METALS OUTLOOK

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J.P. Morgan

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Fundamental economic developments have been misunderstood by many observers.

The truth.

Cumulative change in annual US unwrought aluminum imports from select country groups and annual average prompt Brent crude oil price kmt (bars, LHS), US$/bbl (line, RHS)

Prices, 2013 D6 and D4 RINs credits US$ per gallon

Scott Irwin
University of Illinois at Urbana Champaign

US primary aluminum = structural deficit for 3 decades. 3.2 mmt of imports in 2013.

Aluminum is molting. US primary industry is old and expensive. It also makes a product its local customers increasingly do not want.
Global economic growth is stronger and broader based that at any other point in the past three years.

A structural reorganization of the aluminum sector is challenging traditional trade flows.
The co-movement between cancelled warrants and premium is coincidental not causal. Both are reflections of the broader US and global economic recoveries.

Since 2008, the correlation between MW aluminum premium and dental workers is actually higher than the correlation between MW aluminum premium and LME aluminum cancelled warrants.
More capacity ex-China is competing for shrinking shelf space as the two largest engines of aluminum growth (China and India) remain largely self-sufficient.

### Share of forecast global growth in aluminum use across 2013, 2014, and 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>6%</td>
</tr>
<tr>
<td>2014</td>
<td>7%</td>
</tr>
<tr>
<td>2015</td>
<td>8%</td>
</tr>
</tbody>
</table>

### Energy used to produce one metric tonne of aluminum

<table>
<thead>
<tr>
<th>Kilowatt Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,000</td>
</tr>
</tbody>
</table>

### Source:
Company reports, WBMS, Wood Mackenzie, J.P. Morgan Commodities Research

### China and India combined share of global aluminum use

<table>
<thead>
<tr>
<th>Year</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>38%</td>
</tr>
<tr>
<td>2014</td>
<td>37%</td>
</tr>
<tr>
<td>2015</td>
<td>44%</td>
</tr>
</tbody>
</table>

### Advantages of used beverage aluminum can scrap over primary aluminum

- **Price**: −20%
- **CO₂**: −90%

### Source:
IA, J.P. Morgan Commodities Research

Aluminum bearish scenario: smelter production costs move lower and secondary aluminum takes further market share from primary in the demand mix.

### Global primary aluminum cash production cost (C1)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost in US$ per mt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>$1,500</td>
</tr>
<tr>
<td>2012</td>
<td>$1,600</td>
</tr>
<tr>
<td>2011</td>
<td>$1,700</td>
</tr>
</tbody>
</table>

### Source:
Wood Mackenzie, J.P. Morgan Commodities Research

1. **Production cost support continues to move lower.**
   - The 2013 global average cash cost (C1) for aluminum smelters was reported at almost $60/mt below the 2012 level, which was $80/mt lower than 2011 production costs.

2. **Increased secondary usage in the US is a structural trend.**
   - Secondary usage will continue to displace demand for primary material, offsetting positive end use demand trends.
Aluminum bullish scenario: capacity curtailments in China further shrink a strong production growth profile.

1. The Chinese central government continues to prioritize anti-pollution measures.
   - Measures targeted at reducing industrial overcapacity, including restricting lending to industries including aluminum, make it increasingly likely that loss-making smelters will struggle to maintain solvency.

2. Approval of new capacity additions in China is limited only to efficient, cheap smelters in the West.
   - In February, China’s MIIT disclosed new plans for stricter standards to control aluminum smelter capacity expansions. According to MIIT, a three year ban will be put in place on approvals for new projects. Wood Mackenzie estimates that there are 12 mmt/a of new aluminum capacity, of which 6 mmt/a are already in construction and most likely will not be impacted by the new regulation. Many of the new projects however, will be delayed or canceled.

Civil society in China has discovered air quality indices and monitor them from smart phones. The public is demanding curtailment of coal burn.

Source: US Embassies. FreshIdeas Studio. qz.com
Summary of major projects and growth in primary aluminum.

