwest to  
5 be less than the demand, resulting in a price equivalent to Midwest parity with imported Maya  
6 crude, as it was before 2000.

7           At the USGC, the average price discount on Cold Lake Blend is estimated to have  
8 exceeded \$5.00 (U.S.) per barrel versus Maya since 1996, as shown in Figure 13, when the  
9 Pegasus pipeline to the USGC started up. However, the prices have been volatile; the monthly  
10 discount has been much higher and occasionally there has been a small premium at the USGC.  
11 More recently in 2008, the average discount at the USGC was approximately \$3.24 per barrel.  
12 To be conservative for discussion purposes, we have assumed a price discount of \$3.00 per  
13 barrel, recognizing that the average discount was higher in 2006 and 2007. By increasing  
14 market access for Canadian heavy crudes, the \$3.00 per barrel discount should be avoided in  
15 the future. The price increase should apply to all of the Canadian heavy crude supply, not just  
16 the volume shipped on the Keystone XL Pipeline.

17           The market price received from refiners in other markets such as the Midwest would not  
18 necessarily be the same as the price received from USGC refiners for the DilBit which is shipped  
19 to the region under ship-or-pay commitments. The vast majority of the Western Canadian crude  
20 (89 percent in 2013 based on Table 2) would be delivered to refineries in markets other than the  
21 USGC. This crude would be supplied at a price which is determined by competition in the  
22 market. This should establish a market price for the Canadian crudes other than the committed  
23 volume which is shipped on the Keystone XL Pipeline. The market prices of offshore crudes  
24 delivered to PADD II are higher than the USGC prices because these crudes are delivered north  
25 from the USGC by pipeline, and this adds to the delivered crude cost. Removing volumes from  
26 the PADD II market could cause PADD II demand to exceed the available supply. Purvin &  
27 Gertz expects that PADD II would be the competitive market for Canadian crudes after the

1 Keystone XL Pipeline startup since the PADD II refiners would have demand for the crude which  
2 exceeds the available supply that Purvin & Gertz has forecast in Table 2.

3 The Midwest heavy crude prices are affected by the pipeline tolls between the Midwest  
4 and the USGC. Using current pipeline tolls, the Midwest price of imported heavy crude at  
5 Patoka, Illinois delivered from the USGC is \$2.27 per barrel higher than the USGC price, based  
6 on the Capline toll<sup>22</sup> from St. James, Louisiana to Patoka. If it is not surplus to PADD II,  
7 Canadian heavy crude supply would not move from PADD II to the USGC and would not incur  
8 the toll of \$1.28 per barrel<sup>23</sup> on the Mobil Pegasus pipeline from Patoka to Beaumont, Texas.  
9 Based on the combined tolls, the increase in the Canadian heavy crude price at Patoka would  
10 be \$3.55 per barrel over USGC parity. In this scenario with Midwest price parity against Maya,  
11 Midwest demand for Canadian heavy crude would exceed the available supply and the market  
12 price of Cold Lake Blend would be approximately \$6.55 per barrel above the 2008 price level at  
13 Patoka.

14 If the available supply for PADD II exceeds PADD II demand, the market price would  
15 likely fall to parity elsewhere. If so, sufficient pipeline capacity would be needed to deliver the  
16 Canadian crudes to other markets so that price discounting does not re-occur. There may be  
17 other events that affect the DilBit price which were not considered in this report if not related to  
18 the Keystone XL Pipeline.

19 Synthetic crude oil may also move to the USGC market as production grows. If so, the  
20 price of synthetic crude could drop to USGC parity with conventional light crudes. However, as  
21 for heavy crudes, ship-or-pay commitments on a pipeline to the USGC could mitigate potential  
22 price discounts for synthetic crude and allow a market price which is equivalent to parity with  
23 light crude in PADD II.

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<sup>22</sup> FERC Tariff 34, Amoco Capline for viscosity of 417 SUS.

<sup>23</sup> FERC Tariff A-1171, Mobil Pipeline for heavy crude.



1 Higher crude prices resulting from the Keystone XL Pipeline would increase revenues for  
2 the Canadian producers of heavy crude blends. A Canadian heavy crude producer is expected  
3 to realize an increase in the heavy crude price of approximately \$3.00 per barrel by avoiding a  
4 discount at the USGC, as discussed earlier. Although the price comparison is specifically for  
5 Cold Lake Blend versus Maya, the same level of discounting is generally applicable to all the  
6 other Canadian heavy crude blends including other DilBit, conventional heavy crudes and blends  
7 such as Western Canadian Select ("WCS"), since prices for Canadian heavy crudes track each  
8 other more than the Maya price. If deliveries on the Keystone XL Pipeline relieve the oversupply  
9 of Canadian heavy crudes, a price discount at the USGC should not be necessary. By 2013,  
10 Purvin & Gertz estimates the total supply of all the Canadian heavy crude blends to be 1.84  
11 million B/D (293 10<sup>3</sup>m<sup>3</sup>/d). Based on eliminating an average discount of \$3.00 per barrel on this  
12 volume of heavy crude, the annual revenue to the Canadian producing industry would increase  
13 by approximately \$2.0 billion (U.S.).

14 Additional producer revenues are possible if the Keystone XL Pipeline also relieves the  
15 oversupply situation in the Midwest. As discussed earlier, the market prices of Canadian heavy  
16 crudes should rise in the Midwest and in Western Canada by another \$3.55 per barrel. The  
17 Midwest market price would impact the price of 1.46 million B/D (231 10<sup>3</sup>m<sup>3</sup>/d) which is all of the  
18 Canadian heavy crude supply, except the Keystone XL Pipeline volume of 380,000 B/D  
19 (60.4 10<sup>3</sup>m<sup>3</sup>/d). Based on a further price increase of \$3.55 per barrel versus the USGC, the  
20 annual increase in revenue for 1.46 million B/D (231 10<sup>3</sup>m<sup>3</sup>/d) would be another \$1.9 billion  
21 approximately for the Canadian producing industry in 2013.

22 For the USGC Midwest price parity impacts, we have used heavy crude since its price  
23 has been impacted in recent years. In the future, the impacts could also apply to light synthetic  
24 crudes if supply exceeds demand in the Midwest.

25 Following the startup of the Keystone XL Pipeline, the increased revenues should be  
26 expected to continue until Canadian supply overtakes demand. Other events which were not  
27 considered here could alter producer revenues.

1           The positive revenue gains available to the Canadian producing industry may be partially  
2 offset by other costs. These might include additional pipeline costs and potential impacts on  
3 crude oil netback prices which might temporarily arise from toll changes on other pipelines. In  
4 our opinion, these costs would be less than the expected revenue gains, so the net benefit to the  
5 Canadian producing industry should be positive.

