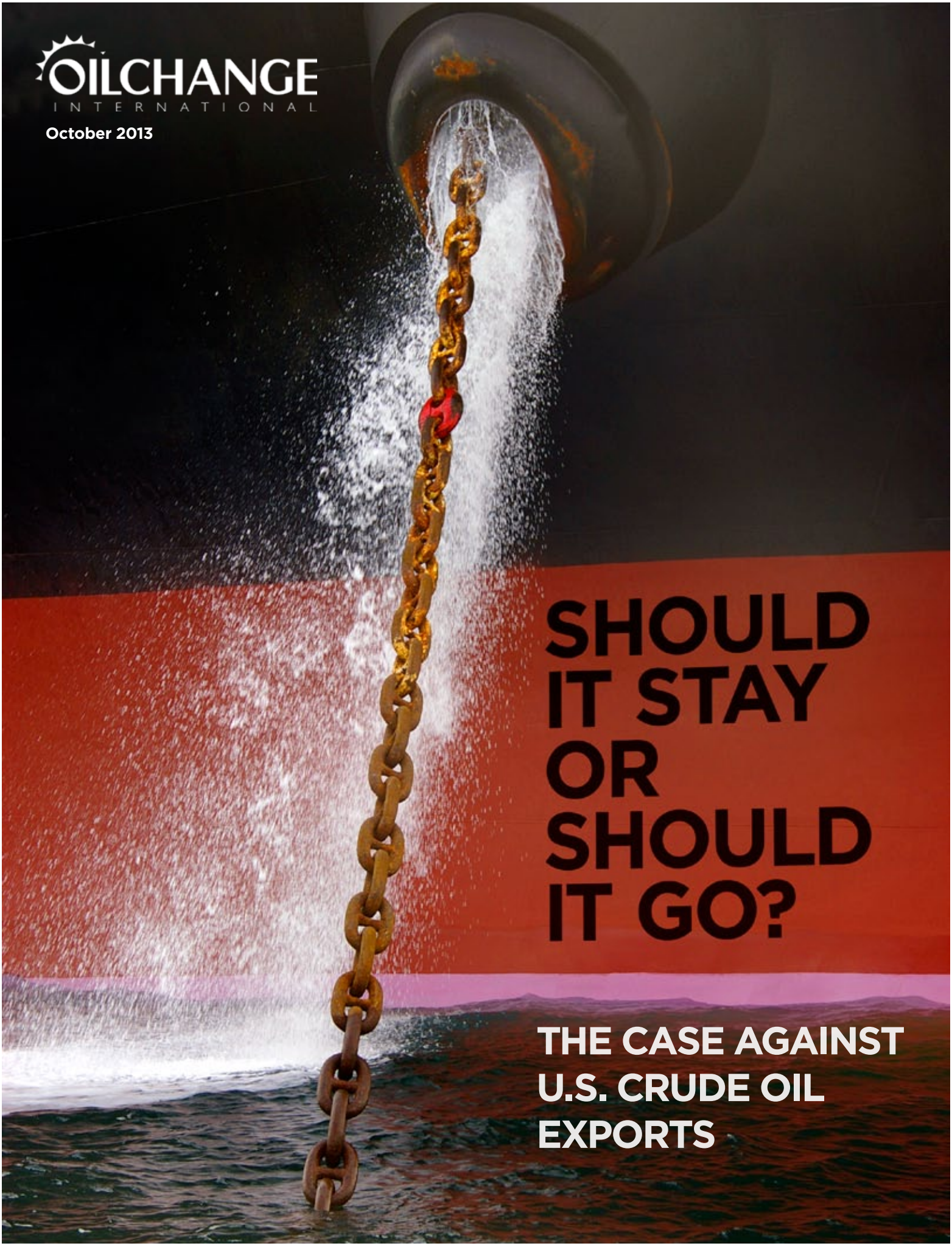
OILCHANGE INTERNATIONAL

October 2013



SHOULD IT STAY OR SHOULD IT GO?

THE CASE AGAINST U.S. CRUDE OIL EXPORTS

Researched and written by Lorne Stockman.
With thanks to Paulina Essunger and David Turnbull for comments.

Design: paul@hellopaul.com
Cover photo: iStock ©Ngataringa

Published by Oil Change International
714 G Street SE, Suite 202
Washington, DC 20003

info@priceofoil.org
www.priceofoil.org

October 2013

CONTENTS

EXECUTIVE SUMMARY

CRUDE OIL EXPORTS WILL UNDERCUT CLIMATE GOALS

America's oil producers want to export American crude oil to boost their profits. This is despite the fact that they produce less than 52 percent of American consumption.[1] However, current regulations restrict U.S. crude oil exports, except to Canada.

The oil producers want to lift these restrictions so that they can get a higher price for their oil on the international market and force American refiners to also pay that price. By raising the price of American oil the producers claim they will be better able to drill in more marginal oil fields and produce more oil; although any prospect of actually bridging the gap between U.S. production and consumption of oil is unrealistic without much greater efforts to reduce consumption.[2]

However, America's current oil boom is not only placing severe stresses on water, land and air resources in hundreds of communities across the country, it is also increasing the proportion of global oil reserves that can never be burnt. Allowing exports will enable more drilling and exacerbate these problems further.

Only 20 to 25 percent of global proven oil reserves can be consumed between now and 2050 if we are to have an 80 percent chance of avoiding devastating climatic changes that would destroy the global economy. Therefore, allowing U.S. crude oil exports specifically to enable exploitation of oil that is currently not included in those reserves is a recipe for disaster. We are in a hole and we need to stop digging.

In order to play its part in meeting global climate goals, it is imperative that the United States maintains the ban on crude oil exports and does everything it can to decrease, rather than increase, the global pool of fossil fuel reserves that are exploited.

REPORT OUTLINE

Chapter 1 of this report describes the current U.S. oil boom, led by the growth in tight oil produced through hydraulic fracturing (fracking).

Chapter 2 describes how the properties of tight oil present problems for some U.S. refineries and how this reduces the value of tight oil in the U.S. market. Raising the price of tight oil is the key driver behind the oil industry's call for deregulating U.S. crude oil exports.

Chapter 3 explains that maximizing tight oil production would have serious environmental impacts. For the United States to play a responsible role in achieving global climate goals it must leave some of its growing reserves of oil (as well as some of its gas and coal) in the ground. Deregulating crude oil exports will make this even more difficult than it already is.

Chapters 4 and 5 describe the current crude oil export regulations and present data on historic and current crude oil exports.

Chapter 6 discusses the current calls to deregulate crude oil exports. Who is making these calls and what are they saying?

Finally, Chapter 7 shows that there is still some way to go before tight oil producers actually run out of North American customers for their product and that it is far from certain that they ever will. Deregulating exports now would only serve to raise U.S. oil prices and make more profit for the industry.

Despite the pleas of greedy oil companies and free market fundamentalists, deregulating crude oil exports should not distract U.S. law makers from the vital imperative to arrest the impending climate crisis. Averting climate disaster means leaving fossil fuels in the ground.

1. Energy Information Administration (EIA) "Petroleum & Other Liquids. Supply and Disposition June 2013." (Current period at time of writing.) Using Field Production of Crude oil and Petroleum products against Products Supplied. http://www.eia.gov/dnav/pet/pet_sum_snd_d_nus_mbblpd_m_cur.htm
2. The highest credible forecasts for U.S. oil production reach 10 to 11 million barrels per day. Oil demand is forecast to remain around 18 million barrels per day. EIA estimates of liquid fuel production that include natural gas liquids, renewable fuels, gas-to-liquids and other non-crude oil liquids appear to bridge the gap but do not necessarily match the qualities of U.S liquids demand.

Averting climate disaster means leaving fossil fuels in the ground

The fracked landscape of the Jonah Natural Gas Field, Upper Green River, Wyoming. ©Ecoflight

The rising price of oil since 2005 has supported the development of technology to bring billions of barrels of tight oil into production

1. BOOM!

The United States is experiencing an unprecedented boom in oil production. High global oil prices have encouraged new intensive extraction methods that have unlocked previously inaccessible oil and led to very swift growth in U.S. oil production. In 2012, the United States led the world in oil production growth, increasing production by 1 million barrels per day (b/d) over the span of just one year.[3] The vast majority of this increase was derived from 'tight oil,' primarily produced via horizontal drilling and hydraulic fracturing (fracking).

Tight oil is present in rocks that have low permeability and low porosity.[4] The oil does not move freely through the rock and it cannot be accessed simply by drilling conventional oil wells. The industry has been aware of the existence of much of the oil in these formations for decades but was unable to produce it economically. The rising price of oil since 2005 has supported the development of technology to bring billions of barrels of tight oil into production.

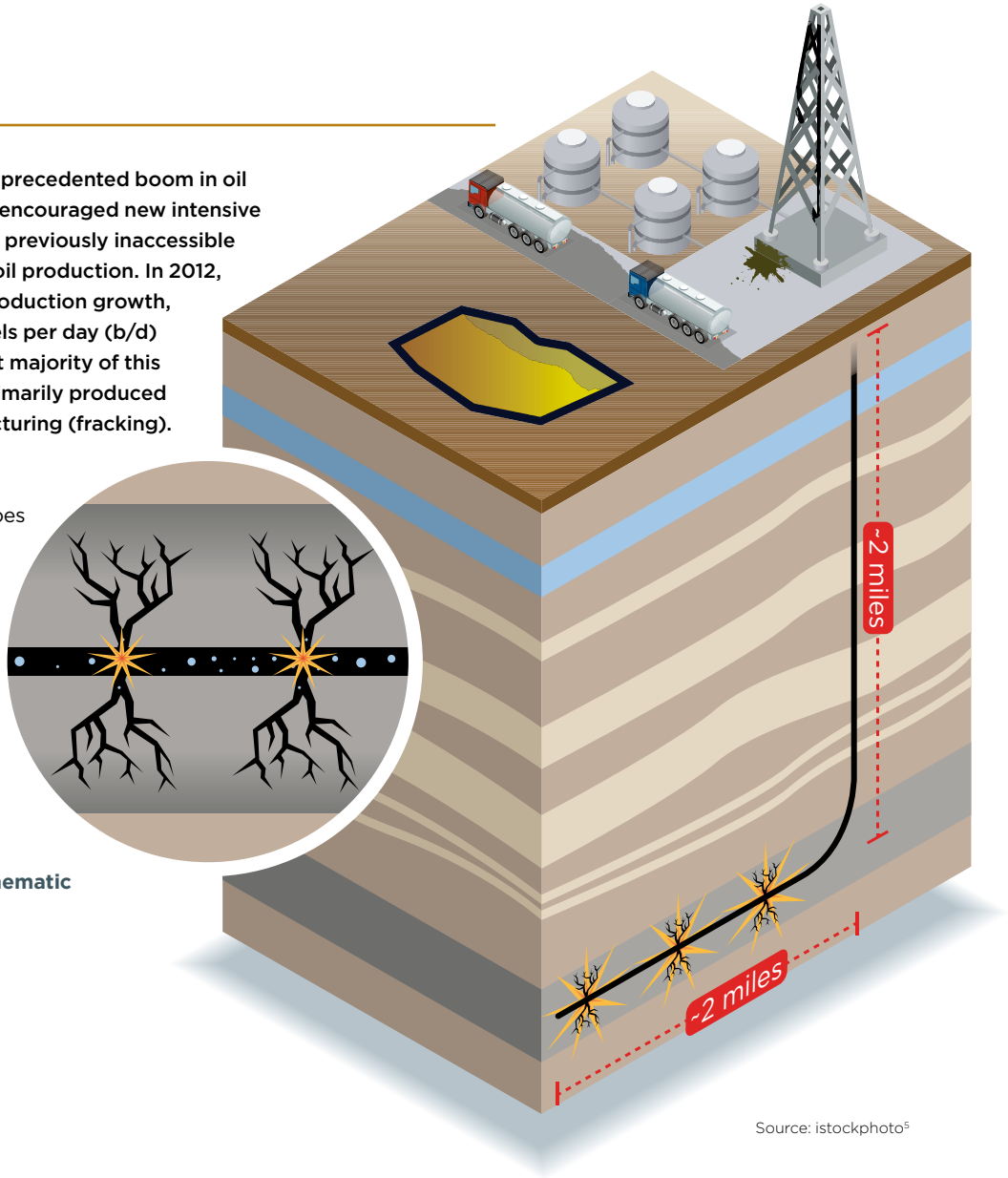


Figure 1. Bakken Tight Oil Fracking Schematic

Source: istockphoto[5]

3. Energy Information Administration (EIA), "U.S. Field Production of Crude Oil." Accessed August 16, 2013. December 2011 to December 2012 production increased 1.063 million barrels per day. http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPUS2&f=M
4. Porosity measures the amount of empty space in the rock. Permeability measures the interconnectivity between the pore spaces, i.e. both of these contribute to how easily fluids and gases can flow through the rock.
5. ©roccomontoya

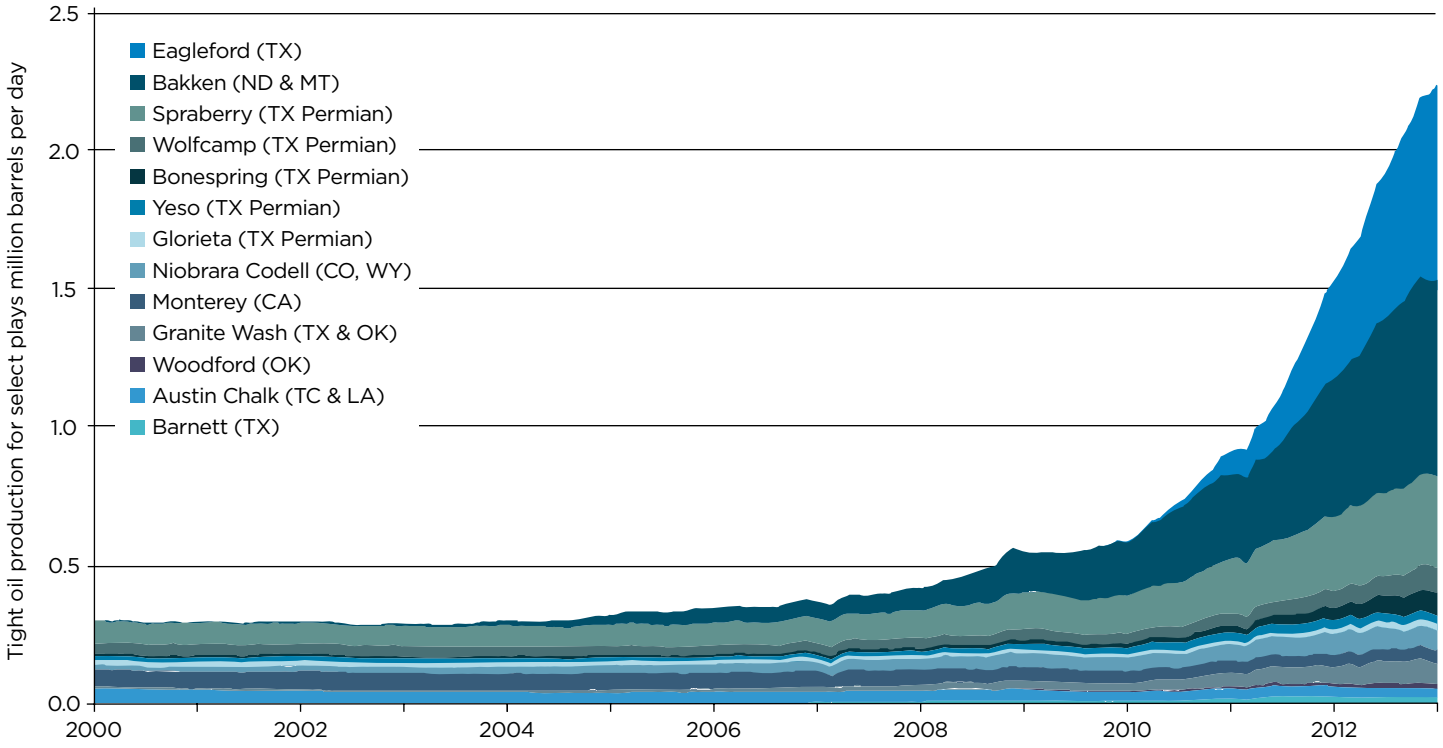
Fracking has enabled drillers to produce tight oil as well as shale gas. The method is more commonly associated with the extraction of natural gas from shale formations (shale gas), but since around 2010 the technique has been increasingly used to access oil and today there are more drilling rigs fracking for oil than gas in the United States.[6]

Fracturing the rock containing the oil and gas enables it to flow towards the well. Together with horizontal drilling, which extends the reach of the well to access a larger area of oil bearing rock (see Figure 1), billions of barrels of previously inaccessible oil, as well as trillions of cubic feet of natural gas, have become available.