Significant Ex-China additions to primary aluminum smelting capacity, 2014 to 2016

- **Canada:**
  - Kitimat expansion: +240 kmt

- **Middle East:**
  - Taweelah expansion: +500 kmt
  - Ras Az Zawr ramp up: +550 kmt

- **India:**
  - Jharsuguda expansion: +550 kmt
  - Korba expansion: +300 kmt
  - Mahan ramp up: +330 kmt
  - Aditya ramp up: +350 kmt

- **Russia:**
  - Boguchanskoye ramp up: +300 kmt

**US capacity utilization in transportation is about 73%. Utilization in resources is 80% to 90%. Manufacturing is in between.**

**Capacity utilization by industrial sector, Jan 2014 (percent)**

Source: Federal Reserve, J.P. Morgan Commodities Research
US capacity utilization relative to trend.

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**Investment in private intellectual property products by the trucking industry is now about $800MM per year.**

**Source:** Bureau of Economic Analysis, J.P. Morgan Commodities Research

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**Source:** Federal Reserve, J.P. Morgan Commodities research. Average is from Jan-1974 to Jan-2014

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Last week, the World Trade Organization issued a ruling against Chinese trade restrictions on rare earth minerals.

Strategic reserves in context: the US has large rare earth oxide (REO) reserves but produced only 4 kmt of REOs in 2013. The US is among the world leaders in oil and gas production but exports virtually none of those commodities.
China’s pull on physical markets is getting larger. Its share of financial trading of commodities risk is 22% in metals but 0% in energy.

Steel base case: China, with 2013 estimated iron ore production of 369 Mt, provides a near-term cushion to iron ore prices given its high costs of production.
Cycles progress. By definition, they never ‘end’. The current investment supercycle is just beyond its midpoint, not at its trough. Prices will be strong, but volatile.

**Supercycle lessons**

1. By definition, the commodity supercycle cannot be ‘over’. A given cycle leads inexorably to the next.
2. The relevant question is: where in the cycle is the current market? And if the correct answer is that a given commodity supercycle has ended, then by definition it also means the next supercycle has begun. But the ‘supercycle is over’ adherents believe neither in a new supercycle nor an imminent strong price ascent.
3. The current supercycle began in October 1999, when spot and forward commodity prices arrived at multidecade troughs and entered its steep ascent phase for spot prices in early 2004. We project the trough will not occur until 2028 or 2029.
4. The current supercycle is actually just beyond its midpoint, in the early days of Phase 3, a consolidation kind of phase, where prices signals have been received and accepted by both consumers and producers but new blueprints have to be translated into real operations.
5. Phase 3 is likely to see far smaller annual spot price increases than Phase 2, but it will also likely bring stronger term structure and higher spot price volatility than in any other phase of the supercycle.

**Stylized view of the stages of the commodity supercycle**

1. Spot prices have troughed, skepticism of price ascent is high, the public has limited interest.
2. Strong ascent of prices across forward curve; significant confusion about drivers; ‘blame game’
3. Strong capex makes longdated prices stationary at new cost equilibrium; market signals work more through sharper oscillations in prompt prices. Backwardations can be steep.
4. Spare capacity mounts, putting downward pressure on spot prices and driving contango curves, public sentiment loses interest in these markets, except on one-off events.

Assets under management in commodity exchange traded products have fallen to about $117 billion. We estimate about $74 billion of this total is in gold funds.
Last spring, technicals were flagging a rising risk of a steep, if brief, correction in metals prices.

After gold prices swooned from $1690/oz in Jan-13 to $1223/oz by June, the 2H2013 avg price of $1300/oz was below all-in sustaining costs for 20% of gold production.
Between Jan and July, 2013, we tracked 940 thousand oz in production cuts and lower guidance in 2013 and a further 1.3 mn oz/year cut from prior plans for 2014 and 2015.

**Gold ounces at risk under various price scenarios (2013E), million oz and percent**

<table>
<thead>
<tr>
<th>Spot gold price level</th>
<th>All-in sustaining production cost</th>
<th>Adjusted all-in sustaining production cost</th>
<th>% of global production</th>
<th>Ounces</th>
<th>% of global production</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,250</td>
<td>30.9</td>
<td>31.8%</td>
<td>15.9</td>
<td>1.0%</td>
<td>15.9%</td>
</tr>
<tr>
<td>$1,300</td>
<td>18.3</td>
<td>18.8%</td>
<td>5.3</td>
<td>5.4%</td>
<td>5.4%</td>
</tr>
<tr>
<td>$1,400</td>
<td>15.7</td>
<td>16.1%</td>
<td>2.5</td>
<td>2.6%</td>
<td>2.6%</td>
</tr>
<tr>
<td>$1,450</td>
<td>6.1</td>
<td>6.3%</td>
<td>1.7</td>
<td>1.8%</td>
<td>1.8%</td>
</tr>
<tr>
<td>$1,500</td>
<td>4.5</td>
<td>5.1%</td>
<td>1.2</td>
<td>1.3%</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

Source: Company reports, J.P. Morgan Commodities Research. Note: the adjusted all-in sustaining cost basis assumes that miners are successful in removing an average of $175/oz from their all-in sustaining cost by trimming SG&A, sustaining capex, and/or exploration expense.

