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Exploration & Production (Citi)
North America

E&P Stock Perspectives Per Underlying Commodity Price Drivers

Benefiting Gas-Leveraged E&Ps, U.S. Industrial Natural Gas Demand Is Projected To Rise 0.7 Bcf/d In 2013; 0.9 Bcf/d in 2014

Robert S Morris
+1-212-816-3139
robert.s.morris@citi.com

P.J. Juvekar
+1-212-816-3097
pj.juvekar@citi.com

Chingiz Gadimov
chingiz.gadimov@citi.com

John J Hirt
john.hirt@citi.com

Rob Teahen
rob.teahen@citi.com

Bryan M Baritot
bryan.baritot@citi.com

- **Storage Withdrawal –** The EIA reported a 91 Bcf injection into U.S. underground natural gas storage for the week ended 06/14/2013, compared with a 63 Bcf injection last year, a 98 Bcf injection in 2011, and a 95 Bcf injection the prior week. Storage is now at 2,438 Bcf, which equates to a 559 Bcf year-over-year deficit and a 47 Bcf deficit versus the five-year average.
- **Storage Analysis –** Last week's withdrawal was slightly above the Street consensus and our forecast. In the East Region, inventories are 94 Bcf below the 5-year average after an injection of 60 Bcf. In the Producing Region storage levels are 3 Bcf above the 5-year average after an injection of 20 Bcf while inventories in the West Region are now 44 Bcf above the 5-year average after an injection of 11 Bcf.
- **Temperatures Last Week –** Based on population-weighted cooling degree days (CDDs), temperatures last week were ~7% cooler than last year and ~7% cooler than the ten-year average, and ~1% warmer than the prior week.
- **2013 U.S. Industrial Natural Gas Demand Forecast Lowered –** Industrial demand accounts for ~1/3 of total U.S. natural gas consumption and is primarily driven by the level of domestic economic activity with only slight weather-driven seasonality. Thus, it is a substantial and more predictable source of demand for the natural gas produced by most companies in our E&P coverage group. Importantly, industrial natural gas demand is very highly correlated to a combination of U.S. industrial production (IP) growth and U.S. ethylene chemical plant utilization. However, the recent explosion at the Williams ethylene cracker (2% of U.S. total capacity) is significant enough to cause a near-term dislocation in the US ethylene market and, partly due to this dislocation, we have lowered our chemical plant utilization forecast to 89.5% this year versus a previous projection of 90.5% (see Citi Chemicals and MLP team's June 13th joint report: Williams Ethylene Plant Explosion - Impact on US Ethylene Market and WMB/WPZ). At the same time, Citi's economists project U.S. IP growth will come in at 2.5% this year (see their June 19th note: Global Economic Outlook and Strategy - June 2013). Thus, the E&P equity team's projection is that U.S. industrial natural gas demand will increase 0.7 Bcf/d this year, which is down from our previous forecast of 0.9 Bcf/d. With major chemical plant expansions by ***CVX***, ***DOW***, ***XOM*** and ***OXY*** not expected to be on line until 2017 but more "normalized" U.S. chemical plant utilization of 90% and U.S. IP growth of 4.3%, we project 2014 industrial natural gas demand will increase 0.9 Bcf/d. Importantly, any variation in our industrial natural gas demand outlook could have a material impact on natural gas prices which, in turn, would then have the greatest impact on our bottom-line projections for the more natural gas-leveraged names in our E&P coverage group including ***UPL***, ***COG***, ***RRC***, ***SWN***, ***CHK*** and ***ECA***.

U.S. Industrial Natural Gas Demand Is Projected To Increase 0.7 Bcf/d in 2013

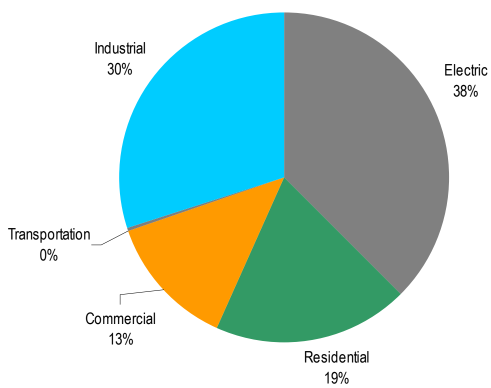
Industrial demand accounts for ~30% of total U.S. natural gas consumption…

…And is primarily driven by the level of domestic economic activity with only slight weather-driven seasonality…

…And, more recently, the growth in the U.S. chemicals sector, thus providing a more predictable and substantial source of natural gas demand for many of the E&P companies in our coverage group.

