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UNITED STATES ASSOCIATION OF ENERGY ECONOMICS

IHS outlook for oil & gas industry trends

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Agenda

• Global and regional economic outlook

• Oil price and production outlook

• Natural gas in North America

• Global upstream spending trends

• Upstream spending trends in North America
Global and regional economic outlook
World economic growth outlook to 2015
Global GDP growth to pick up in 2014 and 2015

World real economic growth rates, 2008–15

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent growth in real GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>-1.9%</td>
</tr>
<tr>
<td>2009</td>
<td>-3%</td>
</tr>
<tr>
<td>2010</td>
<td>4.3%</td>
</tr>
<tr>
<td>2011</td>
<td>3.1%</td>
</tr>
<tr>
<td>2012</td>
<td>2.6%</td>
</tr>
<tr>
<td>2013</td>
<td>2.5%</td>
</tr>
<tr>
<td>2014</td>
<td>3.1%</td>
</tr>
<tr>
<td>2015</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Note: Global GDP growth calculated using real local currency growth rates, aggregated using real exchange rate-based weights.

Source: IHS Economics

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Global real GDP growth will strengthen in 2014–15

(Percent change)

Source: IHS Economics
World and regional economic growth in 2014

World and regional real GDP growth rates in 2014

<table>
<thead>
<tr>
<th>Region</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>2.5%</td>
</tr>
<tr>
<td>Europe</td>
<td>1.6%</td>
</tr>
<tr>
<td>OECD Asia Pacific</td>
<td>2.0%</td>
</tr>
<tr>
<td>Eurasia</td>
<td>2.2%</td>
</tr>
<tr>
<td>Non-OECD Asia Pacific (excluding China)</td>
<td>4.9%</td>
</tr>
<tr>
<td>China</td>
<td>7.5%</td>
</tr>
<tr>
<td>Middle East</td>
<td>3.5%</td>
</tr>
<tr>
<td>Latin America</td>
<td>2.4%</td>
</tr>
<tr>
<td>Africa</td>
<td>4.1%</td>
</tr>
<tr>
<td>World</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Note: Global GDP growth calculated using real local currency growth rates, aggregated using real exchange rate-based weights. North America includes the United States and Canada. Latin America includes Mexico.

Source: IHS Economics
Asia Pacific and Sub-Saharan Africa will achieve the fastest growth in real GDP
Why has growth in emerging markets slowed?

**Cyclical forces**
- Withdrawal of policy stimulus
- Weak export markets
- Capital rotation as US bond yields rise
- Excess capacity after investment booms

**Structural forces**
- Slower labor force growth
- Slower pace of globalization
- End of commodity price supercycle
- Lack of market reforms

Source: IHS Economics
The US expansion is continuing at a solid pace, although a slowdown in inventory accumulation and adverse weather will limit first quarter real GDP growth.

Consumer spending will gradually pick up, supported by gains in employment, income, and household net worth.

Capital spending will accelerate in 2014–15 in response to global market growth.

Interest rates will rise significantly over the next four years as monetary accommodation is withdrawn.

The unconventional oil and gas boom will enhance US competitiveness.

Source: IHS Economics
Western Europe will achieve modest growth

• After a protracted recession, the eurozone economy is growing again, but full recovery in real GDP will take until the beginning of 2016.

• Rising consumer and business confidence, low interest rates, improving export markets, and pent-up demand for durables will support growth.

• Extended fiscal austerity, still-significant banking sector problems, and weak consumer finances will, however, restrain growth in several countries.

• The United Kingdom, Ireland, Germany, and Sweden will lead the region’s growth, while Italy, Spain, Greece, and Portugal will lag.

Source: IHS Economics
South America: Varied investment climates

- The region’s economic growth will slow in 2014, reflecting weak performances in Argentina, Venezuela, and Brazil.

- High interest rates, competitive pressures, deteriorating business sentiment, and a drought will contribute to subpar growth in Brazil.

- Argentina’s growth will stall in 2014 as policy mismanagement, high inflation, foreign-exchange controls, and import restrictions stifle investment.

- Venezuela’s economy faces a protracted recession with high inflation, decreasing currency reserves, and government intervention in multiple sectors.

Source: IHS Economics
Asia Pacific will achieve solid, not spectacular, growth

- Asia’s 2014 performance will be shaped by capital rotation out of emerging markets, key elections, and the pace of domestic macroeconomic reforms.

- China’s rapid credit expansion has created vulnerabilities in real estate, banking, and local government. Fiscal stimulus is supporting growth.

