

US REFINING DYNAMICS

WHY THE EUROPEAN REFINING SECTOR
SHOULD MORE CLOSELY OBSERVE
THE ONGOING TIGHT OIL BOOM IN THE US

BY SAMMY SIX



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1 INTRODUCTION

The global downstream sector is in flux. In the Middle East and Asia large export oriented projects are boosting regional refining capacity and other emerging markets in Latin America are following suit. By 2016 China, Saudi Arabia, Iran, Iraq and Brazil will account for 55 percent of total refining capacity additions through new-builds, driven by a skyrocketing demand for petroleum-based fuels¹. This contrasts sharply with developments in mature markets. In the United States and even more so in Europe, falling domestic demand, structural overcapacity and stringent environmental regulation have turned the refining sector into an unattractive and marginal business, which has forced International Oil Companies (IOC's) to divest downstream assets on a massive scale².

Since the end of 2011, however, the impressive and sudden surge of light, tight oil from shale plays in the United States and oil sands in Canada has completely transformed the outlook for North American refiners. A lack of pipeline capacity has created bottlenecks which have substantially lowered feedstock crude prices for many US refiners. The abundance of cheap natural gas, which reduces operating costs, is also responsible for the recent boost in US refining margins. Although they have had to make large investments to accommodate these new streams of crude, refiners are making billions of dollars in return and now hold considerable competitive advantages over their European counterparts. No longer can global refining – and Atlantic refining in particular – be considered a level playing field.

1 Global Technology Forum (2012). 'Asia Pacific, Middle East and Africa to Drive Global Refining Industry Growth to 2016'.

2 See Meijknecht, J., Correlje, A. & van Holk, B. (2012). 'A Cinderella Story? Restructuring of the European Refining Sector'. Clingendael International Energy Programme.

2 A NEW GOLD RUSH

A sequence of booms³ has led to a dramatic transformation of the energy landscape in North America, having started almost a decade ago with the commercial exploitation of the oil sands in Canada. All of a sudden the Great White North found itself listed in the top three of countries with the highest proven reserves of oil, standing at some 175 billion barrels⁴. Daily production from the Alberta tar sands currently equals 1.3 Mb/d, and this is expected to rise to over 3 Mb/d by 2020⁵. The huge potential of this new kind of unconventional hydrocarbon has not been lost on Canada's southern neighbour. In October 2012, the State of Utah approved the United States' first commercial oil sands project⁶. A Canadian company, US Oil Sands Inc., believes it can eventually produce over 100,000 bpd of bitumen⁷ in Utah, which holds over 50 percent of US oil sands resources, estimated at 60 to 80 billion barrels⁸.

However, it is new technology for extracting natural gas and oil from shale deposits that is overwhelmingly responsible for reversing the decades-long decline of American fossil production and for fuelling dreams of import independence. All over the US drilling rigs have started to transform the landscape, from the lush green hills in the Northeast to the West Texas desert to the desolate Great Plains in the North. Since 2005 hydraulic fracturing ('fracking') and horizontal drilling have been driving an astonishing upsurge in domestic natural gas production. An EIA scenario predicts that the US can make the transition from being a net importer of natural gas to a net exporter early in the next decade, thereby emphasizing that looking forward should also keep in mind the 'unresolved uncertainties surrounding the technological advances' of shale gas production⁹.

3 Stockman, L. (2012). 'Boom Goes the Oil Industry, Bust Goes the Climate'.

4 BP (2012). Statistical Review of World Energy.

5 Blakey, C. (2012). 'Canadian Boom, Environmental Bust: The Tar Sands of Alberta'. University of Hawai'i.

6 UPI (2012). 'Utah Oil Sands Projects Gets Green Light'.

7 U.S. Oil Sands (2012). 'Developing the USA's Largest Oil Sands Resource'.

8 US Department of Energy, Office of Petroleum Reserves (2012). 'Fact Sheet: U.S. Tar Sands Potential'.

9 EIA (2012). Annual Energy Outlook 2012.

The subsequent dramatic fall in US natural gas prices¹⁰, a result of an overzealous drilling campaign driven by cheap credit from Wall Street, together with damaging 'use it or lose it' land lease clauses and perverse company valuations¹¹, spurred energy companies to turn their efforts towards developing more profitable liquids-rich natural gas and especially tight oil basins¹². The total number of oil rigs in the US reached 1,432 by the end of 2012, the highest number since 1987¹³. Supported by robust prices of approximately \$95 per barrel for West Texas Intermediate (WTI), the tight oil and Natural Gas Liquids (NGL) boom is already well underway to significantly cutting the United States' dependency on imported liquids, which by the end of 2012 had already fallen to 41 percent¹⁴. According to the IEA, US light tight oil production will surge by 2.5 Mb/d by 2017, representing the bulk of non-OPEC liquid growth in the medium term¹⁵. The US is expected to reach a 7.5 Mb/d peak in total domestic crude oil production in 2019, after which a gradual decline will be inevitable as the most productive and profitable wells dry up¹⁶.

Increasing Canadian oil sand and especially US tight oil production, coming mainly from the Bakken play in North Dakota (750,000 bpd in October 2012)¹⁷, the Eagle Ford play in Texas (560,000 bpd in December 2012)¹⁸ and increasingly the Utica play in Ohio¹⁹, is currently flooding the market. The state of Texas has not pumped this much crude since 1988, but other states such as Oklahoma, New Mexico and Wyoming have also seen their output rise, respectively by 18, 13 and 7 percent²⁰.

A lack of infrastructure in the American heartland to carry that crude to where the downstream facilities are located has created bottlenecks, and this has driven down WTI prices (determined at Cushing, Oklahoma) compared to the more costly international Brent prices. In order to profit from higher world prices, and in defiance of a longstanding US law restricting crude exports, BP secured permission from the government in October 2012 to ship US crude to Canada, and Shell is following

10 Natural gas prices in the US declined from \$13 USD per thousand cubic feet (mcf) in July 2008 to a little over \$3 per mcf today (EIA, 2012).

11 New York Times (2012). 'After the Boom in Natural Gas'.

12 EIA (2012). 'Statement of Adam Sieminski before the Subcommittee on Energy and Power Committee on Energy and Commerce, U.S. House of Representatives'.

13 Bloomberg (2012). 'American Oil Growing Most Since First Well Signals Independence'.

14 EIA (2012).

15 IEA (2012). Oil Medium-Term Market Report.

16 EIA (2012). Annual Energy Outlook 2013.

17 Petroleum News (2013). 'PN Bakken: King of the Hill'.

18 Petroleum News (2013). 'PN Bakken: King of the Hill'.

19 EIA (2012). 'Rig count in Utica Shale doubles from year ago'.

20 Bloomberg (2012). 'American Oil Growing Most Since First Well Signals Independence'.

suit²¹. Export licenses are also being sought by Statoil, trading company Vitol and many others²². Refineries on the East Coast of Canada are eager to get their hands on Bakken oil, which currently trades at a \$20 discount compared to European crude imports²³. The Department of Commerce's Bureau of Industry and Security, which is in charge of examining requests for these licenses, approves crude exports to Canada mainly so that the US can import the refined product back into the country²⁴. Crude exports from the US to Canada currently amount to some 58,000 bpd and are increasing rapidly²⁵.