The most prolific tight oil fields currently are the Bakken oil field (primarily in North Dakota but also in Montana and some parts of Canada), and the Eagle Ford and Permian oil fields in Texas. However, other fields are also producing tight oil in Oklahoma, Colorado, Wyoming, Louisiana, California and elsewhere. Some of these fields also produce shale gas but one of the most prolific shale gas fields – the Marcellus Shale primarily in Pennsylvania, New York and West Virginia – generally does not produce tight oil.

The steep rise in production has been a surprise to many industry observers, as evidenced by repeated upward revisions to production forecasts.[7] Figure 2 shows the rise in tight oil production from 2000 to 2012. The surge in production in just two years between 2010 and 2012, from around 500,000 b/d in 2010 to over 2.2 million b/d in 2012, is evidence of thousands of wells being drilled in one of the world's most frenzied oil booms. It is the fastest rate of oil production growth in U.S. history. But can it last?

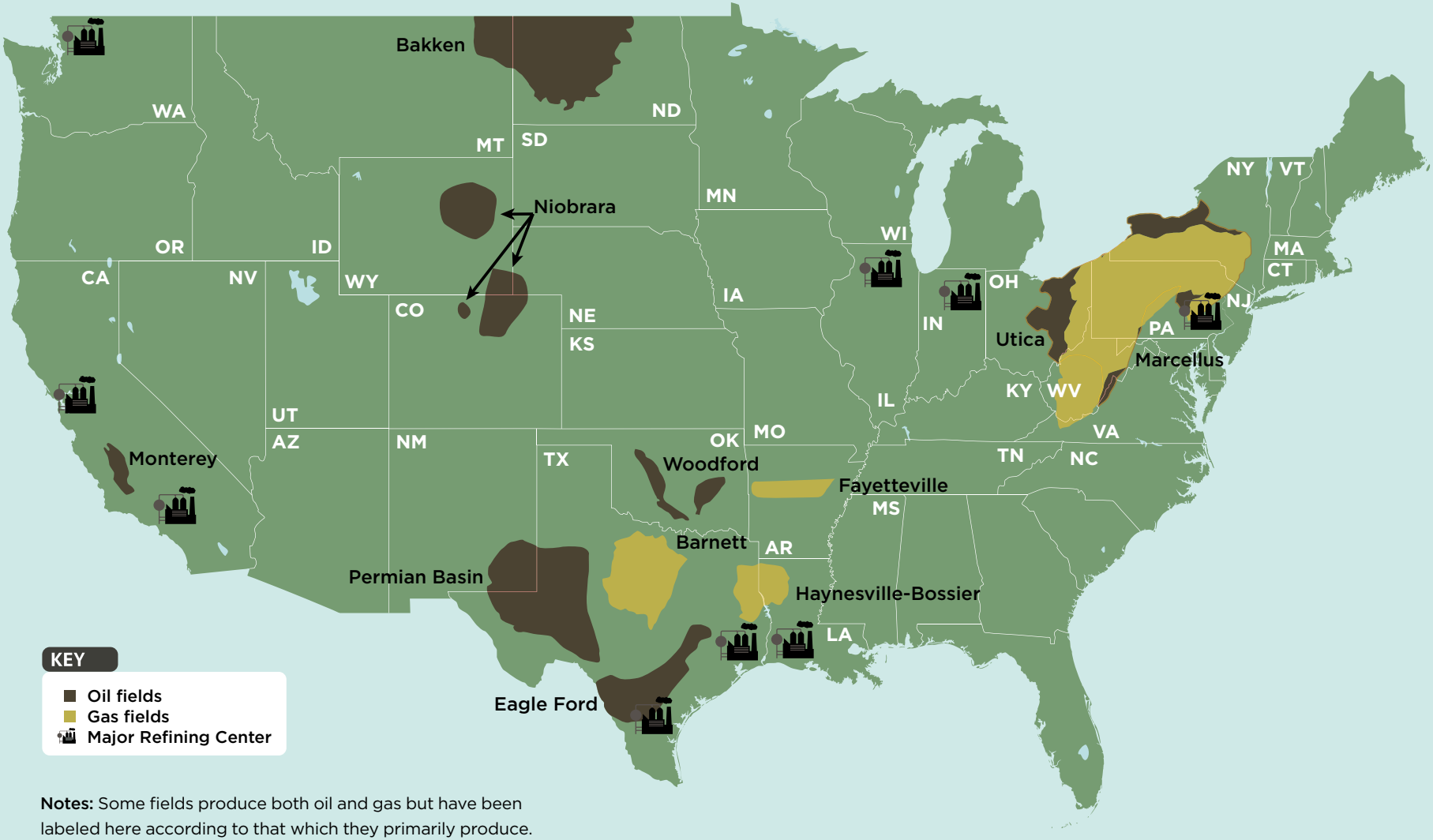
Figure 2. Tight Oil Production, 2000 to 2012



Source: EIA Administrator Adam Sieminski presentation at Deloitte Energy Conference, May 21, 2013.[8]

6. Oil & Gas Journal, "Baker Hughes: US drilling rig count up 13 to 1,791." August 16, 2013. http://www.ogj.com/articles/2013/08/baker-hughes-us-drilling-rig-count-up-13-to-1-791.html
7. See for example discussion in the EIA's Annual Energy Outlook 2013. All tight oil figures were revised up from previous AEO publications. http://www.eia.gov/forecasts/aeo/er/early_production.cfm
8. Available at http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/Energy_us_er/us_er_2013ConfPrsntDay1_Domestic2_May2013.pdf Accessed August 16, 2013.

Figure 3. Primary Tight Oil and Shale Gas Fields in the Lower 48 United States



Notes: Some fields produce both oil and gas but have been labeled here according to that which they primarily produce.

TIGHT OIL FEVER: CAN THE HYPERBOLE BE BELIEVED?

Long-term forecasts of future tight oil production have a very high degree of uncertainty. This is because of the lack of production history at tight oil wells. As Figure 3 illustrates, the vast majority of tight oil wells have only been producing for one or two years, so there is little data upon which to base estimates of their ultimate performance.

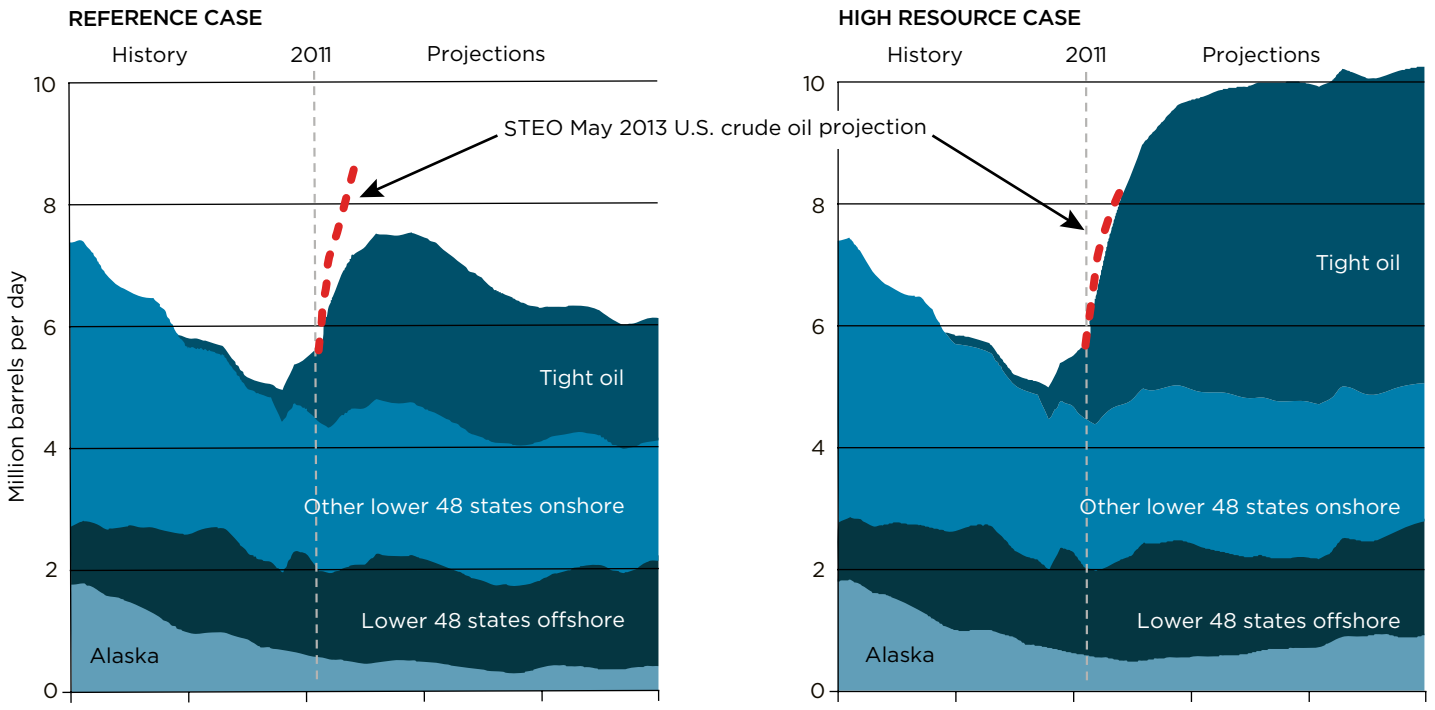
The EIA currently presents 'Reference Case' and 'High Resource Case' estimates for future oil production (see Figure 4). These are starkly different in two ways. Production levels are not only higher in the High Resource case but they are also sustained at high levels for much longer. The High resource case is based on different assumptions about how much oil an average tight oil well will ultimately produce and how many wells can ultimately be drilled.[9]

The dashed red line in Figure 4 shows the production forecast in the EIA's Short Term Energy Outlook 2013.[11] This short term forecast goes out to December 2014 and for this period tight oil production appears to follow the high resource case. As explained above, long-term forecasts for tight oil have a high degree of uncertainty because of the lack of production history for this type of production. So just because production appears to be adhering to the high resource case forecast in the short term, it is not necessarily an indication that it will continue to do so.

There have in fact been a number of recent warnings that the more optimistic tight oil production forecasts should be treated with caution. At a conference in London in May, several senior analysts expressed concern about the hyperbole surrounding tight oil.[12] BP's chief economist Christopher Ruhl told delegates that among some tight oil proponents there is a lot of "... irrational exuberance or hype, these are the same consultants that three years ago were running around saying that we are running out of oil. Now they are saying that we are drowning in it because they have something to sell."[13]

Amrita Sen, Chief Oil Analyst at Energy Perspectives said, "let's not get carried away with reports such as of the US becoming the next Middle East".[14] While former head of oil market analysis at the International Energy Agency, David Fyfe said that tight oil "is a new source of supply that requires continuous spending to keep drilling, keep drilling, keep drilling, thousands and thousands of wells every year."[15] He warned that this "could limit the pace of growth over the next five to seven years from light, tight oil."[16]

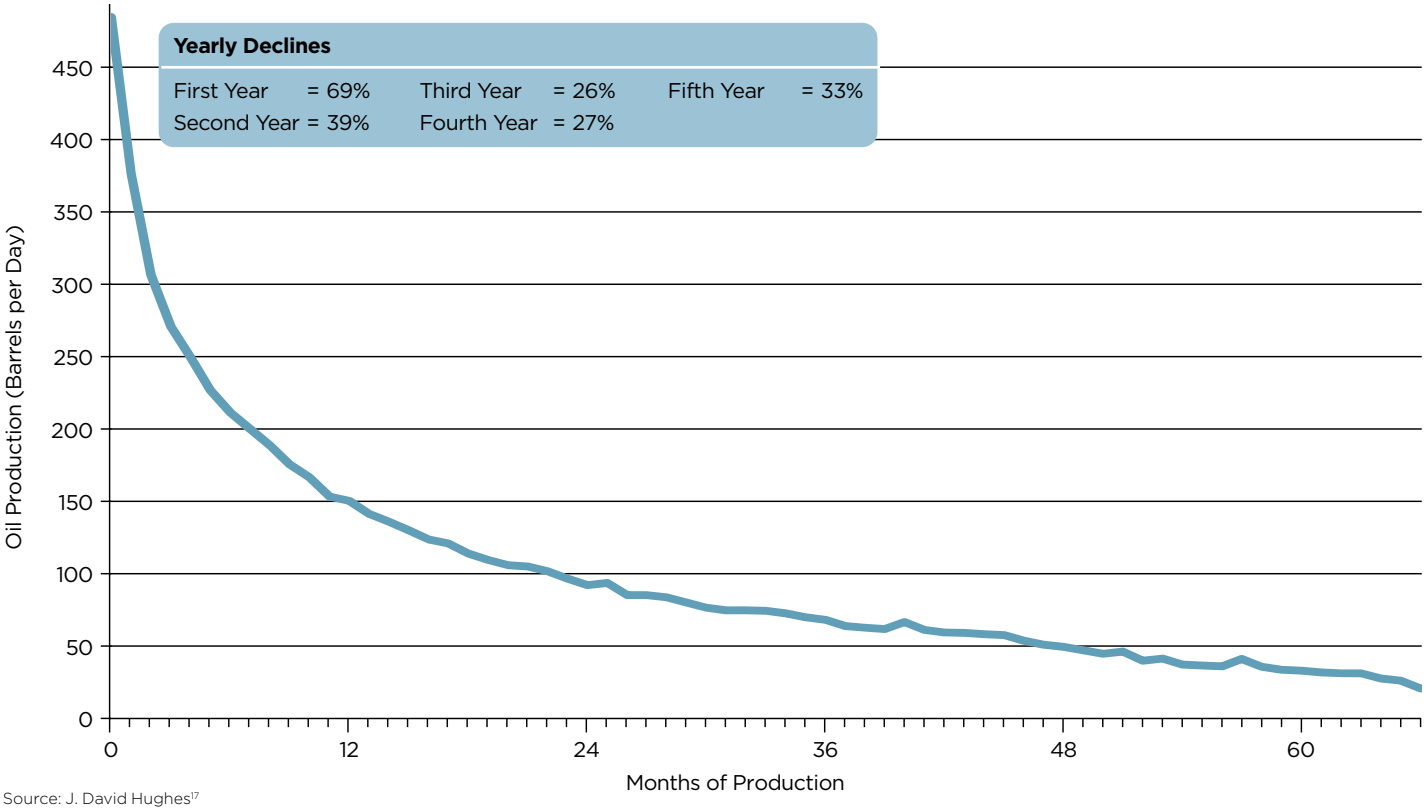
Figure 4. Long Term Tight Oil Production Forecasts Are Highly Uncertain



Source: EIA Administrator Adam Sieminski presentation at Deloitte Energy Conference, May 21, 2013.[10]

9. EIA, "Annual Energy Outlook 2013," page 81.
10. Available at http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/Energy_us_er/us_er_2013ConfPrsntDay1_Domestic2_May2013.pdf Accessed August 16, 2013.
11. EIA, "Short Term Energy Outlook 2013." http://www.eia.gov/forecasts/steo/report/
12. Robert Perkins, "Global boom in tight oil production may be overplayed: BP's Ruhl." Platts, May 13, 2013. http://www.platts.com/latest-news/oil/London/Global-boom-in-tight-oil-production-may-be-overplayed-26932002
13. Ibid.
14. Ibid.
15. John Kingston, "Platts London Crude Oil Summit: a word of caution about shale delirium." The Barrel, May 13, 2013. http://blogs.platts.com/2013/05/13/platts-london-crude-oil-summit-a-word-of-caution-about-shale-delirium/
16. Ibid.