**Cumulative changes to JPM's global gold mine production forecast, thousand oz**

Gold mine production is likely to rise over the next few years. Asia and Latin America are taking production share from Africa and Oceania.
Liquidations from gold ETFs have been largely met by Asian demand, which surged on lower prices.

China has recently displaced India as the #1 market for gold jewelry demand, and its fundamentals will account for a rising proportion of spot gold price formation.

- Chinese consumers generated 716 metric tonnes of jewelry demand in 2013, making China the largest gold jewelry market globally.
- Physical demand for gold in China is in a strong rising trend.
Rising Chinese jewelry sales are not yet large enough to offset the consequences of India’s stumble. The turbulence in this segment is likely to be a source of price volatility.

Our colleagues in JPM Economics Research expect that inflation will remain muted in both DM and EM this year, but year-ahead expectations are at 3.2%.
Gold investment in the context of global financial assets.

Copper: The J.P. Morgan Base Case.

- **Bottom line:** We expect a moderate global refined metal surplus in 2014, followed by a slightly larger surplus in 2015.
- We expect flat global mine supply growth in 2014 on the back of 8.7% growth in 2013. In 2015, we anticipate mine supply growth will recover to above-trend growth of 6%.
- Refined copper production will likely increase by 4% in 2014, as additions to Chinese refined capacity draw down the copper concentrate stockpiles that accumulated in 2013. We expect the global copper market to be in a surplus of 149 kmt in 2014. In 2015, new Chinese refined capacity is expected to operate at capacity, pushing the global refined market into a greater surplus of 264 kmt.
- We forecast average LME cash prices of $7,003 per mt in 2014 and $7,000 per mt in 2015.
- Our long-term copper price forecast is $7,500 per mt.
- Bearish price scenario: $5,500 per mt in 2014.
- Bullish price scenario: $7,800 per mt in 2014.
Copper bearish scenario: accelerated ramp up of Chinese refined capacity and a weaker near-term demand environment in EM lead to rising inventories.

1. Ramp up of Chinese refined capacity in 2Q2014 occurs at a faster rate than expected.
   - Our base case scenario assumes 950 kmt of refined capacity additions in China in 2014 resulting in 16% growth in Chinese copper smelting production.

2. The apparent deceleration in economic activity in China in February resulted in Chinese consumers stepping away from the market.
   - Weaker Chinese demand leads to the accumulation of domestic inventories and weaker imports.

Copper bearish scenario: concentrate stocks continue to build and less demand for cathode due to increased substitution of aluminum.

3. Low consolidation among copper producers results in higher mined production at lower copper prices to preserve revenue streams.
   - Marginal operating cash costs (C1) at the 90th percentile remains well below current prices resulting in further accumulation of concentrates stocks.

4. The price spread between copper and aluminum already shows mounting pressure to substitute.
   - Accelerated substitution could come from air conditioner tubing, heat exchangers, and transformer and winding wire.
Copper bullish scenario: A lower price environment means less scrap availability, delays in refined capacity growth, and production falls below expectations.

1. Current copper prices prove to be too low to incentivize additional scrap supply.
   - Scrap has been difficult to source from the market since 1Q2013, though availability started improving somewhat towards the end of last year. At current prices, scrap availability will deteriorate further, in our view.

2. Chinese copper smelters begin to cut production at current price levels.
   - Chinese smelters amassed significant copper concentrate inventories last year. We estimate that less than 50% of Chinese smelters are hedged, leaving them exposed to a falling domestic price. Weak domestic demand and tight scrap availability will also likely provide additional pressure.

   - LME copper on-warrant inventories at 146 kmt represent only 2.5 days of global demand. 108 kmt out of the total is located in North America. Comex copper stocks stand at only 12.7 kmt.

