

## Mind the Gulf

### Waves of inland crude reaching the Gulf Coast this year could push exports to one million barrels per day, despite obstacles

- **The first waves of crude moving from Cushing to the US Gulf Coast have pushed the inventory glut from PADD II to PADD III, with significant consequences at home and abroad.** US Gulf Coast refiners remain the main beneficiaries, providing them a near-permanent margin advantage. There's fundamentally no benefit received by consumers who continue to pay at global levels for gasoline, jet fuel and diesel. But the consequences are devastating for suppliers from West Africa, the Middle East and the Gulf of Mexico.
- **At first blush there appears to be one clear solution: traditional suppliers to the US need to find other markets, and the recent plunge in imports to the US Gulf Coast is a sign of the pain.** But that choice isn't so easy. On the one hand, some suppliers can at times receive as much as a \$20/bbl higher netback by selling elsewhere, as Mexico's oil marketer PMI, and Saudi Aramco, have recently discovered. On the other hand there remains a lack of upgrading capacity to handle their heaviest and most sour crudes in Europe or Asia.
- **The main problem is a mismatch between incremental US supply, largely light and sweet, and the refining needs of the US market.** This mismatch is resulting in volatile swings in price spreads between light crudes in the US and abroad, with trickle-down consequences for sour crudes on the US Gulf Coast.
- **Later on in 2014, particularly in 2H'14, even larger waves of Canadian crude streams reach the USGC by pipe and rail** and US petroleum product exports should continue to soar. By year-end a combined 500-k b/d or more of Canadian supplies could reach the US East, West and especially Gulf Coasts, creating even more competition for traditional foreign suppliers and exacerbating seasonally volatile crude price spreads.
- **And the problems won't dissipate for WTI, as new supplies from the Bakken and from PADD IV start flowing into Cushing** arriving at just about the same time as the waves of Canadian crude reach the US Gulf Coast, much also via Cushing.
- **One result should be the significant growth of US crude oil exports this year, even if underlying bans remain in place.** Citi sees as much as 1-m b/d of crude exports in 2014 and perhaps as much as another 1-m b/d of foreign product sales. Much of the exports will go to Canada, but Mexico is a potential destination, along with substantial re-exports of Canadian crude to a number of other countries.
- **Otherwise uneconomic refinery expansion is also under way, as it was in the 1970s under other policy constraints,** fueling product exports through the building of inexpensive topping plants and condensate splitters to circumvent the ban on crude exports.

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## Crude oil heading south, east and west

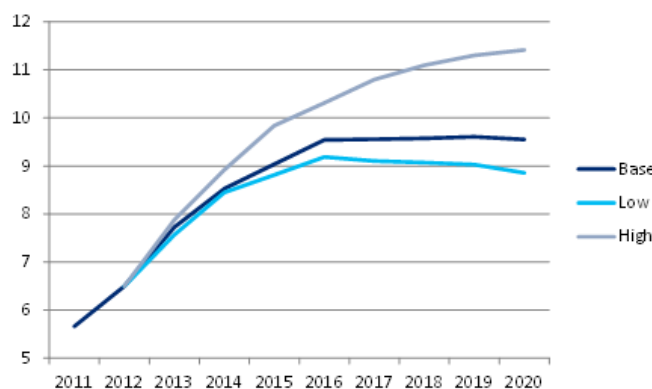
Citi has written extensively on the North American energy revolution, and the ripple effects on pipeline and rail flows, refinery reconfigurations, petroleum product exports, US crude oil price differentials and their signaling of the need for foreign crude suppliers to divert their flows elsewhere, and the growing need for crude exports when surpluses overwhelm domestic refining capacity. In this report the focus of attention is on severely disruptive changes in the US market that are occurring this year and that are likely to have extraordinary impacts on flows in and out of the United States, with profound consequences on global crude oil and product markets.

### Persistent supply growth is the heart of the problem

**The extraordinary facts about the crude oil supply bulge in North America are clear and astonishing: Since 2010, US supply has grown by more than 60% to about 8.4-m b/d, US NGL field output has increased by almost 25% and combined with refinery production is now 3.4-m b/d. And Canadian output has grown over 25% to ~4.2-m b/d. The combined North American liquids production growth of over 4.5-m b/d since the start of this decade is more than the production of every single member of OPEC other than Saudi Arabia, and every country in the world except for Saudi Arabia, Russia and the US itself.**

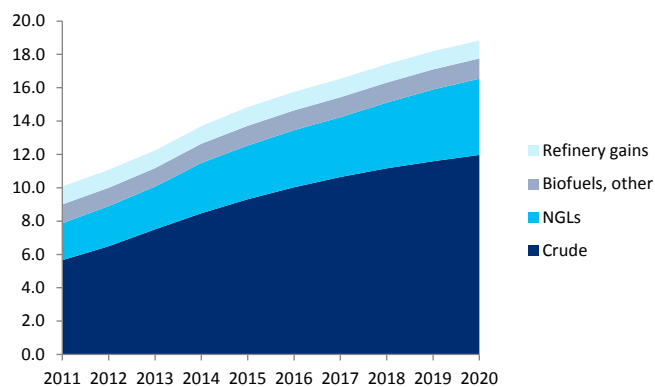
**Just about all of this production growth is bottled up in North America, with Canadian supply still unable to move in large quantities except into the US midcontinent, and now, starting this year, US supply growth begins to reach waterborne areas in large volumes.** Given legal and policy constraints on exports of crude oil out of the United States and infrastructure bottlenecks in Canada, the result has been supernormal refinery margins driving a surge of processed hydrocarbon molecules into soaring exports of petroleum products as well as of natural gas derivative products, or natural gas liquids (NGLs).

Figure 1. EIA AEO 2014 US crude oil production cases (m b/d)



Source: EIA, Citi Research

Figure 2. Citi US liquids production outlook (m b/d)



Source: Citi Research

**While doubts persist about how much further growth is likely to come beyond 2020, there is little doubt about growth continuing into the latter part of the decade.** The EIA has three projections for US output going forward, with a band of peaking between just over 9- to just under 12-m b/d at various points between 2016 and 2020, with its base case of growth to 9.6-m b/d looking questionable given the history of the past three years. Citi's base case is for US onshore production to rise by another 2.7-m b/d by the end of this decade, and offshore production to grow by about 0.8-m b/d, helping nationwide crude production exceed 12-m b/d by 2020. US NGL production could also gain over 2-m b/d, while Canadian oil production could

increase by another 1-m b/d, for a total liquids increment from the North American duo of 6.5-m b/d.

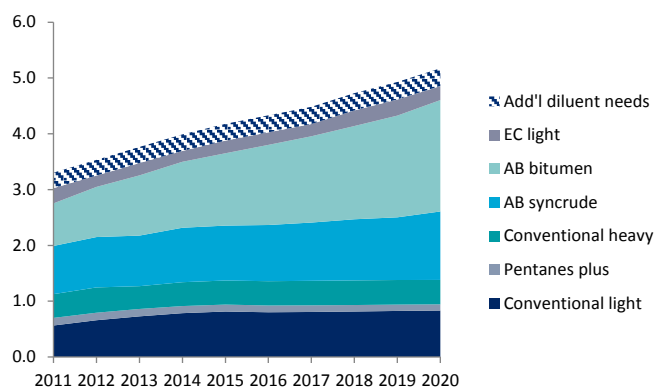
**To put this in context, our expected incremental growth in liquids from Canada and the United States by the end of the decade is almost as high as total Russian crude oil and petroleum product exports, and only 1-m b/d shy of recent Saudi crude oil export levels.**

### Somewhere, somehow, something's gotta give...

All other things being equal, an incremental supply of this magnitude is difficult to absorb but the problems are compounded by the restrictions on crude oil exports from both the US and Canada. Some of the obstacles to crude exports are legal and political, as in the case of the US; some are logistical and political, in the case of Canada. **But accelerating the day of reckoning is that on the US side, incremental production is too light and too sweet for the refining system and even with the accelerated growth of refining, it's too little and too wasteful in terms of capital expenditures.**

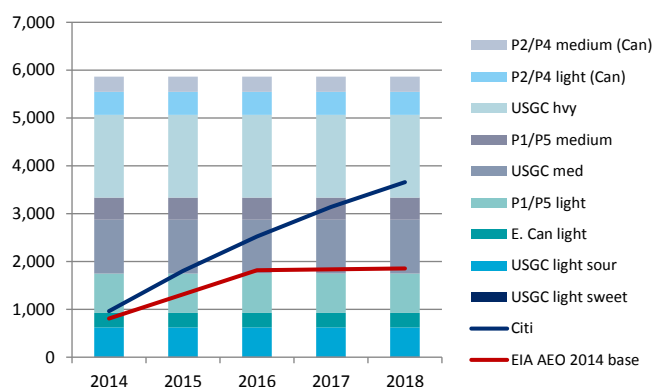
Inevitably, if free market conditions are blocked from the US/Canadian crude oil markets and the export bans and other obstacles remain in place, production has to give at some point and the political system will be responsible for a plateauing of output.

Figure 3. Canadian crude oil production outlook (m b/d, 2011-2020)



Source: NEB, CAPP, Citi Research

Figure 4. EIA AEO 2014 and Citi crude production incremental additions vs. 2013 levels (lines), versus 1Q'14 selected NAM crude imports by quality and region (bars) that can be backed out by US supply growth (k b/d, 2014-18)



Source: EIA, Citi Research

**So the question is: when will the day of reckoning arrive?** At the current rate of production growth and infrastructure development it appears that by 2016 the blocks imposed by current export constraints could result in prices so significantly below those of waterborne crudes of comparable quality, such that production growth tails off significantly, with refiners maxing out in the short-term. The graph above shows US incremental supply growth nationwide versus 2013, overlaid against 1Q'14 crude imports that can be pushed out; it shows the aggregate nationwide picture, and does not take into account the frictions of transportation bottlenecks, stickiness of term contract imports, and crude grade switching costs for refineries. At 1Q'14, USGC light sweet crude imports are practically zero already, while USGC light sour imports are at 600-k b/d. Eastern Canada is importing about 600-k b/d of light crude, of which the US already supplies ~250-k b/d, so there is a

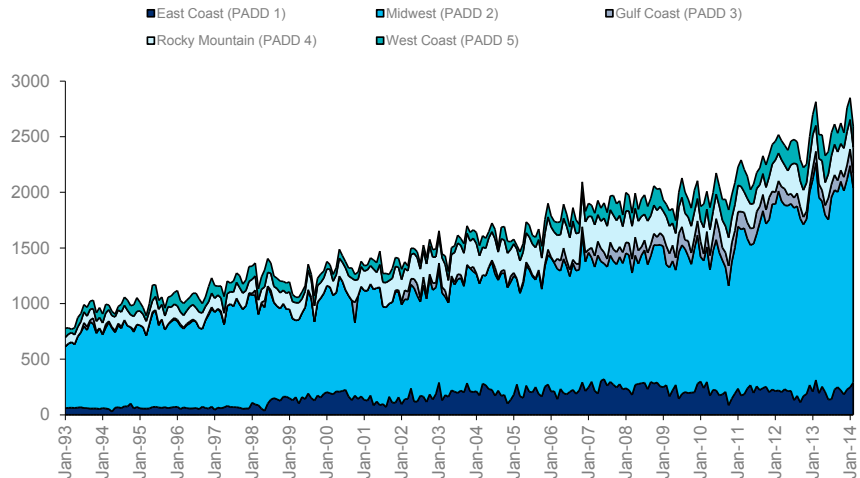
350-k b/d market remaining that could be targeted by USGC flows. (However, Canada could also back out its Atlantic Coast offshore production to send overseas.) PADD I and PADD V light crude imports were around 800-k b/d in 1Q'14; for US midcontinent production can travel by rail as well as limited Jones Act tanker flows via the USGC to erode these markets. By 2016, even with the lower EIA AEO 2014 production outlook, US nationwide light crude imports could be effectively zero (except for light crude imports from Canada), though this aggregate clearing of the US Gulf Coast light crude surplus requires everything to work smoothly in a frictionless world; rail movements to push out East and West Coast light imports would require wider discounts for inland crude, and refinery switching of light sweet crude in place of light sour crude and perhaps heavier crudes would need narrow light-heavy/sweet-sour price differentials. **Pressure to export US light sweet crude should be clear, with US crude grades needing to price for “second-best” solutions to consume the light sweet crude surplus.**

USGC medium crude imports can be progressively pushed out barrel-for-barrel by growing Gulf of Mexico sour production, but does not help light crude balances. PADD I and PADD V medium crude imports number around 450-k b/d, which may be sticky, unless USGC medium sour crude production is shipped there by Jones Act tankers. Heavy crude imports can be backed out barrel-for-barrel by rising Canadian heavy crude flows to the US Gulf Coast, but again, do not help light crude balances. **In fact, the greater availability of local medium and heavy crude supply keep medium and heavy crude prices depressed, meaning refineries have less incentive to switch to using more light crude, unless light crudes price down even further to compete with heavier crudes.**

**But long before even then – perhaps as early as late in 2014 – the next round of refining maintenance reduces demand for crude oil seasonally, and can once again mean that spreads blow out** between US and waterborne grades, bringing with them steep discounts for imported oil if these grades are to remain competitive in the US refining system.

**Exacerbating matters in 2014 is the onslaught of Canadian crude supply**, long trapped both within Alberta and the US midcontinent, rushing to reach the US Gulf Coast by rail and pipe, and both the East and West Coasts of the US (as well as Canada) by rail, creating even more intense competition for foreign sour crude grades in the US market.