Figure 5. Decline Curve for Bakken Tight Oil Wells



Source: J. David Hughes[17]

Fyfe was referring to a common characteristic of tight oil wells that sees production drop off by some 60 to 70 percent within a year of well completion (see Figure 5). Initial flows of oil can be very strong at tight oil wells but this does not last and after several rounds of fracturing, wells are then left to produce at low levels and the drilling and fracking crews move on. This means that to maintain production at high levels drilling and fracking has to be maintained at a frenzied pace.

There is also significant uncertainty about whether the most prolific tight oil fields are already in production and whether fields yet to be drilled will be as profitable. When that point *is* reached, the cost of drilling each new well rises and correspondingly the price received for each barrel will need to rise to support exploitation of the less productive marginal wells. This is where the price lift achieved by deregulating exports will assist U.S. drillers to drill more tight oil and exploit more reserves.

Analysts at Turner Mason & Company have their own high and low estimates for future U.S. oil production similar to the EIA's.[18] In their high production forecast, U.S. crude oil exports would begin in 2018. Their lower growth forecast predicts that it would be sometime after 2020 before real constraints exist.[19]

While it is clear that there is significant uncertainty about the future of U.S. tight oil production, we do not have an opinion on the accuracy of the various estimates available. The recent growth in production has surprised many industry observers and if it does continue at the pace of the last two years there will clearly be a clamor to find new markets abroad. Additionally, there will be substantial implications for climate policy and immense impacts on local communities and their environment.

But as the Turner Mason & Company analysis suggests, oil producers are probably at least five years away from really running out of North American customers for their oil, and perhaps much longer.

In the next chapter we explain why tight oil producers are concerned about finding a market for their product and therefore seek export markets.

17. J. David Hughes, "Drill, Baby, Drill: Can Unconventional Fuels Usher in a New Era of Energy Abundance?" Post Carbon Institute, February 2013. http://shalebubble.org/drill-baby-drill/
18. John R. Auers, "Soaking up the Surplus: How Much Light Crude Can the Market Absorb." Slide 10. Presentation at Argus Americas Crude Summit, January 24, 2013, Houston, Texas. http://www.turnermason.com/wp-content/uploads/2013/06/Soaking_up_the_surplus.pdf
19. Ibid. Slide 24.

The tight oil boom has created an abundance of light oil at a time when many U.S. refineries have recently completed projects to increase the amount of heavy oil they process.

2. MISMATCH: WHY U.S. REFINERIES ARE AWASH IN TIGHT OIL

With the United States importing around 50 percent of the oil it consumes you would think that growing domestic production would be quickly snapped up by America's refineries. But the speed of tight oil production growth has not been matched by the pace of infrastructure development to transport and refine it. While transport logistics are increasingly being addressed by pipeline and rail terminal development, refinery issues are likely to be a much tougher issue to solve. The result is less profit for tight oil producers, which is why they are keen to export.

TIGHT OIL'S INCONVENIENT GEOGRAPHY

The geography of the U.S. oil market has been reversed by the tight oil boom. Until recently, both domestic and imported oil moved north from Texas and Louisiana to refineries in the industrial heartland of the northern Midwest. The east coast has always imported oil either from abroad or from the Gulf Coast region, and today it still receives a significant proportion of its refined products by pipeline from Gulf Coast refineries. The west coast is a relatively isolated market that has relied mostly on its own production and deliveries from Alaska. Foreign imports to the west coast have been on the increase since Alaskan production is in decline. There are no existing pipelines across the Rockies to west coast refineries.

When tight oil production started to rise in North Dakota, a state which for decades had only been a marginal oil producer, the lack of either local refineries, or pipelines to transport the oil to refineries, quickly became a problem.

While the other major tight oil producing state, Texas, has always been a major oil producer, its onshore production had long been in decline and pipeline capacity out of the western part of the state, where tight oil is booming, was inadequate. While the transport logistics out of both North Dakota and Texas are increasingly being addressed by new rail capacity and pipelines, there is a far more difficult issue for tight oil producers to overcome: the configuration of U.S. refineries.

Refinery viewed from the Houston Ship Channel ©OneEighteen/Flikr Creative Commons

A gas flare at a Bakken oil well in North Dakota. About one-third of gas produced at Bakken oil wells is currently flared. iStock ©mellypage

TIGHT OIL'S INCONVENIENT CHEMISTRY

If oil was a consistent product with the same properties regardless of its origin, tight oil could be refined in any American refinery. But the properties of oil are on a wide spectrum and this requires an individual refinery to be configured for the range of oils that it can expect to refine.

The main property of concern to refiners is the density of oil. Density is commonly measured in units termed *API Gravity*. The denser or heavier a particular crude oil is, the lower the API Gravity. The heaviest crudes have a density of about 16 to 20 API while the lightest crudes reach over 50 API. Bitumen derived from Canada's tar sands is about 8 API but it is commonly diluted with very light crude to about 20 API in order for it to flow in pipelines.

Another commonly referred to property of oil is the sulfur content. A crude oil with low sulfur content is known as *sweet* and one with high sulfur content is known as *sour.*

The range of API Gravity values and sulfur content levels of different crude oil categories are summarized in Table 1.

Tight oil is predominately light-sweet oil. Oil from the Bakken fields of North Dakota is typically around 41 API with sulfur around 0.20. Oil from the prolific Eagle Ford fields in west Texas is typically around 45 API, which places it in the super light category.[21]

Condensate is the lightest form of hydrocarbon classified as crude oil. The term refers to hydrocarbons that exist as gas in the reservoir but condense to liquid when reaching the pressure and temperature at the earth's surface.[22] Condensate can be present in gas wells as well as oil wells. Some tight oil deposits have very high condensate content. Crude oil from the Eagle Ford field is said to be anything between 40 and 70 percent condensate.[23]

There are two main refining challenges facing the light oil and condensate streams from tight oil production. The first is the difficulty in converting these crude streams into the kinds of refined products that are most in demand in the U.S. refining market. The second is that many U.S. refineries are configured to process heavier crudes and therefore the amount of light oil they can refine is limited.

Product Yields: Why Tight Oil is Too Light for Some U.S. Refining Markets

A barrel of crude oil cannot be converted into an equivalent quantity of a single refined product, such as gasoline or diesel. The refining process parses crude oil into a range of products, and the proportion of each of these products depends on the properties of the crude oil and the refining processes used.

Like crude oil, different products are described as *light* and *heavy*. The heaviest products include solid residues such as petroleum coke and asphalt. Then there is heavy liquid fuel known as residual fuel oil, which is used in power generation and shipping, or is sometimes sold to be further refined. In the middle of the spectrum is distillate. Diesel fuel is made from distillate. Then there are the blending components of gasoline and finally very light liquids such as butane and propane and refinery gases.

Table 1. Crude Oil Categories and Their Corresponding Density and Sulfur Levels

Crude Oil	API Gravity	Sulfur (percentage by weight)
Condensate	≥ 55.0	All
Super Light	42.0	All
Light Sweet	31.0 – 42.0	≤ 0.99
Light Sour	31.0 – 42.0	≥ 1.00
Medium	24.0 – 31.0	All
Heavy	≤ 24.0	All

Source: Turner, Mason & Company[20]

20. John R. Auers, "The North American Crude Boom: How changing quality will impact refiners." Turner, Mason & Company, Presentation at Platts Crude Marketing Conference, Houston, TX, March 1, 2013. http://www.turnermason.com/wp-content/uploads/2013/05/North_American_Crude_Boom-platt-2013.pdf
21. Ibid.
22. Schlumberger, "Oil Field Glossary." http://www.glossary.oilfield.slb.com/en/Terms/c/condensate.aspx#
23. Sandy Fielden, "Too Much Too Soon? Eagle Ford Crude and Condensate Takeaway." RBN Energy LLC, January 31, 2013. http://www.rbnenergy.com/too-much-too-soon-eagle-ford-crude-and-condensate-takeaway And Sandy Fielden, "Don't let your Crude Oils Grow up to be Condensates." RBN Energy LLC, February 20, 2013. http://www.rbnenergy.com/dont-let-your-crude-oil-grow-up-to-be-condensate

Figure 6. Typical Intermediary Product Yields from Different Density Oils[24]

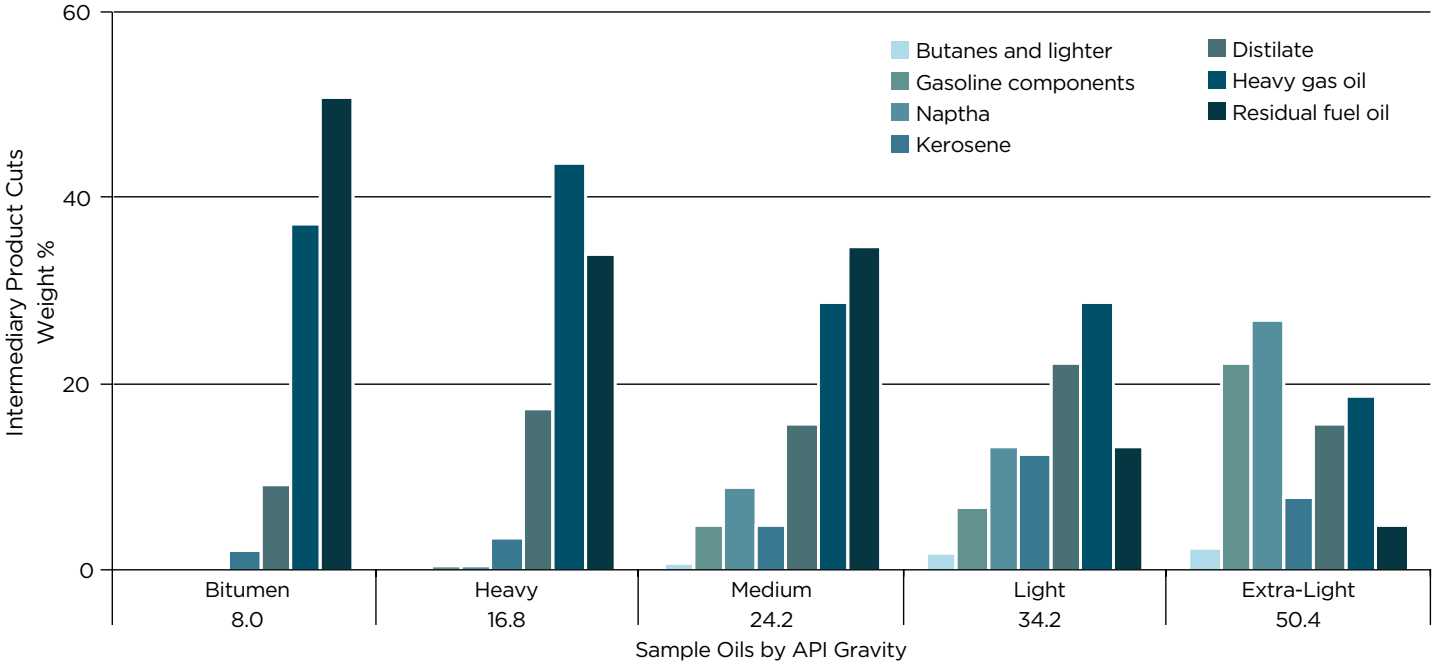


Figure 6 shows the typical product yields from distilling different density crude oils. These products are mostly intermediate products that are then refined further to produce the final products. Although there is some variation in the yield from similar density crudes, the general rule is that heavier crude oil yields more residual fuel oil and distillate and lighter oils yield more gasoline components and refinery gases for petrochemical use (butanes, etc.).

Tight oil is a light oil and in general is better suited for gasoline production than diesel production. The condensate that is abundant in the Eagle Ford tight oil field is not at all useful for diesel and is mostly converted into various feedstock products for petrochemical production.

While gasoline is a popular product in the United States its use is in decline due to the increasing efficiency of light duty vehicles.[25] A surplus of gasoline at some U.S. refineries has led to growing U.S. gasoline exports that reached 400,000 b/d in 2012.[26]

However, the growth market for many U.S. refiners is diesel. Globally diesel is projected to be in increasing demand as emerging economies grow their fleets of trucks and light duty vehicles with diesel engines. U.S. diesel exports reached a record level of nearly 1.3 million b/d in June 2013.[27]

But most refineries produce more gasoline than diesel so the profit margin on diesel is higher, as its supply is only just keeping up with demand. Many refineries in America's biggest refining market, the Gulf Coast region, are configured to maximize diesel production, which they do by running heavier crudes and using special equipment to squeeze more diesel out of each barrel of crude. Valero, America's biggest refining company, is aiming to get the ratio of gasoline to diesel production at its U.S. refineries close to 1-to-1 by 2015.[28]

For many of these refineries, running only tight oil through the refinery would not yield the levels of diesel they would prefer. So yield is one factor that limits the amount of tight oil some U.S. refineries will take. But there is another limiting factor that restricts U.S. tight oil refining capacity further.

Bad Timing: Light Oil Growth in a Heavy Oil Market

The tight oil boom has created an abundance of light oil at a time when many U.S. refineries have recently completed projects to increase the amount of heavy oil they process. These investments were based on the refining sector's view of the crude oil market prior to the tight oil boom, and took several years and billions of dollars to complete.

Five years ago, when many of these projects were initiated, U.S. refiners believed that U.S. oil production would continue its decades long decline and that the only North American supply of oil that would significantly grow in the 21st century would be the Canadian tar sands. Tar sands production yields a very heavy grade of crude so many refiners, particularly in the Midwest and Gulf Coast, invested in equipment to refine more heavy crude. Just five major refinery projects that have come on stream since late 2011 have reduced light oil capacity by 500,000 b/d while increasing heavy oil capacity by 600,000 b/d.[29]

24. Deborah Gordon, "The Carbon Contained in Global Oils." Carnegie Endowment for International Peace, December 2012. These calculations have been drawn from High Temperature Simulated Distillation (HT SD) models, a method that extends the boiling range distribution of hydrocarbons, providing a more accurate assessment of oils that contain high carbon residues.
25. EIA, "U.S. summer gasoline demand expected to be at 11-year low." April 26, 2012. http://www.eia.gov/todayinenergy/detail.cfm?id=6010
26. EIA, "U.S. Exports of Finished Motor Gasoline." http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MGFEXUS2&f=A
27. EIA, "U.S. Exports of Distillate Fuel Oil (Thousand Barrels per Day)." http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MDIEXUS2&f=M
28. Valero, "Investor Presentation," July 2013, Slide 14. http://www.valero.com/InvestorRelations/Pages/EventsPresentations.aspx Note that Valero periodically replaces these presentations with the latest update. This slide may have moved or been replaced in the latest available presentation.
29. These are COP-Cenovus Wood River, IL, BP Whiting, IN, Marathon, Detroit, MI and Valero's Norco and Meraux plants in Louisiana. Some of these increased overall capacity as well, which accounts for the difference in light and heavy oil figures above.

