



WHITE PAPER

# Refinery Margins, Crude Prices and Investments—Breaking Bad-er?

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## Critical Summary

- *Despite the rapid decline in oil prices, ICF International expects crude production in North America to continue rising in 2015. The U.S. crude inventory, at an 80-year high for this time of year, may lead to even lower producer prices and a deeper contango market as producers struggle to move crude with lower refinery demand (turnarounds) and minimal crude export ability.*
- *Higher North American crude production will put even more pressure on demand growth in China, Asia, and Europe to stabilize oil prices. Absent greater demand from China and Europe, action from OPEC to reduce supply, or reversal of the US dollar's valuation rise, the global oversupply picture could get worse before it gets better.*
- *Outside of the energy and petroleum market, investments will be delayed as investors assess the depth and length of the price drop. However, in many markets, we expect investments still will make sense and that shrewd investors will be able to find deals which can position them well long term.*

## Executive Summary

*The oil industry is reeling from the dramatic decline in crude oil prices and the potential impact on U.S., Canadian, and global crude production. Much less discussion surrounds the steady declines in U.S. and global refinery margins that have occurred coincident with the crude price decline and that appear to have led the crude market down. This paper examines the pattern of refinery crude runs and margins, and the potential implications of global and domestic product demands on those margins as well as on the demand and price for crude oil, in particular during the upcoming first quarter U.S. refinery turnaround period.*

## Record Production and Crude Runs Continue

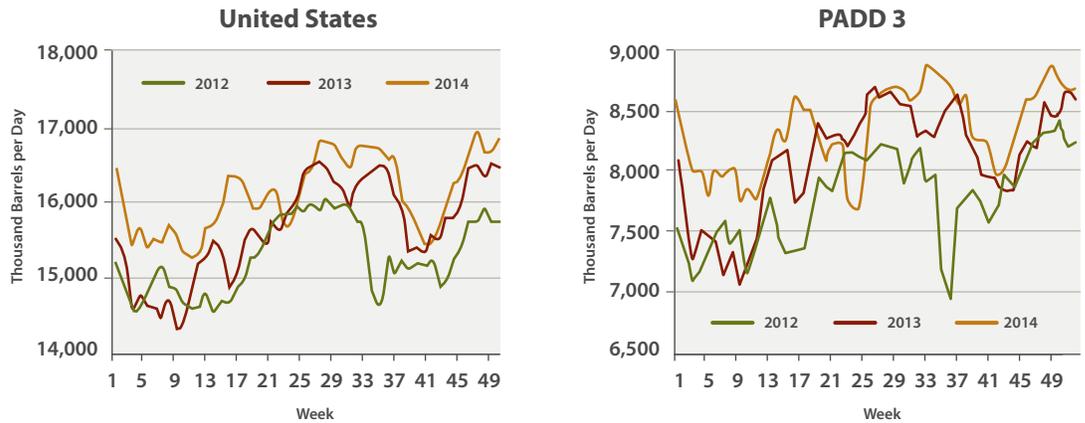
In addition to the well-publicized growth in U.S. crude production, U.S. refiners have continued to aggressively process crude oil at throughputs higher in 2014 than any previous recent period ([Exhibit 1](#)). Crude runs in January 2015 continued at rates around 16.0 million barrels per day (MMbbl/d) in the United States and 8.3 MMbbl/d in the Gulf Coast prior to the initiation of maintenance turnarounds. Crude runs in 2014 averaged 16.1 MMbbl/d, compared with 15.6 MMbbl/d in 2013 and 15.2 MMbbl/d in 2012. These year-on-year higher crude runs have helped support crude prices as domestic supplies have consistently grown since 2011. Refiners in all Petroleum Administration for Defense Districts (PADDs) have adapted their capacity to process additional shale oil supply, which has dramatically reduced foreign waterborne imports, in particular in PADDs 1 and 3.<sup>1</sup> With U.S. demands for gasoline and diesel relatively flat from 2010, the increased crude runs have resulted in significant growth in product exports (and a reduction in product imports) during the past several years.