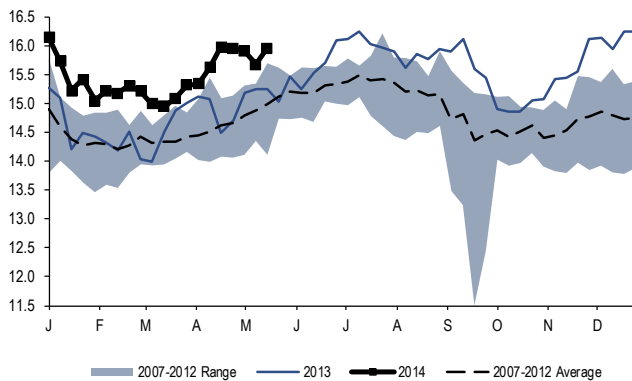
**Figure 5. US crude imports from Canada, by PADD (k b/d) – Canadian crude production growth has been absorbed by PADD II so far; 2H'14 pipelines should allow more crude to end up in PADD III at the expense of PADD II, while western Canadian production growth continues**



Source: EIA, Citi Research

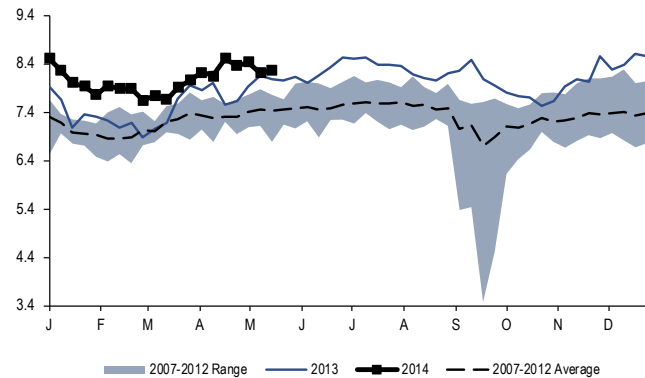
**As a result, either foreign-sourced crude – largely from OPEC countries and Mexico – will either have to step aside and make room for Canadian crudes in the USGC refining system, or discounts in the USGC for these crudes will be so great as to make it logical to re-export Canadian crudes to other markets.**

**Figure 6. US refinery runs far above last year and historical levels as refinery margins have been extremely favorable in the face of high crude stockpiles (m b/d, 2013-14 versus 2007-2012 average)**



Source: EIA, Citi Research

**Figure 7. PADD III refinery runs have been very high, particularly through the spring maintenance season (m b/d, 2013-14 versus 2007-2012 average)**

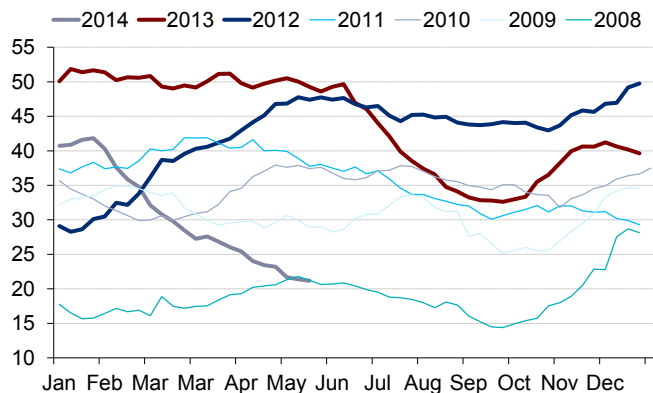


Source: EIA, Citi Research

**Before 2014, foreign-origin light sweet crude had been the first victim of the rise in US light crude production; but local US crude supply that pushed out this competitive crude was largely limited to PADD III production, with the result that US production grew more rapidly than the decline in imports. Two distinct forces were at work. On the one hand US refinery throughput has risen after 2008, both in the midcontinent and on the USGC, with refinery utilization rose from an average of 82.9% in 2009 to 88.3% in 2013. So limitations on crude oil exports became a boon for refiners, reflected in favorable economics of transforming molecules of crude oil into molecules of transformed hydrocarbons exported as**

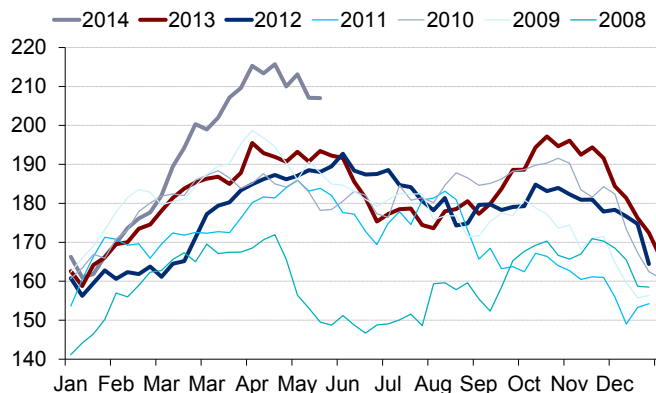
petroleum products, transforming the US from the world's largest net importer of petroleum products into the world's second largest net exporter and soon to be the world's largest by far. On the other hand, a further buffer was the growth in crude oil inventories in PADD II, not just at Cushing, where inventories had grown from 13.4-m bbls in November 2007 to a record of 51.9-m bbls in January 2013. PADD II inventories ex-Cushing have been brimming at the ~70-m bbl level for the last two years, up from the 45-50-m bbl level seen in 2008.

Figure 8. Cushing crude oil inventories (m bbls, 2008-14)



Source: EIA, Citi Research

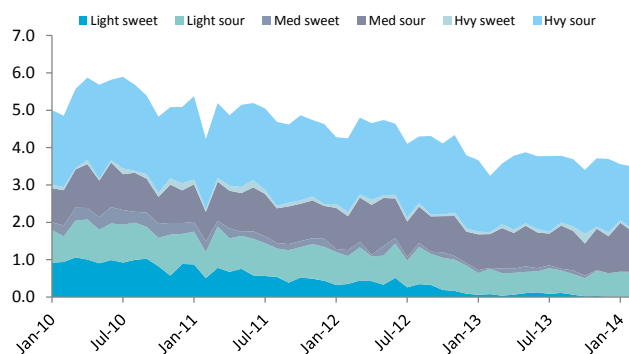
Figure 9. PADD III crude oil inventories (m bbls, 2008-14)



Source: EIA, Citi Research

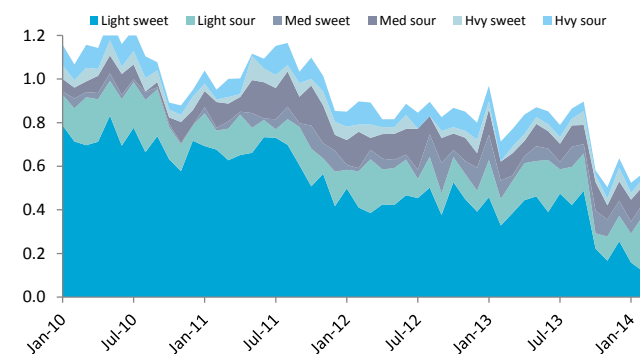
**But as a result, a significant amount of light sweet crude was eliminated from the import slate of the United States, especially through the end of 2013, following the opening of the reversed Seaway pipeline in January 2013, which eventually filled much of its capacity to bring formerly trapped crude to the US Gulf Coast. The reversed line can move either 400-k b/d of light or 300-k b/d of heavier crudes (or a sliding scale in between for a mix of the two). By the end of 2013, light sweet crude imports into the USGC had fallen to a trickle of practically zero from its peak of 1.5-m b/d in March 2007. And by virtue of crude railed to the East and West Coasts, a significant dent was made into imports there as well, particularly on the East Coast where refineries have long lived on a diet of imported crudes from West Africa, the Mediterranean and Northwest Europe. By the end of 2014, there is likely to be close to no light sweet crude coastal imports into PADD I or PADD III and a significant reduction in such imports into Eastern Canada, where US crudes can virtually be freely imported.**

Figure 10. US PADD III crude imports by quality (m b/d, 2010-14)



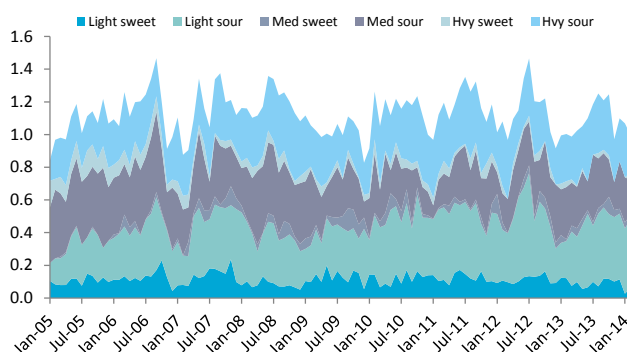
Source: EIA, Citi Research

Figure 11. US PADD I crude imports by quality (m b/d, 2010-14)



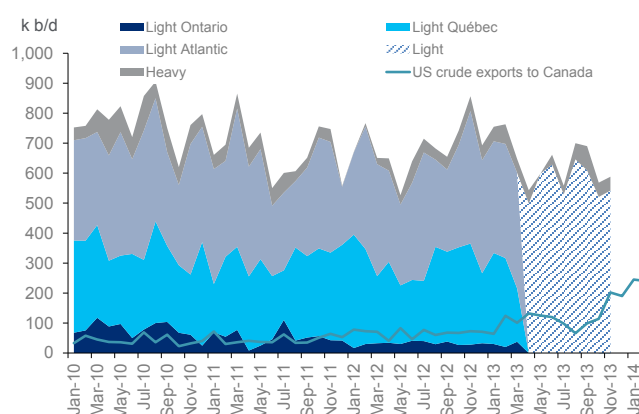
Source: EIA, Citi Research

Figure 12. US PADD V crude imports by quality (m b/d, 2010-14)



Source: EIA, Citi Research

Figure 13. Eastern Canadian crude imports by quality\*, versus US crude exports to Canada (k b/d, 2010-14)



Source: NEB, EIA, Citi Research

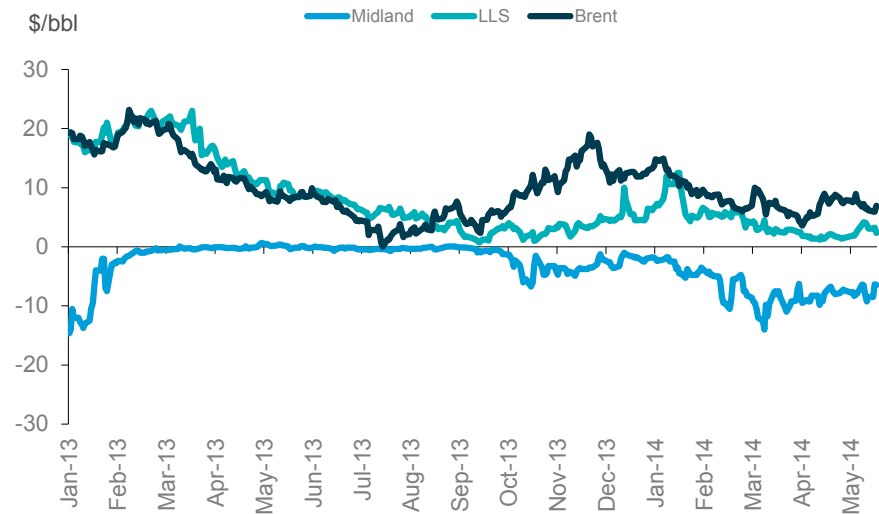
\*NEB stopped disaggregating light crude import data by region in April 2013

## The Big Bulge in 2014

One of the main features of the rapid growth in Canadian and US production has been the lagged timing of pipeline (and rail and truck and barge) takeaway capacity, which has bottlenecked Canadian crude first in Canada and later both in Canada and the US midcontinent and later bottlenecked both Canadian and lighter WTI and Bakken and Permian production at the Cushing, Oklahoma hub. The result has been increased separation of bottlenecked crude streams from competitive, mostly waterborne markets. **But infrastructure and takeaway capacity has punctuated the congestion whether in Hardisty, Alberta, or Clearbrook, Minnesota, or Cushing Oklahoma and relatively rapidly enabled crude prices between once separated crude streams to come close to equilibrating with more competitive conditions.**

**The first big shift toward equilibration began in January 2013**, with the opening of the reversed Seaway pipeline, noted above, facilitating the evacuation of crude from Cushing to waterborne markets on the US Gulf Coast. As a result, a major shift occurred in what had been traditional crude spreads. The historical baseline of course, stems from a time when the US was a massive – and world's largest – importer of crude oil, including light sweet crude streams, virtually all of which are benchmarked against Dated Brent. In order to induce the transportation of these crude streams into the US, Louisiana Light Sweet Crude had to trade at a premium to Brent. **LLS-Brent was typically, rounded, at \$1/bbl. And to move waterborne crudes into the US crude-short inland markets, pipeline tariffs came into play and WTI at Cushing typically traded at \$0.75 to \$1 above LLS, making the WTI-Brent crude spread \$1.75 to \$2, with WTI at a premium.**

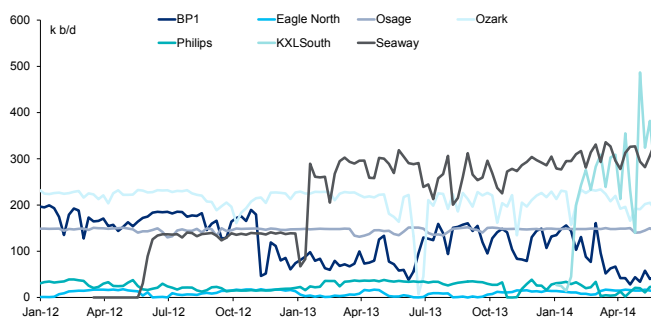
**Figure 14. Brent, LLS, Midland crude oil price differentials to WTI (\$/bbl, 2013-14) – LLS disconnected from Brent as the USGC has become glutted, while Midland also reflects Permian Basin crude abundance and quality specification issues**