The reduction of light oil capacity has affected the Midwest in particular as refineries on the Gulf Coast have for a long time had significant heavy oil capacity due to their proximity to other heavy oil suppliers in Latin America. A number of projects in the last five years, including Valero's refineries in Louisiana, and Total's and Motiva's refineries in Port Arthur, Texas, have increased Gulf Coast heavy oil refining capacity further.

California's refineries also have a history of heavy oil refining as that state has produced conventional heavy oil for some time. The only refining region that does not have substantial heavy oil capacity is the east coast. The refineries there have been through a period of decline primarily because of their lack of access to discounted domestic and Canadian crudes. There has been some revival recently brought about by the arrival of tight oil from North Dakota and Texas by rail and by ship.[30]

The existence of so much heavy oil refining capacity in the key refining regions of the Midwest and Gulf Coast is a real issue for tight oil producers. The economics of heavy oil refining is based on the market valuing light oil above heavy oil. Canadian tar sands oil is trapped in the North American market so it is generally sold even cheaper than Latin American heavy crudes that enjoy a wider market. That may change if the Keystone XL pipeline brings substantial quantities of Canadian tar sands crude to the Gulf Coast. Light oil is also cheaper to refine requiring fewer processes and less energy, so those refineries that do not have heavy oil capacity get some benefit from refining the more expensive light crudes.

The heavy oil refiners want to use the equipment they have invested in to cash in on the heavy oil discount, essentially converting low quality crude into high value products. They can refine some light crude, but only limited quantities.

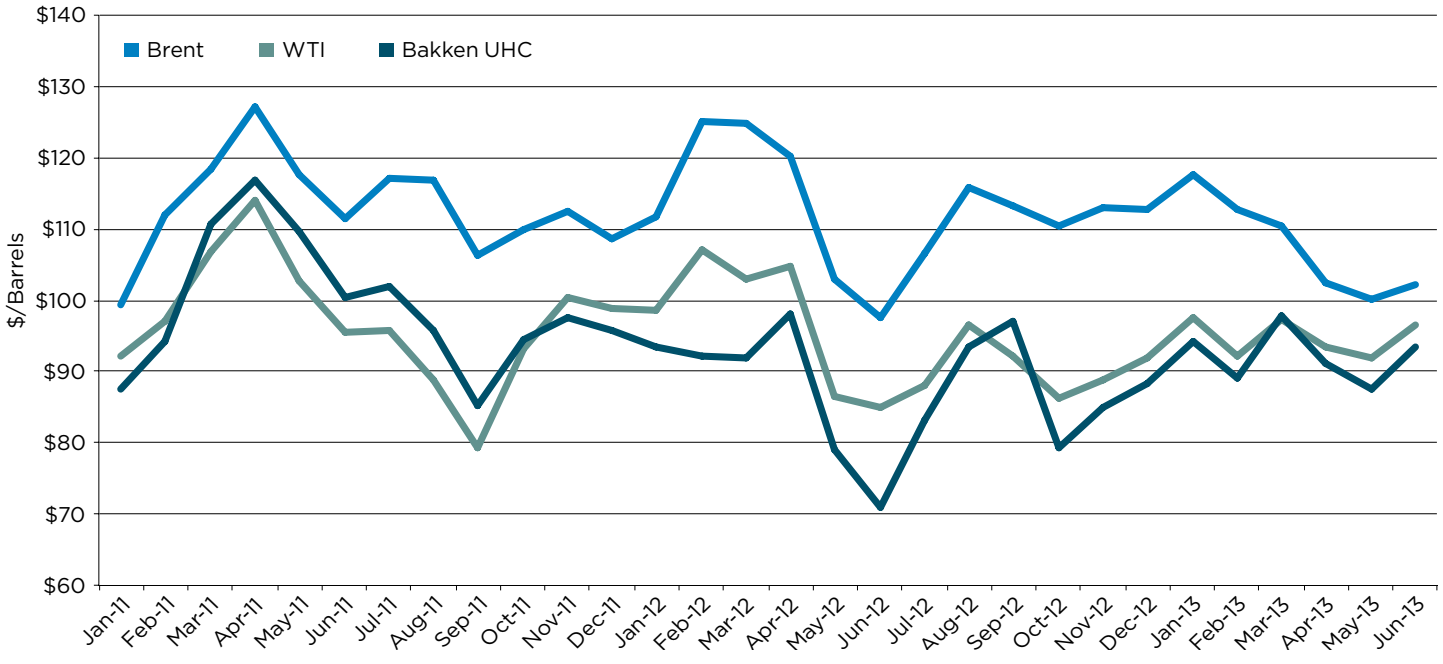
However, the sudden influx of domestic light crudes from tight oil fields is changing this dynamic. As it cannot be exported and so many U.S. refineries are limited in how much they can take, U.S. tight oil is being discounted in the market. Since 2011, when the tight oil boom started to really take off, the price of U.S. light oil (WTI and Bakken UHC) has been between $5 and $25 below similar quality crudes from abroad (Brent) (see Figure 7). The EIA expects that this will remain the case for some time, especially if U.S. crude exports continue to be restricted.[31]

U.S. light oil producers want their oil to sell for the same price as international light oil. If that happens their profits will soar, and they will be able to afford to drill and frack in riskier and more costly fields. Higher prices may also support more fracking in the same fields, increasing the recovery from each area.

In Chapter 7 we discuss how U.S. refiners are making investments to increase their ability to refine tight oil precisely because its discounted price makes it worth investing in. But there are limits. With U.S. oil demand stagnant or declining, a continued steep rise in tight oil production would make it imperative for U.S. oil producers to find new markets.

If the tight oil resource is shown to be able to support the very high production rates in the various high resource forecasts, the U.S. government may be faced with a choice; deregulate crude oil exports or keep billions of barrels of oil in the ground. Climate change should be the deciding factor in that choice. Extracting and burning every last drop of oil in the world is simply not an option. We must leave oil in the ground.

Figure 7. U.S. Light Oil Prices Have Been Discounted to International Light Oil for Over Two Years



Source: Bloomberg

30. EIA "Rail is Likely Supplying an Increasing Share of East Coast Crude Oil" This Week in Petroleum. Sept. 18, 2013. http://www.eia.gov/oog/info/twip/twiparch/2013/130918/twipprint.html
31. EIA, "Absorbing Increases in U.S. Crude Oil Production." This Week in Petroleum, May 1, 2013. http://www.eia.gov/oog/info/twip/twiparch/2013/130501/twipprint.html

As a completely new source of oil, tight oil represents reserves growth just as the world needs to come to terms with keeping a substantial proportion of existing reserves in the ground.

3. UNBURNABLE CARBON: WHY U.S. CRUDE EXPORTS WILL UNDERMINE CLIMATE GOALS

With Arctic summer ice disappearing faster than climate scientists ever predicted,[32] the ocean changing geochemically in ways potentially unprecedented in at least the last 300 million years,[33] and the frequency of certain dangerous climatic extremes increasing strongly,[34] time is running out for getting carbon emissions under control. The world stands on the precipice of major climatic change way beyond the already disruptive changes we are seeing thus far.

In the World Energy Outlook (WEO) 2012, the International Energy Agency (IEA) presented a "carbon budget" (the budget of cumulative fossil fuel carbon dioxide emissions over a period of time) that could keep the risk of exceeding the internationally agreed 2-degree limit to 50 percent (See Box: What is the 2-degree goal and is it sufficient?). Comparing this carbon budget with the amount of carbon in current global proven fossil fuel reserves (coal, natural gas, and oil), the IEA stated that less than one-third of those reserves can be burned and the carbon dioxide emitted, by 2050.[35] However, this budget essentially leaves the chance of maintaining a stable climate to a coin-toss. In order to have an 80 percent chance of staying under the 2-degree limit, only one-tenth of global proven fossil fuel reserves can be burned and the carbon dioxide emitted, by 2050.[36]

The implication of this for any expansion of oil reserves is clear; there is no room for expansion. Proven oil reserves increased by 75 percent from the IEA's WEO 2000 to WEO 2012.[37] Meanwhile, global annual fossil fuel carbon dioxide emissions increased by 40 percent.[38]

At the end of 2011, the carbon content of global proven oil reserves was 630 billion metric tons of carbon dioxide ($GtCO_2$). However, in the same year, the world's proven oil reserves had grown so large, and the remaining fossil fuel emissions "space" in the atmosphere so small, that the carbon *in the oil reserves alone* (not counting the coal or natural gas) amounted to almost twice the total fossil fuel carbon budget associated with an 80 percent chance of maintaining the 2-degree limit.[39]

Naturally, the individual fossil fuels' shares of that budget depend on each other; the larger coal's share of the total fossil fuel carbon budget, the smaller the share remaining for natural gas and oil. For example, in 2010, carbon dioxide emissions from oil amounted to 36 percent, from coal 43 percent, and from natural gas 21 percent, of that year's fossil fuel emissions.[40] If those proportions were to remain the same going forward, four-fifths of the current proven oil reserves would have to stay in the ground until 2050, with only one-fifth burned and the carbon dioxide emitted, by 2050.

32. James Overland and Muyin Wang, "When will the summer Arctic be nearly sea ice free?" Geophysical Research Letters, May 21, 2013. http://onlinelibrary.wiley.com/doi/10.1002/grl.50316/abstract
33. Bärbel Hönisch, et. al., "The Geological Record of Ocean Acidification," Science, March 2, 2012. http://www.sciencemag.org/content/335/6072/1058 Also: NSF, "Oceans Acidifying Faster Today than in Past 300 Million Years." March 1, 2012. http://www.nsf.gov/news/news_summ.jsp?cntn_id=123324
34. Dim Coumou and Alexander Robinson, "Historic and future increase in the global land area affected by monthly heat extremes." Environmental Research Letters 8 034018, 2013. http://iopscience.iop.org/1748-9326/8/3/034018
35. International Energy Agency, "World Energy Outlook 2012." p. 259.
36. WEO 2012 estimates the fossil fuel "carbon reserves" to be 2860 $GtCO_2$. WEO 2012 uses Meinshausen et al. 2009, which estimates a carbon budget of 1440 $GtCO_2$ for 2000-2049 for a 50% probability of exceeding the 2-degree limit by 2100. WEO 2012 subtracts 420 $GtCO_2$ for emissions already emitted from 2000-2011 and, since the WEO is only considering fossil fuel CO_2 emissions, subtracts 136 $GtCO_2$ for non-fossil fuel emissions from 2012 thru 2049, to reach a fossil fuel carbon dioxide budget of 884 $GtCO_2$. For a 20% probability of exceeding the 2-degree limit, Meinshausen et al. 2009 estimate a carbon budget of 886 $GtCO_2$ for 2000-2049 (not to be confused with the 884 $GtCO_2$ budget above). Subtracting the same figures from this as WEO 2012 subtracted from the 1440 $GtCO_2$ budget yields a 2012-2049 fossil fuel carbon budget of 330 $GtCO_2$.
37. WEO 2000 and WEO 2012.
38. CDIAC, "Global CO_2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2010." 2012. http://cdiac.ornl.gov/ftp/ndp030/global.1751_2010.ems and CDIAC, "Preliminary CO_2 emissions 2011." http://cdiac.ornl.gov/ftp/trends/co2_emis/Preliminary_CO2_emissions_2011.xlsx
39. WEO 2012 estimates the fossil fuel "carbon reserves" to be 2860 $GtCO_2$, of which oil reserves account for 22%, i.e., 630 $GtCO_2$. WEO 2012 uses Meinshausen et al. 2009, which estimates a carbon budget of 1440 $GtCO_2$ for 2000-2049 for a 50% probability of exceeding the 2-degree limit by 2100. WEO 2012 subtracts 420 $GtCO_2$ for emissions already emitted from 2000-2011 and, since the WEO is only considering fossil fuel CO_2 emissions, subtracts 136 $GtCO_2$ for non-fossil fuel emissions from 2012 thru 2049, to reach a fossil fuel carbon dioxide budget of 884 $GtCO_2$.
40. WEO 2012, Annex A, p. 554

If instead coal's share of emissions over that same time period is cut by half and natural gas's share grows by half, oil's share would be about half of the budget. In that case, three quarters of the current proven oil reserves would need to be kept in the ground, with one quarter burned and the carbon dioxide emitted, by 2050.

Meanwhile, the rise of unconventional oil sources such as tight oil and tar sands continues to add to the pool of oil reserves every year. Reserves growth, discoveries, U.S. tight oil developments, and other changes to global fossil fuel reserves need to be considered with these carbon budgets in mind. Tight oil reserves in the U.S. have mushroomed in the last 3 years, increasing the EIA's estimate of U.S. proved oil reserves by 15 percent in the most recent year reported, from 2010 to 2011.[41] These reserves likely grew further in 2012 and have also grown in Canada and are likely to grow in other countries.[42]

If we cannot even burn a quarter of the oil that we currently have in global proven reserves, adding further to those reserves is in direct conflict with the goal of limiting climate change.

As a completely new source of oil, tight oil represents reserves growth just as the world needs to come to terms with keeping a substantial proportion of existing reserves in the ground. Exporting tight oil would help producers pull more of the resource out of the ground, making it even more difficult to keep within climate limits. Without an effective international regime to keep global greenhouse gas emissions below recognized thresholds, deregulating U.S. crude oil exports can only exacerbate the impending climate crisis.

What is the 2-degree Celsius goal and is it sufficient?

Global average temperature targets are intended to serve a number of purposes, including to: (a) provide specificity to the language in global climate agreements regarding efforts "to avoid dangerous interference with the climate system"; and (b) provide a metric against which emissions reduction targets and carbon budgets can be determined.

The 2°C (3.6°F) goal has been endorsed by 141 countries by way of the Copenhagen Accord, in which those nations agreed "deep cuts in global emissions are required... with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius."[44] This commitment has also been reiterated by the G8, the G20, and at the 2012 Rio+20 Earth Summit.[45]

Notably, the Copenhagen Accord and other global agreements have also suggested that the 2°C limit may not be sufficient to adequately safeguard the global climate and those most vulnerable to the impacts of climate change. The Copenhagen Accord considers strengthening the global temperature goal to 1.5°C, consistent with the call from 112 least developed and most climate change vulnerable countries.[46]

Researchers have repeatedly warned that the temperature increase up to the 2°C limit cannot be considered "safe"[47] and further, that linking a certain temperature limit with emissions goals that result in a large risk of exceeding that limit is dangerous.[48] Even if the 2°C limit were "safe", the emissions reduction commitments currently in place or under consideration are not even sufficient to provide a 50 percent chance of staying below 2°C.[49]

To summarize, the 2°C limit and existing efforts to meet that limit are too weak in three different ways:

1. The global emissions reduction targets currently associated with the 2°C limit actually entail a large risk of exceeding the limit;

2. The 2°C limit may in fact allow for an unacceptable level of warming and impacts; and

3. Even the existing emissions reduction targets that have been set to give a weak chance of staying below 2°C are not consistently being met by the governments setting them.

Recognizing that current emission reduction goals based on the 2°C limit are inadequate, and that the 2°C limit may itself be dangerous, adds even more urgency to the need to stop adding more oil to the already unburnable fossil fuel reserves.