6           In summary, if the Keystone XL Pipeline causes the USGC price discount to be  
7 eliminated, the annual revenue increase to the Canadian producing industry is estimated at  
8 \$2.0 billion (U.S.). In addition, if the Keystone XL Pipeline causes the Midwest price to rise  
9 above USGC parity, the annual revenue could increase by another \$1.9 billion to reach  
10 approximately \$3.9 billion (U.S.). The increased revenue could apply for several years as long  
11 as refinery demand and pipeline capacity exceed Canadian heavy crude supply. The large  
12 refining capacity at the USGC should allow producers to avoid a price discount below USGC  
13 parity as long as sufficient pipeline access exists for Western Canadian crude.

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## 1 PIPELINE CAPACITY REQUIREMENTS

2 The estimated pipeline capacity for 2011 to export Western Canadian crude oil is shown  
3 in Table 5 including pipeline expansions and projects. The pipelines include Enbridge, Trans  
4 Mountain Pipeline ("TMPL"), Milk River, Rangeland, Express and Keystone Phase 1 to Patoka  
5 with the Cushing extension. Estimated capacities for light crude and heavy crude service are  
6 provided. Overall, the pipeline capacity for total crude is estimated at 3.76 million B/D  
7 ( $598 \times 10^3 \text{m}^3/\text{d}$ ) of which 1.63 million B/D ( $260 \times 10^3 \text{m}^3/\text{d}$ ) is for light crude and 2.12 million B/D  
8 ( $338 \times 10^3 \text{m}^3/\text{d}$ ) is for heavy crude.

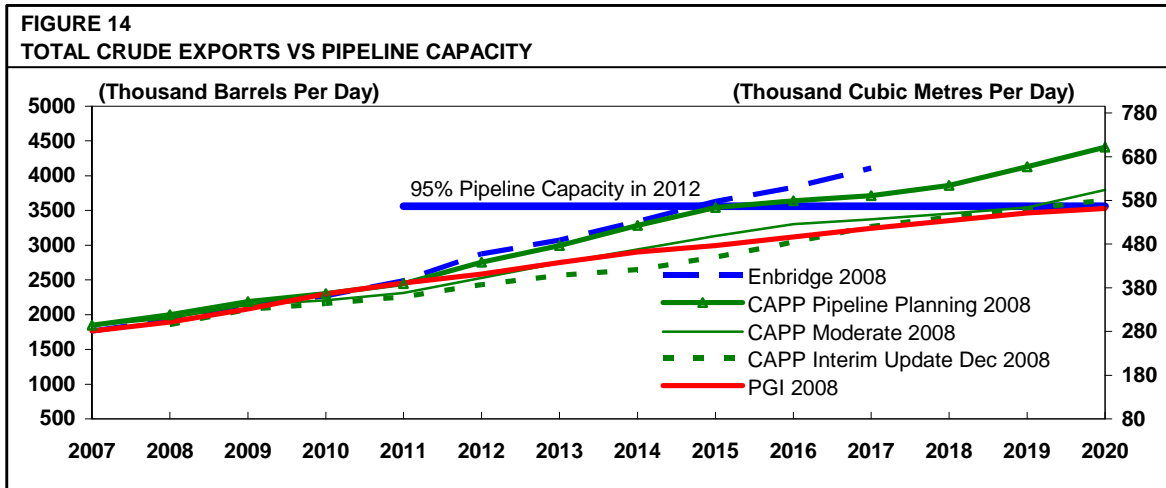
9 For the following analysis, we have used an annualized service factor of 95 percent for  
10 the total pipeline capacity. Although pipelines operate at 100 percent in some months, each  
11 individual line generally does not operate at full capacity every day of the year. Not only do  
12 pipelines have outages, but crude oil producers and refineries have planned and unplanned  
13 outages which cause pipeline deliveries to change, so the available capacity of each individual  
14 pipeline cannot be fully utilized 365 days per year. Pipeline capacity depends on the properties  
15 of the commodities being shipped. Compared with light crude capacity, heavy crude reduces  
16 the pipeline capacity. There can be times when there is spare capacity for light crude on one  
17 line, but another heavy crude line is operating at full capacity. For instance, the NEB  
18 Transportation Assessment<sup>24</sup> notes that Enbridge operated at 88 percent of capacity in the first  
19 quarter of 2008 even though many of its individual lines were fully subscribed or operating at  
20 capacity. Also, the TMPL line operated at 80 percent of capacity in the first quarter of 2008  
21 even though it had apportionment in January 2008. For the overall pipeline industry, there are  
22 times when shippers may prefer to ship to one market rather than another; they would then  
23 choose one pipeline over another, so they need operational flexibility within the overall pipeline  
24 network. Although each pipeline system and each line likely has a service factor incorporated

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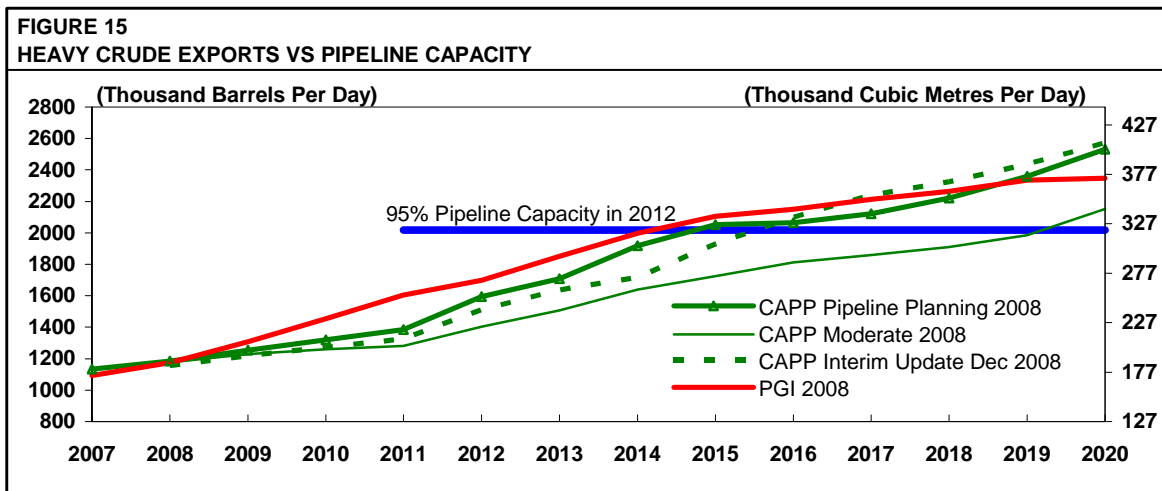
<sup>24</sup> NEB Canadian Pipeline Transportation System: Transportation Assessment, June 2008.

- 1 with its nameplate capacity, the overall pipeline industry will likely continue to operate below 100
- 2 percent of total capacity to avoid disruptions to its shippers.

