

Oil and Gas Practice

Perspectives on
downstream oil and gas**IMPLICATIONS OF LIGHT TIGHT OIL GROWTH FOR
REFINERS IN NORTH AMERICA AND WORLDWIDE****January 2014***Tim Fitzgibbon, Matt Rogers*

The production of light tight oil (LTO) – or unconventional oil – in North America has grown dramatically, rising from almost nothing in 2010 to over 2 million barrels per day (bpd) in 2013. This growth shows no sign of slowing, with production currently increasing by about 75,000 bpd each month.

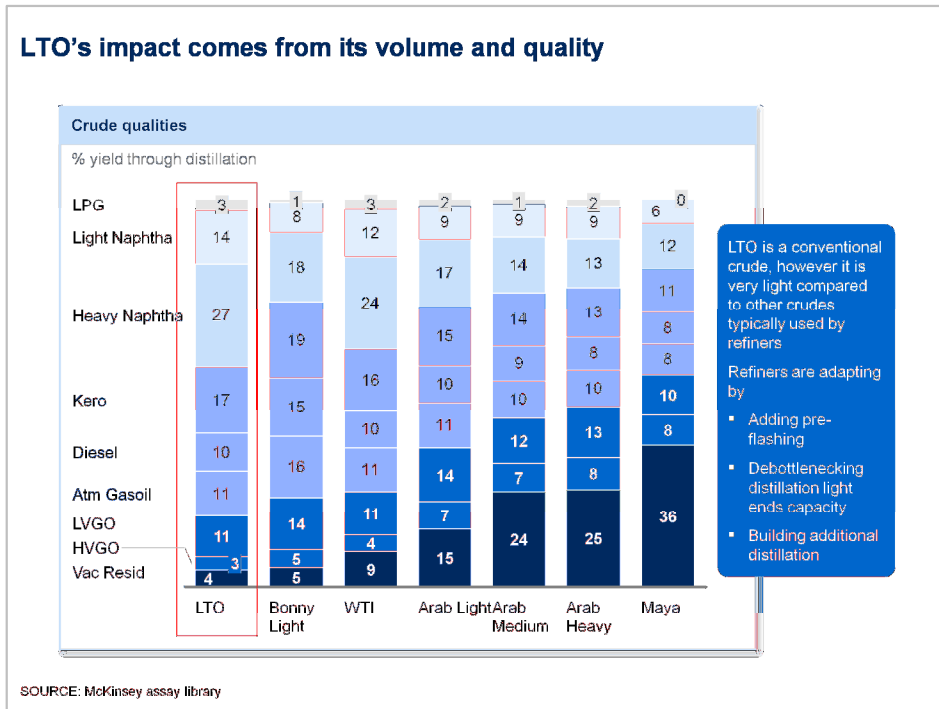
The application of production techniques that were first applied to shale gas – horizontal drilling in combination with hydraulic fracturing—has been driving this trend. These techniques have allowed producers to tap a vast resource that, while well known for many decades, has until now been uneconomic to produce. Most of this growth has come from two basins, the Bakken in North Dakota and the Eagle Ford in South Texas. However, the techniques are increasingly being applied in a number of other areas. While these newer plays are typically smaller -in acreage and resource size than the Bakken and Eagle Ford, several of these developing plays are reporting similar well sizes, and showing attractive economic returns and growth.

The volume, quality, and location of LTO supply growth pose both challenges and opportunities for the refining industry in North America, and the resulting changes could have important consequences for refiners worldwide.

LTO QUALITY AND ITS RAMIFICATIONS

LTO from all resource areas is consistently lighter and sweeter than typical crude oils processed by North American refiners. LTO has almost twice as much naphtha and half as much bottoms material as Arab Light (Exhibit 1). Even relative to other light-sweet grades, such as West African Bonny -Light or West Texas Intermediate (WTI), LTO is noticeably lighter.

EXHIBIT 1



US refiners have invested heavily over the last two decades to process medium- to heavy-crude slates, especially on the US Gulf Coast. To process greater quantities of LTO, most refiners will have to either debottleneck the light-ends part of their distillation, or add new distillation that is specifically suited to LTO. Longer term, as LTO displaces medium and heavy crudes, refiners will struggle to keep their high-value conversion units (FCC, hydrocracking, and coking) full. They will either need to reduce utilization of these units or find ways to backfill, perhaps through importing feedstock.