41. EIA, "U.S. Crude Oil and Natural Gas Proved Reserves, 2011." August 2013. http://www.eia.gov/naturalgas/crudeoilreserves/pdf/uscrudeoil.pdf
42. EIA, "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States." June 13, 2013. http://www.eia.gov/analysis/studies/worldshalegas/
43. Meinshausen et al. 2009 Supp Info.
44. UNFCCC, "Report of the Conference of the Parties on Its Fifteenth Session, Addendum, Copenhagen Accord (Dec. 18, 2009)," UN Doc. FCCC/CP/2009/11/Add.1, Mar. 30, 2010. http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf
45. United Nations, "Resolution adopted by the General Assembly on 27 July 2012." Page 37. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/66/288&Lang=E
46. 350.org, "Countries for 350 ppm / 1.5C." http://350.org/en/countries
47. Cf. "2C or not 2C, that is the question." Nature, 473, 7, May 4, 2011. http://www.nature.com/news/2011/110504/full/473007a.html; Steinacher et al. 2013, "Allowable Carbon Emissions Lowered by Multiple Carbon Targets" 11 July 2013 Vol. 499 Nature. http://www.climate.unibe.ch/~steinach/climate_targets/
48. Cf. IARU, "Climate Congress Closing Plenary." March 12, 2009. https://sites.google.com/site/mtobis/copenhagenclosingplenary; Anderson and Bows 2011, "Beyond 'dangerous' climate change: emission scenarios for a new world" 13 January 2011 vol. 369 Phil. Trans. R. Soc. A. http://rsta.royalsocietypublishing.org/content/369/1934/20.full
49. UNEP 2012. "The Emissions Gap Report 2012." http://www.unep.org/publications/ebooks/emissionsgap2012/

Don't Frack Ohio Protest, July 29, 2013, Warren, OH. ©Wade Gagich/350.org

Local Impacts of the Tight Oil Boom

In addition to the dangerous impacts associated with climate disruption, tight oil production impacts a wide range of other environmental, health, and social issues.

Of these, the EPA lists the following as "already well known," while it continues to conduct a multi-year study of the impacts of hydraulic fracturing on water:[50]

- **"Stress on surface water and ground water supplies from the withdrawal of large volumes of water used in drilling and hydraulic fracturing."**

For example, in Texas, the oil and gas industry is already "dispos[ing] of 290 million barrels of wastewater from fracking" each month; "that's water that can never be used again."[51] In some Texas counties, fracking-associated water-use accounts for more than 20 percent of the water consumption.[52]

- **"Contamination of underground sources of drinking water and surface waters resulting from spills, faulty well construction, or by other means."**

For example, the state of North Dakota "has no real estimate of how much fluid [oil or oil wastewater] spills out accidentally from tanks, pipes, trucks and other equipment. Companies are supposed to report spill volumes, but officials acknowledge the numbers are often inexact or flat-out wrong. In 40 cases last year, the company responsible didn't know how much had spilled so it simply listed the volume of fluid as zero."[53]

- **"Adverse impacts from discharges into surface waters or from disposal into underground injection wells."**

For example, wastewater from oil operations can "drive geological faults to their [seismic] tipping points."[54]

- **"Air pollution resulting from the release of volatile organic compounds and hazardous air pollutants."**

High levels of Volatile Organic Compounds (VOCs) have been detected around fracked oil and gas wells. These can cause breathing difficulties, headaches and other health issues. In some cases residents living near to these wells have not been protected by regulatory authorities despite their being aware of violations. In September 2013, Earthworks Action reported on a case in the Eagle Ford in south west Texas where Texas Commission on Environmental Quality inspectors detected VOC levels at a Marathon Oil processing facility that were so high they evacuated their staff from the site. But they subsequently failed to warn residents and did not prosecute the company.[55]

Additionally, in North Dakota, about one third of the natural gas obtained in conjunction with oil extraction is wasted, flared or vented on-site, because collecting the natural gas is considered too costly in these locations. Flaring this gas is less impactful on climate than venting but still results in wasteful carbon dioxide emissions and local hazardous air pollution.[56]

A widespread concern in conjunction with hydraulic fracturing and other well-stimulating methods is that companies are not required to reveal the chemicals in the fluids used. These include extremely toxic chemicals such as benzene, lead, and hydrofluoric acid.[57]

Resource extraction booms in rural towns and regions are also associated with a rise in violent crime and loss of quality of life.[58] In addition, tight oil boomtowns are exposed to the added social disruptions, infrastructure costs and health and safety risks, associated with very large increases in heavy traffic.[59] A single well involves at least 1000 truck trips.[60]

The impacts of the tight oil boom are wide-ranging and many are still unknown. But, as Magistrate Judge Grewal told the Bureau of Land Management when the Bureau failed to prepare an environmental impact statement in conjunction with offering leases to companies seeking to use hydraulic fracturing on public lands, "that is precisely why proper investigation [is] so crucial."[61]

The goal of deregulating U.S. crude exports is to raise the price of tight oil and maximize its production. This would increase the pollution and disruption being experienced by hundreds of communities across America.

50. EPA, 2013. http://www2.epa.gov/hydraulicfracturing See also Congressional Research Service, "An Overview of Unconventional Oil and Natural Gas: Resources and Federal Actions." 2013. http://www.fas.org/sgp/crs/misc/R43148.pdf
51. Houston Chronicle "Texas Water Crisis" Aug. 16, 2013. http://www.chron.com/opinion/editorials/article/Texas-water-crisis-4739205.php
52. Monika Freyman and Ryan Salmon "Hydraulic Fracturing & Water Stress: Growing Competitive Pressures for Water", Ceres. May 2013. http://www.ceres.org/press/press-releases/new-study-hydraulic-fracturing-faces-growing-competition-for-water-supplies-in-water-stressed-regions
53. Nicholas Kusnetz "North Dakota's Oil Boom Brings Damage Along With prosperity"Pro Publica. June 7, 2012. http://www.propublica.org/article/the-other-fracking-north-dakotas-oil-boom-brings-damage-along-with-prosperi
54. Ker Than "Fracking Wastewater Disposal Linked to Remotely Triggered Quakes." National Geographic http://news.nationalgeographic.com/news/energy/2013/07/130711-fracking-wastewater-injection-earthquakes/
55. Sharon Wilson, Wilma Subra and Lisa Sumi "Reckless Endangerment while Fracking the Eagle Ford: Government Fails, Public Health Suffers and Industry Profits from the Shale Oil Boom." Earthworks Action. Sept. 2013. http://www.earthworksaction.org/files/publications/FULL-RecklessEndangerment-sm.pdf
56. https://www.ceres.org/resources/reports/flaring-up-north-dakota-natural-gas-flaring-more-than-doubles-in-two-years
57. U.S. House of Representatives Committee on Energy and Commerce, "Hydraulic fracturing chemicals." 2011 http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic-Fracturing-Chemicals-2011-4-18.pdf
58. Rick Ruddell "Boomtown Policing: Responding to the Dark Side of Resource Development." Policing 2011. http://www.academia.edu/1115257/Boomtown_Policing_Responding_to_the_dark_side_of_resource_development ; Kevin G. Hall "U.S. oil boom comes with tradeoffs and an angry underbelly." McClatchy Sept. 19, 2012 http://www.mcclatchydc.com/2012/09/19/169011/us-oil-boom-comes-with-tradeoffs.html
59. James William Gibson, "Bombing North Dakota: Living amid the Bakken Oil Boom." Earth Island Institute, Winter 2013 http://www.earthisland.org/journal/index.php/eij/article/bombing_north_dakota/ Joshua P. Fershee, "The Oil and Gas Evolution: Learning from the Hydraulic Fracturing Experiences in North Dakota and West Virginia." Texas Wesleyan Law Review Vol. 19-2012. http://www.academia.edu/2529755/The_Oil_and_Gas_Evolution_Learning_from_the_Hydraulic_Fracturing_Experiences_in_North_Dakota_and_West_Virginia
60. James William Gibson, Op. Cit.
61. Adam Orford, "NEPA: California Federal Court Requires Full Environmental Impact Statement for BLM Leases Involving Hydraulic Fracturing." Marten Law, May 6, 2013 http://www.martenlaw.com/newsletter/20130506-blm-leases-hydraulic-fracturing

Fracking infrastructure in Pinedale, WY.
©Ecoflight

4. CURRENT CRUDE EXPORT REGULATIONS

The current regulations governing U.S. crude exports arose in the 1970s in the wake of the Arab oil embargo. Until then, it was crude imports that were controlled in order to protect U.S. producers from competition from cheaper imports.

The Arab oil embargo triggered a new American oil paradigm that persists today. Rather than imports posing a threat to home grown suppliers of oil, they now threatened domestic consumers of oil with supply shortages and price spikes. It was following the embargo that the goal of 'energy independence' was first expressed by President Nixon, a goal which has been repeated by every president since and achieved by none.

The embargo roughly coincided with a peak in U.S. oil production. The subsequent production decline, coupled with increasing demand and the threat posed by the world's largest reserves of oil being controlled by countries hostile to the United States, precipitated a new mindset around oil that underpins the crude export regulations. That mindset is one of "short supply," a term that headlines the key export regulations.

Laws and regulations that govern the restriction and licensing of crude exports are listed below.

- the Energy Policy and Conservation Act of 1975 (EPCA);
- the Export Administration Act of 1979 (EAA),
- the "short supply" controls in the Export Administration Regulations (EAR);
- the Mineral Leasing Act (MLA);
- the Outer Continental Shelf Lands Act (OCSLA);
- the Naval Petroleum Reserves Production Act (NPRPA);
- the TransAlaska Pipeline Authorization Act (TAPAA) and PL 104-58: "Exports of Alaskan North Slope Oil."

The Mineral Leasing Act (MLA) of 1920 was first amended in 1973 to restrict crude oil exports, stipulating that export licenses can only be granted under certain conditions or if the President provides evidence to Congress that exporting crude oil would not diminish the quantity or quality of U.S. oil supply.[62]

The Energy Policy and Conservation Act (EPCA) of 1975 cemented these restrictions within a broader energy policy that for the first time was focused on energy conservation and security.

The EPCA was in direct response to the energy crisis precipitated by the 1973 Arab oil embargo. Its main achievements were the creation of the Strategic Petroleum Reserve and the vehicle efficiency program known as CAFE.[63] However, among its many provisions were the crude export regulations, which have been maintained through several rounds of amendments, the latest of which were passed in December 2012.[64]

Some of the other acts listed above, the OCLSA and NPRPA, also contain crude export restrictions regarding the specific oil reserves they govern. Conversely, the TAPAA allows for some crude exports of oil from the Alaskan North Slope and Cook Inlet.

Crude oil exports licenses are issued by the Bureau of Industry and Security (BIS) at the U.S. Department of Commerce. Requirements for issuing export licenses are detailed in the Short Supply Controls section of the Export Administration Regulations.[65]

62. Bureau of Land Management, "Mineral Leasing Act 1920 as amended: re-transcribed 8/9/07." http://www.blm.gov/pgdata/etc/medialib/blm/ut/vernal_fo/lands___minerals.Par.6287.File.dat/MineralLeasingAct1920.pdf
63. Corporate Average Fuel Efficiency
64. "Energy Policy and Conservation Act" January 9, 2013. http://www.house.gov/legcoun/Comps/EPCA.pdf
65. U.S. Government Printing Office. Electronic Code of Federal Regulations. Title 15: Commerce and Foreign Trade. PART 754 0 Short Supply Controls. http://www.ecfr.gov/cgi/t/text/text-idx?c=ecfr&SID=eecc5bebf9c27b04895c72f0d08458e4&rgn=div5&view=text&node=15:2.1.3.4.35&idno=15

Refinery viewed from the Houston Ship Channel ©OneEighteen/Flikr Creative Commons

The regulations allow for export licenses to be granted for certain cases including:

- The export of Californian heavy oil (20 API or less) up to an average of 25,000 b/d;
- Exports to Canada as long as the oil is refined or consumed within Canada;
- Exports of oil sourced from the Cook Inlet in Alaska;
- Exports to Canada of oil sourced from Alaska's North Slope and transported over the Trans-Alaska Pipeline up to an average of 50,000 b/d;
- Exports of oil from the Strategic Petroleum Reserve if an equivalent amount of refined product is exchanged in return;
- Exports of foreign crude oil if documentation is provided that shows it has not been comingled with domestic oil during its transit through the United States.

With declining production of both Californian heavy oil and Alaskan oil, exports from these have been negligible for some time.

There are some potential loopholes in the regulations that could allow for exports other than those meeting the conditions above, although there is no evidence that these have been exploited to date. There is dispensation within the rules for the President to allow crude exports if it can be demonstrated that it would serve the national interest. This would apply to specific shipments rather than across the board.

The regulations also allow for applicants to demonstrate that the oil they would export has no viable market within the United States.[66] This is something that may possibly be used by tight oil producers in the future if they can demonstrate that there is no market remaining in America for their oil.

66. See Section (b)(2)(i)(C) "In which the applicant can demonstrate that, for compelling economic or technological reasons that are beyond the control of the applicant, the crude oil cannot reasonably be marketed in the United States."

Since February 2013, U.S. crude oil exports to Canada have shot to over 120,000 barrels per day.

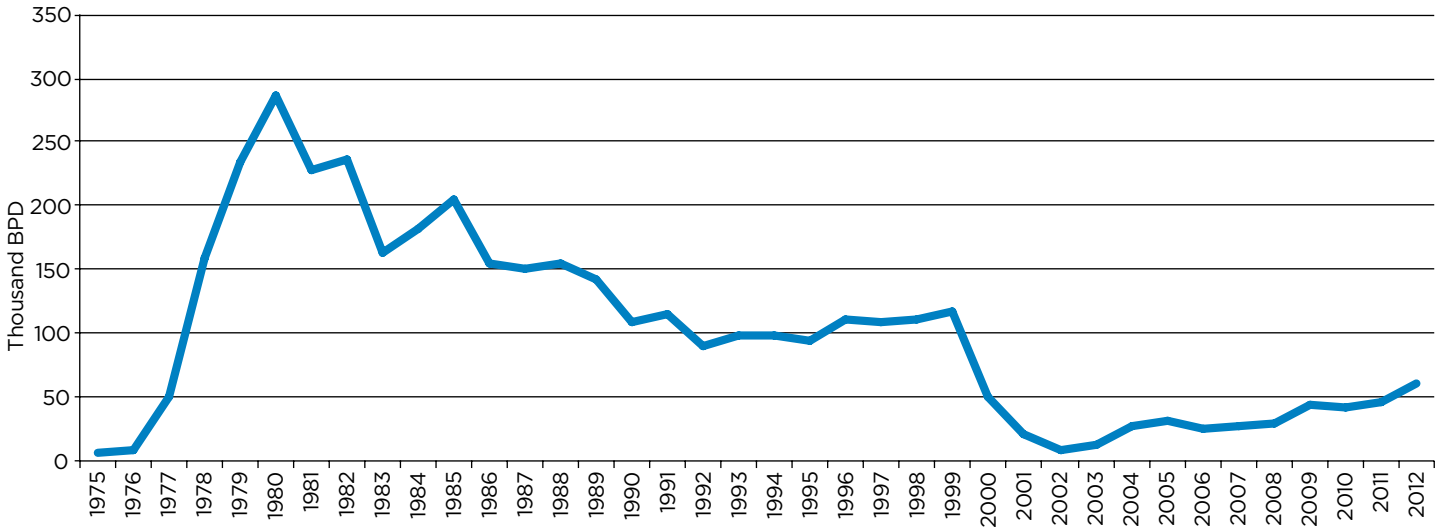
5. CRUDE OIL EXPORTS PAST AND PRESENT

Since the Energy Policy and Conservation Act came into force in 1975, there have been significant exports, mostly to Canada, between 1978 and 2000 averaging between 100,000 and 200,000 b/d in the 1980s and 90s. These dropped off to almost nothing in the early 2000s and then maintained a low level at between 20,000 and 40,000 b/d from 2005 to 2010 (see Figure 8).

In January 2013, the EIA reported that between 2003 and 2012 crude exports averaged 35,000 b/d and that 98 percent of these exports went to Canada.[67] The data shows that there have been occasional one-off shipments in that period to China, France, Cost Rica and South Korea.[68]

In late 2011 and throughout 2012, crude exports started to grow again, averaging closer to 60,000 b/d in that period. But in February 2013, crude oil exports suddenly doubled and have hovered between 100,000 and 130,000 b/d since (see Figure 9). All of this oil went to Canada. This trade is set to continue and is forecast to reach 200,000 b/d in 2013.[69] This would be the highest level of U.S crude oil exports since 1985 (see Figure 8).