It is unclear whether exports to other countries will be allowed anytime soon. The debate about crude oil exports from the US, like the one about natural gas, is gaining momentum²⁶. Crude exports would significantly improve the country's balance of trade, which in turn would have positive effects on the US dollar. It would furthermore prevent a collapse in prices. Without exports WTI could fall to \$50 in the next two years and hamper the North American expansion in hydrocarbon production²⁷. Maria van der Hoeven, executive director of the International Energy Agency (IEA), warned in February 2013 against a confirmation of the US crude export policy, stating that 'changes in technology and market conditions expose a misalignment between resources and regulations'²⁸.

Since the beginning of 2011 insufficient pipeline capacity has spawned an outright midstream boom, creating extremely lucrative opportunities for pipeline companies like TransCanada, Enbridge and Kinder Morgan. The latter is even planning to reconfigure pipelines in such a way that NGLs from fields in South Texas would be able to flow to Alberta, where they could be used to dilute the bitumen coming from the oil sands²⁹. In 2012 and 2013, \$10 billion a year will be spent in North America on oil pipeline projects alone, equalling about four times the average of the previous seven years³⁰. In 2013 alone more than 20 new pipelines will become operational³¹. Oil companies, however, realize that when new pipeline projects –

21 Reuters (2012). 'BP to Export Crude to Canada, Shell Seeks Permit'.

22 Petroleum Intelligence Weekly (2012).

23 Cobb, K. (2012). 'US Can Never Achieve Energy Independence at Current Consumption Rates'.

24 Argus (2012). 'BP, Vitol, Shell Aim for US Crude Export Licenses'.

25 EIA (2012). 'Market Implications of Increased Domestic Production of Light Sweet Crude Oil'.

26 Financial Times (2012). 'Oil Groups Set to Export US Crude'.

27 Bloomberg (2012). 'American Oil Growing Most Since First Well Signals Independence'.

28 Financial Times (2013). 'US Must Avoid Shale Boom Turning To Bust'.

29 Forbes (2012). 'Rich Kinder's Energy Kingdom'.

30 Reuters (2012). 'Oil Pipeline Crunch Shifts U.S. Shale Race from Drillbits to Valves'.

31 Oilprice (2012). 'Refiners Pursue More Pipelines amid Big Gains'.

even Keystone XL – become approved, it will still take years before crude from Alberta and North Dakota will actually find its way south to Gulf Coast refiners.

Therefore, innovative transportation solutions that were inconceivable only a couple of years ago are now actively being pursued by producers, refiners, trading houses and pipeline operators³². Tank car shipments of crude oil via rail have exploded in recent years, reaching volumes not seen in decades³³. In September 2012, for example, Statoil announced it will lease more than 1,000 railroad cars to carry crude from its Bakken and Three Forks fields to refinery outlets all over North America³⁴. Similarly, refiners like Tesoro, Marathon and Phillips 66 have bought or are leasing tank cars to obtain feedstock crude for processing³⁵. Warren Buffett's BNSF railway company plans to expand its shipping capacity to 1 Mb/d in order to ease the glut in North Dakota³⁶. Similar dynamics are occurring in West Texas, where crude is transported by train and truck to as far away as California³⁷. Even barge transport via the Mississippi and Hudson Rivers, often operated by small, private companies, is now economically viable³⁸.

The price spread between Bakken oil and WTI, largely a result of the vehement growth in rail lines and terminals, temporarily jumped from a discount to a premium in September 2012³⁹. A second factor that explains the reversal is the slowing of production growth in the Bakken play⁴⁰. Average well costs in what is now America's second biggest oil-producing state have risen considerably, and the relative decline of the total number of rigs in North Dakota is now being met by a surge in production of the liquids-rich Eagle Ford play. The true scope of developments in West Texas is reflected by the fact that crude bound for domestic markets exported from the Port of Corpus Christi equals about 100 times the volumes seen five years ago⁴¹.

In 2005, net oil product imports coming into the United States reached nearly 4 million barrels. Now, for the first time since 1949, the US is exporting more barrels of

32 Oilprice (2013). 'Rail and Pipelines Merge in Oil Transit Bonanza'.

33 According to the Association of American Railroads, in 2012 200,000 tank-car loads of crude oil were transported via rail, compared to just 9,500 in 2008. The News Tribune (2013).

34 DownstreamToday (2012). 'Statoil: Leasing more than 1,000 Railroad Cars to Ship North Dakota Oil'.

35 CNBC (2012). 'Railroads Are on a Fast Track, Thanks to Bakken Oil'.

36 Financial Times (2012). 'Buffett's Boost to US Shale Revolution'.

37 Bloomberg (2012). 'Texas Oil Boom Fueling Trucker Bonuses Propels Odessa'.

38 DownstreamToday (2012). 'Bakken Crude Reaching Louisiana Refiners by Barge'.

39 Wall Street Journal (2012). 'Bakken Crude Prices Rise as Railroad Reach Grows'.

40 Seeking Alpha (2012). 'Bakken Spot Crude Premium to West Texas Intermediate Could Last into 2013'.

41 Corpus-Christi Caller-Times (2012). 'Eagle Ford Shale Generates Export Boom for Port of Corpus Christi'.

products than it is importing⁴². The country again holds the title of the world's largest fuel supplier⁴³. Lower demand, rising domestic production and a law mandating the use of ethanol in gasoline have significantly curtailed imports, while the abovementioned logistical measures ensure that coastal refineries – particularly those of the Gulf Coast – are able to export record volumes of fuel to growing markets in Central and South America⁴⁴. These record exports of oil products, combined with sharply reduced imports of crude, have contributed to narrowing the US trade deficit with 20.7 percent, much more than was anticipated⁴⁵.

The downstream industry, often dubbed in the US the 'red-headed stepchild'⁴⁶ because of its low profitability, has made a remarkable comeback⁴⁷. In 2012 US refiners witnessed gains of over 85 percent⁴⁸, boosted by refinery margins that rose 46 percent during the October-to-December 2012 period⁴⁹. ExxonMobil and Chevron, as a consequence, saw their net income rise to five-year highs during that quarter. Refineries in the Midwest and Rocky Mountains nearly tripled their profit margins⁵⁰. Lower gas prices – and thus operating costs – on the one hand and access to lower priced feedstock crude on the other hand are the main factors explaining this turnaround⁵¹. Regional markets, however, have not been able to profit equally. Refiner acquisition cost spreads between 2004 and 2009, for example, averaged \$5.52 per barrel annually⁵². The tight oil boom has caused that spread to equal a staggering \$23.78 per barrel in 2011. East Coast refineries paid an average of 23.3 percent more that year for their crude than refineries in the Rocky Mountains.