Source: Bloomberg, Citi Research

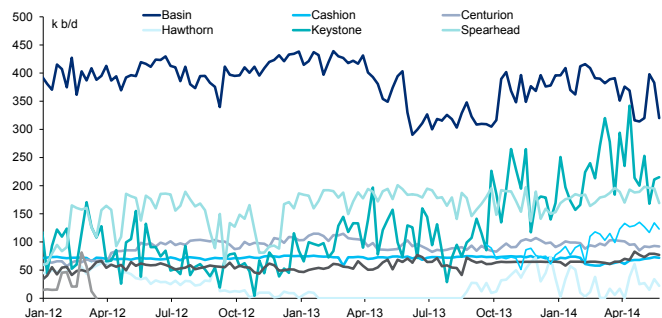
Last year – 2013 – began with a significant blowout in the spread between WTI and Brent, as a record level of inventories in Cushing (just short of 55-m bbls that January) fell through the 40- and toward the 30-m bbl level. But despite the \$20+ WTI discount, due to bottlenecked crude, LLS maintained its historical tie to Brent, trading at a premium through most of the year, as the US still imported some light crude. During the year, especially during peak refinery demand season in Q3, the spreads between WTI and LLS, and LLS and Brent, practically evaporated at times, indicating a new order. **The year ended with a new structural change – the historical correlation between LLS and Brent shifted to a tighter tie between LLS and WTI, with the de-linking of light crude on the US Gulf Coast from waterborne competition and the building out of a crude glut there, and a re-linking and tighter correlation of WTI and LLS, which is now becoming a new structural feature of the US crude landscape.**

**Figure 15. Major pipeline outflows from Cushing, OK**



Source: Genscape, Citi Research

**Figure 16. Major pipeline inflows into Cushing, OK**



Source: Genscape, Citi Research

This year – 2014 – promises to be one of significant disruptive change on the US Gulf Coast and in the relationship between US crude streams and world markets, and so far that promise has not disappointed. But significantly more disruptive

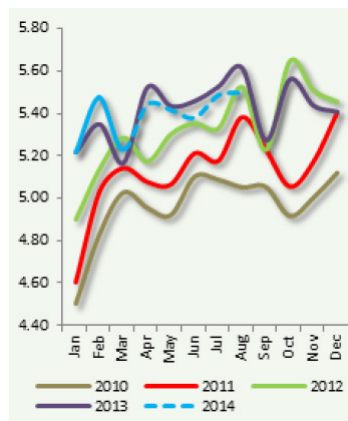
change is on the horizon. These changes are being driven by a combination of a record amount of pipeline takeaway capacity being able to move waves of US light and heavier Canadian crude streams to the US Gulf Coast by the end of the year, and record growth in rail capacity moving US and Canadian crudes to both the East Coast and the West Coast.

**Two safety valves can at times keep US crudes on an even competitive keel with global waterborne markets – rising petroleum product exports, and growing exports of crude oil to Canada.** Beyond this would require significant refinery switching of light for heavy crude and then, potentially, producer curtailments.

**On the first point, product exports have been particularly absorbed by Latin American demand for petroleum products.** Though there are economic headwinds for the region, oil demand growth has remained relatively robust, while refineries have seen lower output due to outages, or slowdowns for modernization projects. Going forward, an expanding product surplus in the US may face more competition in regional and global markets, with modest Latin American demand growth in light products and flattish gasoil demand. Meanwhile, a Latin American fuel oil surplus is ballooning due to substitution by LNG supply for gas-fired power generation in place of fuel oil, reflected also by burgeoning residual fuel oil inventories on the US Gulf Coast.

**Greater product supply from new refinery capacity in the Middle East (and China) place further pressure on petroleum products globally, meaning that US product exports likely need to price down to grow;** this is in line with the expectation of refinery margins worldwide coming under pressure, though US refiners' access to cheap local feedstock could help them keep refinery runs high, while US product demand declines for major petroleum products could drive a larger exportable surplus, with gasoline demand easing on demographic and fuel efficiency, while natural gas substitutes increasingly for diesel demand from the transportation sector. (Some US product demand growth can come from the NGL/LPG sector, but even there, US NGL exports can continue to rise on growing domestic surpluses driven by overwhelming supply growth from shale plays.)

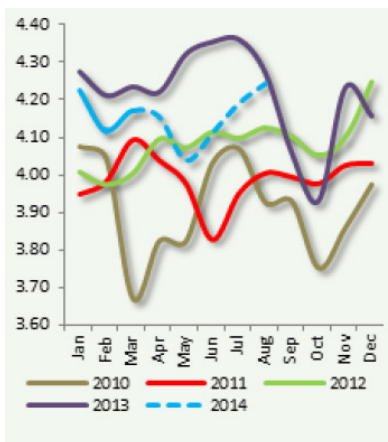
Figure 17. Latam-6\* demand for main petroleum products (m b/d)



Source: FGE

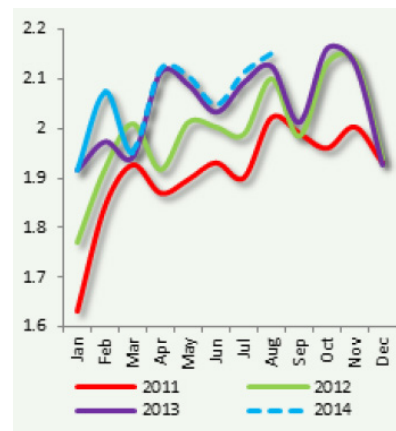
\* Argentina, Brazil, Chile, Ecuador Mexico, Peru

Figure 18. Latam-6 refinery runs have been lower but can begin to recover (m b/d)



Source: FGE

Figure 19. Latam-6 gasoil demand is seeing tepid growth in 2014



Source: FGE

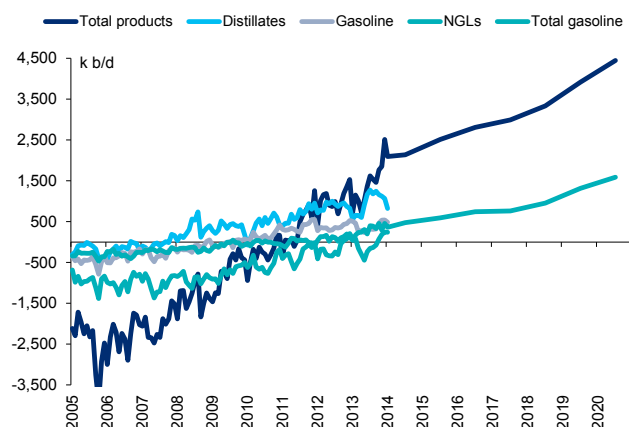
On the second point, even this year, without an allowance for further crude exports, US oil prices should periodically become detached from world markets, blowing out the spreads between WTI/LLS and Brent, and taking with them the heavier, sourer crudes benchmarked against them on the USGC – especially crudes from Kuwait, Mexico, Saudi Arabia and Venezuela.

US Gulf Coast waterborne export capacity is a concern, and is hard to track comprehensively. Citi's assessment, based on company reports, is that current crude and petroleum product export movements may only be utilizing a ballpark 60% of total waterborne export capacity, suggesting that this should not be a constraint for rising export volumes for some time. The problem might be that this capacity is largely in the hands of refiners who have limited incentives to export cheaper than waterborne crude oil, as opposed to petroleum products.

But perhaps most disruptive and dislocational of all could be the waves of Canadian crude reaching the USGC and even the East and West Coasts this year, which from a price competitive perspective is likely at times to be fairly ugly. Pushing out a barrel of heavy crude and replacing it with a barrel of domestic light crude is one thing, requiring light-heavy spreads to narrow and refiners to consider heavy-to-light switching, but Canadian heavy barrels should be highly substitutable, particularly as they become reliable, base-load volumes arriving on the US Gulf Coast.

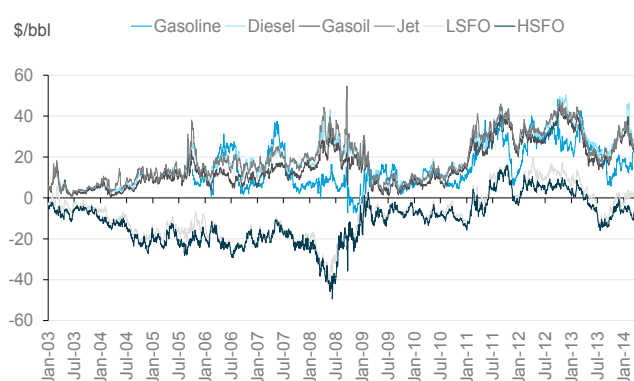
Let us look at these waves of crude flows in more detail.

Figure 20. US net petroleum product exports surge, with more to come, with a chunk driven by NGL supply, also US product demand declines



Source: EIA, Citi Research

Figure 21. US product margins versus WTI stepped up in 2011 as Brent-WTI blew out, and have subsided but are still advantaged globally



Source: Bloomberg, Citi Research

## Open Path to the Gulf

New pipelines from Cushing to the US Gulf Coast and from the Midland area of Texas' Permian Basin should result in a permanent movement of the bottleneck of light and heavier crudes firmly to the US Gulf Coast. The sheer volume of takeaway capacity should mean that the crude surplus in the US can increasingly move to bottlenecks on the USGC and safety valves that can serve to eventually debottleneck the USGC will have to be found there. Logically, that means a combination of (1) higher crude runs, driving higher petroleum product surpluses; (2) lower crude imports; and (3) more crude exports. Empirically, since the USGC refinery system is built on processing heavier and sourer grades, the

mismatch of growing light sweet crude production will mean that eventually pressures will build in that market unless crude exports are allowed more freely.

**Pipelines now connect Cushing firmly to the Gulf Coast, debottlenecking the Oklahoma crude storage hub.** This year began with the 300-350-k b/d (depending on grades) of throughput from via the Enbridge/Enterprise Seaway pipeline (with nameplate capacity of 400-k b/d). But in mid-January 2014, the opening TransCanada's Keystone Gulf line added overnight 700-k b/d of nameplate takeaway capacity from PADD II to PADD III, and the result was a rapid depletion of inventories from Cushing, where stocks fell from some 40-m bbls at the start of the year to a recent low of 21-m bbls, and where USGC inventories built from 161-m bbls to a high of 216-m bbls given refinery maintenance this quarter. Before long, adding to this current 1.1-m b/d in Cushing-to-Gulf takeaway is the twinning of the Enbridge/Enterprise Seaway line, which by mid-year or Q3 should increase combined Cushing-to-Gulf Coast takeaway capacity to 1.55-m b/d.

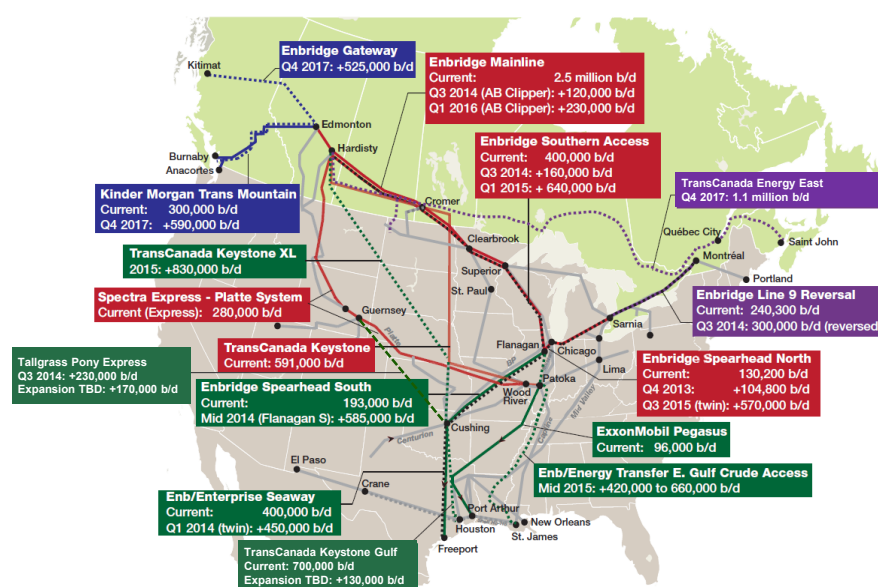
**More capacity is also coming online or already bringing more light crude to the US Gulf Coast, including from the Permian Basin in West Texas.** The prolific Permian Basin used to have its main pipeline takeaway to Cushing via Basin (an expanded 450-k b/d) and Centurion North (~100-k b/d), as well as the already existing West Texas Gulf and Mid Valley pipelines. Starting in 2013, the Permian Basin also added new pipelines directly to the Gulf Coast, allowing fast-growing regional production to reach destination markets, and diverting away from Cushing; these pipelines included Longhorn (which has since ramped up to 225-k b/d) and Permian Express (now up to 150-k b/d), while West Texas Gulf was expanded (from 225-k b/d to 335-k b/d). In 2H'14, the BridgeTex pipeline adds another 300-k b/d of pipeline capacity from the Permian Basin to the Gulf Coast, and 2015 could see the 200-k b/d Cactus pipeline too. Meanwhile, Eagle Ford production can reach Corpus Christi and the western Gulf Coast with fast build-out of local pipelines too.