Based on McKinsey's outlook for LTO growth, we expect the Gulf Coast refiners' crude diet to shift dramatically by 2020. Whereas light crude is currently a small share of total crude diet, by 2020 LTO volumes could increase to more than half of the total crude diet for Gulf Coast refineries, backing out large volumes of crude currently imported from the international market. This has significant implications for domestic producers, for suppliers of current crude imports to the US, and for global trade flows.

LTO PRICING AND LIGHT/HEAVY REFINING DIFFERENTIALS

Greater LTO use on the Gulf Coast will likely result in a depression of US light/sweet crude prices relative to the international market (i.e., Brent). Typically, light sweet crude on the US Gulf Coast has priced at a premium of \$1 to \$2 dollars per barrel to Brent, in line with the delivered prices for the imported light sweet barrels that are needed to meet refinery demand. However, LTO growth has already backed out 700,000 bpd from West Africa and the rest of the light sweet import barrels should be gone soon, with the exception of strategic placements of Saudi crude into the US market.

After all the light sweet barrels are replaced, the economically rational answer would be to begin exporting light sweet oil from the US to simple refineries in Latin America, Asia, and Europe. However, the US currently prohibits crude exports under most scenarios.

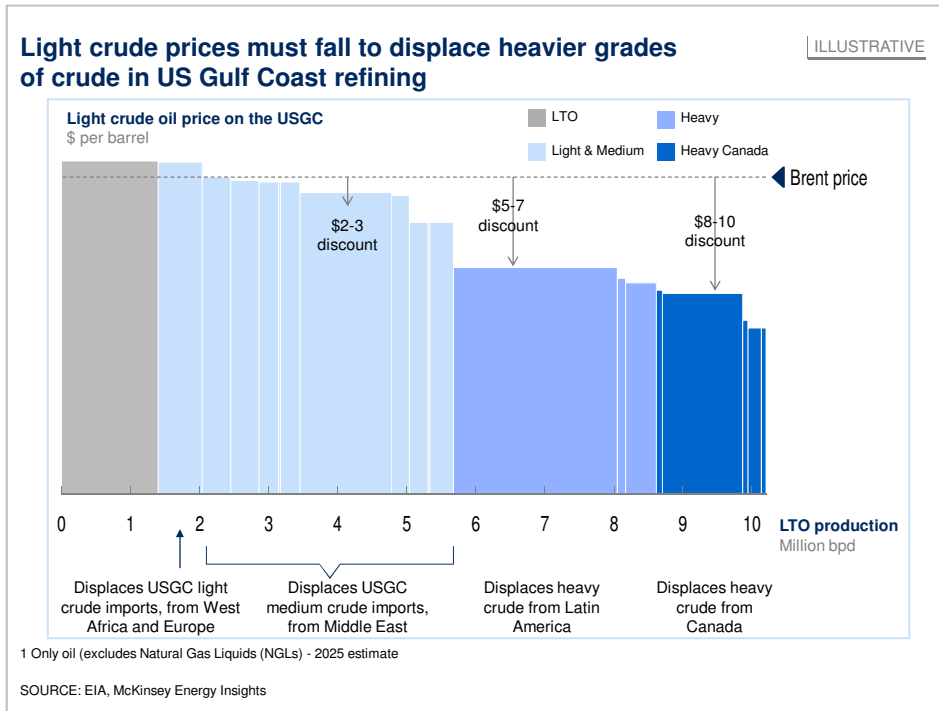
If the export ban stays in place, LTO will have to start displacing cheaper medium-sour barrels (Exhibit 2). This displacement will provide room to absorb several million bpd of additional LTO, but will require the LTO price to drop to remain competitive with the cheaper crude it is displacing in the more complex refining configurations. With greater penetration of LTO, the required price drop for LTO could increase to \$5-7 below Brent. At the highest conceivable levels of LTO supply where LTO has to displace heavy sour crude, this could require a discount of \$8 to \$10 dollars per barrel or more.

On a global scale, LTO also has the potential to affect the global supply-demand balance for residuum (resid) and light/heavy differentials. Greater use of LTO displaces other heavier crudes and results in less production of resid -- the bottom of the barrel material that LTO largely lacks.

The supply-demand balance for resid is already snug due to overbuilding of deep conversion capacity. Resid pricing traditionally moves between a range of levels depending on the supply-demand balance, and is currently pricing at its high-price mechanism, into mild conversion. So a further reduction in resid supply is most likely to support continued pricing at this level.

This is good news for heavy crude producers who realize higher prices as a result. It is bad for refiners who make less money running their deep conversion units that upgrade resid to higher-valued products.