42 Bloomberg (2012). 'U.S. was Net Oil-product Exporter for First Time since 1949'.

43 Bloomberg (2012). 'American Oil Growing Most Since First Well Signals Independence'.

44 Clayton, B. (2012). 'The Hidden U.S. Export Boom'. Council on Foreign Relations blog.

45 Bloomberg (2013). 'Trade Deficit in U.S. Plunges on Record Petroleum Exports'.

46 ICIS (2012). 'Refining the Red-headed Stepchild'.

47 Financial Times (2013). 'Refiners Reap Gains of US Shale Oil Boom'.

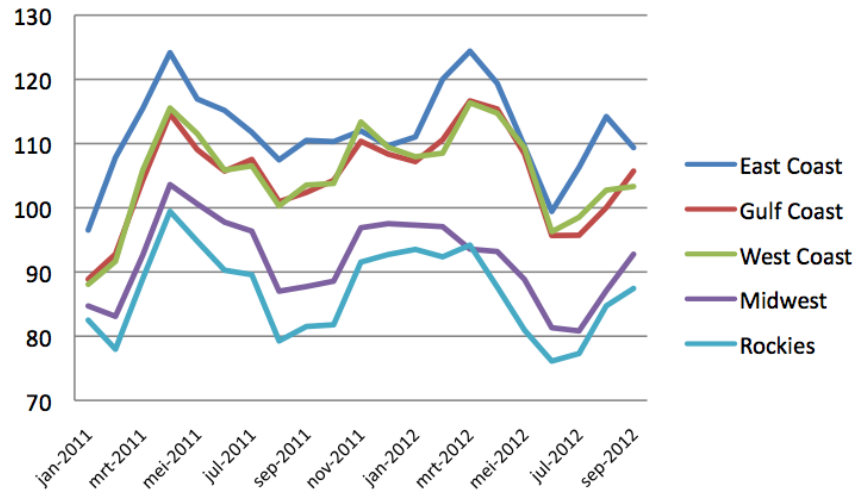
48 Oilprice (2012). 'Refiners Pursue More Pipelines amid Big Gains'.

49 Bloomberg (2013). 'Exxon Profit Rises as Cheap U.S. Oil Lifts Refining'.

50 New York Times (2012). 'Oil Refining's Fortunes Rise'.

51 Grisanti Capital Management (2012). 'The American Oil Renaissance'.

52 EIA (2012).



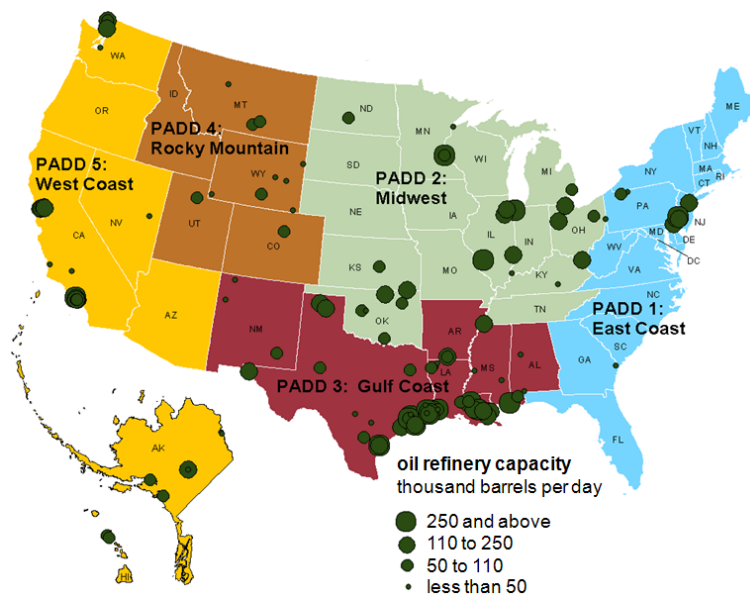
REFINER ACQUISITION COST OF CRUDE OIL

SOURCE: CIEP, BASED ON EIA DATA

Clearly, refining dynamics are delineated by strong regional disparities. The United States is truly a collection of five (four?) separate but interlinked markets which, in order to better grasp where the threat in relation to the European refining sector is coming from, demand a closer look.

3 US REGIONAL REFINING DYNAMICS

During World War II the US government, in order to ration gasoline, divided the nation on paper into five so-called 'Petroleum Administration for Defense Districts' (PADDs)⁵³. Analysts still make use of this differentiation to look at crude and oil product movements within the United States. The East Coast is PADD I, the Midwestern and Rocky Mountain states comprise respectively PADD II and IV, the Gulf Coast is PADD III and the West Coast together with Hawaii and Alaska make up PADD V. Due to its strategic location the Gulf Coast or PADD III is the absolute refining bulwark of the United States, comprising almost half of the country's total 17.7 Mb/d refining capacity. The last time the US reached these total capacity levels dates back to 30 years ago.⁵⁴ The East Coast or PADD I, a heavily urbanized and populous centre with only limited refining capacity, is the main domestic recipient of refined products from the Gulf Coast. Buttressed by rapidly rising crude production in North Dakota and Western Canada, PADDs II and IV have seen their dependency on crude imports from the Gulf Coast lessen. The West Coast or PADD V, isolated from the rest of the country, must be seen as only marginally belonging to the United States in terms of crude and product supply.



OPERABLE REFINERY LOCATIONS AND CAPACITY VOLUMES AS OF JANUARY 1, 2012

SOURCE: EIA

⁵³ EIA (2012).

⁵⁴ EIA (2011).

PADD I – EAST COAST

More than 150 years ago, Colonel Edwin Drake successfully drilled for oil near the small village of Titusville, Pennsylvania. Even though the US East Coast could thus be considered the birthplace of the (American) petroleum industry, today the region has virtually no access to domestic crude production. East Coast refineries, of which 13 are currently in operation with a total capacity of 1.2 Mb/d⁵⁵, import predominantly light sweet and light medium sour grade crudes from Nigeria, Canada, Saudi Arabia, Libya, Algeria and Angola⁵⁶. Priced against the costly Brent benchmark instead of WTI, these imports meet 80 percent of refinery feedstock needs⁵⁷.

The United States consumed an average of 8.7 Mb/d of gasoline in 2012⁵⁸. The East Coast, home to over 112 million people⁵⁹, accounts for 35 percent of total US gasoline demand and 85 percent of US gasoline imports⁶⁰. Import figures are slipping, however, due to an ongoing decline in demand. Sales of gasoline are slipping due to a number of reasons, including changing consumer behavior due to the recent recession and higher prices, increased vehicle fuel efficiency driven by stringent Corporate Average Fuel Economy (CAFE) standards, changing demographic trends and obligatory ethanol blending⁶¹. Compared to 2005 levels, PADD 1 today consumes almost 250,000 bpd less of petroleum-based gasoline⁶².

The combination of overcapacity driven by falling demand and higher Brent prices has resulted in very thin margins in this regional market. Similar to developments in Europe, in 2011 and 2012 a number of refineries along the East Coast were forced to close shop, meaning a 25 percent drop in PADD 1's already modest capacity⁶³. This sparked deep concern as to the security of supply of the East Coast, as transportation restraints hamper the substitution of lost volumes. Most products are supplied by the Gulf Coast via the Colonial (1.15 Mb/d) and Plantation (600,000 bpd) pipelines. Both of these, however, are already running near full capacity⁶⁴. Additional supplies of gasoline and distillates from the Gulf Coast can also reach the

55 Congressional Research Service (2010). 'The U.S. Oil Refining Industry: Background in Changing Markets and Fuel Policies'.