**For Cushing, new inflow pipelines allow inland supplies to flow through to the Gulf Coast.** Already pipelines like Mississippi Lime and Glass Mountain are bringing in almost 200-k b/d more tight/shale oil into Cushing, from Oklahoma, Colorado and Wyoming, and flows could rise further. In 2H'14, the Tallgrass Pony Express pipeline should open, bringing some Bakken crude but also more of the growing PADD IV light crude unconventional output into Cushing, for storage there or onward flow to the USGC, starting at some 230-k b/d of capacity and rising potentially by another 170-k b/d.

**Of equal if not greater importance, in 2H'14, Enbridge's Flanagan South pipeline from Flanagan (near Chicago) to Cushing should open with incremental capacity on that route** adding to Spearhead's current 193-k b/d of capacity to reach a combined 793-k b/d (+600-k b/d), just as Enbridge's Southern Access line from Superior, Wisconsin to Flanagan increases from 400-k b/d to 550-k b/d, with another incremental 640-k b/d expected in early 2015.

As far as crude dynamics, these changes in takeaway pipeline capacity should have a number of interesting wrinkles. One of these is capacity to store crude, including light sweet crude, on the USGC. The other, which we will examine later, is the growth of Canadian crude reaching the USGC before year-end.

Figure 22. Major US crude pipeline developments from western Canada into the US midcontinent and through to the US Gulf Coast



Source: CAPP, Citi Research

**Cushing inventories are in a race to the bottom, whereas USGC PADD III crude inventories are in a race to the top, tempered for now by the easing of crude imports, and the ramping up of refinery utilization now that the maintenance season is ending. Cushing's delivery point, given the pipeline dynamics just described, has become an integral part of PADD III and is no longer wholly captive by pure PADD II supply and demand fundamentals. But those fundamentals do continue to play a role. Whenever PADD III demand for Cushing barrels is strong and Cushing stocks overdraw, WTI needs to rally up to LLS and Light Houston Sweet (LHS) levels in order to pull supply in from Midland via the Basin and Centurion pipelines, or to keep barrels from flowing south. If PADD III demand for Cushing crude drops (whenever PADD III light sweet crude inventories grow too high), then LHS and/or LLS prices would need to fall to WTI levels, also to discourage flows from Cushing to the Gulf Coast. In the current quarter (2Q'14), as Cushing inventories fall from some 27-m bbls to perhaps 20-m bbls and below, while PADD III already built to some 216-m bbls in mid-May, until refineries came fully back, waterborne imports seems to be taking a perhaps temporary beating, falling from around 3.5-m b/d to below 3-m b/d, while exports of crude to Canada from the USGC may have stabilized at around 150-k b/d. So far in 1H'14, PADD III prices have remained stable, with LLS currently at a ~\$2-3 discount to Brent, and WTI also at a ~\$2-3 discount to LLS. Those spreads could tighten significantly as US refinery utilization rises into Q3 toward record levels, imports shift down, and as Cushing stocks fall to low levels. **But Citi expects the spreads to widen precipitously with the next refinery maintenance season at end-3Q and early-4Q. And if imports do rebound and stay sticky, this could add pressure to even the summer period.****

Meanwhile, note that the Cushing hub is likely to remain structurally backwardated for a while, having been structurally in contango for much of 2010-2013. This is due to the changed relationship between Cushing and the USGC and the need for prompt Cushing barrels to price higher than deferred prices as inventories are depleted and to discourage a carry play, but also at times to attract flows from the Midland region in West Texas and elsewhere to keep or build inventories if and as

they fall towards working inventory levels. This situation is, however, subject to change, in the short-run as early as this fall, due to seasonal refinery maintenance and year-end inventory tax avoidance in PADD III (see below), and in the longer run, when the USGC reaches storage saturation, perhaps by late 2015, if US exports of light crude are not allowed.

**How full are PADD III storage tanks and what is their ultimate capacity?** On the face of it even the peak ~216-m bbls of crude stocks reported in EIA weekly data over the last month breaks down into some 45-m bbls of refinery stocks, 20-m bbls of leased capacity, some 35-m bbls in pipelines and thus 110-120-m bbls in tank farms in independent storage. It would appear that with what is purported to be over 200-m bbls in tank farm capacity and more under construction, utilization is not high – around 55-60%. It would appear that total storage capacity in the above four categories is a good 320-m bbls, which means that there is potentially 100-m bbls of storage available, depending on what refiners decide to do with their inventory, and how much they would want to keep in clean products, as refineries could have surprising amount of flexibility in converting product storage into crude storage. Or on the other hand, the need for breakout tanks to manage multiple crude quality types and for blending could mean utilization rates needn't be so high, percentage-wise, for storage to be in short supply in actuality; local pressures could form in key regions like the Houston area, or St James, LA. But importantly, refineries also possess significant product storage capacity, which could be flexibly switched to crude use, meaning the headroom for storage could be even higher.

**But whatever the level, it appears that crude inventories in PADD III, even though currently just under recent record levels, could build significantly higher in 4Q'14, depending on the stickiness of crude imports.** And December 2014 could be particularly painful, as crude oil inventories are drawn down to minimize ad valorem taxes, adding even more barrels on the market temporarily. And that means that LLS and WTI on the USGC could both structurally move into contango even as WTI at Cushing remains structurally backwardated, though this contango could spread up into Cushing if PADD III is severely glutted. USGC contango will be a key sign to watch, along with Brent-LLS price differentials, in determining whether the US market is oversupplied soon with the wrong kind of crude in the wrong places.

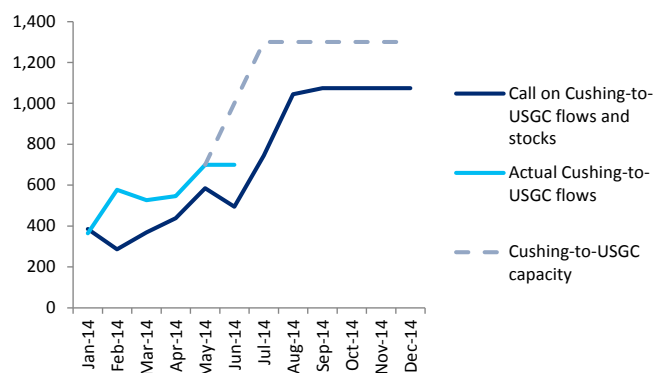
Figure 23 depicts pipeline flows from Cushing to the USGC and contrasts the “call on Cushing-to-USGC flows and stocks” against Cushing-to-USGC outflow capacity and actual flows. The stock draws seen for most of the year-to-date correspond to actual outflows (in teal) to the USGC being higher than call on Cushing-to-USGC flows needed to keep Cushing stocks flat (in dark blue). As Cushing stocks fall to low levels, prices should reflect the teal line needing to converge with the dark blue line – that is, the need to ration Cushing-to-USGC outflows (without much room to increase net inflows to Cushing). This would limit the volumes that enter PADD III, but major new inflows into Cushing in 2H'14 (as shown by the step up of the dark blue line) allow greater outflows from Cushing to the USGC, while keeping Cushing crude stocks level. **This suggests PADD III sees greater pipeline inflows in 2H'14, alongside growing Texas production, Gulf of Mexico production, putting pressure on imports and exports to keep shifting.**

Figure 24 depicts PADD III crude stocks in 2014 under a high and low scenario, with Citi's base case following more the lower scenario. The higher scenario keeps crude imports at the 3.5-m b/d level and crude exports modest at the 150-k b/d level, while the lower scenario allows a shift down to a sustained 3-m b/d average level and growing PADD III crude exports towards 600-k b/d, based on existing 150-k b/d of exports in early-2014, plus another 200-k b/d to eastern Canada, 100-k b/d

to Mexico, 200-k b/d of condensates; Canadian re-exports could reach 200-k b/d, but this would be at the expense of 200-k b/d of heavy crude imports not being pushed out. (The discussion of the potential for these crude export levels is discussed later.)

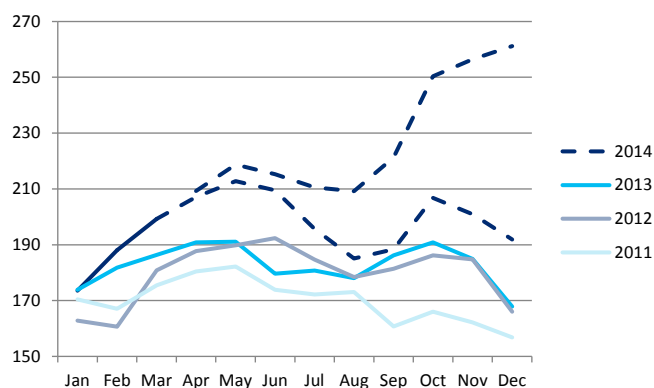
With recent PADD III imports moving sharply down to test sub-3-m b/d levels in three weeks over the last two months, where imports may end up remains a wildcard, although new lows seem to be continue to be tested over time. And, as mentioned before, the second half of the year sees more Canadian heavy crude reaching the Gulf Coast via the Flanagan South pipeline, which could directly substitute for heavier crude imports.

**Figure 23. Pipeline flows from Cushing to the USGC are driving Cushing stock draws, but need to be restrained to keep stocks level (bringing the teal line towards the dark blue line) to well within capacity; in 2H'14, lower PADD III demand for Cushing crude may also limit flows**



Source: Genscape, EIA, Citi Research

**Figure 24. PADD III crude stocks for 2014 under different scenarios versus previous years, given rising production, seasonality of refinery runs, rising flows from Cushing; stocks can stabilize in 2Q'14 at ~215-220-m bbls but fall maintenance pressures a rebalancing of flows**



Source: EIA, Citi Research

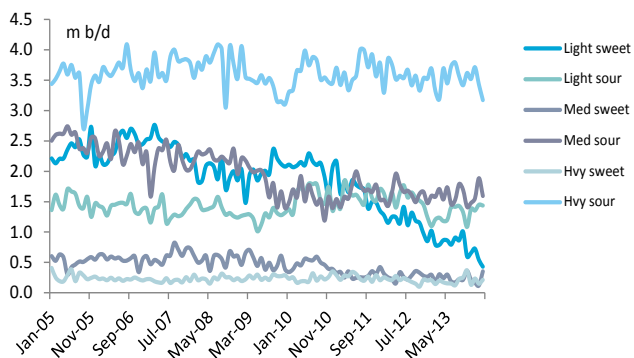
Cushing outflows have recently been overwhelming Cushing inflows, and are potentially going to rise further, unless and until PADD III stocks overbuild and demand for Cushing barrels drops. Without imports falling or exports of crude rising, so as to bear the brunt of adjustment, more oil needs to be kept in Cushing and PADD II, and **Cushing-to-USGC flows will need rationing. This means LLS-WTI would need to tighten at that time.**

PADD III crude stocks are already near record highs, and USGC prices are depressed relative to Brent. But 4Q'14 in particular looks particularly precarious, as pipeline flows rise from Cushing in 2H'14, fed by the start-up of pipelines bringing in more WTI-related crudes (via Pony Express), and perhaps as much as 500-k b/d of Canadian crudes (via Flanagan South). Even if Capline sends higher crude volumes up to Patoka and Chicago in eastern PADD II, this merely shifts inventory between PADD III and II. **Unless crude oil imports into the US are severely reduced, crude stocks in PADD III and II would surge, and with them crude prices relative to world levels should be increasingly depressed.**

**What would it take to tighten PADD III balances?** Either significantly lower imports – from Saudi Arabia, Kuwait, Mexico and Venezuela, all of which might be quite sticky – or significantly higher export volumes from the USGC. In our own balances, December looks like it could be a very glutted month on the USGC given planned refinery maintenance. In fact, refinery maintenance in the US could even be rather heavier and lengthier than currently expected, given the exceptionally light

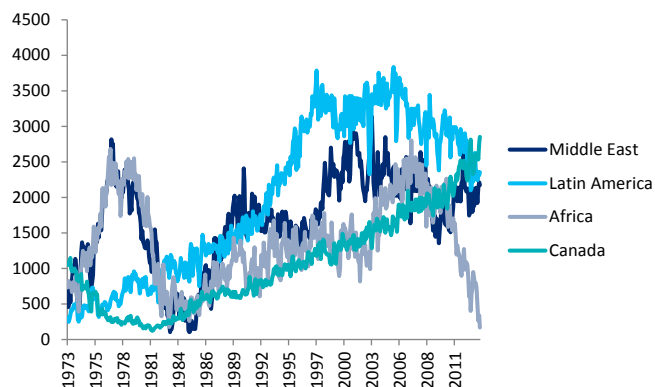
maintenance this spring (due to very favorable refinery margins) and expected high utilization this summer. Further, in our judgment, if the adjustment occurs mainly through lower imports of *heavier* crudes, down to say 2-m b/d from recent levels of just under 3-m b/d, this would not alleviate a glut of *light sweet* crudes, though it would help keep at bay the extreme situation of PADD III aggregate crude stocks hitting tank tops, regardless of crude quality.