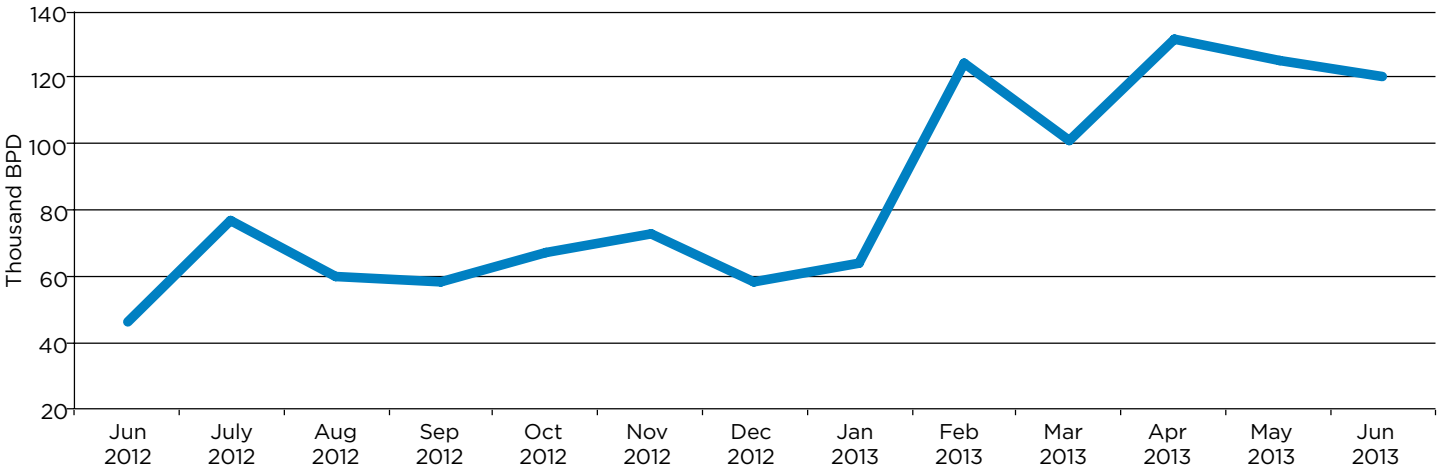
Figure 8. U.S. Crude Oil Exports, 1975 to 2012



Source: EIA[70]

67. EIA, "January 2013 crude oil export to China was a rare event." Today in Energy, April 16, 2013. http://www.eia.gov/todayinenergy/detail.cfm?id=10851
68. EIA, "Crude Oil Exports by Destination." http://www.eia.gov/dnav/pet/pet_move_expc_a_EPC0_EEX_mbblpd_a.htm
69. Citigroup Inc. "Energy 2020 - Independence Day Global Ripple Effects of the North American Energy Revolution," Global Perspectives & Solutions, February 2013. https://www.citivelocity.com/citigps/ReportSeries.action?recordId=16
70. "U.S Exports of Crude Oil" Annual thousand barrels per day. http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCREXUS2&f=A

Figure 9. U.S. Crude Oil Exports, June 2012 to 2013



Source: EIA[71]

The recent rise in crude exports is directly related to the export of tight oil to Canadian refineries. Without changing the export regulations, U.S. crude oil exports could reach record levels next year if more eastern Canadian refineries source their oil from the United States. This may ease the pressure for wider export deregulation but that depends on whether tight oil prices move closer to international benchmarks.

CURRENT EXPORT LICENSES

In October 2012, the Financial Times reported that BP, Royal Dutch Shell and energy trading company Vitol were all applying for licenses to export U.S. crude to Canada.[72] In December 2012, Argus Media reported that Valero had received a license to export Eagle Ford crude to its Jean Gaulin refinery near Quebec City.[73] The same report stated that BP and Vitol had also received licenses and that Shell was considering applying. It quickly became clear that U.S. crude exports were on the rise.

It seems unlikely that the companies mentioned above are the only ones to receive export licenses in recent months. The Bureau of Industry & Security issued 66 licenses in 2012, up from 45 in 2011 and 22 in 2007.[74] However, it does not disclose details of these licenses. An export license is valid for one year and specifies a set amount of crude.

All of these licenses are likely only for exports to Canada, where refineries in the eastern part of the country are keen to gain access to discounted American crudes. A lack of pipeline access to rising Western Canadian crude production leaves eastern Canadian refineries importing crude from the Middle East and West Africa, which is more expensive than the inland North American crudes.

These inland North American crude streams, particularly tar sands crude and tight oil, have been trading at a discount to international 'waterborne' crudes since 2011 (see Figure 7). Most of the refineries in eastern Canada are not equipped to handle the heavy diluted bitumen (dilbit) from the tar sands but can profit from processing the discounted light-sweet crudes from tight oil production (as well as upgraded bitumen/syncrude if they can get it), despite additional transport costs associated with rail transport.

There are currently three documented routes for crude exports to Canada. U.S. crude is exported to Canada via rail, barge and tanker today. However, the Enbridge proposed Line 9 pipeline reversal project, which will reverse the flow of oil in an existing pipeline to run from Sarnia, Ontario to Montreal, Quebec, may one day bring Bakken oil to refineries in the Montreal area.[75]

The current export routes are:

- Bakken crude by rail to Mechanicsville, NY, and then onto St. John, New Brunswick;
- Bakken crude by rail to Albany, NY and then by barge down the Hudson and into the Atlantic to St. John;
- Eagle Ford Crude by tanker from Corpus Christi, Texas to Quebec City, Quebec.

Bakken crude is being railed to Albany, New York and then barged down the Hudson River to a number of U.S. east coast refineries, and also to the Irving Refinery in St. John, New Brunswick.[76] The Irving Refinery also receives shipments of Bakken oil by rail via Mechanicsville NY, where the cars are transferred from Canada Pacific to Pan Am Railways[77] or to the Montreal, Maine and Atlantic Railway (MMA).

The train that derailed and exploded in Lac-Mégantic, Quebec in early July 2013, killing 47 people and destroying much of the city's downtown area, was en-route from North Dakota to the Irving refinery in St. John via the MMA.[78]

Prior to the Lac-Mégantic disaster, Irving Oil signed a multi-year deal with pipeline company Buckeye Partners to provide it offloading, loading and storage services

71. "U.S Exports of Crude Oil" Monthly thousand barrels per day. http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCREXUS2&f=M
72. Gregory Meyer and Ed Crooks, "Oil groups set to export US crude." Financial Times, October 11, 2012.
73. "US clears Valero plan to export Eagle Ford to Canada." Argus Media, December 20, 2012,
74. Dan Murtaugh, "Brent pressured by US tripling crude to Canada." Bloomberg News, May 10, 2013.
75. Enbridge, "Line 9B Reversal and Line 9 Capacity Expansion Project" http://www.enbridge.com/ECRAI/Line9BReversalProject.aspx
76. Sandy Fielden, "Crude Loves Rock'n'Rail – East Coast Delivery Terminals." RBN Energy LLC, April 4, 2013. http://rbnenergy.com/crude-loves-rock-n-rail-east-coast-delivery-terminals
77. Edgar Ang, "Irving Oil's St. John Refinery to Process Bakken Crude Later This Year." Oil Price Information Service in Bakken Oil Business Journal, Nov-Dec 2012.
78. CBC News, "Lac-Mégantic disaster forces Irving Oil to alter routes: Saint John-based company using southern barge, rail options to import crude oil." July 12, 2013. http://www.cbc.ca/news/canada/new-brunswick/story/2013/07/12/nb-irving-oil-supply-952.html

Refinery and tank cars in Sinclair, WY. iStock ©jaypetersen

in Albany, indicating that the rail to barge route is how Irving will transport Bakken crude to its New Brunswick refinery in the future.[79] It is not clear how much crude the Irving Refinery plans to import from the United States. Irving Oil President Mike Ashar told a conference in San Antonio in March that the 300,000 b/d refinery could handle 200,000 b/d of crude delivered by rail.[80] Some of this however could be crude from Canada. The Irving refinery is also a major supplier of refined products to the U.S. North East.[81]

Valero, the world's biggest independent refiner, revealed details of its crude exports to Canada during a conference call at the end of April.[82] Executives told investors on the call that Valero has a license to export up to 90,000 b/d of Eagle Ford crude from its Corpus Christi, Texas terminal to its refinery near Quebec City. It began refining the oil in April. The oil travels by tanker on foreign-owned vessels that cannot be used to ship oil to U.S. ports due to Jones Act regulations.[83] Valero says that the cost of shipping the oil on non-U.S. owned vessels is $2 a barrel compared to up to $6 a barrel to ship oil to the U.S. North East on U.S. flagged vessels.

Valero executives also told investors that it has an interest in Enbridge's Line 9 Reversal project and envisages running the Jean Gaulin refinery in Quebec exclusively on North American oil "within the year or so."[84]

Imperial Oil, the Canadian subsidiary of ExxonMobil, is said to be railing 20,000 b/d of "North American mid-continent crude" to its refineries in Sarnia, Ontario and also in Alberta. But it is not clear how much of this is American.[85]

Canada imported a total of 676,000 b/d of light crude in 2012. Analysts expect some 200,000 b/d of that to come from the United States along with some synthetic crude (syncrude) from the tar sands this year. With Enbridge's Line 9 reversal, this could rise to 400,000 b/d.[86]

79. Edgar Ang, Op. Cit.
80. Dan Murtaugh, "U.S. Crude Exports Highest Since 2000 as Canada Taps Into Shale." Bloomberg, April 30, 2013. http://washpost.bloomberg.com/Story?docId=1376-MM0XCX6S972J01-2KANCLIR9EQ85RL14E8HKCMQ6U
81. www.irvingoil.com
82. "Valero Energy's CEO Discusses Q1 2013 Results - Earnings Call Transcript." Seeking Alpha, April 30, 2013. http://seekingalpha.com/article/1385071-valero-energy-s-ceo-discusses-q1-2013-results-earnings-call-transcript?part=single
83. The 'Jones Act' or Merchant Marine Act of 1920, requires that all shipping between U.S. ports be carried on U.S.-Flag ships.
84. Seeking Alpha, Op. Cit.
85. Dan Murtaugh, Op. Cit.
86. Dan Murtaugh, "Brent pressured by US tripling crude to Canada" Bloomberg News. May 10, 2013. http://www.bloomberg.com/news/2013-05-10/brent-pressured-by-u-s-tripling-crude-to-canada-energy-markets.html

FOREIGN CRUDE EXPORTS: A ROUTE OUT OF NORTH AMERICA FOR THE TAR SANDS

It is increasingly likely that the Keystone XL pipeline, which is designed to bring tar sands crude from Alberta to the Gulf Coast, will enable exports of Canadian crude through the United States. While the economic drivers for this are rapidly evolving, it is certainly the case that the crude export regulations allow for it.

To date, shipments of foreign crude through the United States are rare. So rare in fact that when one occurred in January 2013 it triggered a slew of media reports and became a feature of an EIA 'Today in Energy' post.[87]

In this case a shipment of around 270,000 barrels of crude was exported from Los Angeles to China. While the EIA said it could not disclose the source of the foreign crude, other sources said that the crude was in two batches, one from Ecuador and one from Canada.[88] Platts Commodity News reported that the crude in the shipment had an API density of above 25 API.[89] This suggests that the Canadian crude was not dilbit (diluted bitumen) from the tar sands. Platts suggested that Shell was the only company to import crude of that density into Los Angeles in the preceding period, although it did not know for sure who the exporter was.

The EIA noted that crude exports to China were very rare and that this was the first since 2005. It did not give any figures but suggested that exports of foreign crude do occasionally occur. In explaining the crude export regulations the EIA said:

As noted above, the vast majority (98%) of U.S. crude exports go to Canada. Most of the other exports of crude oil are... exports of foreign-origin crude, imported into the United States but not comingled with U.S.-origin crude oil. These exports typically occur because the owner of the imported crude oil cannot process or resell it in the United States. The license allows the imported crude to be exported.

The export of Canadian oil, via the Unites States, to China in January 2013 shows that the BIS will issue licenses for Canadian crude to be exported from the United States.

The export of Canadian oil, via the Unites States, to China in January 2013 shows that the BIS will issue licenses for Canadian crude to be exported from the United States. The question of whether crude delivered by Keystone XL will be exported depends not on its legality but on economics. The State Department suggested in its March 2013 draft report on the proposed pipeline that the additional transport costs of first piping the crude 1,700 miles across North America before loading it onto tankers to be shipped overseas, worked against the prospects of exporting crude from the pipeline.[90] However, recent analysis from Platts suggests that far from it being uneconomic, the rapidly changing market for oil on the Gulf Coast, precipitated by the tight oil boom, may make crude exports from Keystone XL inevitable.

In a June 20 webinar entitled 'Limits to US Oil Industry Progress', Esa Ramasamy, Editorial Director for Oil Markets at Platts, stated that new pipelines to the Gulf Coast (Keystone XL and Seaway), together with the influx of tight oil from Texas and elsewhere, would inundate the Gulf Coast with crude and create a buyer's market for refiners. He explained that this would lead refiners to pick and choose supplies according to the best deal available and that this would mean that Canadian oil will be exported when it cannot find a refinery customer on the Gulf Coast. The implication is that Keystone XL will actually cause a surplus of heavy oil on the Gulf Coast:

There is a limit to how much (heavy crude) the Gulf Coast refiners can soak up. And a lot of that will depend on the price of Canadian crudes... Bear in mind that U.S. Gulf Coast refiners, it takes them only 3 to 5 days to ship crudes from Colombia, Venezuela into the U.S. Gulf Coast and less than 3 days from Mexico to the Gulf Coast.

So U.S. Gulf Coast refiners sit in a very ideal location where they can pick and choose their most economic crudes that offer them the best netbacks. So that's why, there will be opportunities... I mean the U.S. refiners will not always use Canadian crudes. When the Canadian crudes rise in price they will look at other alternatives, and force the Canadian crudes to move out of the Gulf Coast. The Canadian crudes cannot go back up into Canada again. They will have to go out.[91]

This analysis of how Gulf Coast markets function, from one of the country's top oil market observers, is in complete contrast to everything the State Department, TransCanada and Keystone XL pipeline proponents have been telling the public.

Far from there being a shortage of heavy oil supply to the Gulf Coast that Keystone XL will ameliorate, there will be a surplus. Rather than replacing heavy oil supply from Latin American and Middle Eastern suppliers, Canadian tar sands oil will be forced out to the world market because those suppliers will compete with Canada for market share.

This is the complex reality of the Gulf Coast oil market, in stark contrast to the simplified rhetoric of Keystone XL proponents.