56 EIA (2012).

57 RBN Energy (2012). 'Don't Let the Sun Go Down On Me – East Coast Refining Part 1'.

58 EIA (2012).

59 U.S. Census (2010).

60 EIA (2012). 'Why is the United States Exporting Gasoline when Prices are so High?'

61 EIA (2012). 'Potential Impacts of Reductions in Refinery Activity on Northeast Petroleum Product Markets'.

62 RBN Energy (2012). 'Don't Let the Sun Go Down On Me – East Coast Refining Part 1'.

63 RBN Energy (2012). 'Don't Let the Sun Go Down On Me – East Coast Refining Part 1'.

64 In July 2012 the Colonial Pipeline Company completed a 75,000 bpd distillate expansion and it is also building both a 100,000 bpd and 60,000 bpd expansion on two lines going respectively to North Carolina and the North East, which are scheduled to be operational by mid-2013 (Oil & Gas Journal, 2012).

East Coast via water routes, but Jones Act requirements make it difficult to supply volumes this way within short time frames⁶⁵.

Anxiety about the loss of refining capacity quickly subdued when it became increasingly evident that rail cars filled with Bakken crude could cast an extra lifeline to troubled refineries⁶⁶. Sunoco's Philadelphia refinery (330,000 bpd), for example, was closed but then rescued by the Carlyle Group in the summer of 2012⁶⁷. Carlyle is betting big that it can reverse regional refining economics by supplying the refinery with 50 percent light sweet crude from the Bakken within two years. Moreover, it plans to reduce operating costs by using natural gas from the Marcellus shale to power the region's oldest and largest refinery⁶⁸. Sunoco also closed its Marcus Hook refinery (178,000 bpd) in Delaware, only to give it a second life as a natural gas facility processing Marcellus Shale products such as propane and ethane⁶⁹. The boldest move, however, came from Delta Airlines, which bought Phillips66's Trainer refinery (185,000 bpd) in 2012 in a contentious attempt to control its jet fuel costs⁷⁰. Delta plans to spend about \$100 million to reconfigure the product slate of the Trainer refinery in order for it to yield more jet fuel and less gasoline. The world's largest airline is also looking to supply its refinery with Bakken crude via rail. Currently 300,000 barrels of Bakken oil flow to the East Coast on a daily basis, which is expected to go up to 800,000 bpd in 2013⁷¹.

Without access to these tight oil supplies, the Philadelphia, Marcus Hook and Trainer refineries undoubtedly would have been closed indefinitely. This would have decimated the East Coast's refining capacity. The closure of refineries and transportation restraints could have had positive effects for European refiners, making the import of additional gasoline from across the Atlantic unavoidable⁷². However, the contrary is true, notwithstanding seasonal bright spots⁷³. In 2011 the Northeastern US received 261,000 bpd of gasoline from Western Europe, significantly lower than its 350,000 bpd of gasoline imports in 2007⁷⁴. Once East Coast refineries

65 'The Merchant Marine Act of 1920 (P.L. 66-261) is a U.S. Federal statute that regulates maritime commerce in U.S. waters and between U.S. ports. Section 27 of the statute, also known as the Jones Act, requires that all commercial shipping between U.S. ports and trade or navigation in coastal waters must be performed by U.S.-flag ships constructed in the United States, wholly owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents'. (EIA, 2012).

66 Downstream Today (2013). 'Phillips 66 Signs Oil-By-Rail Contract for New Jersey Refinery'.

67 Reuters (2012). 'Carlyle Saves Big Sunoco Refinery with Shale Boom, JPMorgan'.

68 Oilprice (2012). 'How the U.S. East Coast Just Dodged an Oil Supply Shut-Down'.

69 Daily Finance (2012). 'The Marcellus Shale Saves a Refinery'.

70 Reuters (2012). 'Delta's Trainer Refinery Begins Making Jet Fuel'.

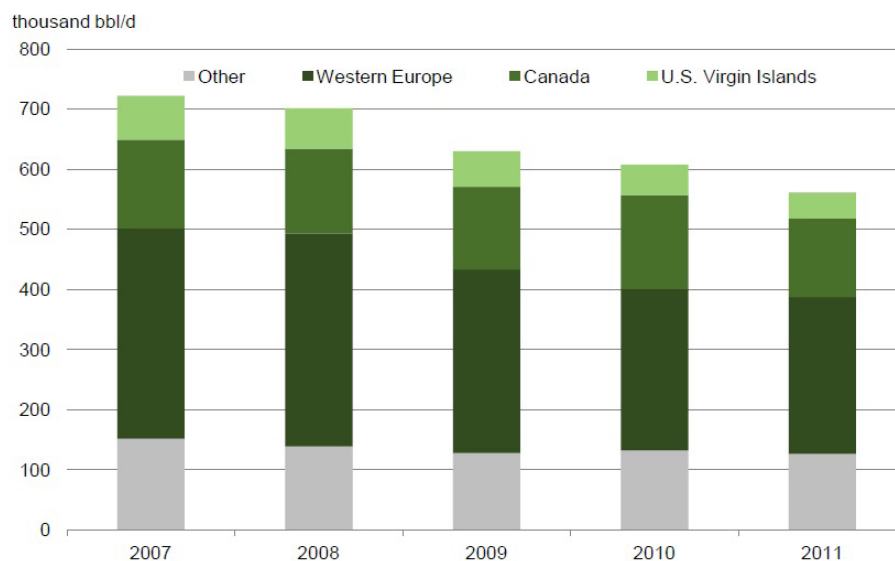
71 Bloomberg (2013). 'North Dakota Bakken Oil Finally Hits the East Coast'.

72 Money News (2012). 'Closed U.S. Refineries Open Door for European Gasoline'.

73 Financial Times (2013). 'European Refiners' Seasonal Profits Soar'.

74 EIA (2012).

are fed by more crude from the Bakken and other tight oil plays, gasoline import needs will likely fall even more. The structural deficit trade, especially with Europe, is diminishing year after year.



NORTHEAST GASOLINE IMPORTS BY ORIGIN, ANNUAL AVERAGE 2007-2011

SOURCE: EIA

Europe is even losing market share to India, which for the time being is only exporting 40,000 bpd of gasoline to the East Coast, but exports from refineries in Asia and the Middle East will surely increase once new build projects come online⁷⁵. These dynamics will keep the Atlantic Basin and especially the Northeastern US a highly competitive product market⁷⁶. European refiners, which on average export about 500,000 bpd of gasoline⁷⁷ to the United States, are increasingly uncertain as to whether they will be able to find new outlets for their surplus barrels of gasoline, especially in this middle distillates-craving world. A much more competitive US is taking over from Europe not only the Latin American export market – as we will see in the section about PADD III – but also West Africa, a key export market for European refiners⁷⁸.