Figure 25. US nationwide crude imports by quality (m b/d, 2005-14) – light sweet crude imports stood at 400-k b/d in February 2014, down from 2.5-m b/d levels in 2005-06



Source: EIA, Citi Research

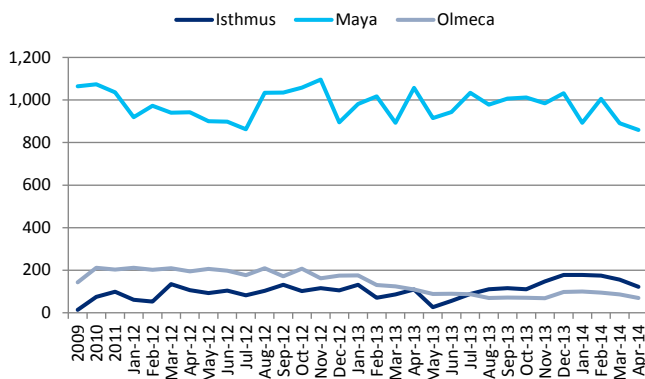
Figure 26. US crude oil imports from major regions/countries (k b/d, 1973-2014) – Canadian imports grew at the expense of Latin American and West Africa, while US domestic supply has also surged



Source: EIA, Citi Research

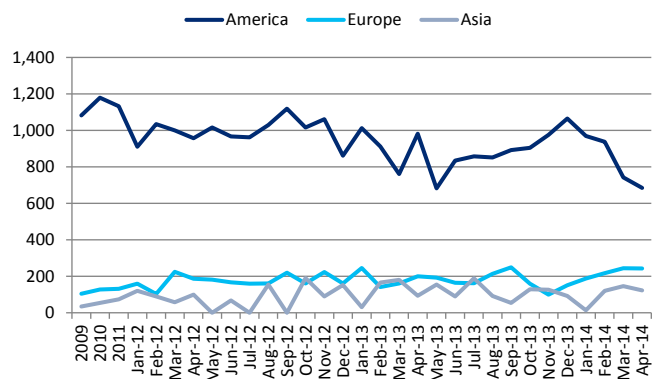
**The heavy, sour crude exporters to the US Gulf coast have seen their realized prices there slipping substantially against what they can received on a netback basis if they shipped to other destinations.** This is particularly true for Saudi Arabia, where delivered sales to the USGC in 4Q'13 had provided a price netted back to the delivery port of Ras Tanura that was about \$20 lower than similar crude delivered to Singapore. That was reflective of the price of similar crudes trading on the US Gulf Coast, which had to sell at a discount to US light sweet crudes to be competitive at refiners, and light crude was discounted because spreads between LLS/WTI and Brent had widened during the refinery maintenance season in the US. Similarly, Venezuela and Mexico saw steep spreads in the US market from what could be realized elsewhere.

Figure 27. Mexican crude exports by grade (k b/d, 2009-14)



Source: Pemex, Citi Research

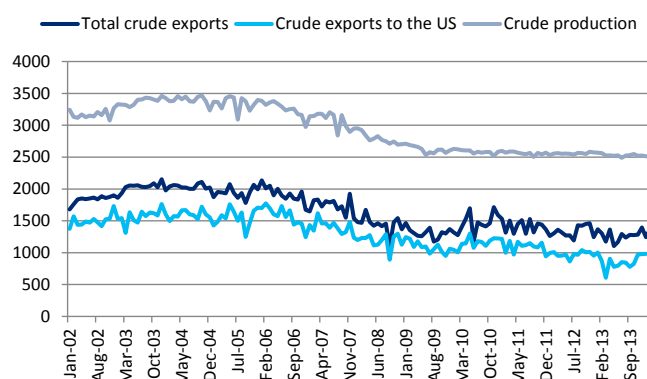
Figure 28. Mexican crude exports by destination (k b/d, 2009-14)



Source: Pemex, Citi Research

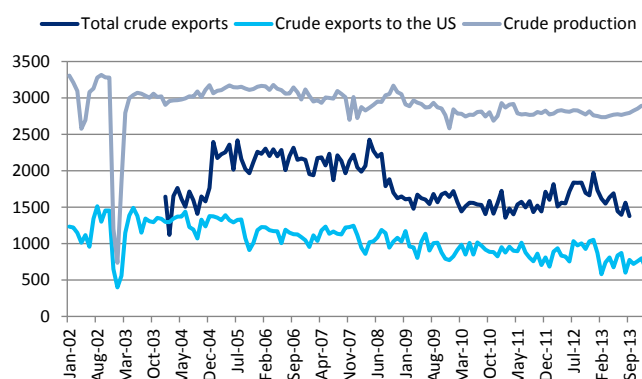
**Three countries dominate imports of sour and heavier crude streams: Mexico, Saudi Arabia and Venezuela.** For the first quarter of 2014 and well into 2Q, Saudi exports to the US appear to have hovered just below 1.5-m b/d. Saudi Aramco has been making its exports to US customers increasingly more expensive for the past half year as a means of sharing in the benefits of their customers' high refining margins and inducing them to take less crude, freeing up the oil for customers in Asia. By 3Q it looks as though Saudi Aramco should be able to divert as much as 500-k b/d to Asian markets to benefit from higher prices. **Similarly Pemex's trading arm, PMI, has been diverting, to the extent it can, its deliveries to the US to destinations in Europe and Asia,** starting with its lighter crude grades – Olmeca and Isthmus. As of the most recent data, this has been marginally successful. In 1Q'14, exports to the US fell slightly to the US and rose to Europe and the moment is in place to deliver more crude to both the US West Coast (and elsewhere in the Pacific Basin) and to Europe, where sales are underway to a broadly diverse set of customers in Switzerland, Rotterdam, Italy and Austria.

Figure 29. Mexico's total crude exports, exports to the US, and crude production (k b/d, 2002-14)



Source: EIA, JODI, Citi Research

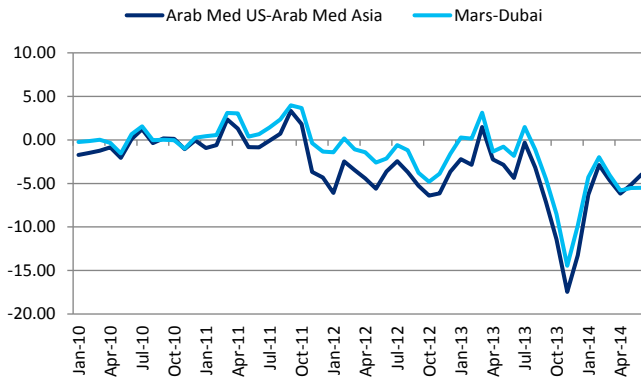
Figure 30. Venezuela's total crude exports, exports to the US, and crude production (k b/d, 2002-14)



Source: EIA, JODI, Citi Research

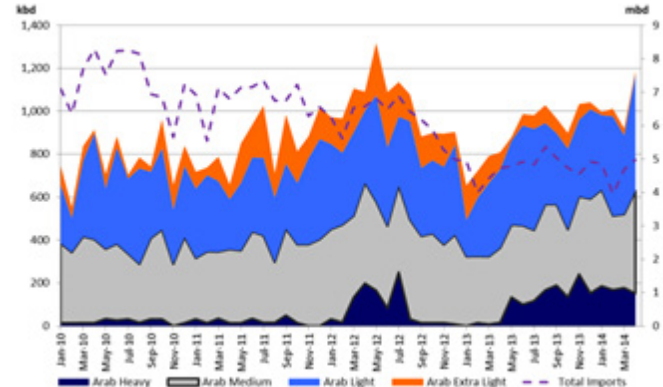
**But the question remains whether the three exporters' ties to the US are sticky enough to result in their maintaining a significant market share.** It is not clear whether Saudi Arabia will be willing to cut its US sales to below 1-m b/d in order to service its downstream investments and also to preserve diversity of markets. For Mexico's PMI and Venezuela's PDVSA, in addition to their own downstream arrangements in the US there is the added lack of alternative refinery systems capable of buying and processing their crudes on term contract basis. It is for this reason that a flood of Canadian soon to be entering this market will result in even more severely competitive price conditions, and the next step-down in US crude import levels.

**Figure 31. Medium sour crudes priced in the US Gulf Coast and Asia – Mars-Dubai, and Arab Medium prices given Mars, Dubai and Saudi OSPs for the two regions (\$/bbl, 2010-14)**



Source: Bloomberg, Citi Research

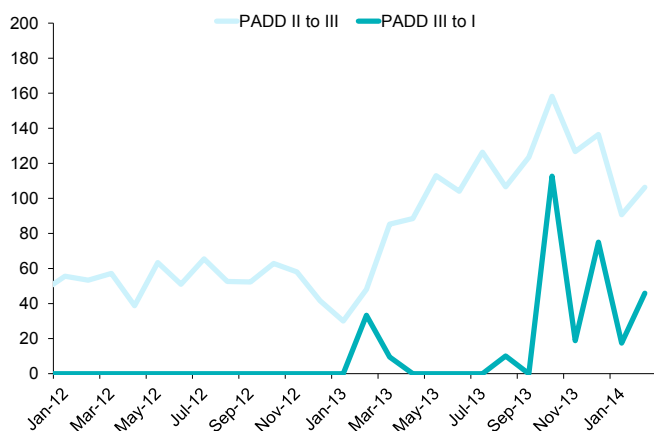
**Figure 32. US Gulf Coast crude oil imports from Saudi Arabia by grade (LHS), versus total (RHS) – Arab Light has dwindled, while other grades have stayed robust, even as total imports have fallen**



Source: Poten, Citi Research

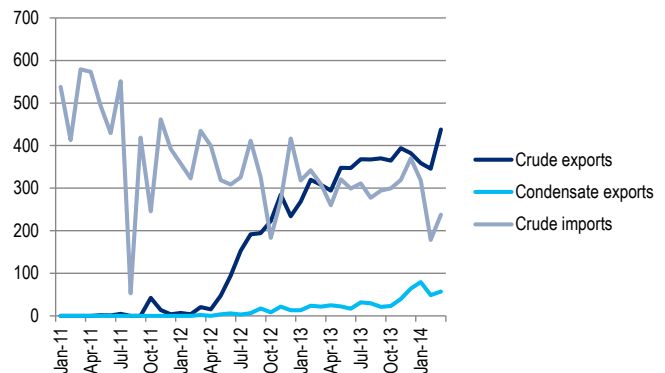
As for other outlets, Jones Act vessel movements of crude oil have stepped up modestly since LLS fell to record discounts to Brent in 4Q'13, as seen in EIA monthly data on PADD III to PADD I movements (Figure 33). These vessels are needed to move crude by sea from the USGC to either the East or West Coasts. Since then, these have fluctuated month to month around 50-k b/d. They require an arb of \$5-6/bbl Brent-LLS, which likely manifests during refinery maintenance in the spring and fall on the US Gulf Coast, and capacity-wise is limited by the Jones Act fleet, split between petroleum product or crude transportation. The backlog of new Jones Act vessels only adds 10-20-k b/d over 2014-15, with five new builds – three net new ones given two existing vessels are being replaced. 2016-17 could see another eight or more vessels.

**Figure 33. Selected inter-PADD tanker and barge movements –barge movements south along the Mississippi have grown, while Jones Act shipments from the Gulf Coast to the East Coast have risen too**



Source: EIA, Citi Research

**Figure 34. Port of Corpus Christi outbound and inbound waterborne shipments (k b/d, 2011-14) – reportedly, 80% of these movements go to ports in Texas and Louisiana, with some 20% to the US East Coast and eastern Canada**



Source: Port of Corpus Christi, Citi Research

This is reinforced by data from the Port of Corpus Christi showing increasing movements out of the port, with some 400-k b/d of crude movements through 2H'14, of which an estimated 20% (80-k b/d) moving to the US East Coast and

eastern Canada, and the remainder to other parts of the US Gulf Coast. This exportable surplus is fed by the nearby Eagle Ford shale play. The port data also break out outbound condensate movements of over 50-k b/d.

The physical bottleneck to using Jones Act vessels suggests that if Congress and the administration want to encourage use of more crude at home they will have to find a way legally to suspend or eliminate Jones Act requirements for crude oil and products.

Other outlets also include some uptick from refineries over time looking to process more light crude. Companies indicate more potential to run light sweet crude in place of heavy crudes, if sweet versus sour prices are favorable enough. New capacity to process light crude is forthcoming, with regards to dedicated condensate splitters, as well as pre-flash and topping units. But these investments require policy certainty over crude export rules. Selected projects shown below show several proposed condensate splitter projects that may yet be canceled.