EXHIBIT 2

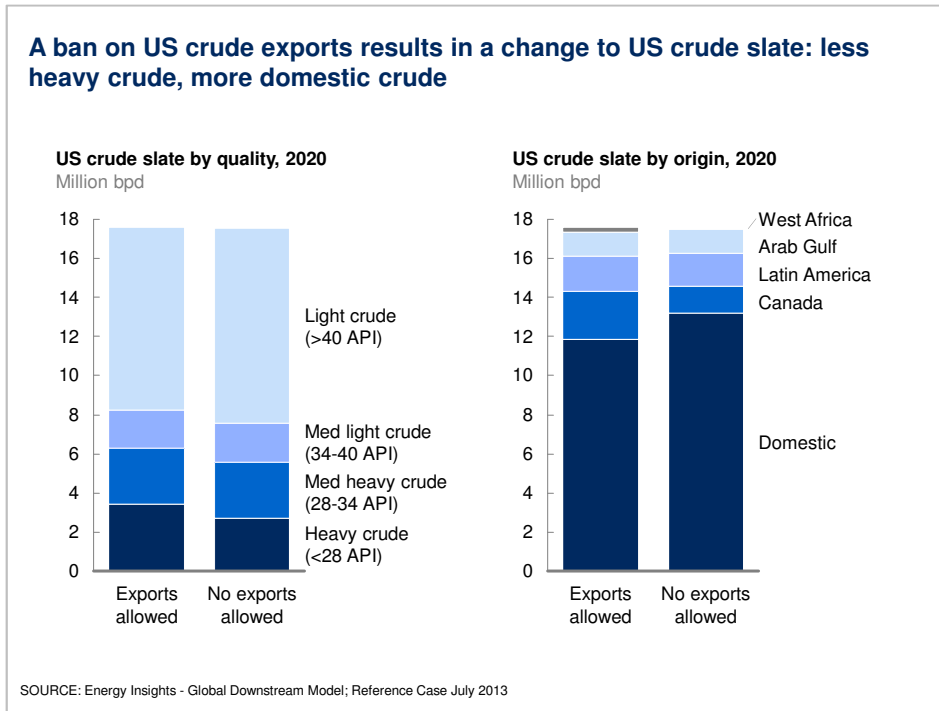


SHIFTING TRADE FLOWS AND PRICING

Currently, the US Gulf Coast is the largest market for Latin American heavy crudes (from Mexico, Colombia, Venezuela, and Ecuador). When LTO begins to push out imported heavy sour grades, Latin American crudes will need to find new outlets, which could possibly include selling to customers much farther from home and increased processing in domestic refineries. If planned domestic refinery expansion and conversion projects move ahead, Latin American players would be able to absorb about half of the loss of demand from the Gulf Coast. The remainder would likely be absorbed by a decline in production.

We assume in our modeling that some US exports of crude would be permitted. However, this is by no means certain. If we instead model a strict ban on exports of US crude (except to Canada), we see an even greater lightening of the US refiner crude slate and backing out of crude imports. In this case we would also be likely to see Canada boost its heavy crude exports significantly; Canada does not restrict its crude exports.