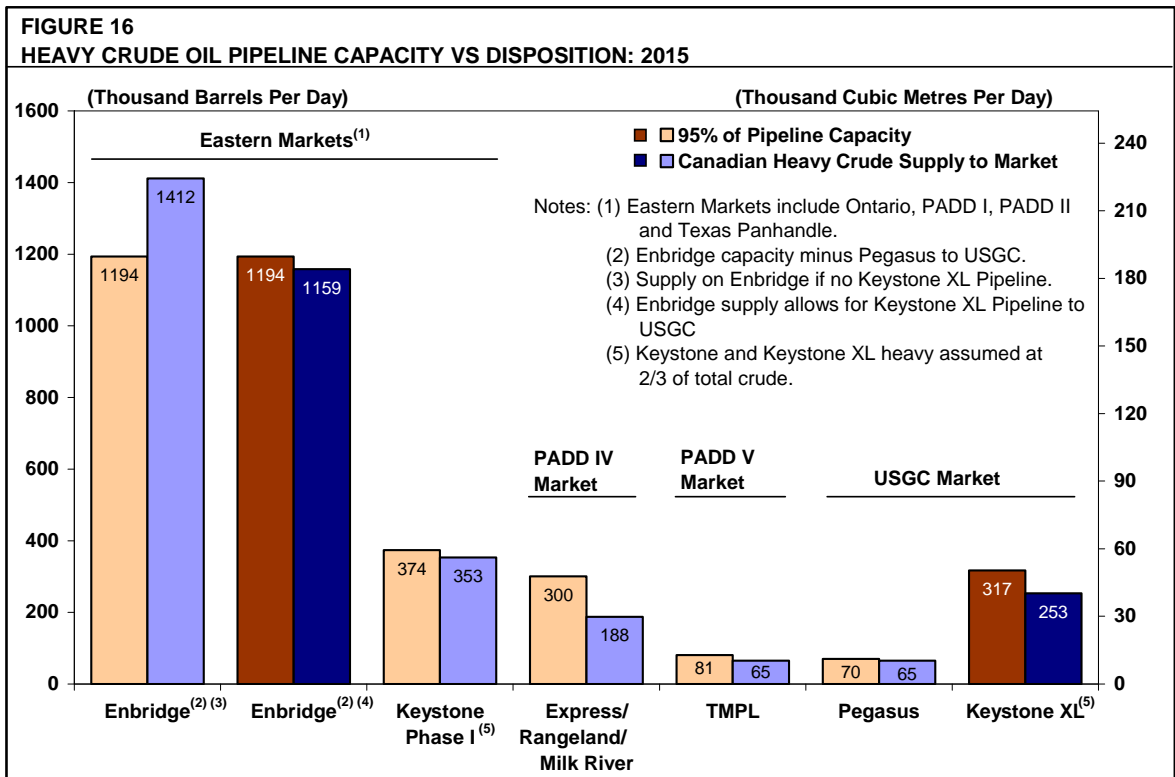
1 Five throughput forecasts for exports of total crude from Western Canada to the U.S.,  
 2 Ontario and offshore are shown in Figure 14. These export forecasts are based on the crude oil  
 3 supply forecasts minus the disposition forecast for Western Canada, as shown in Table 2. In the  
 4 figure, the throughput forecasts are compared with 95 percent of the pipeline capacity from  
 5 Table 5. Based on total crude throughput, the CAPP Pipeline Planning case and the Enbridge  
 6 case would require additional pipeline capacity by 2015. Using the Purvin & Gertz supply  
 7 forecast and other CAPP forecasts for total crude, more capacity would not be needed until  
 8 around 2020.



1            However, for heavy crude oil, pipeline capacity would be needed sooner. The Purvin &  
 2 Gertz 2008 heavy crude supply and disposition forecasts are shown in Table 6. The CAPP  
 3 heavy crude supply forecasts are compared in Table 7. An Enbridge forecast of heavy crude  
 4 supply was not available. The table shows the forecasts of heavy crude exports from Western  
 5 Canada. Figure 15 compares the pipeline throughput forecasts with 95 percent of the heavy  
 6 crude pipeline capacity from Table 5. For heavy crude, the Purvin & Gertz and CAPP Pipeline  
 7 Planning Case heavy crude supply forecasts are similar. In both cases, additional heavy crude  
 8 pipeline capacity would be needed by 2014. CAPP's Moderate Case has less supply of heavy  
 9 crude, so more capacity would not be needed until 2019. CAPP's Interim Update supply  
 10 forecast would require more pipeline capacity for heavy crude by 2015.



1 The forecast disposition of heavy crude to different markets is compared with pipeline  
 2 capacities in Figure 16. For this comparison, the Eastern Markets are those supplied by  
 3 Enbridge and future Keystone (Phase 1) pipelines and include refineries in Ontario, PADD I,  
 4 PADD II and the Texas Panhandle around Borger, Texas. The figure shows that the Enbridge  
 5 pipeline would be short of heavy crude capacity in 2015 if the Keystone XL Pipeline is not in  
 6 service since the pipeline capacity is less than the heavy crude supply. If the Keystone XL  
 7 Pipeline is in service, and delivering 253,000 B/D (40.2 10<sup>3</sup>m<sup>3</sup>/d) of heavy crude, then the  
 8 Enbridge pipeline would be near capacity at that time, as indicated by the darker areas on the  
 9 figure. The figure shows the small existing pipeline capacity to the USGC versus the large  
 10 capacity to the Eastern Markets. Although the Keystone XL Pipeline would increase the  
 11 capacity to the USGC, Canadian heavy crude supply to the Eastern Markets would still be much  
 12 greater. By committing volumes to the Keystone XL Pipeline, Canadian shippers are indicating  
 13 a strategy to supply a market which has had little access to their crude.





1           In summary, more pipeline capacity for heavy crude appears to be needed by 2014-  
2 2015. The Keystone XL Pipeline would serve a large market which now has very limited access  
3 to Canadian crudes, while allowing existing pipelines to operate near their capacity for heavy  
4 crude by 2015.

## 1 SUMMARY AND CONCLUSIONS

2 Canadian crude oil delivered on the Keystone XL Pipeline ultimately would have pipeline  
3 access to 15 USGC refineries with a combined crude capacity of approximately 4.3 million B/D  
4 ( $685 \times 10^3 \text{m}^3/\text{d}$ ) after expansion of 325,000 B/D ( $51.7 \times 10^3 \text{m}^3/\text{d}$ ) by 2011. This large refining  
5 market would be capable of absorbing an incremental 500,000 B/D ( $79.5 \times 10^3 \text{m}^3/\text{d}$ ) of Canadian  
6 crude which is around 12 percent of the refining capacity. This market uses around  
7 1.4 million B/D ( $223 \times 10^3 \text{m}^3/\text{d}$ ) of heavy crude, nearly all of which is imported. Some USGC  
8 refiners are expanding their heavy crude capabilities but heavy sour crude supplies from Latin  
9 America are declining. This market also uses approximately 1.9 million B/D ( $302 \times 10^3 \text{m}^3/\text{d}$ ) of  
10 conventional light crudes. Depending on the delivered volumes, Canadian light synthetic crude  
11 might have to compete with both light sweet and light sour crudes. Shipper commitments on the  
12 Keystone XL Pipeline are for 380,000 B/D ( $60.4 \times 10^3 \text{m}^3/\text{d}$ ). Most of this could be absorbed by  
13 refinery expansion alone.