Figure 35. US refinery capacity additions, mostly geared towards processing light crude

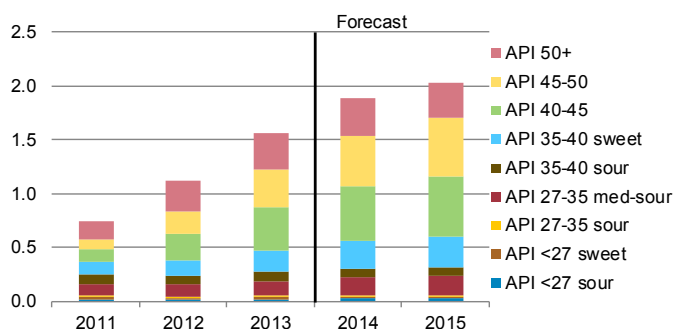
		Existing	2014	2015+
MDU/CLMT Dakota Prairie	Dickinson, ND		20	
Three Affiliated Tribes, Makoti	Dickinson, ND			20
Dakota Oil Processing	Trenton, ND			20
American Energy Holdings, Bison Oil	Devils Lake, ND			20
<b>North Dakota refinery additions</b>			20	60
Marathon condensate splitters	Canton, OH	22	38	
	Catlettsburg, KY			
BASF/TOTAL	Port Arthur, TX	75		
Kinder Morgan condensate splitter	Galena Park, TX		50	50
Trafigura/Magellan	Corpus Christi, TX			50
Targa/Noble	Channelview, TX			35
Castleton Commodities Int'l	Corpus Christi, TX			100
Chevron	Sweeny, TX			100
Martin Midstream Partners LP	Corpus Christi, TX			
<b>Condensate splitter additions</b>		97	88	335
Valero expand light crude processing	Port Arthur, TX		15	
Valero topping unit	Houston, TX			90
Valero topping unit	Corpus Christi, TX			70
Valero refinery expansion	McKee, TX		25	
NCRA refinery expansion	McPherson, KS		15	
Tesoro refinery expansion	Salt Lake City, UT		4	
HollyFrontier refinery expansion	Woods Cross, UT			14
Western refinery expansion	El Paso, TX			25
Husky refinery revamp	Lima, OH			
Alon refinery expansion	Big Spring			5
Rock River resources	Green River, UT		10	
Worldwide Energy Consortium	Eagle Ford, TX			10
<b>Expansions</b>			69	214
<b>Total</b>		97	177	609

Source: Company reports, Citi Research

\* Projects for 2015 and beyond represent some with announced plans but may not be realized

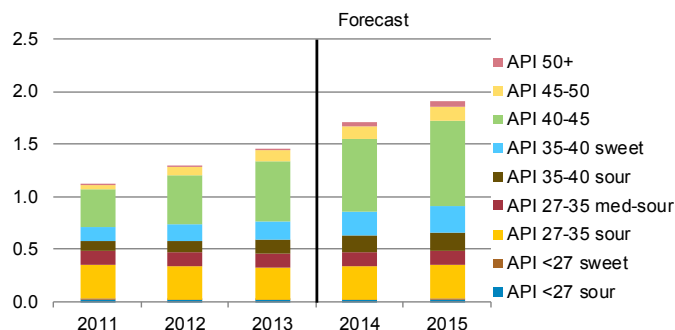
**The growing crude surplus on the Gulf Coast is focused on light crudes, but in particular, in condensates.** (A discussion of the potential for condensate exports is discussed later.) Shale/tight plays produce light sweet crude, with the Eagle Ford producing particularly light – and also variable – crudes. The EIA recently released a report assessing the amount of condensate production in major regions in the US. The report estimated some 300-400-k b/d above 50 API, and another 500-600-k b/d at 45-50 API in the Gulf Coast region. That this production is in surplus (at least, locally) is borne out by posted prices of Eagle Ford condensate at \$10-20 below LLS, indicating distressed prices as well as a higher naphtha yield. It is probable that a significant component of crude stocks that have built up in PADD III are condensates. By comparison, condensate in Alberta is priced for import, given its use in diluent for blending with bitumen from the oil sands, and sees prices close to those of light sweet crudes in western Canada.

**Figure 36. Gulf Coast crude oil production by quality (m b/d, 2011-15) – includes Eagle Ford output plus 50-k b/d of Haynesville and 450-k b/d conventional production**



Source: EIA, DrillingInfo, Texas RRC

**Figure 37. Permian Basin and regional crude oil production by quality (m b/d, 2011-15) – includes some 100-k b/d of non-Permian Basin production**



Source: EIA, DrillingInfo, Texas RRC

## A look at the sour crude market on the USGC

**PADD III has the highest concentration of crude oil upgrading capacity in the world, with a total refining capacity of over 9-m b/d (CDUs on a calendar day basis), with downstream charge capacity of 1.5-m b/d of coking, 2.95-m b/d of catalytic cracking, 1.05-m b/d of hydrocracking capacity, and 0.56-m b/d of alkylation capacity.** No wonder then, at its height, the USGC imported some 6-m b/d of foreign crude. As noted earlier, light crude imports into the USGC have fallen by nearly 1-m b/d to practically nothing, while even heavier sourer crude imports have fallen, with both Mexico and Venezuela reducing exports to the US market by about 300-k b/d each since 2010. At the end of 2013, the USGC import market had fallen to under 4-m b/d, nearly all of it sour crudes.

**The USGC is and is likely to remain a depressed market for sour crude imports, since sour crudes price against light sweet crudes and need to price in at \$5-7/bbl below LLS or WTI USGC prices to be competitive** (see p28 of [“Exit Strategies”](#), October 21, 2013, Eric G. Lee et al, for a discussion of refinery heavy-to-light switching economics), and as we have seen, as the crude oil glut in the US has moved from Cushing to the USGC.

Imports from Iraq have fallen precipitously, but the import market has been quite sticky for understandable reasons. Kuwait’s 300-k b/d of exports to the USGC actually rose into Q2 to over 300-k b/d. These imports are in the face of depressed prices and better potential netbacks to Asia, but the combined factors of contractual

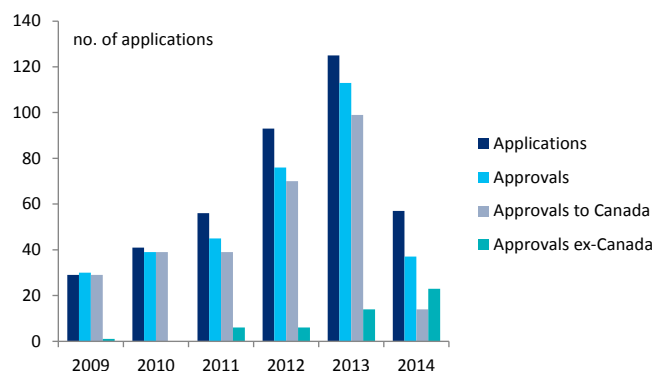
arrangements and marketing strategy and portfolio have meant lagged responses to the market, while the desire to maintain market share despite lower prices may keep these imports stickier over time. As discussed earlier, US crude imports from Saudi Arabia, Mexico and Venezuela look likely to shift gradually downwards, as Saudi Arabia adjusts its official selling prices, as Mexico diverts crude to Europe and Asia and adjusts its formula pricing, and as Venezuela diverts crude to China to pay for its loans in-kind.

**There are several dynamics at play going forward. First, light sweet crude availability has been rising, but this is not direct competition for sour crudes, and would require light-heavy/sweet-sour price spreads to collapse for more switching to occur,** as discussed earlier. Some of the light sour crude imports could yet divert over time, predominantly Saudi volumes. But as discussed, Mexican Maya prices relative to West Texas Sour prices (WTS), which are linked to the Permian Basin situation, which has been depressed. Saudi prices for, say, Arab Medium, have been linked to the Argus Sour Crude Index (ASCI), which moves closely with Mars prices, which averaged around \$4 below LLS in 2013, and around \$3.90 below LLS 2014 year-to-date. **Thus, both heavy and medium sour crudes have priced down to remain competitive vis-à-vis US Gulf Coast light sweet crudes, so far. This could change as light sweet crudes move further into surplus, if there are no additional light sweet crude exports.**

**However, medium and heavy sour crude availability is also increasing this year.** So far, the crude glut that has moved to the US Gulf Coast has been in light sweet crudes, predominantly shale production. But 2H'14 changes this. First, Gulf of Mexico deepwater oil production is beginning to grow again after several years of flat production levels since the Deepwater Horizon disaster and moratorium on activities. Thus, US offshore production could rise by 150-k b/d over the year, which would be of medium sour quality. And second, new pipelines should bring Canadian crude down to the US Gulf Coast, which had hitherto been absorbed by the US Midwest. **As discussed earlier, the new capacity could allow some 500-k b/d of Canadian heavy crude to reach PADD III,** some of this from the drawdown of high PADD II crude inventories (which is temporary), some of this from continued growth in western Canadian production (of ~200-k b/d per year), and some of this diverted away from PADD II use (as Canadian landed prices in PADD II rise and inland use falls). **This means significant heavy crude-on-heavy crude competition on the USGC that can either mean a step down in heavy crude imports, or some countries having to bear lower prices to maintain market share, while Canadian crudes are re-exported for better netback prices elsewhere (discussed below).**

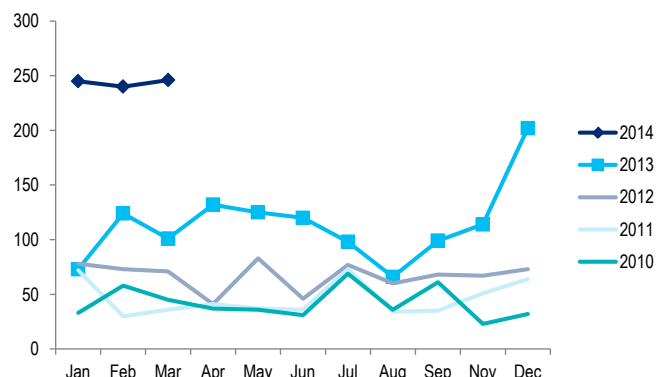
Mexican Maya crude is a base-load feedstock for US Gulf Coast refiners, and has some advantages relative to Canadian WCS. WCS has more of a “dumbbell” yield – producing more light ends and bottoms and less middle distillates – compared to Maya. WCS also has a higher TAN number, or acidity, than Maya. Thus, Pemex may see Maya term contracts having some staying power, but as the arrival of WCS on the US Gulf Coast continues to rise, perhaps relentlessly, the economics of switching from Maya to WCS is likely to be compelling at the right price. In theory, the US Gulf Coast's 2-m b/d of heavy sour crude imports could absorb ten years of Canadian oil sands production growth, if the infrastructure keeps up and similar-quality crude imports are progressively pushed out.

Figure 38. US crude export applications and approvals (NB: 2014 is year-to-end-February)



Source: US BIS, Citi Research

Figure 39. US crude oil exports, mostly to Canada (k b/d, 2010-14)



Source: EIA, Citi Research

## US: A one million barrel per day crude exporter by end-2014?

**The logical market solution to the mismatch between US domestic crude oil quality and US refinery requirements is to allow markets to be arbiter of efficiency, and that means liberalizing the regime for US exports of crude oil.**

The debate that has begun on issues associated with crude oil exports is likely to become both elucidating and polemical. At the end of the day a combination of laws, regulations and political taboos has made the export of crude oil a simpler problem of analysis than of political resolution.

**It remains to be seen whether facts on the ground will impact decisions on exports, for even as the debate unfolds and before it is resolved, the country might well end 2014 exporting as much as 1-m b/d of crude oil as markets seek solutions under the current legal framework to a growing volume of crude oil and condensates that have no natural home in the US market. Unless the issue is resolved soon so as to facilitate a growing volume of exports – even perhaps free exports – prices of crude oil in the US are likely to again become dislocated from global markets and discounted, at times severely, from global prices without accruing any benefits to consumers, and WTI structure would inevitably return to contango, being a matter of time.**

The origins of the domestic ban and other obstacles on crude oil exports have been well explored in public documents over the past few years, such as the recent thorough [report by the Congressional Research Service](#). **Both the laws that directly ban these exports and the emergency powers that otherwise block them are rightly linked to concerns that arose over 40 years ago at the time of the oil embargo of the United States and Netherlands imposed by the Organization of Arab Petroleum Exporting Countries (OAPEC) in 1973.** But they seem antiquated if not quaint in a period of growing supply, when oil is no longer in short supply nor as strategic as it might once have been. They also appear distortionary given that hydrocarbon molecules configured as processed goods (oil products) can be exported in a largely unfettered way under general license while unprocessed crude oil confronts severe obstacles.

**Aside from some modest volumes on marginal oil (e.g. heavy oil produced in California) crude oil exports are permitted, with modest non-volumetric restrictions, to Canada and from Alaska.** Two decades ago exports from Alaska

were fairly robust, reaching a range above 300-k b/d after restrictions on Alaskan exports were eliminated in 1996 and flowed openly to mostly Asian markets (beyond Korea, this included Taiwan, Japan and even China). These exports are by law required to be transported by US flag vessels (not to be confused with Jones Act vessels that in addition to being US flagged, are built in the US and manned by US union members; US flag vessels don't have the tax advantages of Liberian or Panamanian or other flagged ships). They are likely to reach significant volumes by the end of this year or into next year, as explained below.

There are several categories of exports, or safety valves, that are likely to emerge by the end of this year, adding up to 1-m b/d, or possibly even more.

#### **400-k b/d to Canada?**

**By far the most interesting increases in export volumes over the past three years have been light crude oil exports to Canada.** These exports have been allowable under laws passed two decades ago but enshrined in the NAFTA agreements. They, like Alaskan exports, are not permitted under general license but under a restricted license, which is readily obtainable for annual periods, and certify that the crude will not be re-exported as crude oil from Canada. As recently as 2011 this amounted to only some 20-k b/d; but with US crude oil prices depressed relative to global prices, particularly in 2012 and 2013 when Bakken or Eagle Ford light sweet crude was often deliverable to Canada at a significantly lower price than similar crude oil from West Africa, whether by rail or vessel, exports jumped to over 60-k b/d and ended 2013 at around 200-k b/d. In recent months, exports to Canada have jumped to ~250-k b/d. With the prospects for greater rail and waterborne movements from the US to eastern Canada via multiple routes, these exports can continue to grow. As the eastern Canadian market of some 600-k b/d of light crude is being increasingly taken over by US supply, local Canadian offshore production off its Atlantic coast has been diverted to higher-priced environments including northwest Europe, while West and North African crude has also been turned away. Virtually all of these US crude exports to Canada come from PADD II (by rail) and PADD III (by ship).

**Impediments are rail and berthing capacity, but Citi estimates that by end-2014 current export levels to Canada could double and thus it is safe to project that they can reach 400-k b/d by year-end.** There is likely to be a significant jump in exports from the Gulf Coast as US refiner Valero is replacing foreign imported crudes into its Montreal refinery. By year-end it is likely that other foreign crude exports to eastern Canada will drop considerably, if not disappear.