- India and Indonesia are vulnerable to portfolio capital flight, prompting central banks to raise interest rates. Upcoming elections create policy uncertainty.

- The region’s outlook for consumer spending is bright, thanks to robust income growth and deepening financial markets.

Source: IHS Economics
Real GDP growth in Asia Pacific

(Annual percent change)

Source: IHS Economics
China’s economic growth is slowing

- Real GDP expanded 7.7% year on year in the fourth quarter. Data for early 2014 suggest a further slowdown.

- Rapid credit expansion over the past decade has created vulnerabilities in real estate, banking, and local government.

- The central bank is maintaining a neutral-to-tight monetary policy to rein in shadow-banking activities, which pose systemic risk.

- Fiscal stimulus will be applied to keep economic growth near the 7.5% target.

- China’s export-oriented growth model has reached its limits; to sustain growth, China will need to cultivate consumer demand and move up the value chain.

Source: IHS Economics
Summary: An acceleration in the global economy

• Global economic growth will strengthen in 2014, led by better performances in North America and Western Europe.

• The US expansion will gain momentum with improved household finances, a housing market recovery, and reduced fiscal drag.

• Western Europe will gradually recover, with northern countries leading and southern countries with heavy debt burdens lagging.

• China’s growth is slowing; shadow banking problems pose risks.

• Growth paths in emerging markets will depend on structural reforms that raise productivity and allocate capital more efficiently.

Source: IHS Economics
Oil price and production outlook
# Snapshot of global oil fundamentals and price outlook

## FUNDAMENTALS

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>World economic growth</strong></td>
<td>2.6%</td>
<td>2.5%</td>
<td>3.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>(from previous year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>World oil demand growth</strong></td>
<td>1.0 mbd</td>
<td>1.1 mbd</td>
<td>1.5 mbd</td>
<td>1.6 mbd</td>
</tr>
<tr>
<td>(from previous year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-OPEC liquids supply growth</strong></td>
<td>0.4 mbd</td>
<td>1.1 mbd</td>
<td>1.7 mbd</td>
<td>1.5 mbd</td>
</tr>
<tr>
<td>(from previous year)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>OPEC crude spare capacity</strong></td>
<td>2.9 mbd</td>
<td>2.9 mbd</td>
<td>3.0 mbd</td>
<td>3.2 mbd</td>
</tr>
<tr>
<td>(annual average)</td>
<td></td>
<td></td>
<td></td>
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## PRICES

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brent</strong></td>
<td>$112</td>
<td>$109</td>
<td>$107</td>
<td>$100</td>
</tr>
<tr>
<td>(annual average)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WTI</strong></td>
<td>$94</td>
<td>$98</td>
<td>$98</td>
<td>$89</td>
</tr>
<tr>
<td>(annual average)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Liquids supply includes crude oil, condensate, and natural gas liquids. Demand includes refined products, including liquefied petroleum gases. OPEC spare capacity is for crude oil only. Figures are rounded. mbd = million barrels per day.

Source: IHS Energy
With OECD oil demand no longer in aggregate decline, global demand growth will strengthen in 2014–15

Changes in oil demand by region
(volume change from previous year in million barrels per day)

40104-2
Note: Mexico is included in Latin America.
Source: IHS Energy
North America to drive historically strong non-OPEC crude supply growth in near term

Non-OPEC crude oil production change, 2013–15

Data are for the 15 largest non-OPEC producing countries in 2013.

Source: IHS Energy
Dated Brent crude oil price environment to 2015

Prices in Global Redesign raised slightly to reflect heightened geopolitical risk to supply; prices still seen moderating inline with a lower call on OPEC

Updated 1 April 2014.
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Source: IHS Energy; Platts, ©2014 by the McGraw-Hill Companies, Inc. (historical)
US crude discounts subject to downward pressure
WTI-Brent spread likely to widen as it becomes more difficult for the United States to absorb growing volumes of domestic tight oil output

Note: Data points are quarterly averages.
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Source: IHS Energy, Platts (historical)
Key messages for global crude oil market: April 2014

• **Dated Brent near-term price view lifted slightly from last month.** The higher track reflects persistent geopolitical risk to supply. Our outlook for Dated Brent is on average about $0.50 per barrel higher in 2014 than our March outlook. A historically large amount of crude—about 3 mbd—is offline globally for aboveground issues, notably in Libya and Iran. This is keeping global spare production capacity tight. We also see a range of geopolitical risks—including in Eurasia, Iraq, and Venezuela—as a potential source of market anxiety about future supply outages. IHS still expects Dated Brent prices to moderate in 2014–15 as historically strong non-OPEC supply growth—led by US tight oil—meets or exceeds world demand growth, reducing the call on OPEC crude. Dated Brent is expected to average $107 in 2014 and $100 in 2015 in Global Redesign.