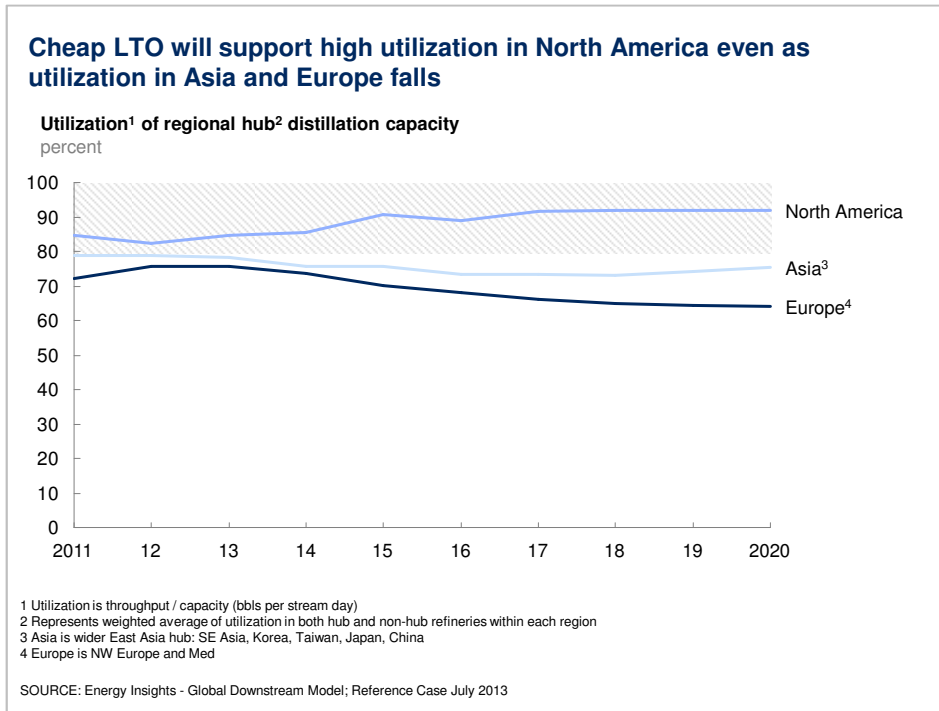
EXHIBIT 3



In this more extreme scenario, it is probable that Canadian and Latin American crude flows would increase to other more-distant markets, especially Asia. This would serve to depress all Americas crude relative to the rest of the world by \$2 to \$5 dollars per barrel.

A further impact of LTO growth will be higher utilization rates for North American refineries, compared to the rest of the world (Exhibit 4). Although they have capacity well above what is required to satisfy domestic demand, US refiners (especially on the Gulf Coast) will have a strong incentive to run flat out to supply the export market.

EXHIBIT 4

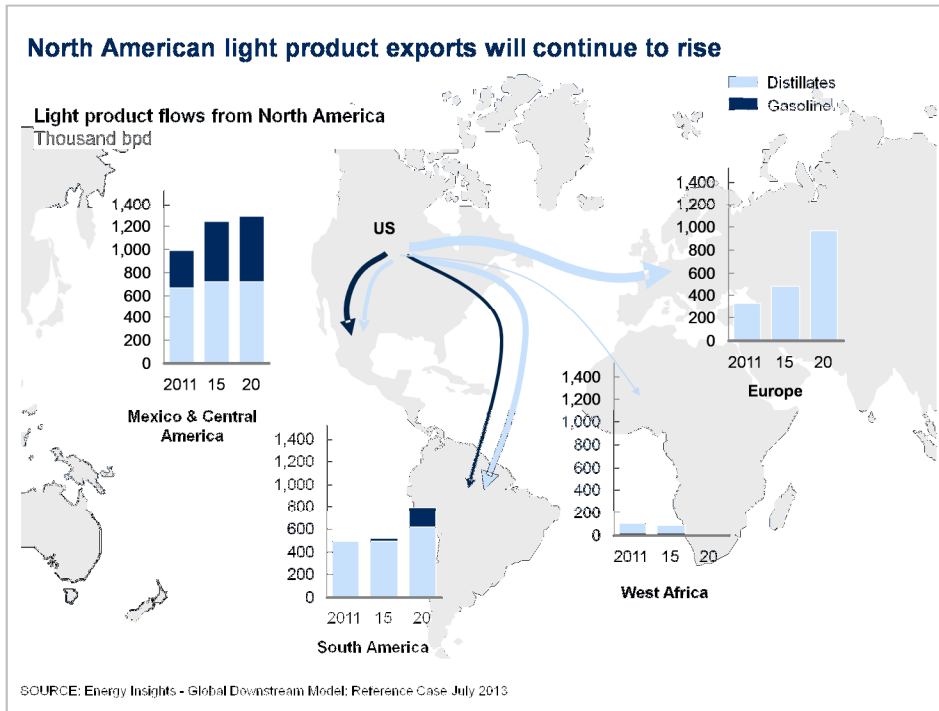


This ability to play in the export market will be critical in enabling US refiners to maintain high utilization rates even though they face a steadily declining domestic market. While demand for transportation should continue to grow, fuel demand in the US is expected to decline as a result of government-mandated fuel-efficiency requirements that will be introduced over the next 10 years. It is worth noting that were it not for the ability to export growing amounts of product, US refiners would face falling utilization and the need to rationalize capacity, similar to what is currently happening in Europe.

As a result of these developments, global trade flows for light products will also see a shift. The US is likely to send increasing volumes of product to both Europe and Latin America.

LTO lowers the cost of crude in North America relative to other refining centers that could play that export role. Unconventional gas, in turn, makes hydrogen and energy significantly cheaper for US refineries, further extending their advantage. These trends make North American refining more competitive than rival refining centers worldwide. This outcome is also helped by very complex refining configurations on the Gulf Coast.

EXHIBIT 5



Exports to Europe will consist primarily of diesel. Europe is already quite long on gasoline, so it does not have room to absorb exports from North America. However, it needs diesel imports, taking significant imports from Russia and the Middle East. Imports of diesel from the US are already proving very competitive against these other sources due to the low feedstock costs and high complexity of US export refineries. LTO growth should further reinforce this competitive advantage, displacing imports to Europe from other sources, and adding to the need for continued rationalization of less competitive European refining capacity.