14 The supply of Western Canadian crude oil is forecast to rise due to growth in oil sands  
15 production. If 500,000 B/D ( $79.5 \times 10^3 \text{m}^3/\text{d}$ ) of Canadian crudes are delivered to the USGC by the  
16 Keystone XL Pipeline, deliveries to PADD II refineries should still continue to rise due to  
17 increasing supply, except for the pipeline startup year. The PADD II refineries should be able to  
18 use the crude, based on the Purvin & Gertz supply forecast. With higher supply forecasts such  
19 as those of CAPP and Enbridge, additional pipeline capacity to various markets might be  
20 needed.

21 Pricing of Canadian heavy crudes has been weak due to oversupply. The access to the  
22 large USGC market to be provided by the Keystone XL Pipeline should help to strengthen the  
23 market price of Canadian heavy crude by reducing the oversupply in PADD II. Similarly, if a  
24 surplus of light synthetic crude develops, the Keystone XL Pipeline should also help to mitigate  
25 potential price discounts. The annual increase in revenue for the Canadian producing industry

1 in 2013 is estimated to be in the range of \$2.0 to \$3.9 billion (U.S.) if the Keystone XL Pipeline  
2 relieves the oversupply of heavy crude and causes heavy crude prices to strengthen.

3 More pipeline capacity for Canadian heavy crude appears to be needed by 2014-2015.  
4 The Keystone XL Pipeline would deliver crude to the USGC market which now has limited  
5 access to Canadian crude, while allowing existing export pipelines to operate near their capacity  
6 for heavy crude.

TABLE 1  
WESTERN CANADIAN CRUDE SUPPLY AND DISPOSITION

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<i>(Thousand Barrels Per Day)</i>															
<b>Supply</b> <sup>(1)</sup>	2,313	2,348	2,463	2,653	2,877	3,046	3,202	3,379	3,540	3,643	3,776	3,903	4,019	4,138	4,206
<b>Disposition</b>															
Western Canada <sup>(1)</sup>	562	586	570	572	579	593	616	628	640	651	655	661	666	672	677
Ontario <sup>(1)</sup>	212	217	273	274	278	282	328	373	377	380	383	386	387	388	390
Subtotal, Canada	774	803	843	846	857	875	944	1,002	1,017	1,031	1,038	1,046	1,054	1,060	1,067
PADD I	65	59	63	63	63	63	63	63	63	63	63	63	63	63	63
PADD IV	278	295	305	311	306	311	325	336	350	352	357	362	368	375	381
PADD V	109	132	143	152	172	164	157	151	152	153	154	155	156	157	157
Subtotal PADDs I, IV, V <sup>(1)</sup>	452	487	510	526	540	538	545	550	565	568	573	580	587	594	602
Texas Panhandle (PADD III) <sup>(2)</sup>	1	11	26	40	40	40	40	75	110	110	110	110	110	110	110
USGC (PADD III) <sup>(3)</sup>	57	65	65	65	65	65	65	445	445	445	445	445	445	445	445
Subtotal PADD III	58	76	91	105	105	105	105	520	555	555	555	555	555	555	555
Total (except PADD II)	1,285	1,365	1,445	1,478	1,502	1,518	1,594	2,072	2,137	2,154	2,167	2,181	2,195	2,209	2,223
Available for PADD II	1,029	983	1,019	1,175	1,375	1,529	1,608	1,307	1,404	1,489	1,609	1,722	1,824	1,929	1,983
<i>(Thousand Cubic Metres Per Day)</i>															
<b>Supply</b> <sup>(1)</sup>	367.7	373.3	391.6	421.8	457.4	484.3	509.1	537.3	562.9	579.2	600.4	620.5	639.0	657.9	668.6
<b>Disposition</b>															
Western Canada <sup>(1)</sup>	89.3	93.1	90.7	91.0	92.0	94.2	98.0	99.9	101.7	103.5	104.2	105.0	105.9	106.8	107.6
Ontario <sup>(1)</sup>	33.8	34.5	43.4	43.5	44.2	44.9	52.1	59.3	60.0	60.5	60.9	61.3	61.6	61.8	62.0
Subtotal, Canada	123.0	127.6	134.1	134.5	136.2	139.1	150.1	159.2	161.7	163.9	165.1	166.3	167.5	168.5	169.6
PADD I	10.4	9.4	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
PADD IV	44.2	47.0	48.5	49.5	48.6	49.4	51.7	53.5	55.6	55.9	56.7	57.6	58.5	59.5	60.6
PADD V	17.3	21.0	22.7	24.2	27.3	26.1	24.9	24.0	24.2	24.3	24.5	24.6	24.7	24.9	25.0
Subtotal PADDs I, IV, V <sup>(1)</sup>	71.9	77.4	81.1	83.7	85.9	85.5	86.6	87.5	89.8	90.2	91.2	92.2	93.3	94.4	95.6
Texas Panhandle (PADD III) <sup>(2)</sup>	0.2	1.7	4.2	6.4	6.4	6.4	6.4	11.9	17.5	17.5	17.5	17.5	17.5	17.5	17.5
USGC (PADD III) <sup>(3)</sup>	9.1	10.3	10.3	10.3	10.3	10.3	10.3	70.7	70.7	70.7	70.7	70.7	70.7	70.7	70.7
Subtotal PADD III	9.3	12.0	14.5	16.7	16.7	16.7	16.7	82.7	88.2	88.2	88.2	88.2	88.2	88.2	88.2
Total (except PADD II)	204.2	217.0	229.7	234.9	238.8	241.3	253.4	329.4	339.7	342.4	344.5	346.8	349.0	351.2	353.4
Available for PADD II	163.5	156.3	161.9	186.9	218.6	243.0	255.6	207.9	223.2	236.8	255.9	273.7	290.0	306.7	315.2

Notes: (1) Source: PGI estimates in proprietary market analysis, April 2008.

(2) For WRB Refining at Borger, Texas.