75 EIA (2012).

76 EnSys Energy & Systems (2012). 'Impacts of East Coast Refinery Closures'.

77 Meijknecht, J., Correljé, A. & van Holk, B. (2012). 'A Cinderella Story? Restructuring of the European Refining Sector'. Clingendael International Energy Programme, The Hague.

78 Citi Commodities (2012). 'Capturing the Full Refinery Margin Potential: Margin Hedging An Imperative in Trying Times'.

PADD II & IV – MIDWEST

'MidCon' refiners, as product suppliers in PADD II and IV are commonly referred to, have a total capacity of 4.2 Mb/d, of which the lion's share is located in PADD II⁷⁹. Feedstock crude has traditionally and almost exclusively been imported from Canada⁸⁰. Access to nearby light tight oil from the Bakken and heavy bitumen from the Athabasca oil sands has given Midwest refiners a substantial competitive edge over their coastal competitors. The massive influx of these unconventional hydrocarbons has quickly overwhelmed the regional transportation infrastructure. Two bottlenecks, one at Cushing, Oklahoma⁸¹ and another in Western Canada, have forced producers to sell their crude at a discount, which has lowered refinery acquisition costs and thus improved the margins of many refiners in the Midwest. In December 2012 Western Canadian crude was traded at \$45 per barrel, \$41 dollar less than WTI and a staggering \$61 cheaper than Brent⁸². Crude oil runs and refinery capacity utilization skyrocketed⁸³, and so did stock prices of these strategically located refineries: CVR Energy, for example, saw its shares go up 112 percent, Western Refining went up 89 percent and HollyFrontier gained 82 percent⁸⁴.

The unanticipated scale of new production output in the United States, especially in North Dakota, has caught many by surprise. As mentioned above, insufficient pipeline capacity⁸⁵ has induced tremendous opportunities for truck-, barge- and rail companies. In the long run, however, mounting volumes of surplus production will have to find their way down south to Gulf Coast refiners via pipeline. From an economic point of view, transporting crude on a long haul basis is a lot cheaper via pipeline than via other inland transport modes such as rail, truck or barge. Moving Bakken crude to the Gulf Coast via pipeline, for example, costs approximately \$10.50 per barrel⁸⁶. In comparison, the same logistical operation using rail costs around \$20.75 per barrel. East Coast refineries that get their hands on Bakken crude via a combination of truck, rail and barge are set back \$24 per barrel. A second reason why tight oil supplies will flow southward is the simple fact that refineries in PADDs II and IV don't have enough capacity, as opposed to refineries in PADD III, which have seen tremendous upgrades in recent years. Furthermore, most pipeline

79 Congressional Research Service (2010). 'The U.S. Oil Refining Industry: Background in Changing Markets and Fuel Policies'.

80 EIA (2012).

81 In 2012 the crude supply overhang at Cushing averaged around 500,000 bpd (PIW, 2012).

82 Financial Times (2012). 'Canada: the Land of Cheap Oil'.

83 EIA (2012).

84 Investors.com (2012). 'Bakken Oil, MLPs Drive Fast-Changing Refinery Sector'.

85 In 2012 new U.S. pipeline capacity totalled half a million barrels per day, while crude output rose 780,000 bpd (Financial Times, 2013).

86 RBN Energy (2012). 'The Bakken Buck Starts Here – Bakken Crude Pricing Part III'.

infrastructure in the United States has been constructed on a predominantly north-south basis and is thus not suited to hauling crude to the coasts.

In the spring of 2012 the Seaway pipeline, which originally brought imported crude from the Gulf Coast into Cushing, was reversed to help ease the glut⁸⁷. The Seaway pipeline originally pumped 150,000 bpd of Cushing crude to the Gulf Coast, which was increased to 400,000 bpd in January 2013⁸⁸. The mere announcement of this capacity expansion caused the WTI-Brent spread to shrink to a three-month low⁸⁹, only to widen substantially again in February 2013, when it became clear that the expansion did not solve the bottleneck⁹⁰. Crude oil stocks at Cushing paradoxically increased by almost two million barrels compared to the end of 2012⁹¹. A new pipeline parallel to Seaway is also scheduled for construction and by mid-2014 will more than double the capacity of the entire project to 850,000 bpd.

The construction of new pipelines is not only extremely costly, but it also and foremost takes a long time to complete, due both to its large-scale nature and to the permitting process, which can be politically challenging. Nowhere has this been more apparent than in the case of Keystone XL, TransCanada's by now epic attempt to bring crude from Alberta and the Bakken all the way to refineries along the Gulf Coast.

The 830,000 bpd, 1,700 miles and \$7 billion extension to the existing Keystone pipeline consists of two legs⁹². The northern segment connects Hardisty, Alberta (Canada) with Steele City, Nebraska (US). The Bakken Marketlink Project allows 150,000 bpd of crude from the Williston Basin to enter Keystone XL in Baker, Montana. The southern leg of Keystone XL, named the Gulf Coast Project, then allows for transport of crude from Cushing to Nederland, Texas along the Gulf Coast.

87 Seaway Crude Pipeline Company (2012).

88 Financial Post (2013). 'Seaway Pipeline Expansion Completed'.

89 Downstream Today (2013). 'Crude Benchmarks Narrow Gap as Pipeline Expands'.

90 Bloomberg (2013). 'Oil Little Changed as Brent-WTI Spread Widens on Seaway'.

91 Financial Times (2013). 'Brent-WTI Price Differential Tops \$20'.

92 Congressional Research Service (2012). 'Keystone XL Pipeline Project: Key Issues'.



SOURCE: TRANSCANADA

Given that the northern segment of Keystone XL crosses the US border, TransCanada needs the approval of the US State Department before it can actually start construction. In 2008 the company filed its first application for a permit which, after tremendous opposition by environmentalist groups and the State of Nebraska, was denied on January 18, 2012. TransCanada then successfully worked together with Nebraska lawmakers to find an alternative route for the pipeline which bypasses the environmentally sensitive Sand Hills region, which was the main bone of contention for the State⁹³. The second Obama administration is expected to make a final decision on the fate of Keystone XL in early 2013, based upon a supplemental environmental impact statement (SEIS) drafted by the US State Department⁹⁴. Much will depend on John Kerry, who was nominated by President Obama in December 2012 to head the State Department⁹⁵. The Gulf Coast Project, however, situated fully within the US, is moving full speed ahead and should be operational by the end of 2013. Together with the reversal and expansion of the Seaway pipeline, this will at least alleviate some pressure in Cushing.

Keystone XL, which according to energy expert Michael Levi is 'non-essential to U.S. energy security'⁹⁶ has strongly polarized the public. Those in favour quote the many jobs the project would create and highlight that it will foster American energy

93 New York Times (2013). 'Nebraska Governor Approves Keystone XL Route'.

94 Inside Climate News (2013). 'The Year Ahead in Keystone XL: Climate Worry Introduces Big Unknown'.

95 CNN (2012). 'Obama nominates John Kerry to be Secretary of State'.

96 Oilprice (2012). 'Keystone XL: Welcome to the Proxy Energy War'.

independence by substituting imported barrels from Mexico and Venezuela. Opponents stress that: (1) Keystone XL and the diluted bitumen or 'dilbit' it transports endangers the US' pristine nature and wildlife; (2) existing pipelines between Canada and the US have enough spare capacity to handle increasing volumes of crude until 2019; (3) its construction will lead to higher fuel prices for Midwest consumers and (4) tariff free zones along the Gulf Coast incentivize exports of crude and products, earmarking Canadian crude for international markets rather than those of the US⁹⁷.