Exports to Latin America currently include significant flows of both diesel and gasoline. Most of Latin America is short of refined products due to strong domestic demand growth and an inability of local refiners to expand refining capacity. These trends are likely to continue, creating a strong market for North American exporters, in turn supporting continued high refinery utilization and refiners' ability to absorb large volumes of LTO supply (Exhibit 5).

There is some potential risk to these projections from expansion of Latin American refineries. Many of the large importers have plans to expand existing refineries and/or build new greenfield plants. However, these plans have proven slow to get off the ground, and going forward, the ready availability of product imports from the US should reduce the pressure to make these investments happen.

The expected robust position of North American refiners is in sharp contrast to Asia and Europe. In Europe, utilization will likely continue to fall as domestic demand for oil declines and refiners struggle to compete in the export market due to high costs for crude, hydrogen, and energy, as well as poor refinery configurations. Instead of being able to export to high value markets, European refiners will face brutal competition in shrinking local markets. Asia will be put at a disadvantage as a result of an anticipated overbuilding of refining capacity over the next few years and high crude costs relative to the rest of world.

IMPLICATIONS FOR REFINERS

The implications of this outlook are largely positive for US refiners, though combined with a great deal of uncertainty and need for investment that will still pose significant strategic challenges.

- **Margin outlook** – In general, LTO growth should be good for US refining profitability—with low crude costs, low energy costs, and high exports supporting high refinery utilization. However, LTO will also cap light/heavy differentials, which have traditionally been the principal driver of high US refiner margins. In fact, LTO is likely to prolong the current narrow light/heavy condition. How much impact it will have, though, will depend on the volume of LTO produced, the eventual level of exports, and the supply of other more conventional crude, all of which are highly uncertain. To an even greater degree than in the past, refiners will need to craft scenarios that are robust in a highly uncertain environment.
- **Growing role of exports** – Product exports will be an important offset to declining domestic demand. US refiners should remain highly competitive due to abundant LTO as well as low-cost natural gas, which itself is providing a cost advantage of \$0.5 to \$1 per barrel. Taking full advantage of this opportunity will require investment in export infrastructure, light products shipping capacity, as well as development of deeper trading and logistics capabilities.
- **Changing crude quality** - LTO pricing will be a source of margin advantage. However, capturing this advantage will require investment to handle LTO's extra light-ends. To do this, refiners will need to be able to make the case for significant investment in a market that has traditionally been very challenging. This will require a clear market view and robust project evaluation.
- **Changing crude sources** – Refiners will be in a very different world in terms of crude supply chain. This will require a whole new way of thinking about where and how to source crude and how to manage the volatility and uncertainty in the supply chain on a month-to-month basis. This will require refiners to think very differently about logistics assets and capabilities (rail, barge, etc.).

Continued growth in LTO will also have important implications for refiners in other parts of the world.

- **European refiners** – LTO and other domestic crudes will allow US refiners to place barrels economically into Western Europe at below breakeven levels for European hydroskimming. This will accelerate the rationalization of European refining capacity that is already happening.
- **Latin American refiners** – While Latin American refiners have traditionally seen a strong incentive to invest to serve both local demand and the export market, LTO is now changing the equation. Increasingly, Latin American refiners will need to focus domestic investment on serving only the local market, and the room for inefficiencies in project spending and plant operations will be much smaller.
- **Asian refiners** – LTO will drive increased flows of a variety of crude oil grades to the Asian market as LTO contributes to oversupply in the Atlantic basin. This development will provide an opportunity for Asian refiners to broaden crude slates and adapt configurations to a more flexible operating strategy. On the negative side, growing US product exports will be a strong competitor to new refining capacity in Asia that is focused on the export market. These trends are likely to contribute to overall excess capacity across the region and falling margins and utilization.

In summary, the continued growth of LTO in North America has the potential to drive a fundamental restructuring of the downstream industry, in North America and beyond.

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This article draws on one of Energy Insights' Market Analytics tools -- the ***Global Downstream Model*** -- to identify the impact of North American supply discontinuities on the North American refining sector. The ***Global Downstream Model*** covers global petroleum markets up to 2030, providing a quantitative mid- to long-term perspective on global demand for crude, crude flows, regional petroleum product balances, and refinery utilization rates. The model takes local supply and demand trends, infrastructure and refining configurations into account at a very granular level to ensure a comprehensive view on how local trends will play out on a local and global scale.