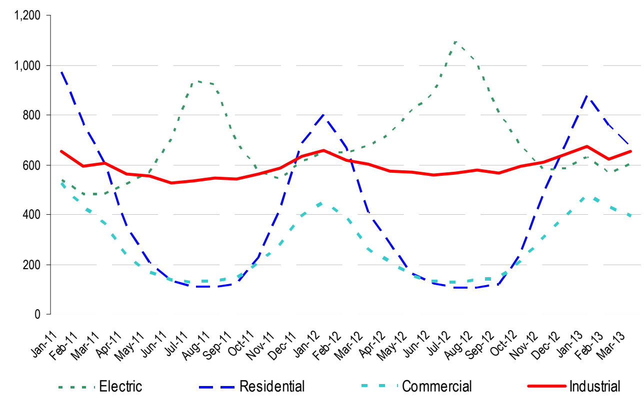
On average, industrial usage accounts for about 30% of total U.S. natural gas demand, comprising the second largest consumer after electric power generation, which has ~38% share of overall natural gas consumption (see Figure 1). Importantly, for large natural gas producers such as ***CHK***, ***APC***, ***DVN, SWN, ECA*** and ***COG***, the industrial sector provides a less seasonally variable source of natural gas demand. While some weather-related fluctuations are present with facility heating needs leading to slightly higher demand during the winter months, the seasonal variation is nowhere near that exhibited by residential and commercial demand (Figure 2). Looking at data from last year, average industrial natural gas demand in the summer months was down just ~11% from the average during the winter months while residential natural gas demand declined ~84% from the winter to the summer, on average. Unlike residential demand, commercial and to a lesser degree electric power demand which tend to be largely weather driven, industrial natural gas demand is still primarily a function of the level of domestic economic activity and, more recently, the growth in the U.S. chemical sector, thus providing a more predictable and substantial source of natural gas demand for many of the E&P companies in our coverage group.

Figure 1. U.S. Natural Gas Demand By Sector (Past 12 Months)



Source: Citi Research

Figure 2. Electric, Residential, Commercial and Industrial Natural Gas Demand Over The Past 2 Years (Bcf)



Source: Citi Research

Industrial natural gas demand through March of this year (latest available EIA data), was up 1.0 Bcf/d over the same period in 2012…

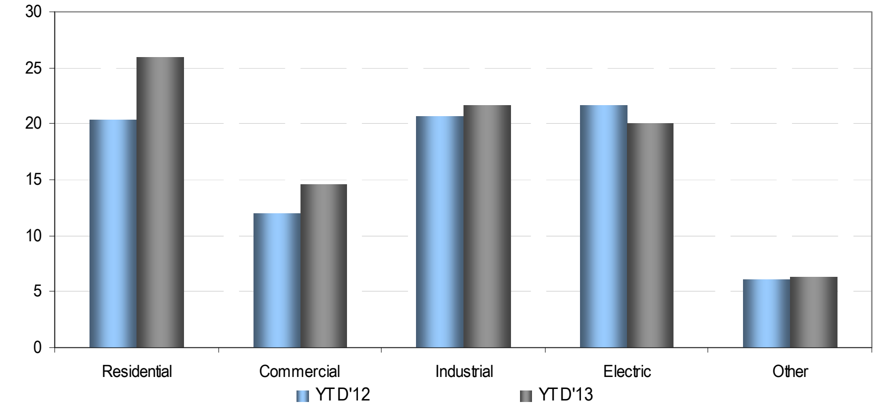
…Underscored by a 2.1% year-over-year increase in U.S. Industrial Production…