   - We estimate at the end of 2013 China’s refined stocks represented 56% of global inventories. With January refined copper imports up 83% yoy, China continues its restocking activity. However, with domestic demand weak YTD, we estimate China has moved into a destocking phase and we expect substantially weaker imports going forward. Improvement of domestic demand could lead to higher Chinese imports, drawing down available inventories in the world outside of China.
Refined copper demand growth is still driven by China, but at a slower pace. China’s smelter capacity additions and a stronger production profile suggest imports will moderate.

By 2H2014, the global copper market will likely become increasingly reliant on Chinese smelter expansions to turn ample concentrate availability into refined metal.
China is in a copper restocking phase. The rest of the world balance is likely to remain tight until 2H2014.

In addition to builds in copper concentrate stocks, Chinese refined copper inventories are rising. We estimate that 56% of global cathode inventories are in China.
Nickel: The J.P. Morgan Base Case.

- **Bottom line:** We expect the global balance will be in a slight deficit in 2014, moving into a deeper deficit in 2015.
- We expect the Indonesian ban on nickel ore exports remains in place, leading to cuts in nickel pig iron production in China.
- However, the nickel pig iron industry will likely react by accelerating Indonesian capacity build out and the Chinese stainless industry will react by adjusting the mix of stainless grades production towards more no-or-low nickel grades.
- We forecast average LME cash prices of $15,250 per mt in 2014 and $15,750 per mt in 2015.
- Our long-term nickel price forecast is $18,000 per mt.
- Bearish price scenario: $13,000 per mt in 2014.
- Bullish price scenario: $19,000 per mt in 2014.

**METALS OUTLOOK**

- Bearish price scenario: $13,000 per mt in 2014.
- Bullish price scenario: $19,000 per mt in 2014.

Nickel bearish scenario: an easing of the Indonesian ore export ban or significant investment in Indonesian NPI capacity keeps the global market well-supplied.

1. The Indonesian ore export ban is reversed or relaxed after the presidential election on July 9th.
   - Indonesia supplies 24.8% of global primary contained nickel in ore and we estimate China’s nickel pig iron (NPI) industry is approximately 60% reliant on Indonesian ores.
2. Faster than expected build-out of domestic Indonesian nickel pig iron capacity.
   - We now assume 83 kmt of Indonesian NPI production in 2015 and 153 kmt in 2016. There is 180 kmt/a of potential capacity additions.
Nickel bearish scenario: elevated stocks provide a significant buffer and the Chinese stainless industry has some flexibility to increase scrap share from primary metal.

3. The Chinese stainless industry increases its scrap usage and adjusts its production mix towards lower or no nickel stainless grades.
   - With the advent of NPI, Chinese stainless scrap ratios fell from over 40% in 2006 to around 20% in 2013. In an extreme example, a 2015 return to the previous highs of 40% would equate to an additional 165kt of secondary units at the expense of primary units.

4. The market continues to carry record inventories.
   - LME stocks alone are 283kmt. Sustained backwardations would likely see that figure increase further as metal currently held off-exchange will be delivered into LME locations. The Chinese nickel market is also well supplied.

Nickel bullish factor: marginal nickel production costs move higher and strong stainless demand pulls on that marginal tonne.

1. The new Indonesian NPI cost structure is unknown.
   - Ore costs will likely be significantly cheaper, but labor costs in Indonesia are 2 to 3 times higher than in China. Power availability is also limited.

2. Stronger than expected end use demand is coupled with re-stocking by distributors.
   - Anticipation of higher nickel prices, combined with heavy destocking and cuts to production in the later part of 2013, could result in re-stocking activity at distributors.
Nickel bullish factor: Massive capex requirements and technical challenges likely mean little (if any) new capacity is built outside of Indonesia.

- Massive capex and major technical difficulties result in no new major nickel capacity being built ex-Indonesia.
  - Laterite ores surpassed sulphide nickel production in 2009. Escalating capital intensity of building HPAL facilities to treat lateritic ores and failure to ramp up new greenfield projects to capacity will likely deter new investment in future capacity.
  - New capacity will require an incentive price above $20,000/mt.
  - Western producers are currently unwilling to commit to the high capital spending that is needed to bring new capacity on stream and Chinese producers have no access to feed stock. Where will the production come from?

