Domestic Energy - Current Themes

**Situation:**
- Domestic production of oil, natural gas and natural gas liquids (“NGLs”) is growing rapidly
- Resources used to be hard to find and easy to recover, now they are easy to find and hard to recover
- Technology (primarily horizontal drilling and hydraulic fracturing) has made the US a major global power, again

**Result:**
- We are importing MUCH less crude oil than we have in decades
- Our typical domestic markets are out of balance, particularly in producing regions
- The world is looking for ways to help us with this “problem”

**Solution:** Massive investment in **PROCESSING** and **EXPORT**
## Solving the US Market Imbalance

<table>
<thead>
<tr>
<th>Potential Solutions</th>
<th>Constraints</th>
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<tbody>
<tr>
<td>Consume as fuel domestically</td>
<td>US refined product demand is not growing</td>
</tr>
<tr>
<td>Convert to products for domestic consumption and for export</td>
<td>Refining capacity is designed for foreign oil (heavy oil from Venezuela, Mexico and Canada)</td>
</tr>
<tr>
<td>Export directly</td>
<td>Petrochemical development is a partial solution, but it takes many years + billions of $$$</td>
</tr>
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- See the refinery capacity note above
- Restricted by law for most crude oil
- Restricted by infrastructure, cost or physics for everything else
Crude Oil Turnaround

U.S. Crude Oil Production

As this trend continues, growth in US production is expected to match GLOBAL growth in production.

Source: EIA, Tudor, Pickering, Holt & Co.
With politics preventing the development of alternatives, USGC is the outlet for NAM crude oil.

**Midstream:** Houston and the Gulf Coast is the destination for 72% of all NAM crude pipelines under construction, and 100% of all US pipelines.

**Downstream:** Gulf Coast refineries are being expanded to accommodate more shale oil.

**Exports:** Refineries and new processing facilities are increasing export capacity to exploit the arbitrage between US and global prices.
Light Crude Oil Imports Halved Since 2008

Total US Light Imports (MBPD)

Growing NAM production push out 1.1 MMBPD OPEC barrels since 2008

% change, MBPD since 1/08

Source: EIA (data as of February 2013); >35° gravity

Nigeria: -76%, -395 MBPD
Algeria: -100%, -381 MBPD
Venezuela: -91%, -125 MBPD
Saudi Arabia: -21%, -46 MBPD
Iraq: na
Other OPEC: -93%, -150 MBPD
Canada: 164%, +224 MBPD
Mexico: 26%, +28 MBPD
Other non-OPEC: -78%, -318 MBPD

Source: EIA (data as of February 2013); >35° gravity
USGC Leading Push for Refined Product Exports

- Most crude oil exports are still restricted by law
- However, refined products exports are allowed, and are growing rapidly
- $1+ billion planned in USGC refining expansions to solve the imbalance of light crude oil

Source: EIA.
90% of production moves through Mont Belvieu.

70% of US NGLs are consumed on the Gulf Coast.

**Chemicals:** NGL prices enable the US to compete with Middle Eastern chemical costs. $40B of projects to consume 800 MBPD of NGLs (mostly ethane) come online this decade.

**Exports:** For non-ethane NGLs, the Houston Ship Channel will become home to as much NGL export capacity as the entire country of Qatar, the current #1 global exporter, by 2016-17.
Increased NGL Production = Chemicals Boom

US Ethane Supply/Demand Forecast

- Ethane (the lightest NGL component is forecasted in surplus for the foreseeable future…..That is good for Chemicals

Source: Tudor, Pickering, Holt & Co.

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>750 MBPD C2 Cracking and PDH Capacity by 2020

Propane demand likely negated by ethylene switching

Source: Tudor, Pickering, Holt & Co.

*Braskem and SABIC also investigating newbuild ethane crackers in the US*
The US will become the world’s largest LPG exporter by 2015, and will more than double Qatar (the world’s current leader) in capacity by 2016.

To accommodate flood of US supply, global pricing will have to move away from oil-linked pricing, but must still provide a premium to Mont Belvieu to incentivize exports.

**LPG Export Capacity (MBPD)**

- Most of the increased LPG export capacity is centered on the Gulf Coast, which will surpass Qatar, the world’s current #1 exporter.

Source: Tudor, Pickering, Holt & Co.
LNG’s Best Hope is also the USGC

Nearly all of the US gas export build-out is taking place on the Gulf Coast, totaling >$100B of capex.

Regulatory hurdles remain: 4 Bcf/d of export pipes are proceeding but LNG requires DOE approval. 40% of 19 Bcf/d have received DOE Non-FTA approval; 11% are under construction.

Source: EIA, Tudor, Pickering, Holt & Co.
Natural Gas will Find a Premium in the USGC

Increasing industrial, power gen, and export demand on the Gulf Coast will likely create a Gulf Coast-premium market by 2020.

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Project</th>
<th>Timing</th>
<th>Size (bcf/d)</th>
<th>Comm?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGT/TCO</td>
<td>Gulf Bi-direction</td>
<td>Q2 2013</td>
<td>0.54</td>
<td>0.54</td>
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<tr>
<td>TGP</td>
<td>Gulf Reversal</td>
<td>Q2 2014</td>
<td>0.50</td>
<td>0.50</td>
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<tr>
<td>TETCO</td>
<td>TEAM 2014</td>
<td>Q4 2014</td>
<td>0.30</td>
<td>0.30</td>
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<tr>
<td>TETCO</td>
<td>TEAM South</td>
<td>Q4 2014</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>TETCO</td>
<td>OPEN</td>
<td>Q4 2015</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>TGP</td>
<td>Utica Backhaul</td>
<td>Q4 2015</td>
<td>0.35</td>
<td>0.00</td>
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<tr>
<td>TGT</td>
<td>OH-LA Access</td>
<td>Q2 2016</td>
<td>0.50</td>
<td>0.30</td>
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<tr>
<td>CGT/TCO</td>
<td>Leach/Rayne Xpress</td>
<td>Q3 2016</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>TETCO</td>
<td>Gulf Mkt Exp 1</td>
<td>Q4 2016</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>CGT/TCO</td>
<td>Cameron Access</td>
<td>Q3 2017</td>
<td>0.83</td>
<td>0.83</td>
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<tr>
<td>TGP</td>
<td>Cameron LNG</td>
<td>Q3 2017</td>
<td>0.55</td>
<td>0.20</td>
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<tr>
<td>TETCO</td>
<td>Gulf Mkt Exp 2</td>
<td>Q3 2017</td>
<td>0.40</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Total (bcf/d) 6.27 5.37

Source: Tudor, Pickering, Holt & Co.
<table>
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<tr>
<th>Commodity</th>
<th>Gulf Coast Trend</th>
</tr>
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<tr>
<td>Crude Oil</td>
<td>- Increased exports as refined products</td>
</tr>
<tr>
<td></td>
<td>- Minor chance of political support for actual crude oil exports</td>
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<td></td>
<td>- Imports will continue to decline</td>
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<tr>
<td>Natural Gas Liquids</td>
<td>- Petrochemical build-out will catch up with supply of ethane by 2020, making the US a major player in global polyethylene production</td>
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<td></td>
<td>- LPG exports will continue to grow, changing the structure of the global market</td>
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<tr>
<td>Natural Gas</td>
<td>- Industrial demand and power switching is driving US manufacturing competitiveness</td>
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<tr>
<td></td>
<td>- Exports will shift power away from Russia and the Middle East given our low marginal cost of production</td>
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