The conflict over Keystone XL could potentially damage the good relations between Canada and the US. Should the State Department reject the pipeline again, Canada will most certainly look for ways to diversify its crude exports to growing markets in Asia via pipeline projects linking Alberta to the British Columbia coast⁹⁸. So far Keystone XL has experienced nothing but opposition. The latest setback dates from December 2012 when a Texas judge temporarily halted construction of the Gulf Coast Project part of the pipeline because the largely solid oil sands are not in accordance with Texas and federal statutory codes, which define crude oil as 'liquid hydrocarbons extracted from the earth at atmospheric temperatures'⁹⁹.

New pipeline capacity from Seaway, Keystone XL and other direct competitors like Enbridge's 600,000 bpd Flanagan South project¹⁰⁰ are believed to endanger Midwestern refinery margins. If transportation bottlenecks are resolved, Canadian and Bakken crude will find larger markets, prices will increase and the WTI-Brent spread will diminish¹⁰¹. Yet, even with the reversal of the Seaway pipeline, refining margins and crude oil supplies in the heartland have held their ground¹⁰². Delek US Holdings, a small player that has made tremendous profits with its two inland refineries, states that 'pipelines being built are only going to replace what's being used for rail. If rail activity decreases, there is going to be just as much trapped crude as this year, factoring in higher production from E&P companies'¹⁰³. At least in the medium term it seems that these refiners can hold on to their competitive advantages. Consumers in PADDs II and IV, unfortunately, have not been able to benefit. The Midwest, due to a lack of refining and product inventory capacity, still imports

97 Natural Resources Defense Council (2012). 'Keystone XL Pipeline: Undermining U.S. Energy Security and Sending Tar Sands Overseas'.

98 CBC News (2012). 'Oil Pipelines Need to be a 'National Priority', TD Says'.

99 DownstreamToday (2012). 'Texas Judge Grants Injunction to Halt KXL Work'.

100 Enbridge (2012). 'Flanagan South Pipeline Project'.

101 Starks Energy Economics (2012). 'Focus: US Midcontinent Refineries'.

102 CME Group (2012). 'It's Still Good to be a Refiner in the U.S. Midcontinent'.

103 DownstreamToday (2012). 'Brentwood, Tenn., Geography Lets Refiner Buy Oil Cheap'.

substantial amounts of product from the Gulf Coast¹⁰⁴. This has caused prices for fuels such as gasoline and diesel to remain in line with national and international levels^{105,106}.

PADD III – GULF COAST

Ideally located to function as an import and export hub for crude and oil products to other PADDs and the Atlantic Basin, the Gulf Coast rightfully claims its position as the ‘Saudi Arabia of the refining world’¹⁰⁷. PADD III possesses 44 operable refineries, of which ten of them have a capacity of over 300,000 bpd¹⁰⁸. The Gulf Coast can process 7.7 million barrels of crude oil per day – five new projects will boost this number to 9 Mb/d¹⁰⁹ – which accounts for 44 percent of US capacity and 10 percent of global capacity^{110,111}. Traditionally, crude imports from Mexico, Saudi Arabia, Venezuela, Kuwait and Iraq have complemented domestic refinery input from onshore Texas and the Gulf’s outer continental shelf¹¹².

Years before the tight oil boom took off, Gulf Coast refiners started making tremendous capacity upgrade investments to handle increasing volumes of heavy, high sulphur conventional and unconventional crudes¹¹³. Heavy crude and natural bitumen supplies, predominantly found in Canada, Venezuela and Mexico – all countries in the Western Hemisphere – were at that time seen as the main alternatives for dwindling supplies of lighter and higher quality hydrocarbons¹¹⁴. Now rising volumes of heavy crudes on the one hand and light sweet oils on the other hand have caused a ‘dumbbelling’ of global and US crude supplies¹¹⁵. This trend will only intensify once new pipeline additions link shale and oil sand basins to refineries in PADD III. Producers in the Middle East are expected to cut output in 2013 to accommodate for these rising volumes of light sweet crude, and this could potentially lead to sour crude shortages¹¹⁶.

104 Energy Institute at Haas, University of California, Berkeley (2012). ‘The Incidence of an Oil Glut: Who Benefits from Cheap Crude Oil in the Midwest?’

105 Congressional Research Service (2012). ‘Keystone XL Pipeline Project: Key Issues’.

106 Wall Street Journal (2012). ‘American Oil: Shape Up or Ship Out’.

107 The Houston Chronicle (2012). ‘Gulf Coast Refineries Look Seaward for Sales’.

108 Congressional Research Service (2010). ‘The U.S. Oil Refining Industry: Background in Changing Markets and Fuel Policies’.

109 BENTEK (2012). ‘Overseas Imports of Crude Oil to the U.S. Gulf Coast Region Projected to Plummet over 40% over Next Five Years’.

110 IEA (2012).

111 Downstream Today (2012). ‘IEA Says Crude Refining Volumes on Rise’.

112 EIA (2012).

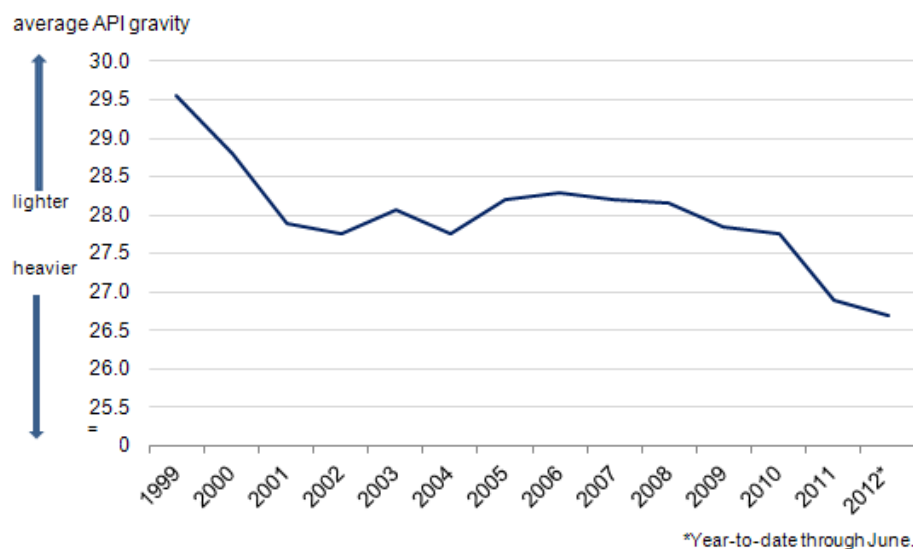
113 RBN Energy (2012). ‘Gulf Coast Diesel Crack Habit – Can Refiners Live Without It? – Part 2’.