Just over 20% of the global refined nickel market comes from China’s NPI. Of the nickel ore required to feed China’s NPI output, 60% is dependent on Indonesia.
Uncertainty surrounding Indonesia’s mineral export policies leaves Chinese stainless production vulnerable. Nickel use in non-stainless applications will likely fare better.

Oil price probabilities.

| Market based probability of oil price at expiry for these futures contracts: | NYM WTI CONTRACT |
|---|---|---|---|---|
| 11-Mar-14 price | May-14 | Jul-14 | Sep-14 | Nov-14 |
| Below $85 | 1% | 7% | 13% | 19% |
| Below $96 | 27% | 40% | 46% | 50% |
| Below $100 | 53% | 58% | 61% | 63% |
| Above $105 | 18% | 22% | 23% | 24% |
| Above $110 | 4% | 9% | 11% | 13% |
| Above $115 | 0% | 3% | 4% | 6% |

Source: NYM. Note: at settlement for prompt NYM WTI, 3-year average is $96.17, one-year high is $110.53, one-year low is $86.68.
Jones Act compliant vessels represent less than 5% of the global fleet and cover less than 2.5 days of US petroleum demand.

US existing, planned, and proposed rail crude oil loading capacity compared to US products supplied

Jones Act vessel capacity (LHS, mb) compared to US products supplied (RHS, mbd)

Total US product and crude oil exports

Source: Company Data, News Reports, North Dakota Pipeline Authority, J.P. Morgan Commodities Research
Source: EIA, J.P. Morgan Commodities Research
Source: EIA, J.P. Morgan Commodities Research

Domestic crude is more expensive than imported crude.

US crude oil imports by API gravity

Difference between US refiners' acquisition costs of crude oil (domestic crude price – import crude price)

Source: EIA, J.P. Morgan Commodities Research
Note: Heavy and medium = API < 30, light = API > 30.
How many countries grow crude production or consumption by more than 100 kbd?

<table>
<thead>
<tr>
<th>Countries with more than 100 kbd of crude oil production growth in 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States (+1,252 kbd)</td>
</tr>
<tr>
<td>Canada (+258 kbd)</td>
</tr>
<tr>
<td>U.A.E. (+123 kbd)</td>
</tr>
<tr>
<td>Russia (+102 kbd)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Countries with more than 100 kbd of crude oil consumption growth expected in 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>China (+439 kbd)</td>
</tr>
<tr>
<td>Russia (+108 kbd)</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Commodities Research.

Industry data suggest 865 kbd of US tight oil production growth in April 2014.

Source: EIA, J.P. Morgan Commodities Research.
Annual oil output from three key tight basins is above 1mbd each. Legacy decline rates are now 242 kbd/m across the six key basins. EagleFord decline > 100kbd.

The more successful North America is in exploiting its advantage in shale energy production, the greater the pressure to export that crude and gas to Asia.
US petroleum product exports are now more than 3.6 mbd—the largest in the world.

Where would US crude exports go?

Crude oil import dependency (balance divided by consumption). Deepest red is most import dependent, deepest green indicates most self sufficient. Annual, 1980-2013E.
China imported 6.7 mbd of crude in January. The delta to trend was about 900 kbd – the size of the entire US ethanol industry. This was barely more than 1 sigma.

Shale production contributes to lower-than-average unemployment rates.

Unemployment rates by State, seasonally adjusted, December 2013

- N. Dakota: 2.6%
- S. Dakota: 3.6%
- Nebraska: 3.6%
- Kansas: 4.9%
- Oklahoma: 5.4%
- Texas: 6.0%
Workers migrate to take advantage of employment opportunities but oil booms can severely tighten local housing markets.

Population of Williston, ND and Detroit, MI Index, 100 = 2000

<table>
<thead>
<tr>
<th>City</th>
<th>Average rent for a 700-sq foot, one bedroom apartment US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williston, N.D.</td>
<td>$2,394</td>
</tr>
<tr>
<td>San Jose, C.A.</td>
<td>$1,881</td>
</tr>
<tr>
<td>San Francisco, C.A.</td>
<td>$1,776</td>
</tr>
<tr>
<td>Dickinson, N.D.</td>
<td>$1,733</td>
</tr>
<tr>
<td>Key West, F.L.</td>
<td>$1,640</td>
</tr>
<tr>
<td>Boston, M.A.</td>
<td>$1,537</td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>$1,504</td>
</tr>
<tr>
<td>Los Angeles, C.A.</td>
<td>$1,411</td>
</tr>
</tbody>
</table>

Source: US Census Bureau, J.P. Morgan Commodity Research
Note: Estimates are as of July 1.