• **Tension between the West and Russia after the annexation of Crimea could lead to unexpected consequences and bodes ill for a resolution to the Iranian nuclear issue.** US and EU sanctions against Russia have been relatively mild, with modest economic impact expected. But the situation in the region is fluid and could escalate. Iran will look to the demise of Ukraine’s security guarantees—linked to nuclear disarmament in the 1990s—and question the wisdom of further concessions in its nuclear negotiations. Worsening relations between Russia and the West also complicate efforts to end the Syrian civil war.

• **US crude price discounts to widen in the near term.** We continue to expect US crude price discounts to widen in 2014–15 as it becomes more difficult for the United States to absorb growing volumes of domestic tight oil output. This view assumes that the US government ban on most crude exports remains in place during the period. WTI is expected to trade $8 and $11 below Dated Brent in 2014 and 2015, respectively, little-changed from our view last month.

Source: IHS Energy
Natural gas in North America
Components of US demand growth relative to 2008: A tale of two tenors

US lower-48 gas demand growth relative to 2008

- **Coal displacement**
- **Power growth**
- **LNG Exports**
- **Industrial**
- **NGVs**
- **Mexico Exports**

Source: EIA and IHS Energy

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Storage and pace of change lead to higher natural gas prices

April 2014 Henry Hub history and projection

Source: IHS Energy, CME Group, Intelligence Press

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Key North American gas message: A tale of two tenors

• Short term: Rapid demand growth and deliverability issues drive price spikes.
  • Polar Vortex and idled/retired coal generation heightened demand and drew storage inventories to record low.
  • Increased demand for storage injections driving higher prices to reduce coal displacement, but rail issues may limit fall balance.
  • Rapid demand growth balance of this decade will exceed supply, draw down storage again, and drive volatile prices to a higher level.

• Long term: Massive resource base is a constant downward force on price.
  • Pace of demand growth slows, reducing cost pressure, and technology/productivity is expected to keep prices closer to $4 per million Btu (MMBtu) in real terms.
  • Marcellus and Utica are expected to grow to 25% of North American supply, having continental impacts as break-even costs are $3 per MMBtu or lower.
  • Infrastructure investment constrains growth and will likely contribute to some investment cycle oscillations.
Global upstream spending trends
Upstream Research

Capex

Capital Cost Analysis Forum Upstream (CCAF)

• The Upstream Capital Costs Index was slightly up in 2013, compared to an increase of over 4% in 2012. Even with the moderate overall increases some operators finally could not bear cost levels and delayed certain projects.

• Since the end of 2010, capex costs have increased 11% and are expected to increase 9.9% by the end of 2016. This indicates a further moderation in cost escalations.

• Despite weakness over most of 2013, in 4Q13 the steel market saw its first increase in over two years, with indexed prices on average finally reaching 2010 levels. At this point, suppliers cannot lower prices any further without suffering losses. At these levels, it is not sustainable for the supplier mix to remain as it is, and 2014 could see a wave of rationalization in the market.

• Offshore rig day rates continued to rise. Unlike 2013 where the increases were driven by deepwater rigs, 2014 will bring an escalation in rates for jackup rigs, owing to the fact that many of these are newbuilds and therefore command premium pricing.

• Engineering and Project Management (EPM) firms will continue to shy away from turnkey projects. They would prefer to take on mostly “cost-plus” assignments, as this shifts the risk of cost overruns away from them. Operators, however, would prefer the former; this dynamic seems to lead to a very competitive bidding market, as EPM firms are willing to trade lower margins for predictable backlog and work levels.
Upstream Research

Opex

Operating Cost Analysis Forum Upstream (OCAF)

• 2013 was a relatively slow year with regards to cost escalations. The UOCI increased 3.1%, as opposed to over 4% the year prior.

• Since the end of 2010, opex costs have increased 13.8%, and are projected to increase 9.1% by the end of 2016. This indicates a moderation in cost escalations.

• Competition continues to be extremely intense among service companies. In North America, many small service companies are able to deliver the relatively straightforward offerings required for the development of unconventional resources. Internationally, large projects requiring the use of high technology are highly desirable, so capable companies bid on them aggressively.

• Commodity prices continue to put pressure on the UOCI, but change could come in 2014. There has been a flood of goods such as proppant and tubing & casing in to the market, which depressed overall costs in 2013. This trend could change as companies now strive to provide more targeted, engineered offerings which they can sell to operators for a premium.