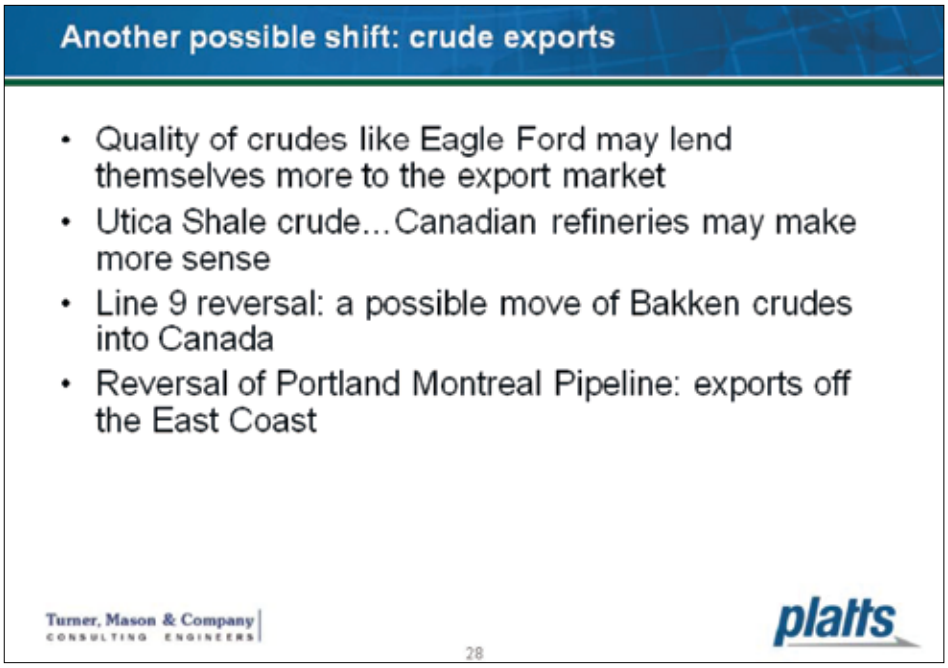
87. EIA, "January 2013 crude oil export to China was a rare event." Today in Energy, April 16, 2013. http://www.eia.gov/todayinenergy/detail.cfm?id=10851
88. "Rare US west coast to Asia-Pac crude cargo re-exported," Argus Media, April 2, 2013.
89. Esa Ramasamy and Jeff Mower, "US reexported foreign crude to China in January, not domestic: sources." Platts Commodity News, April 3, 2013.
90. The U.S. Department of State, "Keystone XL Pipeline Project Draft Supplementary Environmental Impact Statement", March 01, 2013. 1.4 Market Analysis, page 1.4-16. http://keystonepipeline-xl.state.gov/documents/organization/205654.pdf
91. Esa Ramaswamy, "Limits to US oil progress." Webinar, Platts, June 20, 2013. https://event.webcasts.com/viewer/event.jsp?ei=1017631

6. BOOM OR BUST!
INCREASING CALLS FOR U.S. CRUDE OIL EXPORTS MAY BE GAINING TRACTION

The industry's interest in increasing crude exports first came to our attention in November 2011 when a presentation by analysts at Platts discussed the shifting dynamics of U.S. petroleum imports and exports. A slide from that presentation shown in Figure 10 outlines the discussion at that time.

While current exports have emerged through different routes envisaged by Platts at that time, the general trend foreseen by their analysts has come to pass. Such presentations are generally for the eyes of industry insiders only, and the discussion on U.S. crude exports is still today primarily conducted at industry conferences and seminars. Where the issue has surfaced in the media, it has mainly been in business press reporting of these industry meetings.[93] Judging by these reports, the discussion within industry circles has increased significantly in 2013.

Figure 10. Slide from November 2011 Platts Presentation



Source: Platts[92]

It is clear that the industry is actively lobbying in Washington in favor of crude exports, but there is no sign yet of a vociferous public relations campaign on the issue, such as we have seen in support of the Keystone XL pipeline and natural gas exports.[94] The oil industry's leading lobby group, the American Petroleum Institute (API), told the Wall Street Journal in April that it may support a campaign in the future.[95]

Oil exports are a highly contentious issue in America as a result of 40 years of imbalance between America's production and consumption of oil. There is a near universal public conception of scarcity around oil that will be very difficult to shift, and the idea of exporting domestic oil runs sharply counter to this conception. That the rise in domestic oil production has not been accompanied by falling prices at the pump is not working in the industry's

92. File no longer available.
93. For example: Ben Lefebvre and Alison Sider, "Oil Exports Get Second Look: As Domestic Output Rises, Industry Weighs Push to Ease Ban Dating From '70s." Wall Street Journal, April 3, 2013. http://online.wsj.com/article/SB10001424127887323361804578389061086381802.html and Stephen Voss and Lananh Nguyen, "U.S. Won't Allow Crude Exports Within the Next Decade." Bloomberg News, April 11, 2013. http://www.bloomberg.com/news/2013-04-11/u-s-won-t-allow-crude-exports-within-the-next-decade.html#disqus_thread
94. See API campaigns at: http://www.api.org/policy-and-issues/policy-items/keystone-xl/keystone-xl-pipeline and http://www.api.org/policy-and-issues/lng-exports
95. Ben Lefebvre and Alison Sider, Op. Cit.

favor.[96] Sixty percent of attendees at an April 2013 Bloomberg Oil Forum in London said that they did not think U.S. crude exports would be allowed within ten years, and over 40 percent thought that it would never happen.[97]

Many people believe the industry faces an uphill battle to deregulate crude oil exports and they may well be right. But with billions of dollars at stake it seems clear that the industry is likely to throw its considerable financial weight behind a campaign at some point. That campaign may not yet have begun at the public level but it is increasingly clear that it is well underway among professionals in the industry.

The following points are commonly used to argue for deregulation of U.S. crude exports:

- U.S. production from tight oil is predominately light-sweet oil and is a mismatch with a large proportion of U.S. refining capacity that is configured for heavy oil.
- A time will come when U.S. refineries will not be able to handle any more light-sweet oil and therefore exports will be necessary for U.S. oil production to reach its full potential.
- Free markets operate better than regulated ones so allowing crude exports would more efficiently allocate crude in the global market.
- Billions of dollars in annual trade will result, raising U.S. export revenues.

The most prominent organizations so far to publically support deregulating U.S. crude oil exports are generally policy think tanks with an aggressive free market agenda. The American Enterprise Institute blogged on the issue in June,[98] while the Council on Foreign Relations published a "Policy Innovation Memorandum" in July making "the case for allowing U.S. crude oil exports."[99]

Oil and gas pads in Jonah, WY. ©Ecoflight

In February 2013, international trade attorney Scott Lincicome wrote in the Cato Institute's *Free Trade Bulletin* that U.S. restrictions on both natural gas and crude oil exports were in breach of various articles of the General Agreement on Tariffs and Trade (GATT).[100] He concluded the article by calling for the DOE and BIS to approve all pending oil and gas export applications and for an overhaul of the entire energy export licensing regime so that, "applications are automatically approved within a finite period, unless the agency can demonstrate a tangible and immediate national security risk."

The advocates for free trade are also finding support from countries that would like to import U.S. oil. In July a spokesperson for EU trade commissioner Karel De Gucht told the press that "(t)he EU wants to use the TTIP [Transatlantic Trade and Investment Partnership] negotiations in order to engage with the US. on ensuring that no restrictions apply to the export of the different raw materials in the energy area, including crude oil."[101] The next round of TTIP negotiations will take place in Brussels in October 2013.

Perhaps the most prominent public call for deregulation so far has come from the executive director of the International Energy Agency (IEA) Maria van der Hoeven. In a February 2013 opinion piece in the Financial Times she claimed that, "new export outlets will ultimately be necessary to leverage the full potential and reap the benefits of the new American oil revolution... Washington will need to address this misalignment, lest the great American oil boom goes bust."[102] This

96. Michael Levi, "Why More U.S. Oil May Not Mean Cheaper U.S. Gas." Bloomberg News, April 16, 2013. http://www.bloomberg.com/news/2013-04-16/why-more-u-s-oil-may-not-mean-cheaper-u-s-gas.html
97. Stephen Voss and Lananh Nguyen, Op.Cit.
98. Mark J. Perry, "Growing oil output means US should end export ban." American Enterprise Institute, June 18, 2013. http://www.aei-ideas.org/2013/06/growing-oil-output-means-us-should-end-export-ban/
99. Blake Clayton, "The Case for allowing U.S. crude oil exports." Council on Foreign Relations, July 8, 2013. http://www.cfr.org/oil/case-allowing-us-crude-oil-exports/p31005
100. Scott Lincicome, "License to Drill: The Case for Modernizing America's Crude Oil and Natural Gas Export Licensing Systems." Free Trade Bulletin No. 50, February 21, 2013. http://object.cato.org/sites/cato.org/files/pubs/pdf/ftb-50_1.pdf
101. "EU wants US to end crude export restrictions." Argus Media, July 15, 2013. http://www.argusmedia.com/pages/NewsBody.aspx?id=855669&menu=yes
102. Maria van der Hoeven, "US must avoid shale boom turning to bust." Financial Times, February 6, 2013. http://www.ft.com/intl/cms/s/0/af84760a-6fa2-11e2-956b-00144feab49a.html#axzz2bwwgdm6o

The economic benefits of reducing oil demand far outweigh the benefits of exporting U.S. oil to the world and avoid the cost of increasing local pollution and climate change.

The fracked landscape of the Jonah Natural Gas Field, Upper Green River, Wyoming. ©Ecoflight

article was republished in the Huffington Post[103] and reported in both industry and mainstream media.[104]

These advocates for U.S. crude exports generally dismiss or ignore the following key issues:

- Maximizing U.S. oil production will exacerbate climate change and incur substantial damage to U.S. land, water and air as well as cause disruption and stress in hundreds of American communities.

- There remains significant scope for U.S. and Canadian refiners to increase their intake of North American light crudes under the existing export regime. Maintaining the current regulations incentivizes them to do so by keeping U.S. tight oil discounted to imported light oil. A genuine shortage of light oil refining capacity is still many years off.

- There remains a significant gap between U.S. oil consumption and production and this gap may never be bridged by increasing production. By far the best way to bridge this gap is to reduce domestic demand for oil further. The economic benefits of reducing demand far outweigh the benefits of exporting U.S. oil to the world and avoid the costs of both increasing local pollution and climate change that deregulating exports would incur.

INDUSTRY'S DISSENTING VOICES

The case for U.S. crude exports is being made with increasing confidence and regularity, but support for crude exports beyond Canada is not shared by all industry players.

Independent refiners, refining companies with no interests in oil and gas extraction, clearly have an interest in maintaining the ban so that they continue to have access to 'price advantaged' crudes. The largest independent refiner, Valero, is clearly against the idea of deregulating exports, as its interests lie in supplying its North American refineries with as much discounted North American crude as possible. A Valero spokesman told the Financial Times that, "(i)t actually makes more sense to keep the oil here and refine it at a low cost and then export products."[105] Valero is the leading U.S. exporter of refined products.

And while they have been mostly silent on this issue, newly independent large refiners are likely to agree with Valero. Both Marathon Oil and ConocoPhillips have recently split the refining segments of their business into separate companies, creating two new large companies operating in the U.S. refining space. These new independent refiners, Marathon Petroleum and Phillips66, share Valero's interest in maintaining the status quo on crude exports, and keeping discounted North American crude in North America.

As the Bloomberg survey mentioned above demonstrates, many in the industry are skeptical that crude oil export regulations will change any time soon. North America's refiners have an interest in maintaining the status quo and have plenty they can do to relieve the pressure for exports by expanding their capacity to refine America's light-sweet oil. The next section explains what refiners are doing in this regard and demonstrates that in contrast to some of the pro-export rhetoric, the United States may yet be some way from running out of refinery space for its growing light oil production.

103. http://www.huffingtonpost.com/maria-van-der-hoeven/obstacles-in-the-path-to_b_2638047.html
104. See for example CNBC, "IEA chief: Export ban could limit US oil boom -FT op ed." February 6, 2013. http://www.cnbc.com/id/100439702
105. Gregory Meyer, "US crude exports argument needs refining." Financial Times, February 8, 2013. http://www.ft.com/intl/cms/s/0/a53a708e-71fd-11e2-89fb-00144feab49a.html#axzz2bwwgdm6o

Gas flares in the Williston oil field, ND. ©Ecoflight

Stone Energy Drill Pad 2,
Lewis Wetzel Wildlife Management Area, WV -
©D. Manthos - SkyTruth, via LightHawk

7. WILL THE TIGHT OIL REFINING WALL EVER REALLY HIT?

Deregulating crude oil exports would greatly expand the market for U.S. tight oil. U.S. tight oil could be refined in the vast majority of the world's refineries and would compete with high quality crudes from the Middle East, North and West Africa and other major sources. This would raise the price of tight oil to international levels and support increased production in the United States. This is the main driver behind increasing calls from industry proponents for an end to the export ban.

While deregulating exports now would almost certainly raise profits for U.S. crude producers, it remains open to debate whether, and at what point in time, tight oil production will actually exceed North American refining capacity. Hitting that wall depends on both the ability of refiners to expand their capacity to process more light oil, and the pace of tight oil production growth.

While Chapter 1 explained that there remains a lot of uncertainty as to how much tight oil can actually be produced, this chapter describes how refiners are raising their capacity to refine tight oil.

THE GROWING NORTH AMERICAN MARKET FOR TIGHT OIL

Without a change in the crude export regulations oil producers and refiners have a number of options to increase the market for tight oil:

- Refinery Modifications: modifications can be made to increase light oil capacity even at refineries that are configured for heavy oil;
- Condensate Splitters: Refiners and producers can invest in relatively inexpensive 'splitters' that parse condensates into products that can be exported without a license;
- Increase exports to Canada: With additional investment in transport logistics, Canada can absorb around 400,000 b/d of U.S. light oil;
- Exploit loopholes: if producers are faced with a genuinely limited market for light oil they may attempt to exploit loopholes in the export regulations that may allow exports if no option is available to producers to market the oil in the United States.

As explained above, exports to Canada are already growing and this may take the pressure off of deregulation for some time. But what are U.S. refiners doing to take advantage of the flood of discounted domestic oil that is coming their way?

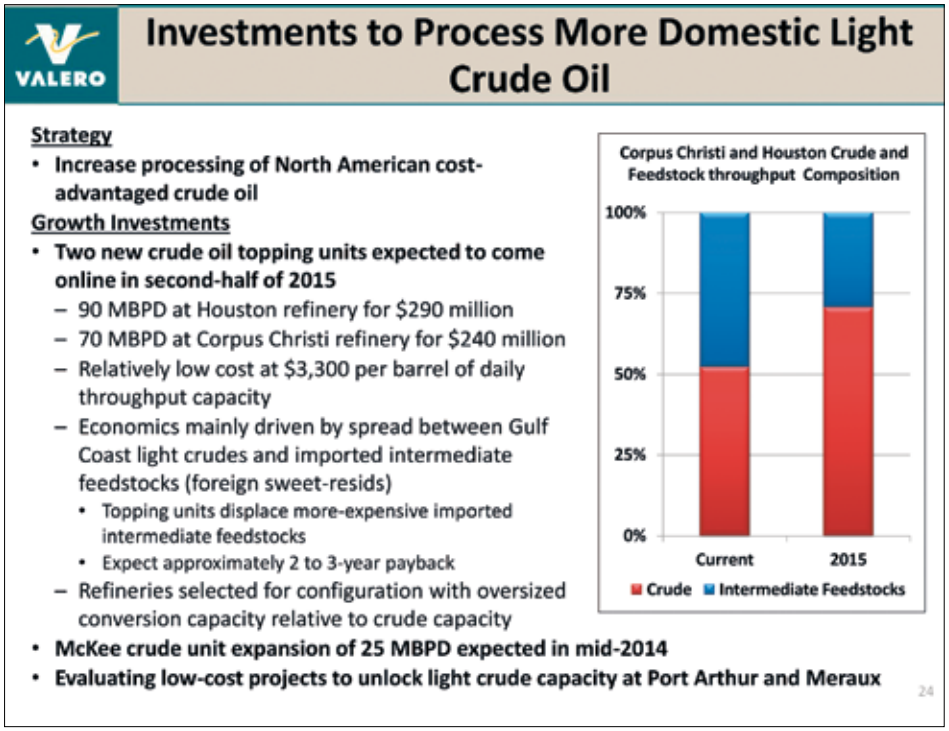
Refinery Modifications: Increasing U.S. Capacity to Refine Light Oil

The flood of tight oil in the U.S. is challenged by limited capacity to refine the particular quality of oil being produced. Refiners with access to domestic light-sweet crude have first replaced similar quality imported crude with domestic supply. They then have sought to optimize existing equipment to handle more light-sweet oil, where previously the high price of imported light crude led them to seek cheaper heavier grades. For example, Valero told the Financial Times in February 2013 that light-sweet oil has gone from being about a third of its overall supply to around half.[106]

But as tight oil continues to grow, many refiners are investing in new equipment to significantly increase their capacity to refine light oil. Each refinery is different, so modifications to increase light oil

106. Greg Meyer, "US crude exports argument needs refining." The Financial Times, February 8, 2013. http://www.ft.com/intl/cms/s/0/a53a708e-71fd-11e2-89fb-00144feab49a.html#axzz2bwwgdm6o

Figure 11. Investments to Process More Domestic Light Crude Oil



Source: Valero July 2013 Investor Presentation, Slide 24.[107]

capacity will differ among refineries. Some will need to modify the crude distillation tower that first parses the crude into different intermediate products to be further refined. Others will need to add 'downstream' capacity to process those intermediate products into finished fuels.