…And 2.9% year-over-year increase in the U.S. chemical plant utilization…

U.S. industrial natural gas demand through March of this year (the latest available data from the EIA) averaged ~21.7 Bcf/d, which was up 1.0 Bcf/d over the ~20.7 Bcf/d average during the same period in 2012. This occurred as the U.S. economy continued to expand with U.S. Industrial Production (IP) increasing by 2.1 % year-over-year in the first quarter of 2013, in addition to a 2.9% year-over-year increase in U.S. chemical plant utilization, which has become an important variable for industrial natural gas demand as we outline on the following pages. Meanwhile, the ~4% colder-than-normal and 29% colder-than-last year first quarter led to a significant increase in natural gas demand from the residential and commercial sectors through March this year, which increased by ~5.6 Bcf/d and ~2.7 Bcf/d, respectively, versus the same period in 2012. This was partially offset by lower electric power generation, which fell ~1.7 Bcf/d through March due to lower price-driven coal-to-gas switching (see Figure 3) in order to effectively balance the market with domestic natural gas storage levels ending March at just slightly below the five-year average.

...Although a much colder Q1'13 than last year underscored a much sharper increase in natural gas demand from the residential and commercial sectors which was partially offset by the drop in price-driven coal-to-gas switching in the power generation sector.

Figure 3. Year-To-Date Through March Natural Gas Demand By Segment



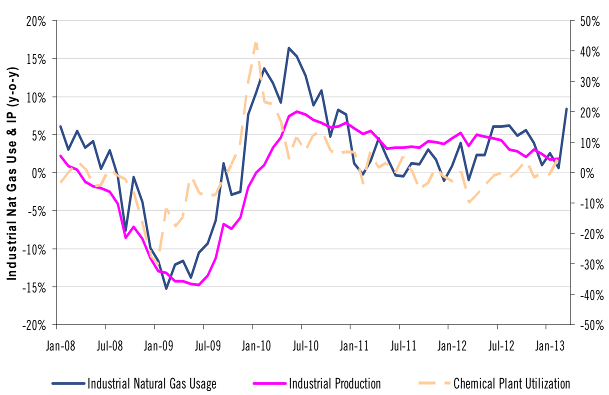
Source: Citi Research

Historically, industrial natural gas demand had most often been closely correlated to changes in the U.S. industrial production (IP) index…

…But an even higher correlation has more recently emerged based on a combination of U.S. IP growth and U.S. ethylene chemical plant utilization.

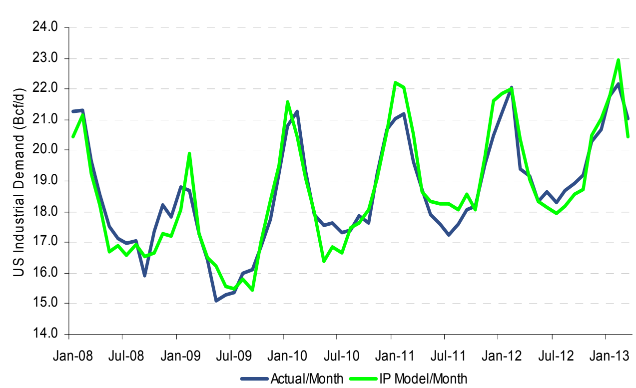
Year-over-year variations in industrial natural gas demand had historically been most closely correlated to changes in the U.S. industrial production (IP) index published by the Federal Reserve. Leading up to 2009, the correlation averaged above 90%, although this relationship severely weakened during the economic downturn in 2009, with the correlation dropping below 10% but then rebounding to ~70% over the past 3 years. However, incorporating U.S. ethylene plant utilization, the correlation between these three variables (industrial natural gas usage to the U.S. IP index and ethylene utilization) increases to ~94% for the past five years (see Figure 4 and 5). This is because the U.S. chemicals sector comprises ~12% of the Fed's IP index but accounts for about one-third of total U.S. industrial natural gas demand due to the highly energy-intensive nature of the chemicals manufacturing process. Importantly, the combination of low feedstock natural gas prices and the abundance of domestic gas supplies led many chemical manufacturers to boost output over the past few years with plant utilization rates jumping from an average of ~85% in 2008 to ~91% in 2011. However, with chemical plants sharply ramping utilizations throughout 2011, many chemical manufacturers used the beginning of last year to perform turnaround and maintenance work. As a result the average utilization rate declined to ~89% last year, which in turn, drove industrial natural gas usage up at a slower pace than would have otherwise been indicated by a correlation to just U.S. IP.