(3) Via Pegasus and Keystone XL Pipelines

TABLE 2  
WESTERN CANADIAN CRUDE SUPPLY AND DISPOSITION SCENARIOS

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<i>(Thousand Barrels Per Day)</i>														
<b>Supply Scenarios:</b>														
PGI 2008 <sup>(1)</sup>	2,313	2,348	2,463	2,653	2,877	3,046	3,202	3,379	3,540	3,643	3,776	3,903	4,019	4,138
CAPP Moderate, 2008 <sup>(2)</sup>	2,373	2,431	2,516	2,712	2,786	2,906	3,146	3,372	3,580	3,785	3,961	4,034	4,124	4,214
CAPP Pipeline Planning, 2008 <sup>(3)</sup>	2,373	2,431	2,567	2,762	2,880	3,036	3,372	3,621	3,923	4,196	4,297	4,375	4,528	4,802
Enbridge 2008 <sup>(3)</sup>	2,280	2,350	2,500	2,710	2,850	3,080	3,490	3,700	3,980	4,280	4,490	4,770		
CAPP Interim Update Dec 2008 <sup>(4)</sup>			2,425	2,649	2,739	2,851	3,047	3,194	3,288	3,478	3,702	3,930	4,073	4,196
<b>Demand Scenario with Keystone XL at 380,000 B/D</b>														
Total (except PADD II)	1,285	1,365	1,445	1,478	1,502	1,518	1,594	2,072	2,137	2,154	2,167	2,181	2,195	2,209
Including USGC	57	65	65	65	65	65	65	445	445	445	445	445	445	445
<b>Available for PADD II, based on supply:</b>														
PGI 2008	1,029	983	1,019	1,175	1,375	1,529	1,608	1,307	1,404	1,489	1,609	1,722	1,824	1,929
CAPP Moderate, 2008	1,088	1,066	1,071	1,234	1,284	1,388	1,552	1,300	1,443	1,631	1,794	1,853	1,928	2,005
CAPP Pipeline Planning, 2008	1,088	1,066	1,123	1,284	1,378	1,519	1,778	1,549	1,787	2,042	2,130	2,194	2,333	2,593
Enbridge 2008	995	985	1,055	1,232	1,348	1,562	1,896	1,628	1,843	2,126	2,323	2,589		
CAPP Interim Update Dec 2008			980	1,171	1,237	1,333	1,453	1,122	1,151	1,324	1,535	1,749	1,878	1,987
<b>Demand Scenario with Keystone XL at 500,000 B/D</b>														
Total Demand (except PADD II)								2,072	2,257	2,274	2,287	2,301	2,315	2,329
Including USGC								445	565	565	565	565	565	565
<b>Available for PADD II, based on supply:</b>														
PGI 2008								1,307	1,284	1,369	1,489	1,602	1,704	1,809
CAPP Moderate, 2008								1,300	1,323	1,511	1,674	1,733	1,808	1,885
CAPP Pipeline Planning, 2008								1,549	1,667	1,922	2,010	2,074	2,213	2,473
Enbridge 2008								1,628	1,723	2,006	2,203	2,469		
CAPP Interim Update Dec 2008								1,122	1,031	1,204	1,415	1,629	1,758	1,867
<b>Export Scenarios<sup>(5)</sup></b>														
Western Canada Demand	562	586	570	572	579	593	616	628	640	651	655	661	666	672
<b>Export Scenario based on Supply</b>														
PGI 2008	1,751	1,762	1,893	2,081	2,299	2,454	2,586	2,751	2,901	2,992	3,121	3,242	3,353	3,466
CAPP Moderate, 2008	1,811	1,846	1,946	2,140	2,207	2,313	2,530	2,743	2,940	3,134	3,305	3,374	3,457	3,542
CAPP Pipeline Planning, 2008	1,811	1,846	1,997	2,190	2,301	2,444	2,756	2,993	3,283	3,545	3,642	3,714	3,862	4,131
Enbridge 2008	1,718	1,764	1,930	2,138	2,271	2,487	2,874	3,072	3,340	3,629	3,835	4,109		
CAPP Interim Update Dec 2008			1,855	2,077	2,160	2,258	2,431	2,566	2,648	2,827	3,047	3,269	3,407	3,524
<i>(Thousand Cubic Metres Per Day)</i>														
<b>Supply Scenarios:</b>														
PGI 2008	367.7	373.3	391.6	421.8	457.4	484.3	509.1	537.3	562.9	579.2	600.4	620.5	639.0	657.9
CAPP Moderate, 2008	377.3	386.5	400.0	431.2	442.9	462.0	500.2	536.0	569.1	601.8	629.7	641.4	655.6	669.9
CAPP Pipeline Planning, 2008	377.3	386.5	408.2	439.1	457.9	482.7	536.1	575.7	623.7	667.1	683.2	695.5	719.9	763.5
Enbridge 2008	362.5	373.6	397.5	430.8	453.1	489.7	554.8	588.2	632.8	680.4	713.8	758.3		
CAPP Interim Update Dec 2008			385.5	421.1	435.5	453.3	484.4	507.8	522.7	552.9	588.6	624.8	647.5	667.1
<b>Demand Scenario with Keystone XL at 380,000 B/D</b>														
Total Demand (except PADD II)	204.2	217.0	229.7	234.9	238.8	241.3	253.4	329.4	339.7	342.4	344.5	346.8	349.0	351.2
Including USGC	9.1	10.3	10.3	10.3	10.3	10.3	10.3	70.7	70.7	70.7	70.7	70.7	70.7	70.7
<b>Available for PADD II, based on supply:</b>														
PGI 2008	163.5	156.3	161.9	186.9	218.6	243.0	255.6	207.9	223.2	236.8	255.9	273.7	290.0	306.7
CAPP Moderate, 2008	173.0	169.5	170.3	196.2	204.1	220.7	246.8	206.6	229.4	259.4	285.2	294.6	306.6	318.7
CAPP Pipeline Planning, 2008	173.0	169.5	178.5	204.2	219.1	241.4	282.7	246.3	284.0	324.7	338.7	348.8	370.9	412.3
Enbridge 2008	158.3	156.6	167.7	195.9	214.3	248.4	301.4	258.8	293.1	338.0	369.3	411.6		
CAPP Interim Update Dec 2008			155.8	186.2	196.6	212.0	231.0	178.4	183.0	210.5	244.1	278.0	298.5	315.9
<b>Demand Scenario with Keystone XL at 500,000 B/D</b>														
Total (except PADD II)								329.4	358.8	361.5	363.6	365.8	368.1	370.3
Including USGC								70.7	89.8	89.8	89.8	89.8	89.8	89.8
<b>Available for PADD II, based on supply:</b>														
PGI 2008								207.9	204.1	217.7	236.8	254.6	270.9	287.6
CAPP Moderate, 2008								206.6	210.4	240.3	266.1	275.5	287.5	299.6
CAPP Pipeline Planning, 2008								246.3	265.0	305.6	319.6	329.7	351.8	393.2
Enbridge 2008								258.8	274.0	319.0	350.3	392.5		
CAPP Interim Update Dec 2008								178.4	164.0	191.5	225.0	259.0	279.5	296.8
<b>Export Scenarios<sup>(5)</sup></b>														
Western Canada Demand	89.3	93.1	90.7	91.0	92.0	94.2	98.0	99.9	101.7	103.5	104.2	105.0	105.9	106.8
<b>Export Scenario based on Supply</b>														
PGI 2008	278.5	280.2	301.0	330.8	365.4	390.1	411.1	437.4	461.1	475.7	496.2	515.4	533.1	551.1
CAPP Moderate, 2008	288.0	293.4	309.3	340.2	350.9	367.8	402.2	436.1	467.4	498.3	525.5	536.4	549.6	563.1
CAPP Pipeline Planning, 2008	288.0	293.4	317.5	348.1	365.9	388.5	438.2	475.8	522.0	563.6	579.0	590.5	614.0	656.7
Enbridge 2008	273.2	280.5	306.8	339.8	361.1	395.4	456.9	488.3	531.0	577.0	609.6	653.3		
CAPP Interim Update Dec 2008			294.9	330.1	343.5	359.0	386.5	407.9	421.0	449.5	484.4	519.8	541.6	560.3
<b>Supply Sources:</b>														
(1) PGI proprietary market analysis, April 2008														
(2) CAPP, Crude Oil Forecast, Markets and Pipeline Expansions, June 2008														
(3) Enbridge, Liquids Pipeline Development, Enbridge Day Presentation, October 7 and 8, 2008														
(4) CAPP, Interim Update, 2008-2020 Western Crude Oil Forecast, December 11, 2008														
(5) Export from Western Canada includes shipments for Ontario														