<sup>1</sup> PADD 1—East Coast, PADD 2—Midwest, PADD 3—Gulf Coast, PADD 4—Rocky Mountain, PADD 5—West Coast.





**Exhibit 1: Record Crude Runs**



Source: EIA

The U.S. product net exports, which have increased by 2.1 MMbbl/d from 2009 to 2014,<sup>2</sup> also have served to fulfill global demand for petroleum and have contributed to the reduced demand for foreign crude oil. The higher volume of product net exports—coupled with about 2.6 MMbbl/d lower crude imports (excluding Canada) from the 2009–2011 period—has, in total, pushed about 4.7 MMbbl/d of petroleum supply into world markets from the U.S. and Canadian energy industry.

### Gross Margins Continue to Weaken

The high crude runs and limited economic outlets for Gulf Coast products have caused product prices to weaken in order to sustain product export volumes in a slowing global economy. Although refiners in the Gulf Coast have found incremental crude runs still to be profitable, their gross margins have weakened considerably in the past six months, particularly in PADD 3 ([Exhibit 2](#)). The declining margins in a falling market mean that product prices have fallen faster than crude prices. Gross crack spread margins<sup>3</sup> for WTI and Maya in PADD 3 are approaching the low levels seen in 2009 and 2010 following the economic collapse.<sup>4</sup>

Margins for PADD 1 refiners based on Brent crude have been more resilient in part because the East Coast market has been insulated from the product discounts on the Gulf Coast. Shipments up the Colonial and Plantation pipelines to the Southeast and Northeast have kept those lines near capacity. The poor economics and lack of availability of Jones Act vessels have precluded refiners or traders from increasing shipments of Gulf Coast products into the East Coast.<sup>5</sup>

Gulf Coast product prices are being driven by the export market and competition for space in Colonial and Plantation pipelines. Substantial discounts to NYMEX futures have been required to make the export arbitrage economic. The discounts have increased for both gasoline and diesel in particular since early November, with diesel (ULSD) at levels as much as 28 cents per gallon below the front month NYMEX ([Exhibit 2](#)).

<sup>2</sup> Higher exports and lower imports

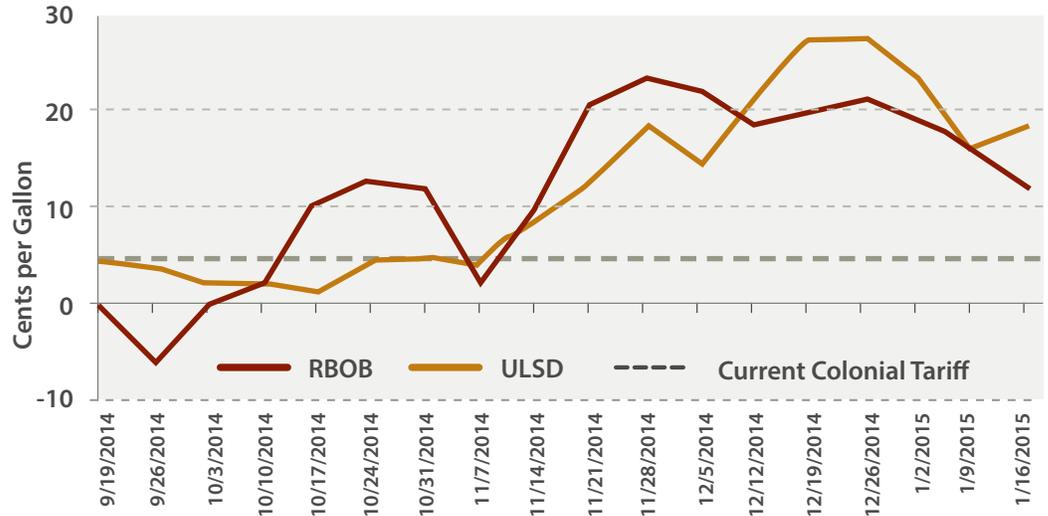
<sup>3</sup> Gross crack spread margins reflect the spread between product prices for gasoline and diesel and crude oil

<sup>4</sup> The margins are estimated using a 2-1-1 crack spread in the Midwest and Gulf Coast.