Where will US crude export infrastructure be built? Washington state has raised its hand.

Economic reality of Grays Harbor
- Unemployment rate of 12.4% (2nd highest in Washington)
- Median household income of $39,836, 70% of the state average of $55,500

Why Grays Harbor?
- Proximity to open ocean
- Class 1 rail access
- Room to expand
- Experienced labor

Source: WA State Dept of Ecology, Port of Grays Harbor
Source: Port of Grays Harbor (January 2013)
Deviations from normal weather are strong, but not uniform.

This winter Lake Erie has completely frozen over, while temperatures broke through 107°F (42C) in Melbourne in January.
Seismic activity in Tokyo and offshore Japan increased significantly in both frequency and intensity following the Tohoku-Oki earthquake of March 2011.

On February 20 one hundred metric tons of contaminated water leaked from a tank, according to Reuters. This is the worst incident since last August.

According to the operator, TEPCO, the contaminated water is unlikely to have reached the ocean, 700 meters away.

Arctic clippers have sent Consuming East cash markets spiking much higher than consensus believed possible, but higher vol is an underlying trend.
Implied volatility in prompt NYM WTI crude oil and NYM natural gas.

Prompt NYM natural gas
Frequency by implied vol (%). Histogram since 16-Mar-93. Solid gray line is the distribution since 15-Dec-09. Dotted gray line is max of this distribution. Green line is implied vol as of 24-Feb-2014 and solid red line is current implied vol.

Prompt NYM WTI crude oil
Frequency by implied vol (%). Histogram since 15-Jul-93. Solid gray line is the distribution since 15-Dec-09. Dotted gray line is max of this distribution. Red line is current implied vol.

Implied volatility in prompt CMX gold, CMX copper, and LME aluminum.

Prompt CMX gold
Frequency by implied vol (%). Histogram since 14-Dec-93. Solid gray line is the distribution since 15-Dec-09. Dotted gray line is max of this distribution. Red line is current implied vol.

Prompt CMX copper
Frequency by implied vol (%). Histogram since 27-Dec-93. Solid gray line is the distribution since 15-Dec-09. Dotted gray line is max of this distribution. Red line is current implied vol.

Prompt LME aluminum
Frequency by implied vol (%). Histogram since 8-Mar-07. Solid gray line is the distribution since 15-Dec-09. Dotted gray line is max of this distribution. Red line is current implied vol.
US natural gas market is balanced on Canadian inflows. Domestic baseload demand is rising, but production will be higher by 2020.

The economic purpose of the enormous oil-gas price gap is to encourage large-scale displacement of diesel fuels by gas in the transportation segment.
Existing alternative fuel infrastructure in the US.

- 49 LNG stations
- 323 biodiesel stations
- 7,597 electric stations
- 670 CNG stations
- 2,382 ethanol (E85) stations
- 2,736 LPG stations

Source: DOE. Excludes private stations.
US working gas capacity grew by just 2% in 2013.

<table>
<thead>
<tr>
<th>Region</th>
<th>Nov-12</th>
<th>Nov-13</th>
<th>%-Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>2,300</td>
<td>2,305</td>
<td>0.2%</td>
</tr>
<tr>
<td>Producing</td>
<td>1,522</td>
<td>1,572</td>
<td>3.3%</td>
</tr>
<tr>
<td>Salt</td>
<td>407</td>
<td>449</td>
<td>10.3%</td>
</tr>
<tr>
<td>Nonsalt</td>
<td>1,114</td>
<td>1,123</td>
<td>0.8%</td>
</tr>
<tr>
<td>West</td>
<td>753</td>
<td>804</td>
<td>6.8%</td>
</tr>
<tr>
<td>Lower 48</td>
<td>4,575</td>
<td>4,681</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