A key investment that enables increases in light oil distillation capacity at refineries designed for heavier crudes is a 'pre-flash' or 'topper' unit. These are drums or towers used to separate out the lightest components of the crude before it enters the main distillation tower. These 'light ends' – naphtha and other petrochemical feedstocks and gasoline blending agents – can then be exported as refined product even if they require further processing. This helps a refinery increase its intake of discounted domestic oil without having to seek markets for increased production of finished fuels such as gasoline, the demand for which is in decline in the United States.

Valero is installing topping units at two of its Texas refineries and is evaluating additional projects at its other Gulf Coast refineries (see Figure 11).

Other modifications depend on both the design of the refinery and its market. Importantly, these modifications are relatively cheap, ranging from tens to hundreds of millions of dollars. As Figure 12 shows, Valero is spending less than $300 million on each of its planned topping units and is expecting a two to three year payback. This is in contrast to the billions involved in projects to process heavy sour oil that many U.S. refiners have undertaken in recent years.[108]

Splitters: One Answer to the Condensate Problem

As explained in Chapter 2, condensate is the lightest form of hydrocarbon classified as crude oil. There is a limit to how much condensate a refinery will process as it can only be used for making the lightest refined products. Some U.S.-produced condensate is blended with tar sands bitumen as a diluent, which enables bitumen to move in pipelines.[109]

As a result of its limited uses, condensate sells at a discount to crude oil and that discount has been increasing with the growing supply of condensate. In the last quarter of 2012, the discount reached over $26 a barrel compared to under $7 in 2010.[110]

But refiners are now building condensate splitters, which are basically very simple refineries that can be cheaply built and operated. They are designed to split the condensate into various components such as naphtha, kerosene and gasoil. These can then be exported as refined products, and therefore splitters provide a relatively inexpensive solution to the condensate market problem. Exporting the products produced in condensate splitters could raise revenues from condensate by nearly $10 billion a year.[111]

Some of the products from these splitters will also go to domestic chemical producers, many of which are expanding to take advantage of the flood of cheap feedstock.[112] Total and BASF already have a 75,000 b/d splitter running at an ethylene plant in Port Arthur, Texas. Kinder Morgan is building a splitter in the Houston area that has already been upsized twice while still under construction. The first phase will begin production in 2014 and expansions will come on stream in 2015. The 100,000 b/d expanded facility is said to cost $360

107. http://www.valero.com/InvestorRelations/Pages/EventsPresentations.aspx Note that Valero periodically replaces these presentations with the latest update. This slide may have moved or been replaced in the latest available presentation.
108. For example, BP's Whiting Refinery has just completed a $3.8 billion, 5 year project to enable it to switch 85% of its capacity to processing Canadian tar sands heavy oil. http://www.bp.com/content/dam/bp/pdf/WRMP.pdf
109. Sandy Fielden, "It's a Kinder Magic - The Eagle Ford Canada Diluent Trail." RBN Energy LLC, January 22, 2013. http://www.rbnenergy.com/its-a-kinder-magic-the-eagle-ford-canada-diluent-trail
110. Bradley Olson and Mike Lee, "Crude Export Ban No Match for Lightest U.S. Shale Oil." Bloomberg News, February 26, 2013. http://www.bloomberg.com/news/2013-02-26/crude-export-ban-no-match-for-lightest-u-s-shale-oil-energy.html
111. Ibid.
112. Ed Crooks, "US shale gas sparks a chemical revolution." Financial Times, December 17, 2012. http://www.ft.com/intl/cms/s/0/d1a183d2-40a3-11e2-aafa-00144feabdc0.html#axzz2Ub4jfVZx

Refinery viewed from the Houston Ship Channel ©OneEighteen/Flikr Creative Commons

million dollars, a pittance compared to building a refinery.[113]

Valero and Marathon are also said to be planning condensate splitters.[114] Marathon's may be in the Midwest to take advantage of Utica Shale condensates coming on stream in Ohio.

Exploiting Loopholes

If tight oil production does grow to the extent that it overwhelms North American refineries, and if the crude export regulations are not changed, there may be attempts to petition for an export license on the basis that there is no viable market in the U.S. for the crude. This seems a long way from happening right now, but there is language in the export regulations that appears to open the door.

Section (b)(2)(i)(C) reads:
...the following kinds of transactions will be among those that BIS will determine to be in the national interest and consistent with the purposes of EPCA... In which the applicant can demonstrate that, for compelling economic or technological reasons that are beyond the control of the applicant, the crude oil cannot reasonably be marketed in the United States.[115]

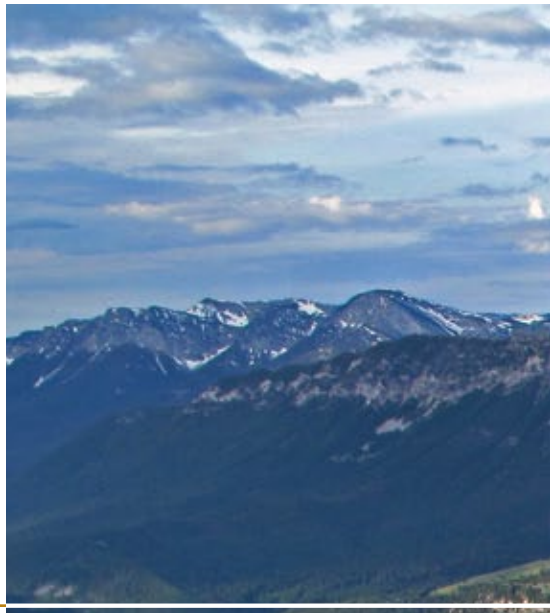
To our knowledge this has not yet been attempted and it is unclear what documentation BIS would require but the language does suit the potential situation that U.S. producers might face.

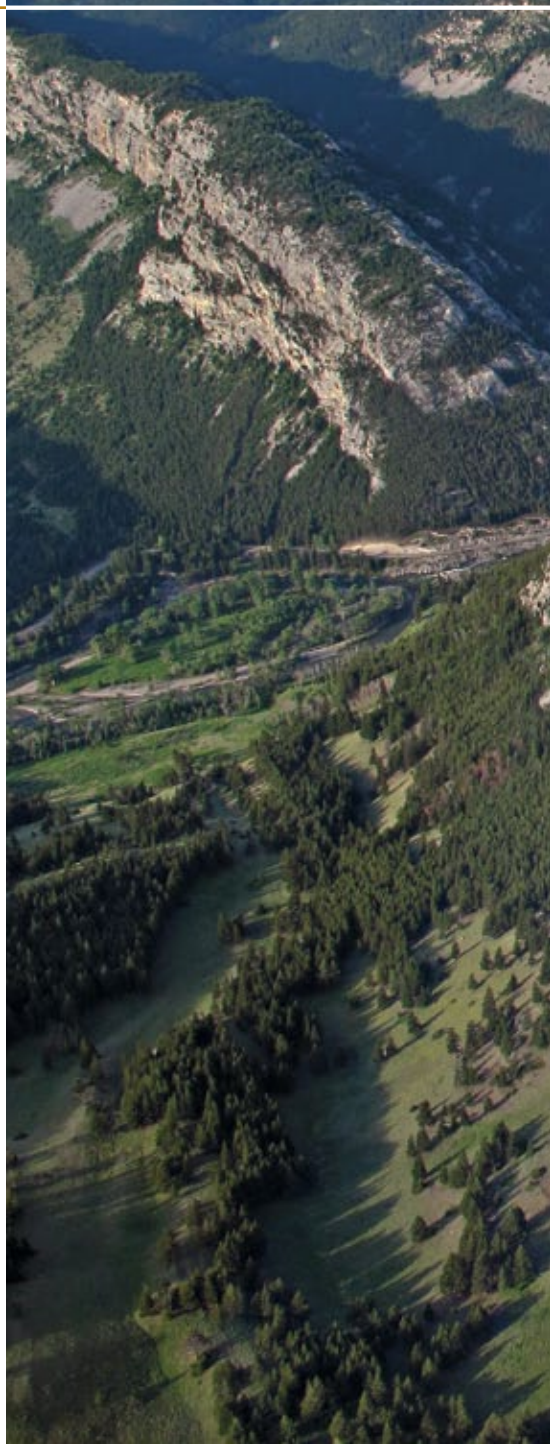
Other than exploiting loopholes in the regulations, many of these means of expanding North American tight oil refining capacity are already in development. The expansion of refining capacity or construction of condensate splitters are permitted by local and state governments. The export of crude oil to Canada complies with existing export regulations. But making significant changes to the export regime will require an act of Congress.

Implementing an act of Congress to deregulate crude oil exports will involve study and debate of the costs and benefits. As one of the aims of deregulating exports is to increase tight oil production, the impact of tight oil production on local communities, land, water and air as well as its contribution to climate change must be considered.

113. "Kinder Morgan may further expand Houston condensate facility." Reuters, April 17, 2013, http://www.reuters.com/article/2013/04/17/kindermorgan-condensate-idUSL2N0D42KW20130417
114. Seeking Alpha, February 27, 2013. "Valero's New Splitters for Bakken/Eagle Ford Condensates and its Retail spin-off mean more value." http://seekingalpha.com/article/1229431-valero-s-new-splitters-for-bakken-eagle-ford-condensates-and-its-retail-spin-off-mean-more-value
115. U.S. Government Printing Office. Electronic Code of Federal Regulations. Title 15: Commerce and Foreign Trade. PART 754 0 Short Supply Controls. http://www.ecfr.gov/cgi/t/text/text-idx?c=ecfr&SID=eecc5bebf9c27b04895c72f0d08458e4&rgn=div5&view=text&node=15:2.1.3.4.35&idno=15

©Ecoflight





8. CONCLUSION

The development of hydraulic fracturing and horizontal drilling has unlocked billions of barrels of new oil in America. This oil is very different to the heavy oil from Canada's tar sands that until recently many U.S. refiners assumed would form the bulk of their supply in the future.

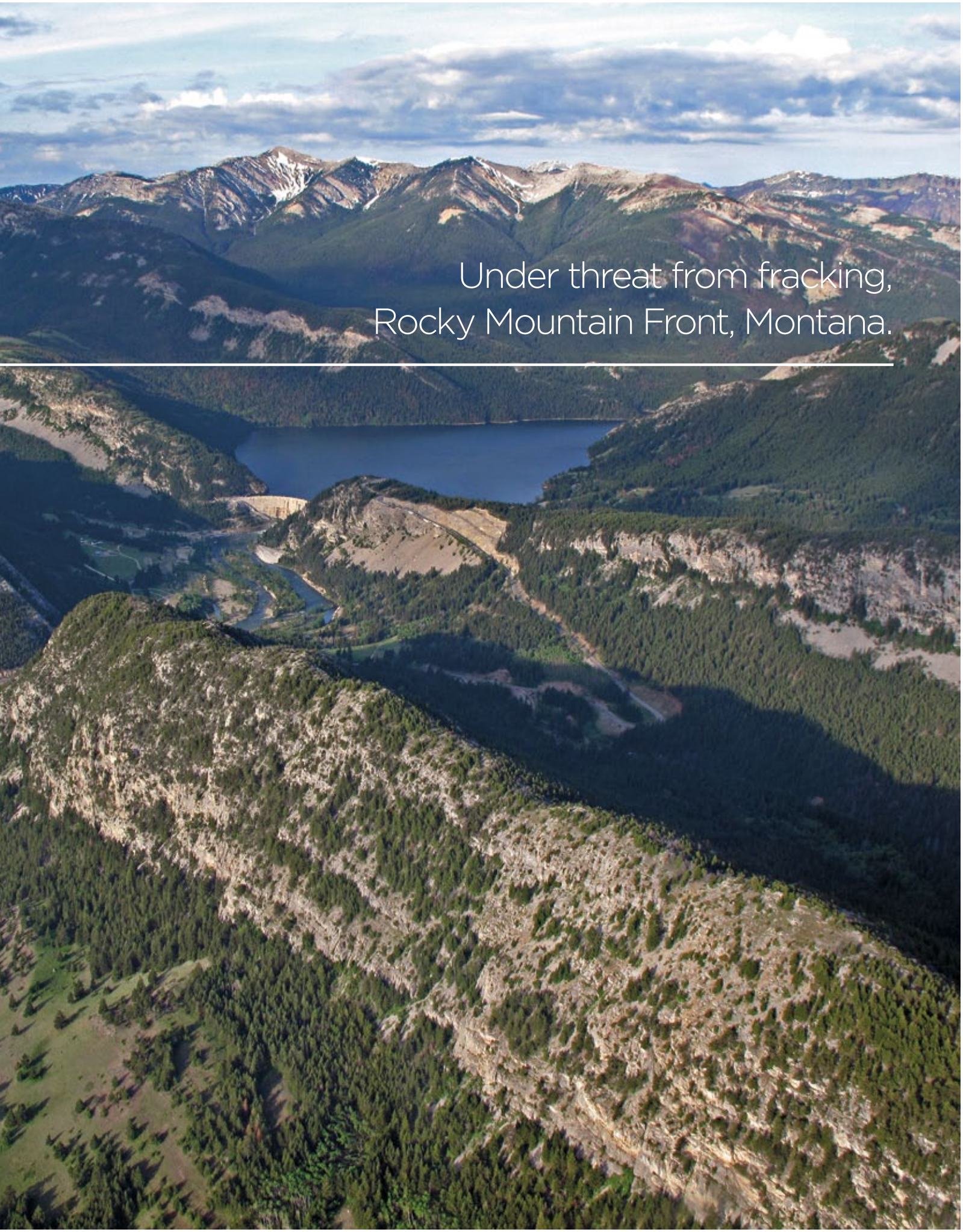
The resulting mismatch between U.S. oil production and U.S. refining capacity is a problem for American oil producers because they cannot export their crude beyond Canada. Prices for U.S. oil have fallen below those on the international market in recent years and are expected to remain discounted for years to come as a result of the restricted market that the export ban creates.

America's oil producers want to change the 40 year-old export regulations so they can increase production and maximize their profits. But the environmental stresses of increasing tight oil production to maximum levels at both the local and global level would be substantial.

Only 20 to 25 percent of existing global proven oil reserves can be produced and consumed if the world is going to avoid catastrophic climatic change. In order to achieve the climate goals articulated in the Copenhagen Accord, signed by the United States, a large proportion of existing fossil fuel reserves must be kept in the ground.

The motivation behind industry calls for deregulated crude oil exports is to enable development of so far undeveloped oil reserves and increase production. This would add to oil reserves that we already cannot fully consume without destroying the climate. This added production would not enhance U.S. energy security or reduce energy prices, it is intended to raise prices and serve international markets.

Without an effective regime in place to limit greenhouse gas emissions globally, deregulating U.S. crude oil exports can only exacerbate an already critical global climate crisis. The United States should not export its crude oil but should instead play a leading role in international efforts to keep fossil fuels in the ground.



Under threat from fracking,
Rocky Mountain Front, Montana.

OILCHANGE INTERNATIONAL

October 2013