<sup>5</sup> Brent based crudes, usually Nigerian, are the last barrels into the East Coast refiners. Bakken crudes are typically more economic and are maximized.



**Exhibit 2: NYMEX Front Month vs. Gulf Coast RBOB and ULSD, September 2014-Current**

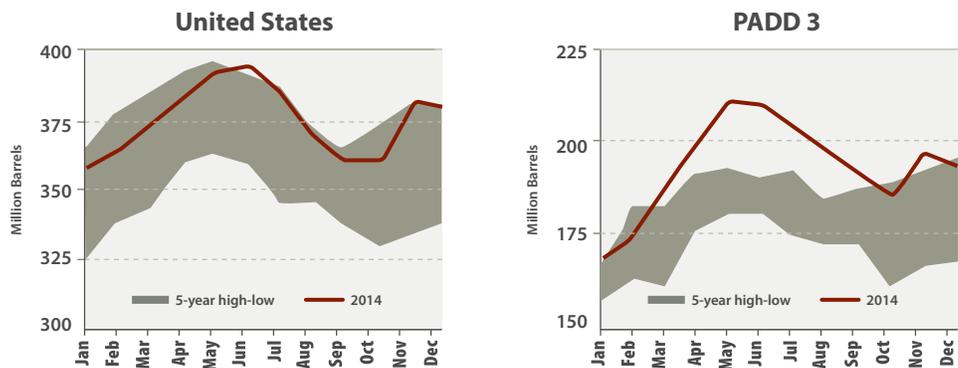


Source: Bloomberg, EIA

As noted earlier, refiners have continued to process crude oil at high rates even with the weakening margins. Despite the high crude runs and the increased level of crude oil exports (up to 400,000 barrels per day recently and averaging 366,000 barrels per day in the second half of 2014), U.S. crude inventory levels have continued to be very high, ending 2014 at about 385 million barrels of commercial stocks, with nearly 200 million barrels of those stocks in PADD 3 (Exhibit 3).

Historically, there is a substantial increase in crude inventory in the first quarter as refineries reduce crude runs to complete refinery maintenance turnarounds and manage inventories at the refinery. This seasonal increase has been roughly 10-40 million barrels from January 1 to April 1, and was over 35 million barrels in 2014 for the U.S. This additional inventory on top of the current very high levels may lead to physical storage limitations and have a significant downward impact on crude prices.

**Exhibit 3: 5-Year High-Low and 2014 Crude Inventories**



Source: EIA

Note: High-low is the maximum and minimum for the respective months from 2009 to 2013.



The Extent of continued inventory rise in 2015 may depend on whether refiners can negotiate reductions of imports of medium and heavy crudes (including Saudi and other Middle East crudes) that may have contractual requirements for lifting. This negotiation may be critical as ICF anticipates that 2015 North American crude production will continue to rise based on the momentum from 2013 and 2014 upstream investments.

Finally, crude prices have continued to be under pressure. As of January 28, WTI was under \$45/barrel; Bakken at Clearbrook was under \$41/barrel. Wellhead prices were roughly \$38/barrel. Western Canadian Select prices were at \$32/barrel.<sup>6</sup>

### Lack of Demand a Huge Issue

In addition to the domestic factors noted above, several other key factors are influencing the market.

- Global oil demand is slowing down. The IEA's recent Oil Market Report identifies weakening Chinese, European, and Japanese demand in the backdrop of softer global economic growth outlook, which negatively affects petroleum demands.<sup>7</sup> The World Bank also noted weak global economic conditions in 2014, as many large economies still struggle to recover from the 2008 financial crisis.<sup>8</sup>
- The relatively recent appreciation of the U.S. dollar also contributes to weak petroleum demand. While a 10 percent appreciation of the U.S. dollar can lead to between less than 3 to 10 percent oil price declines, the relative depreciation of other currencies offset the benefit from lower oil prices somewhat for non-USD economies.<sup>9</sup>
- The sustained increase in global crude supply from U.S. shale oil impact, Canadian growth, and restoration of Iraq and Libya supply—coupled with the weak global petroleum demand—has precipitated the crude market to move into a contango structure.<sup>10</sup> This structure provides incentives to parties to store crude oil to take advantage of higher future prices. As a result, traders and others have chartered as much as 30 million barrels of VLCC<sup>11</sup> floating capacity for crude storage.<sup>12</sup>

### Near-Term Supply Outlook Will Get Worse

Given the factors currently in the petroleum markets, it is difficult to see how fundamental supply factors will reverse the trends that have prevailed over the past six months.