114 Petroleum Equities Inc. (2000). ‘Heavy Oil: A Solution to Dwindling Domestic Oil Supplies’.

115 Turner, Mason & Company (2012). North American Crude Oil Outlook 2012-2020.

116 Petroleum Intelligence Weekly (2013).

Refineries along the Gulf Coast that can process light crudes from the new shale plays like the Bakken, Eagle Ford and Permian are cutting imports of similar grades on a massive scale¹¹⁷. Some refiners, such as Valero and Phillips 66, have already communicated that they no longer source any light, sweet crude imports for their PADD III refineries¹¹⁸. Currently the US as a whole imports 400,000 bpd less of premium-quality light sweet oil each year, which will lead to near-zero import figures of this type of crude in about two to three years¹¹⁹. Between 2005 and 2011, for example, the US already substituted 127 million barrels of Bonny Light crude from Nigeria, 46 million barrels from Angola and 44 million barrels from Algeria¹²⁰. This change in oil flows between Africa and the United States could have unintended positive effects for the European refining industry. West African barrels of crude that are diverted from the US market, for example, will possibly be offered to Europe and India, causing Brent prices to fall and margins to go up^{121,122}. One may ask whether this is in the best interest of European refiners, considering that light sweet crudes yield more gasoline per barrel than heavier ones and that this would therefore only add to the already serious gasoline surplus in Europe. Structurally lower feedstock prices, however, would be a significant boon for the troubled industry.



AVERAGE API GRAVITY OF U.S. GULF COAST CRUDE OIL IMPORTS

SOURCE: EIA

117 Financial Times (2012). 'Oil Trade in Throes of Historic Shift'.

118 PIW (2013).

119 Financial Times (2012). 'Oil Trade in Throes of Historic Shift'.

120 Arab News (2012). 'US Refiners Hunting for Heavy Sour Crude'.

121 Downstream Today (2013). 'More West African Crude Seen Heading to Mediterranean, NW Europe'.

122 Wall Street Journal (2012). 'U.S. Oil Boom Upends Nigerian Exports'.

Heavy crude imports in PADD III have not experienced these steep declines, as equity refineries in PADD III are supplied under long-term contracts and substantial volumes are still needed to blend with domestic light crudes¹²³. Mars crude from the Gulf of Mexico for example, a medium sour grade, can be blended perfectly with crude from Eagle Ford¹²⁴. The result is a generic version of Louisiana Light Sweet (LLS) – the much more expensive Gulf Coast benchmark – which yields more profitable middle distillates. In this way Gulf Coast refiners can make optimal use of previous investments to process cheap heavy oil while also profiting from the upsurge in domestic light crude production, conveniently priced at a discount as well.

Contrary to their lighter equivalents, imported volumes of heavy crude will thus most likely not see a dramatic decline in this regional market. The source of imports will, however, witness a rebalancing between Latin American and Canadian supply. With the construction of Keystone XL, Canadian heavy barrels will find their way to the Gulf Coast in a more cost-efficient way than barrels coming from Mexico, Venezuela, Colombia and Ecuador¹²⁵. Producers from the latter countries will be forced to look to Asia to sell their crude, which will be possible once the expansion of the Panama Canal will be finished in 2015.

These developments, coupled with a significant drop in domestic demand¹²⁶, have spurred a product export boom, in which the Gulf Coast plays a pivotal role. Refined product exports from PADD III, responsible for 80 percent of all US gasoline and distillate exports, reached 1.2 Mb/d in February 2012¹²⁷. In 2010 the US imported a net 269,000 barrels on a daily basis, while in 2011, also on a net daily basis, 439,000 bpd of oil products found a buyer overseas, a historic shift¹²⁸. Gasoline exports that year reached record levels of 526,000 bpd or an increase of 57 percent, while distillate exports equalled 854,000 bpd or a 30 percent upswing.

Apart from shipping substantially more oil products to key hubs like Rotterdam and Singapore¹²⁹, the United States has seen total oil product exports to Latin America increase by 850,000 bpd since 2006¹³⁰. Exports to Venezuela, for example, increased fivefold to record heights of 196,000 bpd in September 2012¹³¹. Mexico is by far the

123 EIA (2012). 'The Impact of U.S. Crude Oil Production on Gulf Coast Crude Imports'.

124 RBN Energy (2012). 'Heaven Sent Blend – A Mars/Eagle Ford Mix'.

125 PIW (2013).

126 Since 2005, the U.S. consumes nearly 2 million barrels of oil products less per day (Bloomberg, 2012).

127 EIA (2012).

128 Bloomberg (2012). 'U.S. Was Net Oil-product Exporter for First Time Since 1949'.

129 The Wall Street Journal (2011). 'U.S. nears milestone: net fuel exporter'.

130 The Houston Chronicle (2012). 'Gulf Coast refineries look seaward for sales'.

131 Bloomberg (2012). 'American Oil Growing Most Since First Well Signals Independence'.

largest gasoline export market, and since 2009 gasoline exports from the Gulf Coast to Mexico have displaced 30 million bpd of imports from Europe¹³². Real growth, however, lies in exports of Ultra Low Sulphur Diesel (ULSD)¹³³. Overall, exports of this fuel have increased by 49 percent since 2010 and represent more diverse outlets than for gasoline. Europe remains a big market, with a 44 percent average annual growth, but it is Latin America that really shows tremendous potential. USLD exports to Chile, for example, have increased by 368 percent year-on-year, and exports to Latin America averaged an annual 53 percent growth since 2010. Many, however, are skeptical about the sustainability of these exports, considering that key players like Brazil and Mexico all have impressive plans to boost their own refining capacities¹³⁴. What is certain is that Europe is losing market share rapidly, on the back of increased US refining competitiveness.

PADD V – WEST COAST

The United States' West Coast market is characterized by some unique features which make this PADD the odd one out. The West Coast is largely isolated from the other PADDs due to the near-absence of overland pipeline connections to the other US and Canadian regions¹³⁵. Together with its distance from the actively traded physical product markets of the Atlantic Basin, this makes PADD V a vulnerable market in times of supply disruptions. This was evident in May and October 2012 when a series of refinery outages, caused by fires and maintenance layovers, tightened the gasoline market, depressing inventories and causing prices to rise significantly in this local market. According to a report by McCullough Research, however, gasoline prices did not spike because of supply shortages but were in fact the result of an abuse of market power¹³⁶. California is a unique market due to its stringent clean air rules mandating the use of a specially formulated blend of gasoline¹³⁷. The absence of adequate product pipelines means that this kind of gasoline can only be made by refiners along the West Coast, the majority of them being in the hands of only three companies: Chevron, Tesoro and BP. In this closed market outside competition is non-existent, which enables these companies to keep supplies tight and prices high.