**TABLE 3**  
**PADD III REFINERY CRUDE CAPACITY: 2008 <sup>(1)</sup>**

	Thousand Barrels per Day	Thousand Cubic Metres per Day
<b><u>Group 1 - Coastal Refineries - Direct Pipeline Access to Canadian Crude</u></b>		
Motiva Enterprises LLC; Port Arthur, TX	285	45.3
Total Petrochemicals; Port Arthur, TX	232	36.9
Valero Energy Corp.; Port Arthur, TX	289	45.9
Exxon Mobil; Beaumont, TX	349	55.4
Pasadena Refining; Pasadena, TX	100	15.9
Houston Refining (Lyondell); Houston, TX	271	43.1
Valero Energy Corp.; Houston, TX	83	13.2
Deer Park Refining; Deer Park, TX	330	52.5
Exxon Mobil; Baytown, TX	567	90.1
BP; Texas City, TX	478	76.0
Marathon Oil; Texas City, TX	76	12.1
Valero Energy Corp.; Texas City, TX	200	31.8
Calcasieu Refining; Lake Charles, LA	53	8.4
CITGO; Lake Charles, LA	430	68.3
ConocoPhillips; Lake Charles/Westlake, LA	239	38.0
Sub-Total Group 1	3,981	632.9
<b><u>Group 2 - Coastal Refineries Requiring Pipeline / Water Transfer of Canadian Crude</u></b>		
Hunt Refining Co.; Tuscaloosa, AL	35	5.6
ConocoPhillips; Belle Chasse, LA	247	39.3
Exxon Mobil; Baton Rouge, LA	503	80.0
Valero Energy Corp.; Krotz Springs, LA	80	12.7
Valero Energy Corp.; St. Charles, LA	185	29.4
Marathon Oil; Garyville, LA	256	40.7
Chalmette Refining; Chalmette, LA	193	30.7
Murphy Oil; Meraux, LA	120	19.1
Motiva Enterprises LLC; Norco, LA	236	37.5
Motiva Enterprises LLC; Convent, LA	235	37.4
Placid Refining; Port Allen, LA	56	8.9
Shell Chemical; Saint Rose, LA	55	8.7
ChevronTexaco; Pascagoula, MS	330	52.5
ConocoPhillips; Sweeny, TX	247	39.3
CITGO; Corpus Christi, TX	156	24.8
Valero Energy Corp.; Three Rivers, TX	96	15.3
Flint Hills Resources; Corpus Christi, TX	288	45.8
Valero Energy Corp.; Corpus Christi, TX	142	22.6
Sub-Total Group 2	3,460	550.1
<b><u>Group 3 - Inland PADD III Refineries with Possible Pipeline Connection to Canadian Crude</u></b>		
Navajo Refining; Artesia, NM	84	13.4
WRB Refining; Borger, TX	146	23.2
Valero Energy Corp.; Sunray/McKee, TX	171	27.2
Alon USA; Big Spring, TX	67	10.7
Delek; Tyler, TX	58	9.2
Sub-Total Group 3	526	83.6
<b><u>Others Without Access</u></b>		
Sub-Total Other	449	71.4
PADD III GRAND TOTAL	8,416	1,338.0

Note: (1) Source: U.S. Energy Information Administration (EIA), Refining Capacity, 2008.

**TABLE 4**  
**PADD III REFINERY CRUDE TYPES AND SOURCES**

	Estimated 2007 Crude Runs <sup>(1)</sup>				2008 Crude Capacity
	Light Sweet	Light Sour	Heavy <sup>(2)</sup>	Total	
<b>Thousand Barrels per Day</b>					
<b>Group 1 Refineries <sup>(3)</sup></b>					
Domestic Crude	124	161	37	322	
Imports <sup>(1)</sup>	661	904	1,395	2,959	
Total Crude to Group 1	784	1,065	1,432	3,281	3,981
<b>Total PADD III <sup>(4)</sup></b>					
Domestic Crude	930	848	50	1,828	
Imports <sup>(1)</sup>	1,596	1,530	2,452	5,578	
Total Crude to PADD III	2,525	2,378	2,502	7,406	8,416
<b>Thousand Cubic Metres per Day</b>					
<b>Group 1 Refineries <sup>(3)</sup></b>					
Domestic Crude	19.7	25.7	5.9	51.2	
Imports <sup>(1)</sup>	105.0	143.6	221.8	470.5	
Total Crude to Group 1	124.7	169.3	227.7	521.7	632.9
<b>Total PADD III <sup>(4)</sup></b>					
Domestic Crude	147.8	134.9	7.9	290.5	
Imports <sup>(1)</sup>	253.7	243.3	389.9	886.8	
Total Crude to PADD III	401.5	378.1	397.7	1,177.3	1,338.0

Notes: (1) Estimated crude runs from DOE import data as well as PGI estimates of refinery crude runs and domestic crude use.

(2) Heavy includes High TAN crudes.

(3) 15 Group 1 refineries from Texas City to Lake Charles, LA as listed in Table 3.

(4) PADD III includes Group 1 refineries.

**TABLE 5**  
**CAPACITIES OF EXPORT PIPELINES FOR CANADIAN CRUDES: 2012**

	(Thousand Barrels Per Day)			(Thousand Cubic Metres Per Day)		
	Light	Heavy	Total	Light	Heavy	Total
<b>Enbridge<sup>(1)</sup></b>						
Line 1 <sup>(a)</sup>	77		77	12.2		12.2
Line 2 <sup>(b)</sup>	440		440	70.0		70.0
Line 3 <sup>(b)(c)</sup>	500		500	79.5		79.5
Line 4 <sup>(b)</sup>		880	880		139.9	139.9
LSR <sup>(d)</sup>	186		186	29.6		29.6
Clipper <sup>(b)</sup>	-	450	450	-	71.5	71.5
<b>Subtotal<sup>(e)</sup></b>	<b>1,203</b>	<b>1,330</b>	<b>2,533</b>	<b>191.3</b>	<b>211.4</b>	<b>402.7</b>
<b>Express<sup>(2)</sup></b>	<b>94</b>	<b>188</b>	<b>282</b>	<b>14.9</b>	<b>29.9</b>	<b>44.8</b>
<b>TransMountain<sup>(3)</sup></b>	<b>85</b>	<b>85</b>	<b>170</b>	<b>13.5</b>	<b>13.5</b>	<b>27.0</b>
<b>Milk River<sup>(4)</sup></b>	<b>5</b>	<b>113</b>	<b>118</b>	<b>0.8</b>	<b>18.0</b>	<b>18.8</b>
<b>Rangeland/Aurora<sup>(4)</sup></b>	<b>50</b>	<b>15</b>	<b>65</b>	<b>7.9</b>	<b>2.4</b>	<b>10.3</b>
<b>Keystone<sup>(5)</sup></b>						
Phase 1-A & B	197	393	590	31.3	62.5	93.8
<b>Total</b>	<b>1,634</b>	<b>2,124</b>	<b>3,758</b>	<b>259.7</b>	<b>337.7</b>	<b>597.5</b>
<b>95% of Total</b>	<b>1,552</b>	<b>2,018</b>	<b>3,570</b>	<b>246.7</b>	<b>320.9</b>	<b>567.6</b>

Notes: (1) Enbridge sources below. Crude capacities ex Cromer, Manitoba.