The annual U.S. refinery maintenance cycle will likely result in near-historic growth in the U.S. crude inventory in the first quarter of 2015. This growth will put significant pressure on producers and/or further drive crude oil into storage and strengthen the contango market. Although the reductions in crude runs will likely impact product prices and refinery margins favorably, the potential impact on crude prices could be very negative. On January 14, EIA reported that U.S. crude inventories on January 9 were at the highest level at that point in the year in the past 80 years. Platt's reported on January 13 that more than 85 percent of global commercial crude storage was used.<sup>13</sup> Furthermore,

<sup>6</sup> Oilgram Price Report, Platts. McGraw Hill Financial. January 16, 2015.

<sup>7</sup> International Energy Agency (IEA). "Oil Market Report." IEA, December 12, 2014: Paris, France. Available at <https://www.iea.org/media/omrreports/fullissues/2014-12-12.pdf>.

<sup>8</sup> World Bank (WB). "Global Outlook: Disappointments, Divergences, and Expectations." WB, January 2015: Washington, DC. Available at <http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015a/pdfs/Chapter%201%20Highlights.pdf>.

<sup>9</sup> World Bank. "Understanding the Plunge in Oil Prices: Sources and Implications." WB, January 2015: Washington, DC. Available at [http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015a/pdfs/GEP2015a\\_chapter4\\_report\\_oil.pdf](http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015a/pdfs/GEP2015a_chapter4_report_oil.pdf).

<sup>10</sup> Contango is a market pricing structure in which the current price is lower than the future delivery price.

<sup>11</sup> VLCC refers to a very large crude carrier, holding about two million barrels of crude oil.

<sup>12</sup> "Trading majors book supertankers," Oilgram Price Report, Platts. McGraw Hill Financial. January 13, 2015.

<sup>13</sup> "Oil futures continue slide, as Brent-WTI gap closes," Oilgram Price Report, Platts. McGraw Hill Financial. January 14, 2015.



during the week ending January 16, crude inventories reported by EIA increased by another 10 million barrels to nearly 398 million barrels, the largest weekly inventory build in 14 years. And inventories reported by EIA for the week ending January 23 increased another nine million barrels. The beginning of run cuts for turnarounds and operational outages layered on sustained production increases is driving this trend.

The potential impact of the seasonal turnaround period (layered onto a global market where crude oil supply remains high and demand for petroleum products has slowed) is likely to create an even greater contango market for crude. This increase may trigger more floating crude storage as well as inventory growth in Cushing. Refining margins in the United States may be improved somewhat due to the reduced gasoline and distillate that is produced with maintenance turnarounds. However, the underlying global economic recovery may take considerably more time to develop. Hence, refinery margins may stay weak when run levels increase after turnarounds and more product is pushed out into the global market.

This overhang in U.S. and global crude inventories normally takes some time to dissipate, especially when a contango market provides economic incentive to sustain high inventory levels. The ultimate resolution is difficult to forecast, especially because factors on both sides of the supply/demand equation that would need to change. Increases in U.S. crude runs following maintenance downtime works to reduce U.S. crude inventories. A return to high U.S. crude runs may not make as large of an impact on inventory due to higher U.S. domestic production. The conditions that have slowed growth globally (and especially in Asian markets) will need to change in order to increase demands and provide support to oil markets. When the demands increase, it may take some time to “clear” the overhang in crude inventories.