132 Baker & O'Brien (2012). 'Increasing Product Exports: It's a New Ball Game for the U.S.'.

133 In Latin America demand for diesel that contains less than 50-ppm sulphur is booming, driven by stringent regulation to halt pollution in heavily populated areas. Local refineries are unable to produce these fuels which is boosting exports by Gulf Coast refiners. Oil & Gas Journal (2012).

134 The Houston Chronicle (2012). 'Gulf Coast refineries look seaward for sales'.

135 EIA (2012).

136 McCullough Research (2012). 'May and October 2012 Gasoline Price Spikes on the West Coast'.

137 Los Angeles Times (2012). 'Gas market's structure hits drivers hard'.

PADD V's 27 operable refineries¹³⁸ together make up for a total regional refining capacity of a little over 3.2 Mb/d¹³⁹. Crude production from California and the North Slope in Alaska, mainly shipped via the Trans-Alaska Pipeline System (TAPS) and then tanker, supplies PADD V refineries with 42 percent of their crude import needs¹⁴⁰. Crude imports into the West Coast from outside the United States, priced against the Brent benchmark, come mainly from Iraq, Canada, Ecuador, Saudi Arabia and Colombia¹⁴¹. In contrast to the rest of the country, only minor volumes of gasoline are being imported or exported to or from other PADDs or abroad¹⁴². Imports of gasoline, complicated by California's stringent fuel specifications during the summer, mainly come from Canada and into Arizona via pipeline from PADD III while exports from PADD V mostly end up in Mexico.

Logistically separated from the rest of the country, refiners here have only marginally been able to profit from the surge in domestic US production. However, discounted prices have made the transport of Bakken and West Texas crude via rail and truck all the way up to Washington State and California refineries economically feasible. Tesoro, for example, has been hauling Bakken crude via rail to its 120,000 bpd refinery in Anacortes, Washington since September 2012¹⁴³. Other midstream players are considering the possibility of moving crude to the West Coast as well. Since no plans for new pipelines to the West Coast have been made so far, barge operator Kirby is looking into possibilities to deliver Bakken crude to California now that it has already successfully reached Washington by rail¹⁴⁴. Meanwhile pipeline giant Kinder Morgan plans to convert part of a natural gas pipeline system which would transport up to 400,000 bpd of Permian crude to Los Angeles-area refiners, lessening their dependency on more expensive Alaskan crude¹⁴⁵.

Hauling crude from North Dakota and Texas by rail, however, might also become completely obsolete once oil and gas companies start venturing into California itself. The Golden State is home to the Monterey Shale, which is believed to hold over 400 billion barrels of tight oil of which 15 billion barrels are believed to be technically

138 Congressional Research Service (2010). 'The U.S. Oil Refining Industry: Background in Changing Markets and Fuel Policies'.

139 EIA (2012).

140 Turner, Mason & Company (2012). 'The Game Shifts: How the North American Crude Boom May Change Refining and Marketing'.

141 EIA (2012).

142 EIA (2012). EIA (2012). 'Potential Impacts of Reductions in Refinery Activity on Northeast Petroleum Product Markets'.

143 Bloomberg (2012). 'Bakken Oil Surges on Tesoro, Irving Refinery Rail Shipments'.

144 Petroleum News (2012). 'PN Bakken: Bargaining ahead on Pacific Coast'.

145 Reuters (2012). 'Kinder Morgan May Convert California Natgas Line to Crude-CEO'.

recoverable¹⁴⁶. This could potentially have transformative effects, breaking PADD V's isolation, depending in part on the goodwill of the State's powerful environmental lobby¹⁴⁷.

Securing access to unconventional onshore sources of crude is not the only way West Coast refineries can improve their margins. An even bigger game changer would be the 27 billion barrels of oil that lie below the Arctic Beaufort and Chukchi seas¹⁴⁸. In September 2012, after obtaining permits by the Obama administration, Shell went ahead with drilling exploratory wells in Northern Alaska, only to pull back quickly due to a series of mishaps that are forcing lawmakers and government officials to rethink the project¹⁴⁹. For now Arctic oil is still a far off reality, but many analysts think that the Arctic seas could eventually produce up to 1 Mb/d¹⁵⁰, which would displace every drop of foreign oil coming into PADD V.

146 CNN Money (2013). 'California Could be Next Oil Boom State'.

147 New York Times (2013). 'Vast Oil Reserve May Now Be Within Reach, and Battle Heats Up'.

148 Washington Times (2012). 'Arctic Oil and Gas Exploration Could Revitalize West Coast'.

149 The Daily Caller (2013). 'Former Clinton, Obama Officials Call for Halt to Arctic Drilling'.

150 U.S. Energy & Commerce Committee (2011).

4 BACK TO EUROPE

After having experienced a short-lived uplift during the summer of 2012, Europe's refining sector is again heading for stormy waters. Falling domestic demand, structural overcapacity, high energy costs and burdensome environmental regulation are largely responsible for the downward pressure on European refining margins. Increasing international competition, predominantly coming from more competitive new projects in Asia and the Middle East, is furthermore challenging the survival chances of most European refineries. In India and Saudi Arabia large downstream projects expected to come online soon clearly have the European market in their crosshairs.

Largely neglected or underestimated, however, is the impact of current developments on the other side of the Atlantic, i.e., on the European refining sector. Technological advances like horizontal drilling and hydraulic fracturing have made possible the extraction of vast supplies of hydrocarbons in North America, which has given US refiners a tremendous new sway over their European counterparts. Since the end of 2011, cheap feedstock crude and low operating costs have boosted US refining margins and caused a surge in oil product exports. The Gulf Coast and East Coast are supplying more cleaner fuels to Latin America and West Africa. European refiners, as a direct consequence, are increasingly unable to sell excess volumes of gasoline into these markets. To make matters worse, the US East Coast is cutting back its gasoline imports from Europe, driven by lower demand.

Rapidly growing production of crude oil in North America and the trade of products with Latin America are isolating the Western Hemisphere in terms of supply and demand. As a consequence of this and of sluggish demand in Europe, Middle Eastern producers will almost exclusively focus on supplying energy-savvy customers in Asia. Europe is at risk of being left behind. Its security of supply is threatened by both an import dependence of crude and diesel and an export dependence of excess volumes of gasoline. This spells trouble for European refiners, as the export of products has become a key driver of profits over the years.

Aware of the dire situation of many European refiners, the European Union is currently taking the lead in assessing the damage. It initiated a 'fitness check' to evaluate competitiveness and set up a Refining Forum to give stakeholders a more

institutionalized discussion platform. This approach fits the European Commission's plan to reverse the declining role of the European industry in general, which by 2020 should contribute 20 percent of the EU's GDP. In the US, the shale revolution has already sparked a re-industrialization driven by a return of the petrochemical, steel and other energy intensive sectors, which are attracted by cheap and abundant natural gas supplies. Large manufacturers in these sectors, such as ArcelorMittal, are shifting production from Europe to the US.

EU policy measures to stimulate industry in general and refining in particular, however, received only a lukewarm reaction from the European petroleum sector. Moreover, some countries are more vulnerable than others, which may lead to fierce intra-EU competition. The future of refining is becoming a battleground issue, which has and will continue to have serious security of supply implications for Europe.



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