(a) Enbridge Pipeline System Configuration, March 2006 for total capacity = 237,000 B/D ( $37.6 \times 10^3 \text{ m}^3 / \text{d}$ ).

Crude capacity is reduced by delivery of refined products and natural gas liquids assumed at 160,000 B/D ( $25.4 \times 10^3 \text{ m}^3 / \text{d}$ ).

(b) Enbridge Appendix 14 in Reponse to Information Request 14 of Communications, Energy & Paperworkers Union (CEP) at NEB hearing OH-4-2007, re Clipper.

(c) Source (b) includes change in Line 3 service from heavy crude to light crude

(d) Enbridge Facility Application for Southern Lights Vol. 1. pg 2-3, February, 2007 (NEB hearing OH-3-2007)

(e) Enbridge subtotal assumes sufficient takeaway capacity from Superior to Chicago and Marysville.

(2) Source: Kinder Morgan website\business\Canada for total crude capacity. Express heavy crude assumed = 2/3 of total crude.

(3) Source: Terasen Pipelines Inc. Facility Application for Trans Mountain Pipeline Anchor Loop, pg 2-4, Feb. 17, 2006.

for total capacity = 300,000 B/D ( $47.7 \times 10^3 \text{ m}^3 / \text{d}$ ). Export capacity is reduced by domestic delivery of light crude and refined products assumed at 130,000 B/D ( $20.7 \times 10^3 \text{ m}^3 / \text{d}$ ). TransMountain crude capacity assumed at half light crude for Washington.

(4) Purvin & Gertz estimates

(5) Keystone heavy assumed at 2/3 of total crude.



TABLE 6  
WESTERN CANADIAN HEAVY CRUDE SUPPLY AND DISPOSITION

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<i>(Thousand Barrels Per Day)</i>															
<b>Supply</b> <sup>(1)</sup>	1,117	1,171	1,263	1,398	1,565	1,727	1,822	1,978	2,127	2,236	2,282	2,348	2,400	2,474	2,487
<b>Disposition</b>															
Western Canada <sup>(1)</sup>	87	77	87	91	111	124	125	127	129	131	132	134	136	137	139
Ontario <sup>(1)</sup>	71	61	102	123	125	126	137	149	165	167	168	168	169	170	202
Subtotal, Canada	158	138	189	214	236	250	262	276	294	297	300	302	305	307	342
PADD I	37	36	37	37	37	37	37	37	37	37	37	37	37	37	37
PADD IV	144	138	158	162	166	168	174	179	183	188	189	191	193	195	196
PADD V	31	47	62	74	88	79	71	65	65	65	65	65	65	65	65
Subtotal PADDs I, IV, V <sup>(1)</sup>	212	221	257	273	291	284	283	281	285	289	291	293	295	297	298
Texas Panhandle (PADD III) <sup>(2)</sup>	1	11	26	40	40	40	40	75	110	110	110	110	110	110	110
USGC (PADD III) <sup>(3)</sup>	57	65	65	65	65	65	65	331	331	331	331	331	331	331	331
Subtotal PADD III	58	76	91	105	105	105	105	406	441	441	441	441	441	441	441
Total (except PADD II)	428	435	537	592	632	639	650	962	1,020	1,028	1,032	1,036	1,041	1,045	1,081
Available for PADD II	689	736	726	806	933	1,088	1,172	1,016	1,107	1,208	1,250	1,311	1,360	1,429	1,407
<i>(Thousand Cubic Metres Per Day)</i>															
<b>Supply</b> <sup>(1)</sup>	177.6	186.1	200.8	222.3	248.8	274.6	289.7	314.5	338.1	355.5	362.8	373.2	381.6	393.3	395.5
<b>Disposition</b>															
Western Canada <sup>(1)</sup>	13.8	12.2	13.9	14.5	17.7	19.6	19.9	20.2	20.5	20.7	21.0	21.3	21.6	21.8	22.1
Ontario <sup>(1)</sup>	11.2	9.8	16.2	19.6	19.8	20.0	21.9	23.7	26.3	26.5	26.6	26.8	26.9	27.0	32.2
Subtotal, Canada	25.1	22.0	30.1	34.1	37.5	39.7	41.7	43.8	46.7	47.3	47.7	48.1	48.5	48.9	54.3
PADD I	5.8	5.7	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
PADD IV	22.9	22.0	25.2	25.8	26.4	26.8	27.7	28.4	29.1	29.8	30.1	30.4	30.7	31.0	31.2
PADD V	4.9	7.5	9.8	11.7	14.0	12.6	11.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
Subtotal PADDs I, IV, V <sup>(1)</sup>	33.7	35.2	40.8	43.3	46.2	45.2	44.9	44.6	45.3	46.0	46.3	46.6	46.9	47.1	47.4
Texas Panhandle (PADD III) <sup>(2)</sup>	0.2	1.7	4.2	6.4	6.4	6.4	6.4	11.9	17.5	17.5	17.5	17.5	17.5	17.5	17.5
USGC (PADD III) <sup>(3)</sup>	9.1	10.3	10.3	10.3	10.3	10.3	10.3	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6
Subtotal PADD III	9.3	12.0	14.5	16.7	16.7	16.7	16.7	64.5	70.1	70.1	70.1	70.1	70.1	70.1	70.1
Total (except PADD II)	68.0	69.2	85.4	94.1	100.4	101.6	103.4	153.0	162.2	163.4	164.1	164.8	165.5	166.1	171.8
Available for PADD II	109.5	116.9	115.4	128.1	148.4	173.0	186.4	161.5	176.0	192.1	198.7	208.5	216.2	227.1	223.6

Notes: (1) Source: PGI estimates in proprietary market analysis, April 2008.