**But by early 2015, US exports to Canada will likely have peaked and start eroding. The 600-k b/d by then should be significantly supplied by Enbridge's Line 9 with 300-k b/d of throughput capacity bringing Canadian upgraded syncrude to Canada's internal eastern market.** Already that line, which used to bring Atlantic Basin and Russian crudes into the internal Canadian and US markets, has been reversed into Westover, Ontario since mid-2013. Further extension to Montreal and possibly even to Portland, Maine, looks likely for early 2015. After that the conversion of TransCanada's Mainline, once a gas line, into a 1.1-m b/d oil pipeline (called "Energy East") sometime in 2017 should see US crudes backed out from that region and looking for different homes.

#### **Resumption of Alaskan crude oil exports – 100-150-k b/d?**

**Late last year the economics worked for bringing Alaskan crude oil into Asian markets. 2014 should see increased congestion in PADD V's two main refining markets, Washington State and California. Rail delivery capacity to the US West**

Coast both from North Dakota and Canada is growing to over 600-k b/d from a little more than half that this year, and as much as 1.2-m b/d including planned capacity out to 2016. At the same time, Mexican crude (see below) from the Salinas Cruz terminal is now reaching Pacific Basin markets, including in California, where Isthmus crude brings a higher netback return than in the US Gulf Coast.

**This three-pronged growth of new supply into PADD V – from Canada, North Dakota and Mexico – should free up meaningful volumes of ANS crude from Alaska to receive higher netback cash value through exports to the Pacific.**

South Korea is a likely target of these ANS exports given the tax incentives for Korean refiners to import from countries with which the Republic of Korea has FTA agreements, and that includes the US, providing a 3% tax advantage over crude supplies from OPEC countries. Citi projects some 100-k b/d of steady Alaska exports into Asia by year-end and the volumes could be substantially higher.

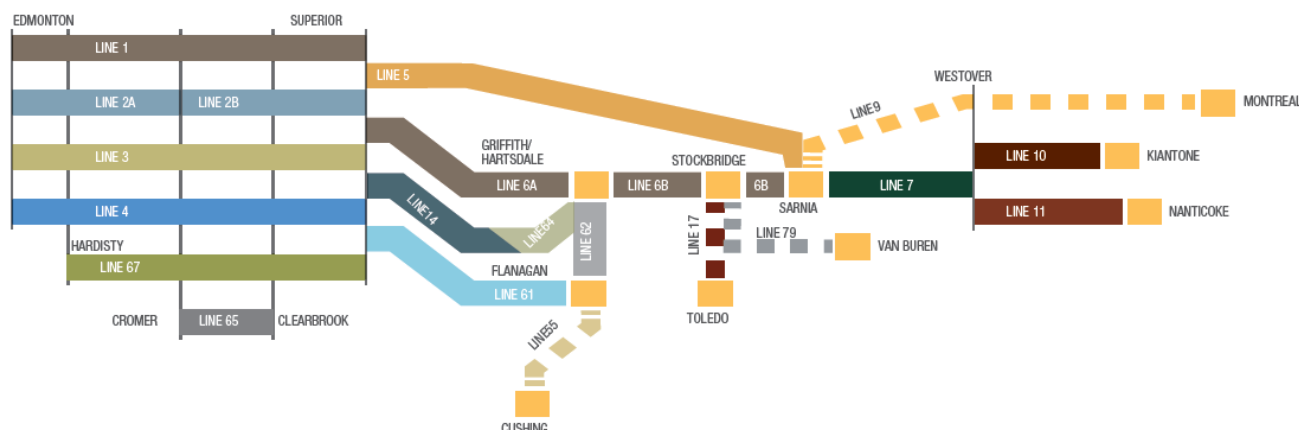
#### **Re-exports of Canadian crude – 200-k b/d?**

**Re-exports of foreign crude grades imported into the US are re-exportable as long as they are not contaminated by adverse co-mingling with US crude supplies.** There is a long history of re-exporting imported crude oil contained in isolated tanks on the US Gulf Coast. Already in 2013 there was a limited amount of re-exports of Canadian crude according to data obtained from the BIS in the US Commerce Department. This was mostly crude oil railed into the east coast terminals.

**There are at least eight rail terminals on the US East Coast with 945-k b/d of off-loading potential that can receive Canadian crudes** and some crudes are being re-exported in modest quantities to depots in the Caribbean. Similarly there are limited re-export options for railed Canadian crude on the US Gulf Coast (where there was 985-k b/d of off-loading capacity at end-2013) and the West Coast, particularly in Washington.

**But the real test comes this year with the wave of Canadian crude supply that will be able to reach the USGC.** The main facilitator is the vast increase in takeaway capacity from Cushing, which should grow from 400-k b/d at the start of 2014, to 1.55-m b/d by Q3, with the addition of TransCanada Keystone XL's southern leg from Cushing and the twinning of Enbridge/Enterprise Seaway line. But the second half of 2014 should bring a major addition to the expansion of the Enbridge system, with Flanagan South adding perhaps 600-k b/d of capacity from Flanagan, IL to Cushing, OK, for onward journey along the Seaway line to the Gulf Coast. The Flanagan South (or Line 59) pipeline is fed from further upstream, the pipeline sections of which are also set for expansion. This is part of Enbridge's Southern Access Program, which sees Line 61 (from Superior, WI to Flanagan, IL) expand by 160-k b/d to 560-k b/d also in 2H'14, with another 640-k b/d in 2H'15 to bring the line to 1.2-m b/d. And further upstream again, the section from Alberta to Superior, WI also sees expansions. First, the Alberta Clipper (Line 67) from Hardisty, AB to Superior, WI, is being expanded from its 450-k b/d capacity today to 800-k b/d by 2H'15. Second, the replacement of Line 3, running from Edmonton, AB to Superior, WI, would bring the capacity of the line from 390-k b/d to 760-k b/d in 2017. This means the combined pipelines from Alberta to Superior, WI rise from 2.31-m b/d (Lines 1, 2, 3, 4 and 67) to 2.66-m b/d by 2H'15, and 3-m b/d by 2017.

Figure 40. Enbridge Mainline pipeline system configuration at 1Q'14



Source: Enbridge

**In short, by the end of 2014, more than 500-k b/d of Canadian crudes, including Canadian diluted bitumen should be able to reach waterborne areas of the US, mostly in the US Gulf Coast market, but also on both the East and West Coast.** This should make the already-crowded USGC market even more so, especially for heavier sourer grades from the Middle East and also from Mexico and Venezuela. The sour crude market of the US is becoming a significantly less attractive area to which to sell crude than once was the case. This is because, in the first place, ultimately sour crudes are bought by refiners in reference to the price of light sweet crudes and as the price of LLS and WTI in Houston sink relative to waterborne values, so too do the prices of these sour grades. But secondly, the surge in light crude production is crowding out some of the sour grades from the refining system on the USGC, which are made for the sour crude streams, so market share is also being challenged and lost. As we have seen Pemex/PMI and PDVSA have been moving more crude out of the USGC market to Europe and South and East Asia, but there is a limit to how much they can sell there.

**In a free market, US light sweet crudes would be exported from the USGC, lifting their prices to waterborne levels (thereby also providing uplift to foreign sour grades) and US refiners would be optimizing runs of sour grades and running more, helping to preserve market share.** With the wave of Canadian crudes coming to the US via pipeline and with more to come with increasing production from Canada, something will have to give and in all likelihood Canadian crudes will be exported in meaningful volumes from the US, unless they are substitutable for heavy imports in a meaningful way, given contractual and quality issues. There are two factors, which have arisen as impediments to this occurring, but there are measures to ameliorate for these difficulties.

**One problem is the lack of regulation on re-exporting pipelined crude.** It's easy to allow re-exports of crudes imported into isolated storage tanks; it's also easy to determine that crude imports by rail are exactly the same crudes as what was imported. But with pipelines, co-mingling issues need to be resolved as crude is batched through a pipeline system. It is Citi's understanding that the Commerce Department has been forthcoming and cooperative in resolving the issue of co-mingling, and pipeline re-exports look as though they will be easier to achieve than was earlier thought.

**The second problem is Canadian crude quality**, which might not be as attractive in the Atlantic Basin as in the USGC. Here there is both a solution and another potential problem. The solution would be to increase the mixture of diluent that facilitates flow of bitumen through a pipeline. Enough diluent could create a crude cocktail or crude blend that would look a great deal like Urals crude and which would find a home in the European refining system. But one main source of diluent or blending material would be US-based condensate, with its high naphtha content. (Canada produces an increasing amount of condensate as well, but US and Canadian condensates are co-mingled in the process.) That would make it especially attractive in naphtha-short Europe, but the problem posed is that currently lease condensate – super-abundant in the Eagle Ford and perhaps also in the Permian – also falls under the US export ban. But perhaps, as we outline below, that too could be resolved in the near term.

There has been a flurry of licenses to export Canadian crude. In mid-spring this year, two announcements of such licenses were made. Valero, which has substantial export capacity in its refining system on the USGC, indicated it could be re-exporting Canadian crude to its Pembroke, UK refinery. In addition, Canadian pipeline firm, Enbridge, which is building much of this year's pipeline evacuation capacity from Canada to the USGC, received licenses to re-export Canadian crude oil. Reuters reported that a subsidiary of the pipeline firm could be exporting about 10-k b/d to refiners in Spain and Italy. Reuters has also reported that the Commerce Department's Bureau of Industry and Security has for the firm time since 2008 started issuing re-export licenses in large quantities to European buyers in Germany, Italy and the UK.

Figure 41. Map of Pemex refineries\* and CDU capacities



Source: EIA, Citi Research

\* The Deer Park, TX refinery is a JV with Shell

### 100-150-k b/d to Mexico?

The same laws that allow exports of US crude oil to Canada can be used to allow exports to Mexico, also a signatory to NAFTA. Mexican crude exports are

being severely challenged by congestion in the US Gulf Coast and Mexico no longer exports light Olmeca crude to USGC markets, where prices are depressed, but instead is seeking markets in Europe, including Spain (where state-owned PEMEX until recently held shares in Repsol), Switzerland, and potentially Italy and Germany, as well as into crude-short northwest Europe.

**Mexico is also selling growing volumes of crude through its deepwater Pacific port of Salinas Cruz.** The pipeline system that feeds into the Mexican west coast from just south of Veracruz also provides a crude oil diet to a couple of sizeable inland refineries including Salamanca and Tula, with a combined distillation capacity of 490-k b/d. Buying relatively low cost US light sweet crudes could have advantages in improving the light product yield of simpler refining units, without incurring costs of upgrading those units. Salina Cruz, Minatitlan, Ciudad Madero and Cadereyta have coking capacity, but Salamanca and Tula run mostly on light sweet crude. It is highly unlikely, even unimaginable for the US government to refuse a Mexican request to have rules written for licensing crude exports to Mexico that are identical to those that relate to Canada. If there are any impediments, they lie on the Mexican side, where the politics might be difficult until well after Mexican energy reform is enacted. However, there are two other mechanisms that could work – swaps and exchanges. An exchange would be volumetric and could “offset” US imports of some 750-k b/d of Mexican crude. Swaps would be more difficult and involve evaluations of the different crude streams involved, higher priced US light versus lower priced Mexican heavy crude.

Crude sales into the Pacific Basin such as exports to the US West Coast could be favorable from a netback valuation perspective. While that would help to reduce some of the sour crude glut on the US Gulf Coast, imports of distressed priced US light crude to improve product yields in Mexico’s refineries also suggest imports to grow from the US. These imports would facilitate a reduction in fuel oil production and a growth in production of much needed diesel and gasoline.

As an aside, just as Canadian bitumen blended with condensate could create a commercially viable Urals crude substitute in the Atlantic Basin, as could a blend of Mexican Maya and condensate.

On the other hand, Pemex has been working on deep-conversion upgrades to the Salamanca refinery, with similar plans for Tula and Salina Cruz. This might mean greater ability to use more heavy crude use at home over time.

#### **Will 180- to 200-k b/d of condensate exports be licensed?**

**It is no commercial secret that among the hundreds of export license requests that are pending in the Commerce Department are requests to export condensates** – crude oil, or mostly natural gasoline, so light in gravity that it really can be thought of as a petroleum product. The surge in such applications reflects the situation described earlier – the US refinery system is geared to maximize processing of heavy to medium sour crudes. Refiners have done what they can to maximize use of light and sweet, low sulfur crudes, with more available at narrowed light-heavy/sweet-sour price differentials, but there is a limit to this, and major incremental refinery investments are regarded as too risky.

**The problem stems from the wrong kinds of crudes being available in the US and the logical solution is to export the crude to markets where US light crudes are needed and to continue to import heavier and more sour grades. The first line of action is focused on the lightest of the crude streams – condensates,** which are so light that they can be readily turned into exportable products. The problem is made complicated by accidents of different definitions of condensate,

depending on who is defining it. Thus the American Petroleum Institute, the Society of Petroleum Engineers, the Energy Information Administration and the Department of Commerce have used different definitions. For some it is very light crude—above 50° API gravity, for others it is at a higher level of above 55°. For some it comes out of a certain process. In general, condensates are natural gas liquids whose molecules have five or more carbon atoms (C5+, also known as pentanes plus or natural gasoline) versus methane (C1), ethane (C2), propane (C3/LPG), butane (C4/LPG). They are virtually always above 50° gravity and have significant naphtha content (usually more than 50%). Once it is a liquid it usually stays a liquid, although often this requires a processing through a stabilization unit. On the other hand, condensates also resemble crude oil in that they can be processed into a variety of products fairly easily. But they are significantly lighter than light sweet crudes which are generally defined as above 34° API gravity and containing less than 0.7% sulfur.