• There continues to be a shortage of skilled labor. Around the world, there is very high demand for skilled tradespeople, as well professional, degreed engineers with experience levels ranging from 10 to 20 years. Since there is only a very finite supply of these workers, companies can only hope to lure them away from one another with high compensation packages.
The UCCI and UOCI at a high level

Cost market summaries

Note: Historical curves include inflation and currency exchange (USD). Outlooks exclude currency exchange (USD).

Source: IHS
Upstream spending trends in North America
2013 seems to have been a challenging year financially for many operators.

Cost levels and productivity seems to be key challenges.
Continued uncertainty and increasing costs, force operators to plan for lower capex in 2014

Selected operators - Estimated capex spending 2014 (Change from 2013)

Increasing costs and expectations of a lower oil price cited as the most important factors for reducing capital expenditure going forward
As a result, operators spending growth is slowing down - growth mainly cost driven

Global spending surveys (change from previous year):

- **Barclays Capital**
  - 2013: +10%
  - 2014: +6.1%

- **IHS Upstream Spend report**
  - 2013: +8.1%
  - 2014: +5.7%

- **Cowen & Co. Original E&P Survey**
  - 2013: +5.5%
  - 2014: +4.0%

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North America to remain largest region in terms of onshore spending

Onshore spending by region

Large gains seen over last decade – some reversal expected in next years linked to slowdown in drilling activities
New unconventional wells now starting to level off in North America…

No. of spud wells per year

Source: MSS and IHS North American Upstream Spend Report
…but regional spending is up

US unconventional spending

Source: MSS and IHS North American Upstream Spend Report
...causing tremendous growth in North American oil and gas production in short timeframe

Source: MSS and IHS North American Upstream Spend Report
Infrastructure development still trying to catch up to balance the market

- **Dec. 2013:** Enbridge’s Northern Gateway receives approval
- **Pipelines for gas export to Mexico under construction**
- **Jan 2014:** TransCanada completes Gulf Coast Project – Easing Cushing
- **March 2014:** TransCanada’s Energy East Pipeline project plans filed
- **LNG:** EPC contracts for 5 US projects totalling 62 mtpa have been awarded. 16 mtpa currently under construction.
- **LNG:** Kitimat project awarded. Total of 109 mtpa of capacity has received export approval.

North American E&P, Pipeline Construction and LNG Liquefaction Spending

- **LNG liquefaction infrastructure**
- **Pipelines**

Source: MSS and IHS North American Upstream Spend Report
The North American LNG export race is on

Source: IHS CERA.

28 announced US projects (~250 mtpa)
16 announced Canadian projects (~150 mtpa)
Summary

Weakening oil futures to impact spending in price sensitive regions

Increasing uncertainty

Spending growth to slow down

Leading indicator overview – February 2014

As a result, operators spending growth is slowing down - growth mainly cost driven

NAM: Slowdown in new wells and spending growth

Continued rise in spending and production

Infrastructure development still trying to catch up to balance the market

Large needed infrastructure developments underway

BJORN SLIDES

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Spending growth to slow down

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David Vaucher
Director, Upstream Operating Costs, Field Operations & Well Construction Specialist

David Vaucher leads the team of IHS experts staffed on the Upstream Operating Costs Analysis Forum, which enables operating companies not only to benchmark the costs of operating their producing assets, but also forecast them. Mr. Vaucher has deep technical knowledge of oil & gas field operations, and has published and presented several Society of Petroleum Engineers (SPE) papers on the topic of well workovers. He has years of field experience, and is highly knowledgeable about completion tools generally, and “thru-tubing” intervention tools specifically.

During his time with IHS, Mr. Vaucher has been instrumental in driving the growth of the operating costs forum, which has more than doubled in membership. His biggest contribution has been spearheading the effort to forecast cost escalations for every single market in the cost service for over a dozen countries, under all 3 of IHS’ Global Energy Scenarios, over a forecast period that spans over two decades.

He began his oil and gas career as an engineer at Schlumberger based in Texas, and then worked for TAM International (a maker of specialty completion tools) as a Technical Advisor supporting the company’s global field operations. He is the current editor-in-chief of “The Way Ahead” magazine, the SPE’s official publication for young professionals, and also writes the weekly column “Building Hydrocarbon Bonds” for the Houston Chronicle.

Mr. Vaucher holds a Bachelor of Science degree in mechanical engineering from Rice University, an MBA from the University of Texas at Austin, and a Master’s in petroleum engineering from Texas A&M at College Station.
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