(2) For WRB Refining at Borger, Texas

(3) Via Pegasus and Keystone XL Pipelines

TABLE 7  
WESTERN CANADIAN HEAVY CRUDE SUPPLY AND DISPOSITION SCENARIOS

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<i>(Thousand Barrels Per Day)</i>															
<b>Supply Scenarios:</b>															
PGI 2008 <sup>(1)</sup>	1,117	1,171	1,263	1,398	1,565	1,727	1,822	1,978	2,127	2,236	2,282	2,348	2,400	2,474	2,487
CAPP Moderate, 2008 <sup>(2)</sup>	1,213	1,211	1,263	1,321	1,372	1,404	1,527	1,634	1,768	1,855	1,944	1,994	2,046	2,123	2,291
CAPP Pipeline Planning, 2008 <sup>(2)</sup>	1,213	1,211	1,272	1,345	1,431	1,508	1,719	1,836	2,047	2,182	2,196	2,255	2,357	2,497	2,671
CAPP Interim Update Dec 2008 <sup>(3)</sup>			1,244	1,311	1,384	1,450	1,635	1,764	1,845	2,058	2,231	2,374	2,461	2,572	2,711
<b>Demand Scenario with Keystone XL at 380,000 B/D</b>															
Total (except PADD II)	428	435	537	592	632	639	650	962	1,020	1,028	1,032	1,036	1,041	1,045	1,081
Including USGC	57	65	65	65	65	65	65	331	331	331	331	331	331	331	331
<b>Available for PADD II, based on supply:</b>															
PGI 2008	689	736	726	806	933	1,088	1,172	1,016	1,107	1,208	1,250	1,311	1,360	1,429	1,407
CAPP Moderate, 2008	785	776	726	729	741	765	877	671	748	828	912	957	1,005	1,078	1,210
CAPP Pipeline Planning, 2008	785	776	735	753	800	868	1,069	874	1,027	1,155	1,164	1,219	1,317	1,452	1,590
CAPP Interim Update Dec 2008			707	719	752	811	985	802	825	1,030	1,199	1,338	1,420	1,527	1,630
<b>Demand Scenario with Keystone XL at 500,000 B/D</b>															
Total Demand (except PADD II)								962	1,104	1,112	1,116	1,120	1,125	1,129	1,165
Including USGC								331	415	415	415	415	415	415	415
<b>Available for PADD II, based on supply</b>															
PGI 2008								1,016	1,023	1,124	1,166	1,227	1,276	1,345	1,323
CAPP Moderate, 2008								671	664	744	828	873	921	994	1,126
CAPP Pipeline Planning, 2008								874	943	1,071	1,080	1,135	1,233	1,368	1,506
CAPP Interim Update Dec 2008								802	741	946	1,115	1,254	1,336	1,443	1,546
<b>Export Scenarios<sup>(4)</sup></b>															
Western Canada Demand	87	77	87	91	111	124	125	127	129	131	132	134	136	137	139
<b>Export Scenario based on Supply</b>															
PGI 2008	1,030	1,094	1,176	1,307	1,454	1,604	1,697	1,851	1,998	2,105	2,150	2,214	2,265	2,336	2,348
CAPP Moderate, 2008	1,126	1,134	1,176	1,230	1,261	1,280	1,402	1,507	1,639	1,725	1,812	1,860	1,910	1,986	2,151
CAPP Pipeline Planning, 2008	1,126	1,134	1,184	1,254	1,320	1,384	1,594	1,709	1,919	2,052	2,064	2,121	2,222	2,359	2,532
CAPP Interim Update Dec 2008			1,157	1,220	1,273	1,326	1,510	1,637	1,716	1,927	2,099	2,240	2,325	2,435	2,572
<i>(Thousand Cubic Metres Per Day)</i>															
<b>Supply Scenarios:</b>															
PGI 2008	177.6	186.1	200.8	222.3	248.8	274.6	289.7	314.5	338.1	355.5	362.8	373.2	381.6	393.3	395.5
CAPP Moderate, 2008	192.9	192.5	200.8	210.0	218.2	223.2	242.8	259.7	281.0	295.0	309.1	317.0	325.3	337.6	364.2
CAPP Pipeline Planning, 2008	192.9	192.5	202.2	213.9	227.6	239.7	273.3	291.9	325.5	346.9	349.2	358.5	374.8	397.0	424.6
CAPP Interim Update Dec 2008			197.8	208.4	220.0	230.5	259.9	280.4	293.3	327.2	354.7	377.4	391.3	408.9	431.0
<b>Demand Scenario with Keystone XL at 380,000 B/D</b>															
Total Demand (except PADD II)	68.0	69.2	85.4	94.1	100.4	101.6	103.4	153.0	162.2	163.4	164.1	164.8	165.5	166.1	171.8
Including USGC	9.1	10.3	10.3	10.3	10.3	10.3	10.3	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6
<b>Available for PADD II, based on supply:</b>															
PGI 2008	109.5	116.9	115.4	128.1	148.4	173.0	186.4	161.5	176.0	192.1	198.7	208.5	216.2	227.1	223.6
CAPP Moderate, 2008	124.9	123.3	115.4	115.9	117.7	121.6	139.5	106.7	118.9	131.6	145.1	152.2	159.8	171.4	192.3
CAPP Pipeline Planning, 2008	124.9	123.3	116.8	119.8	127.2	138.1	170.0	138.9	163.3	183.6	185.1	193.7	209.3	230.8	252.8
CAPP Interim Update Dec 2008			112.4	114.3	119.6	128.9	156.6	127.4	131.2	163.8	190.6	212.7	225.8	242.8	259.2
<b>Demand Scenario with Keystone XL at 500,000 B/D</b>															
Total (except PADD II)								153.0	175.5	176.7	177.4	178.1	178.8	179.5	185.2
Including USGC								52.6	66.0	66.0	66.0	66.0	66.0	66.0	66.0
<b>Available for PADD II, based on supply:</b>															
PGI 2008								161.5	162.6	178.7	185.3	195.1	202.8	213.8	210.3
CAPP Moderate, 2008								106.7	105.5	118.3	131.7	138.9	146.5	158.1	179.0
CAPP Pipeline Planning, 2008								138.9	150.0	170.2	171.8	180.4	196.0	217.5	239.4
CAPP Interim Update Dec 2008								127.4	117.8	150.5	177.3	199.3	212.4	229.4	245.8
<b>Export Scenarios<sup>(4)</sup></b>															
Western Canada Demand	13.8	12.2	13.9	14.5	17.7	19.6	19.9	20.2	20.5	20.7	21.0	21.3	21.6	21.8	22.1
<b>Export Scenario based on Supply</b>															
PGI 2008	163.7	173.9	186.9	207.8	231.1	255.0	269.9	294.3	317.7	334.7	341.7	351.9	360.1	371.4	373.3
CAPP Moderate, 2008	179.1	180.3	186.9	195.5	200.5	203.6	222.9	239.5	260.6	274.2	288.1	295.7	303.7	315.7	342.0
CAPP Pipeline Planning, 2008	179.1	180.3	188.3	199.4	209.9	220.0	253.5	271.7	305.0	326.2	328.2	337.2	353.2	375.1	402.5
CAPP Interim Update Dec 2008			183.9	193.9	202.4	210.9	240.1	260.3	272.9	306.4	333.7	356.1	369.7	387.1	408.9

**Supply Sources:**

- (1) PGI proprietary market analysis, April 2008  
(2) CAPP, Crude Oil Forecast, Markets and Pipeline Expansions, June 2008  
(3) CAPP, Interim Update, 2008-2020 Western Crude Oil Forecast, December 11, 2008  
(4) "Export" from Western Canada includes shipments for Ontario