**The fundamental problem is that some condensate is defined as product, which can be freely exported under general license, and some is defined by production at a field or wellhead (lease condensate) which cannot be exported (except to Canada, where it can be exported freely) because it is defined as crude oil.** Molecularly, however, the two sorts of condensate – plant condensate and lease condensate – cannot be distinguished. Even though lease condensate is often indistinguishable from natural gasoline, it cannot be exported because it is not a product. But it can be upgraded by a simple process (see above) and then exported.

**Evidence is overwhelming that the government is wrestling with the issue of defining condensate in such a way as to enable it to be exported more freely, perhaps to be exportable under general license.** Recent public statements from White House and Department of Energy officials that consideration was being given to exports of Eagle Ford crude, which is up to 50% condensate, provide some indications. But getting a decision right in a congressional election year is not easy politically.

**Several sets of problems emerge with condensate or extra light crude oil that suggest that exports could serve the national interest by resulting in even more crude oil production growth,** and that the superabundance of condensates is impeding that growth. The US Gulf Coast refining system has been built to process and upgrade heavier and sourer crudes such that it has the highest concentration of upgrading units in the world. And recent upgrades in PADD II including at BP Whiting, Marathon Detroit, and Phillips 66 Wood River, amounting to almost 850-k b/d of total CDU capacity, were designed to upgrade greater volumes of heavier Canadian crudes. The growth since 2010 of light crudes through the midcontinent and Gulf Coast has led refiners to increase their capacity to process light crudes by at least 1-m b/d.

**There are clear limits to how much light crude the US refinery system can process, and condensate are a significant part of the problem.** At some point refinery plants geared to refine sour crudes find their overall yield reaching a point of no return and falling if they process too much light sweet crude. These constraints are readily identifiable. The plants that distill crude oil at some point are unable to process the amount of vapor associated with very light crude oil. Similarly heat exchangers have limitations in their flexibility to condense a very high volume of light and extra light crude oil. Sometimes gas plants which are the point of separation of liquids are inadequate to process more light ends. Since light crudes, condensates in particular, have large amounts of naphtha, they reach bottlenecks to processing capacity. Once the refining system as a whole reaches utilization limits,

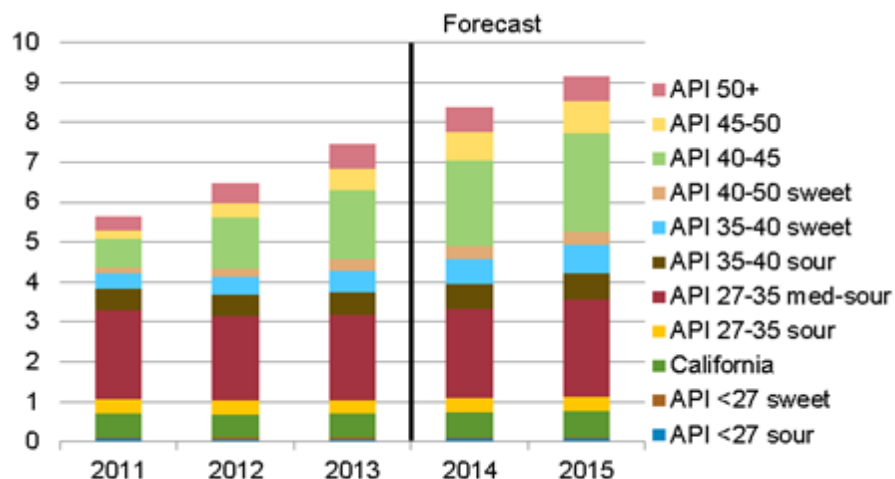
light crudes and condensates cannot be used, are dislocated and stranded and their prices falls with no clear use.

**There are also, therefore limits to production without exporting very light crude streams. If producers have no natural off-takers or buyers they reach a point where they cannot expand production more rapidly.** It is for this reason that IHS in a recent study of crude oil exports, argued that if the US ended all bans on crude oil exports, production in the US would increase by 949-k b/d by 2016.

**Both distressed sales and geopolitics are pushing the US government to ease controls on condensate exports, and it appears that 180- to 200-k b/d of exports could be licensed by the end of 2014.** In geopolitical terms, condensates blended with either Canadian bitumen or Mexican Maya crude could form a synthetic Brent crude that could be exported to Europe. Actually, if European refiners found that they could process such crude they might well find that the high naphtha content would make them especially attractive, in naphtha-short Europe. For the export “arb” to Europe to work, the underlying feedstock – bitumen or Maya – would have to remain depressed versus world levels, as is currently the case.

**Additionally, condensate export licenses appear to have been filed by parties seeking to export to Asia as petrochemical feedstock.** The abundance of condensates in various North American producing areas and the need for petrochemicals producers, particularly in Asia, to find competitive feedstock, particularly naphtha, makes it likely that the export market for C5+ molecules would be as attractive as those for C3 and C4, which has already propelled the US into being an even larger exporter of LPG than Saudi Arabia.

Figure 42. EIA assessment of US crude oil production by type (m b/d, 2011-15)



Source: EIA, DrillingInfo, Colorado DNR, Texas RRC

**It looks extremely likely that by year end the Commerce Department/BIS will find a way to issue licenses to export condensate.** What is unclear is the grounds or rationale for the licenses. One limit could be current port facilities on the US Gulf Coast, although these look north of 200-k b/d and could be built out relatively quickly. Another could be crude by gravity. A recent EIA report indicates that at present there is 600-k b/d of nationwide production of crude oil of over 50° API gravity. A straightforward definition of lease condensate above this level of gravity would be a clear cut rule. Or the Commerce Department could decide on an ad hoc

basis to allow crude that has a distressed price for exports on a case-by-case basis. Or, it could define condensate based on a process of separation from other hydrocarbons as through a stabilization process. It is also unclear whether Commerce will begin to issue licenses on an ad hoc basis, issue a rule, or propose a rule for public comment. But the fact that senior officials of the administration have been talking openly about the issue is a sign that a positive decision might well come.

**All in all, projecting 1-m b/d of US exports of crude by year-end does not look so far-fetched and could change political sentiments with respect to changing the regulations and laws on crude oil exports.** Adding together potential exports to Canada (400-k b/d), from Alaska (100-k b/d), into Mexico (120-k b/d), re-exports of Canadian crude (200-kb/d), and exports of condensate (200-k b/d) point in that direction. It could mean that US crude oil exports could be larger than those of a number of OPEC countries (Ecuador, Libya) and approximate those of some (Algeria). Combined with growth exports of petroleum product, it would make the US on a gross export basis fall just under Saudi Arabia and Russia as a gross exporter of crude and products, although on a net basis, the US would still be a net hydrocarbon importer.

**Unless relief is found soon on the export constraints for US crude oil (as well as for Canadian crude oil), the implications for prices, time spreads, and spreads to waterborne crudes can become volatile and severe.** We examine these implications in the next section.

### **If a restrictive export regime stays in place through 2015...**

**Without a rise in crude exports, the situation for domestic US crude prices worsens considerably.** In 2015, high PADD III inventories (particularly for light, sweet crude) keep the pressure on, though heavier imported crudes could be backed out by Canadian heavy crude; light-heavy crude differentials would need to narrow to encourage the light crude glut to be cleared by refinery switching. 2016 could see Bakken rail to the East Coast saturated too, having pushed out all Brent/West African light sweet crude imports. Cushing can begin to build again as pipeline inflows rise, widening LLS-WTI back to pipeline costs, although pipeline tariffs look to narrow over time back down towards the \$1/bbl level, with FERC making rulings on the Seaway line, which had tolls of under \$1 when it was running from the Gulf Coast up to Cushing. Meanwhile, some condensate splitter capacity could chip away at the surplus.

**2017-18 could see Energy East pipeline alleviate western Canadian stranded crude. But in the US, LLS and WTI could price at major discounts to Brent as light crude is in surplus on a nationwide basis, and refineries have switched to a larger diet of light sweet crude in their crude slates.** The Brent-LLS spread in 2017 and 2018, without a broad-based opening up of crude exports, could blow out until producers shut-in production; numbers shown here are illustrative, but point to the potential for perhaps \$60 WTI.

Figure 43. North American crude price outlook under a restrictive export regime

	4Q'12	1Q'13	2Q'13	3Q'13	4Q'13	1Q'14	2Q'14	3Q'14	4Q'14	2015	2016	2017	2018
WCS Cushing-WCS	17	16	8	10	15	11	10	7	7	10	10	10	7
Maya-WCS Cushing	15	19	13	6	5	0	0	0	0	0	3	2	1
Maya-WCS	32	36	21	16	20	11	10	7	7	10	13	12	8
LLS-WTI	21	20	11	4	1	6	2	1	1	0	3	2	1
Brent-LLS	1	-2	-2	0	5	4	6	6	10	15	20	25	30
LLS-Maya	17	11	7	11	8	15	8	8	7	5	5	6	7
WTI-WCS	27	27	17	23	27	21	16	14	13	15	15	16	14
Brent-WCS	49	45	26	27	33	30	24	21	24	30	38	43	45
Brent	110	113	103	112	105	108	109	111	108	105	95	95	95
LLS	110	114	105	110	100	105	103	105	98	90	75	70	65
WTI	88	94	94	106	99	99	101	104	97	90	72	68	64
Maya	93	103	98	99	92	90	95	97	91	85	70	64	58
WCS	61	67	77	83	72	79	85	90	84	75	57	52	50

Source: Bloomberg, Citi Research

### Base case: some exports and outlets, but these lag behind production growth

**2Q'14 could see Cushing down to 15-20-m bbls, and WTI could rally relative to Houston or LLS crude prices to ration pipe outflows. Imports remain sticky but continue to be backed out progressively, though this is heavier crude.**

**Exports ramp-up as discussed earlier, with condensates progressively evacuating the system, allowing real relief for light crude balances.** 2H'14 sees Flanagan South and Pony Express pipelines supply more crude into Cushing, which can flow straight through to the Gulf Coast, but LLS-WTI may need to stay tight to keep enough barrels in Cushing for operating levels. Refinery turnarounds in 4Q'14 could drive a fast stock build again, and December 2014 could see extra bearishness due to the desire to minimize PADD III inventories for end-of-year tax reasons. Import and export adjustments help keep Brent-WTI from blowing out too much, but blow-outs remain periodic and seasonal risks as adjustments lag production growth.

**2016 onwards, the Keystone XL pipeline and other inflow pipelines into Cushing widen LLS-WTI in 2016 onwards.** The Energy East pipeline, which could be ready by 2017-18, allows western Canadian production to reach the eastern Canadian coast and be exported to foreign markets outside the US.

Figure 44. Base case price outlook, with growing exports and falling imports that barely keep pace with growing availability of crude

	4Q'12	1Q'13	2Q'13	3Q'13	4Q'13	1Q'14	2Q'14	3Q'14	4Q'14	2015	2016	2017	2018
WCS Cushing-WCS	17	16	8	10	15	11	10	7	7	10	7	7	7
Maya-WCS Cushing	15	19	13	6	5	0	0	0	0	0	3	2	1
Maya-WCS	32	36	21	16	20	11	10	7	7	10	10	9	8
LLS-WTI	21	20	11	4	1	6	2	1	1	0	3	2	1
Brent-LLS	1	-2	-2	0	5	4	4	3	8	6	6	6	4
LLS-Maya	17	11	7	11	8	15	8	8	7	8	8	8	9
WTI-WCS	27	27	17	23	27	21	16	14	13	18	15	15	16
Brent-WCS	49	45	26	27	33	30	22	18	22	24	24	23	21
Brent	110	113	103	112	105	108	109	111	108	105	95	90	90
LLS	110	114	105	110	100	105	105	108	100	100	89	84	86
WTI	88	94	94	106	99	99	103	107	99	100	86	82	85
Maya	93	103	98	99	92	90	97	100	93	92	81	76	77
WCS	61	67	77	83	72	79	87	93	86	82	71	67	69

Source: Bloomberg, Citi Research

## With full exportability of US crude oil from 2015...

Export legislation is not likely to see another change until after the November mid-term elections, but in 2015, a more widespread change to legislation could happen. If exports were freely allowed, Brent-LLS could return to a waterborne transportation relationship of ~\$2, but with LLS at a discount to Brent, rather than a premium to Brent, as had been the case historically, when the US Gulf Coast was a net importer of light, sweet crude; now, the US Gulf Coast would be in a position to export light, sweet crude, and the arbitrage would be reflected by lower US Gulf Coast crude prices relative to world prices.

Figure 45. Price outlook under a full open export regime

	4Q'12	1Q'13	2Q'13	3Q'13	4Q'13	1Q'14	2Q'14	3Q'14	4Q'14	2015	2016	2017	2018
WCS Cushing-WCS	17	16	8	10	15	11	10	7	7	10	7	7	7
Maya-WCS Cushing	15	19	13	6	5	0	0	0	0	0	3	2	1
Maya-WCS	32	36	21	16	20	11	10	7	7	10	10	9	8
LLS-WTI	21	20	11	4	1	6	2	1	1	0	3	2	1
Brent-LLS	1	-2	-2	0	5	4	4	3	8	2	2	2	2
LLS-Maya	17	11	7	11	8	15	8	8	7	10	10	10	10
WTI-WCS	27	27	17	23	27	21	16	14	13	20	17	17	17
Brent-WCS	49	45	26	27	33	30	22	18	22	22	22	21	20
Brent	110	113	103	112	105	108	109	111	108	105	95	85	85
LLS	110	114	105	110	100	105	105	108	100	103	93	83	83
WTI	88	94	94	106	99	99	103	107	99	103	90	81	82
Maya	93	103	98	99	92	90	97	100	93	93	83	73	73
WCS	61	67	77	83	72	79	87	93	86	83	73	64	65

Source: Bloomberg, Citi Research

## Appendix A-1

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