Figure 4. U.S. Industrial Production vs. Industrial Natural Gas Demand vs. Chemical Plant Utilization (Yr/Yr % Change)



Source: EIA, CMAI, Citi Research

Figure 5. Historical Actual vs. Model Predicted U.S. Industrial Natural Gas Usage (Bcf/d)



Source: Citi Research

U.S. chemical plant utilization through May averaged much higher than for the same period last year…

U.S. chemical plant utilization through May (the latest available data from the IHS) averaged much higher than for the same period last year (89.3% vs. 86.8%), due to less maintenance activity this year through May, which has helped to boost natural gas demand in the industrial sector. However, the recent explosion at Williams' ethylene plant may lower overall chemical plant utilizations going forward. The ethylene plant in Geismar, Louisiana, is majority owned by ***Williams*** (83%) and the ethylene cracker had a capacity of ~1.3bn lbs, amounting to ~2% of total U.S. ethylene capacity. In addition, the site's ethylene capacity was supposed to increase by 600mm lbs in the third quarter of this year but the status of this expansion is now unclear following the explosion. According to our Chemicals and MLP teams, the explosion at the Williams plant is significant enough to cause a near-term dislocation in the U.S. ethylene market, particularly given that several other US ethylene crackers are currently offline. According to IHS, about 10% of U.S. ethylene capacity is presently offline for maintenance or unscheduled outages including the Williams Geismar plant. Besides Williams, there are three other plants which had been offline for maintenance as of last Friday: ***Dow's*** ~1.4bn lbs Freeport plant, ***ChevronPhillips's*** ~1.9bn lbs Port Arthur plant and ***Royal Dutch Shell's*** ~1.3bn lbs Norco plant. The majority of that capacity, however, is expected to be operational by the end of June.

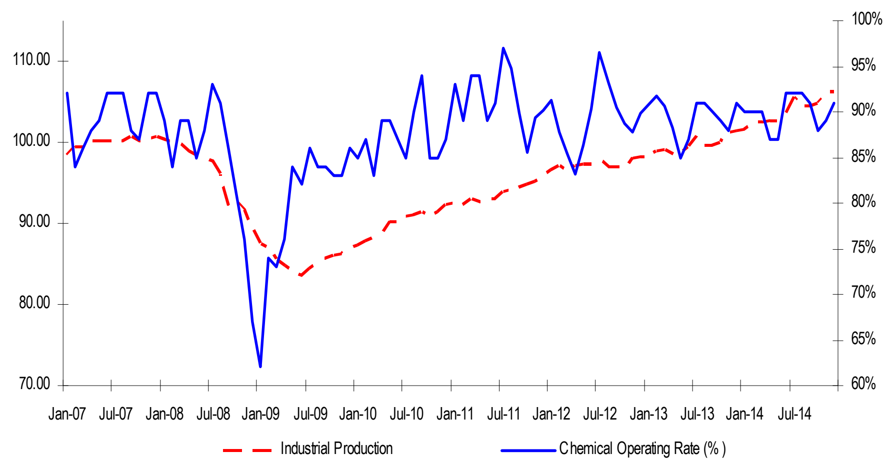
...However, the recent explosion at the Williams ethylene cracker (2% of U.S. total capacity) is significant enough to cause a near-term dislocation in the US ethylene market, with about 10% of ethylene capacity now offline due to maintenance…

According to Citi's Chemicals team, other ethylene players like **LYB** are likely to benefit from a tighter ethylene market, while buyers of ethylene such as **DOW** and **AXLL** could be negatively impacted. Ethylene derivatives such as **EG, PE, PET**, and **PVC** could also be affected, in their view, although an ethylene price spike could also help push derivative prices higher with a possible 30-day lag. For more information see our Chemicals and MLP joint-team report from June 13th 2013: Williams Ethylene Plant Explosion - Impact on US Ethylene Market and WMB/WPZ.

…And thus, at this juncture, we now expect chemical plant utilization will average ~89.5% this year versus our previous projection of ~90.5%...

Thus, at this juncture, we now expect U.S. chemical plant utilization rates will average ~89.5% in 2013 versus our previous projection of ~90.5%, largely due to outage at Williams ethylene cracker plant.