Of course, Saudi Arabia and OPEC could change the equation at any time by adjusting their production, but OPEC has repeatedly stressed that it will not adjust output. The rationale for the decision not to adjust could be for a number of reasons. The declining price of crude is clearly impacting investment in U.S. shale oil development and is having an even greater impact on Canadian Oil Sands investment. Several Canadian companies have pulled back from oil sands investments. On January 13, Suncor announced a layoff of 1,000 people and a \$1 billion reduction in capital spending.<sup>14</sup> On January 21, the Canadian Association of Petroleum Producers estimated<sup>15</sup> that in 2015, \$23 billion of investment will be cut out of \$69 billion planned across the industry in Canada. These results will impact longer term production growth. ICF believes that ongoing production investments through 2014 and more targeted shale oil drilling are likely to result in continued increases in North American oil production in 2015, with the impact of investment cuts beginning to be seen in 2016.

## Investment and Sector Impacts

Not surprisingly, today’s oil prices and expectations will have substantive impacts on petroleum markets.

- The reduction in crude prices will reduce upstream investments, impacting the entire supply chain that has supported the economic boom in North Dakota, Texas, and other states. These impacts also will extend to the rail industry and to companies manufacturing materials and equipment in support of the crude production infrastructure. Recent layoffs announced by Suncor and Schlumberger, among others, reflect the perspective that the situation is not perceived to be temporary. However, the upstream may get stronger in the long run by more focus on cost management and more selective drilling.

<sup>14</sup> <http://www.suncor.com/en/newsroom/5441.aspx?id=1911200>.

<sup>15</sup> <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/capp-oil-forecast/article22548386/>.



- The impact on the Canadian oil industry and government revenues is significant, because oil revenues are a more critical component of the economy. Approval of TransCanada's Keystone XL pipeline may provide some level of optimism that new crude production could be economically brought to market, but approval remains very uncertain.
- The sluggish global demand for petroleum products may result in weaker U.S. refinery margins and the threat of some closures if margins continue to erode and do not recover quickly following the ongoing turnaround period.
- The U.S. crude midstream market has been poised with major investments in pipelines to move the increasing growth of domestic crude from the Permian, Bakken, and Niobrara regions to market. Some of these projects may be at risk if upstream investments are delayed, although ICF believes continued domestic crude production growth still will demand new infrastructure to connect markets.
- Lower global crude oil and product prices also threaten U.S. and Canadian liquefied natural gas (LNG) export projects that require a wide spread between delivered LNG and alternative oil products in order to be economically viable.
- Limitations on crude oil exports are preventing U.S. producers from moving crude out into global markets other than Canada. The ability to export would positively affect domestic crude oil production (based on an ICF study and a study of the issue by the U.S. Government Accountability Office) and may mitigate—to some limited degree—the economic impact on oil industry jobs.

## Conclusion

Recovery in oil markets must be linked to both oil production reductions and restoration of global demand growth through a more robust economy. In particular, China and other Asian markets are essential to restoration of oil demands. In Europe, the recent €1.1 trillion (\$1.2 trillion) stimulus program set up by the European Central Bank (ECB) may provide a boost, but the ECB points out that the program must be supported by structural reforms to individual member country economies.

The potential for much lower crude prices in the next six months clearly exists absent some dramatic impact on the global supply/demand balance. The timing of restoration of oil prices to levels that will support continued growth in shale oil and oil sands development may take substantially longer to achieve, and may require resolution of currency and liquidity issues along with supply/demand alignment. The pressure on the producing, midstream, and downstream sectors in the oil industry is significant. The implications of price levels, production outlooks, and refinery margins will have an impact on all stakeholders—including investors, consumers, and state and federal agencies seeking to assure a reliable and economic supply as well as an energy infrastructure that is physically and economically resilient to disruption.

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### About the Author

**Tom O'Connor** is a Principal in the Energy, Environment, and Transportation division at ICF International. He focuses on assessment of global fuels markets in areas of supply and demand outlook and infrastructure, market pricing analysis, biofuels pathways and integration, refinery capacity forecasting, litigation work as an expert witness, greenhouse gas inventory management, policy impact evaluations, and regulatory work for state entities. He holds a degree in Chemical Engineering from the University of Notre Dame, and has more than 40 years of petroleum and energy management experience.