Planned newbuilds and expansion of US gas storage capacity.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year in Service</th>
<th>Capacity (Bcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Bayou Storage Project</td>
<td>2014</td>
<td>-</td>
</tr>
<tr>
<td>Bobcat Gas Storage Cavern 4</td>
<td>2014</td>
<td>-</td>
</tr>
<tr>
<td>East Cheyenne Phase 2: Lewis Creek Field</td>
<td>2014</td>
<td>12</td>
</tr>
<tr>
<td>Kentucky Energy Hub Project</td>
<td>2014</td>
<td>8</td>
</tr>
<tr>
<td>Leaf River Energy Center Cavern 3</td>
<td>2014</td>
<td>16</td>
</tr>
<tr>
<td>Leaf River Energy Center Cavern 4</td>
<td>2014</td>
<td>16</td>
</tr>
<tr>
<td>Magnum Gas Storage Project - Cavern 1 and 2</td>
<td>2014</td>
<td>27</td>
</tr>
<tr>
<td>Sawgrass Storage Facility</td>
<td>2014</td>
<td>45</td>
</tr>
<tr>
<td>Tres Palacios Gas Storage - Cavern 4</td>
<td>2014</td>
<td>14</td>
</tr>
<tr>
<td>Tricor Ten Section Storage Project</td>
<td>2014</td>
<td>33</td>
</tr>
<tr>
<td>Central Valley Gas Storage Expansion Project</td>
<td>2014</td>
<td>3</td>
</tr>
<tr>
<td>Dominion Allegheny Storage Project</td>
<td>2014</td>
<td>2</td>
</tr>
<tr>
<td>Leaf River Energy Center Cavern 1</td>
<td>2014</td>
<td>4</td>
</tr>
<tr>
<td>Leaf River Energy Center Cavern 2</td>
<td>2014</td>
<td>4</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 1</td>
<td>2015</td>
<td>-</td>
</tr>
<tr>
<td>Leaf River Energy Center Cavern 3</td>
<td>2015</td>
<td>14</td>
</tr>
<tr>
<td>Tricor Ten Section Storage Project</td>
<td>2015</td>
<td>14</td>
</tr>
<tr>
<td>Perrvile Salt Dome Cavern 2</td>
<td>2015</td>
<td>14</td>
</tr>
<tr>
<td>LA Storage Project/Liberty Gas Storage Expansion Project</td>
<td>2015</td>
<td>19</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 2</td>
<td>2016</td>
<td>-</td>
</tr>
<tr>
<td>D’Lo Gas Storage Cavern 2</td>
<td>2016</td>
<td>-</td>
</tr>
<tr>
<td>Floridian Natural Gas Storage Phase II</td>
<td>2016</td>
<td>-</td>
</tr>
<tr>
<td>McBay Storage Hub</td>
<td>2016</td>
<td>60</td>
</tr>
<tr>
<td>Picaecho Peak Gas Storage Cavern 1</td>
<td>2016</td>
<td>-</td>
</tr>
<tr>
<td>Picaecho Peak Gas Storage Cavern 2</td>
<td>2016</td>
<td>-</td>
</tr>
<tr>
<td>Golden Triangle Storage Cavern 4</td>
<td>2017</td>
<td>11</td>
</tr>
<tr>
<td>Golden Triangle Storage Cavern 5</td>
<td>2017</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>300</td>
</tr>
</tbody>
</table>
Planned investments in US natural gas pipelines.

Price fireworks have been in the Northeast, but opportunity is still greatest in the Southeast and Mexico.
The energy reforms in Mexico are extremely important. Likely to succeed.

Onshore shale gas and shale oil basins of eastern Mexico’s Gulf of Mexico basin

- According to FERC, as of November 2013, the price of LNG at the Altamira regasification facility on the western coast of Mexico was estimated around $16.40/MMBtu. Waterborne LNG reports that April landed prices into Mexico from the spot market have priced around $16.90/MMBtu.
- Mexico’s Energy Reform, announced in early 2013, will allow private sector participation for oil and gas exploration while still maintaining state ownership of hydrocarbons. The move is expected to reduce energy costs for the country as it expands its power grid.
- On January 24, the Mexican government announced that three companies, PepsiCo, Cisco Systems and Nestle, will invest $7.35 billion USD in Mexico.

METALS OUTLOOK

Source: Mexican govt, FERC, Waterborne LNG

On January 24, the Mexican government announced that three companies, PepsiCo, Cisco Systems and Nestle, will invest $7.35 billion USD in Mexico.

And the walls come a-tumblin’ down.

The trade walls trapping NAM natural gas are falling

Source: DOE, NEB, JPMorgan Commodities Research. Notes: Cove Point has been approved for 1 Bcf/day of exports to FTA countries and 77 Bcf/day to non-FTA countries. Freeport LNG’s second application of 1.4 Bcf/day was approved for 1.4 Bcf/day to FTA countries and .4 Bcf/day to non-FTA countries. The Jordan Cove LNG project application currently pending has been filed for 1.2 Bcf/day of FTA export capacity and .8 Bcf/day of export capacity to non-FTA countries.
“Walls” and JPM estimates of probability they will fall.

A check indicates this event has already happened in 2013

<table>
<thead>
<tr>
<th>Walls Coming Down</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approvals of US LNG export permits surpass 5 Bcfd</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Approvals of Canada LNG export permits surpass 10 Bcfd</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mexico allows FDI in domestic petroleum market</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>US RFS mandate is reduced sufficiently to prevent hitting blend wall</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Levelized cost of energy for thin film solar PV falls below $0.13/kWh</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Major US GTL or NGL cracker project is scuttled on feasibility uncertainty</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Iraq crude production &gt; 3.5 mbd</td>
<td>78%</td>
<td>88%</td>
</tr>
<tr>
<td>Global aluminum inventories &lt; 15 weeks of global use</td>
<td>77%</td>
<td>86%</td>
</tr>
<tr>
<td>Propane exports &gt; 450 kbd</td>
<td>68%</td>
<td>80%</td>
</tr>
<tr>
<td>Retail fuel stations offering CNG &gt; 700</td>
<td>67%</td>
<td>86%</td>
</tr>
<tr>
<td>Obama Administration approves northern leg of Keystone XL pipeline</td>
<td>56%</td>
<td>79%</td>
</tr>
<tr>
<td>Indonesia reverses course on banning exports of mineral ores</td>
<td>53%</td>
<td>75%</td>
</tr>
<tr>
<td>US crude exports &gt; 200 kbd on licenses from executive branch</td>
<td>45%</td>
<td>54%</td>
</tr>
<tr>
<td>China allows the renminbi cross with the USD &lt; 6.0</td>
<td>43%</td>
<td>62%</td>
</tr>
<tr>
<td>Global iron ore production growth slows to &lt; 4.0%</td>
<td>29%</td>
<td>77%</td>
</tr>
<tr>
<td>Libya crude exports &gt; 1.0 mbd</td>
<td>30%</td>
<td>47%</td>
</tr>
<tr>
<td>US crude exports &gt; 200 kbd following change in US trade law</td>
<td>28%</td>
<td>39%</td>
</tr>
<tr>
<td>India lifts import restrictions on gold</td>
<td>25%</td>
<td>46%</td>
</tr>
<tr>
<td>China liberalizes retail prices of petroleum products</td>
<td>18%</td>
<td>30%</td>
</tr>
<tr>
<td>Japan allows nuclear utilization for power generation &gt; 25%</td>
<td>17%</td>
<td>22%</td>
</tr>
<tr>
<td>P5+1 Sanctions against Iran are loosened enough that exports &gt; 2.0 mbd</td>
<td>17%</td>
<td>23%</td>
</tr>
<tr>
<td>China reverses course on banning imports of high sulfur coal</td>
<td>8%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Commodities Research

NB: a ‘wall’ is a restriction or impediment, either natural or policy driven, standing in the way of the free movement of commodity supply to meet commodity demand.

Leviathan and Prometheus.

<table>
<thead>
<tr>
<th>LEVIATHAN</th>
<th>&quot;THE MARKET&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSET CLASS</td>
<td>2014 SIZE (Tn)</td>
</tr>
<tr>
<td>EQUITIES</td>
<td>$54</td>
</tr>
<tr>
<td>BONDS</td>
<td>$22</td>
</tr>
<tr>
<td>FIX</td>
<td>$5</td>
</tr>
<tr>
<td>COMMODITIES</td>
<td>$1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROMETHEUS</th>
<th>&quot;THE REAL ECONOMY&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>US = #1 LIQUIDS PRODUCER AND CONSUMER</td>
<td></td>
</tr>
<tr>
<td>US = #1 GAS PRODUCER AND CONSUMER</td>
<td></td>
</tr>
<tr>
<td>US = #1 PRODUCTS EXPORTER AND CONSUMER</td>
<td></td>
</tr>
<tr>
<td>US = AWAKE AND UNBOUND</td>
<td></td>
</tr>
</tbody>
</table>

Source: BIS, British Library, Classical Wisdom