Figure 6. U.S. Industrial Production vs. U.S. Chemical Plant Utilization



Source: Citi Research, CMAI(IHS), Fed IP index

But with minimal new U.S. ethylene capacity projected to come online in the near-to-medium term, the pace of natural gas demand growth from the chemicals sector is expected to be somewhat limited relative to U.S. IP-driven growth.

But with North American natural gas prices near the lowest in the world (except for a few stranded gas areas in the Middle East), chemical manufacturers have continued to arbitrage the low-cost shale gas advantage by boosting U.S. production and switching their feedstock from a more expensive oil derivative naphtha to cheaper ethane to the extent possible. Chemical manufacturers continue to look to expand U.S. capacity and invest in new projects, as existing operations have approached full capacity. However, new capacity coming online in the short to medium term totals less than 3% of the U.S. nameplate capacity per year in each of the next three years. Longer term, ***CPChem (Chevron Phillips66 JV), Dow Chemical, Exxon, Formosa, Shell, Sasol, and Occidental*** have already announced plans to build new ethylene crackers later this decade. With no new chemical plants projected to come online in the near term though, the lack of additional chemical plant capacity is expected to somewhat limit the pace of industrial natural gas demand growth relative to just pure U.S. IP growth.

Citi's economists project U.S. IP growth of 2.5% this year (vs. 3.6% in 2012)…

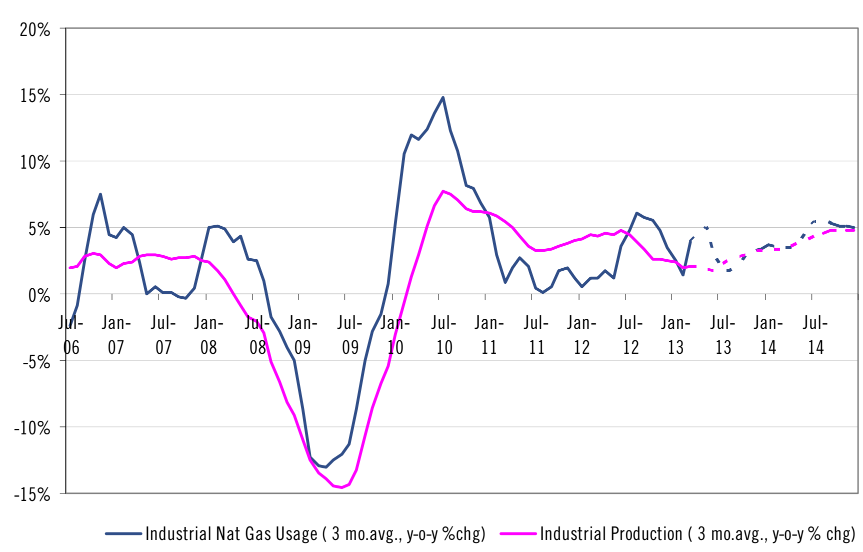
…While Citi's Chemicals team expects U.S. ethylene plant utilization to average ~89.5% this year (vs. 89.2% in 2012)…

On the IP side of the equation, Citi's Economists currently project that U.S. IP growth will come in at ~2.5% this year and 4.3% in 2014 versus a 3.6% uptick in 2012. For more information on our economists' latest projections, see their June 19th note: Global Economic Outlook and Strategy - June 2013. Therefore, based on this forecast and our revised outlook for the U.S. chemical plant utilization (~89.5% in 2013 vs. 89.2% in 2012), the E&P equity team projects U.S. industrial natural gas demand will increase from ~19.5 Bcf/d in 2012 to ~20.2 Bcf/d, or a 0.7 Bcf/d uptick. This will be higher than the 0.5 Bcf/d increase last year as higher year-over-year ethylene plant utilization more than offsets lower projected U.S. IP growth.

Looking ahead to 2014, the E&P equity team projects industrial natural gas demand will grow 0.9 Bcf/d to 21.1 Bcf/d based on Citi's IP growth forecast of 4.3% and more "normalized" 90% U.S. chemical plant utilization. Importantly, we would note that any change in our industrial natural gas demand outlook could have a material impact on natural gas prices which, in turn, would then have the greatest impact on our bottom-line projections of the more natural gas-leveraged names in our E&P coverage group including ***Cabot***, ***Chesapeake, Encana, Range, Southwestern*** and ***Ultra*** (see Figures 8 and 9).

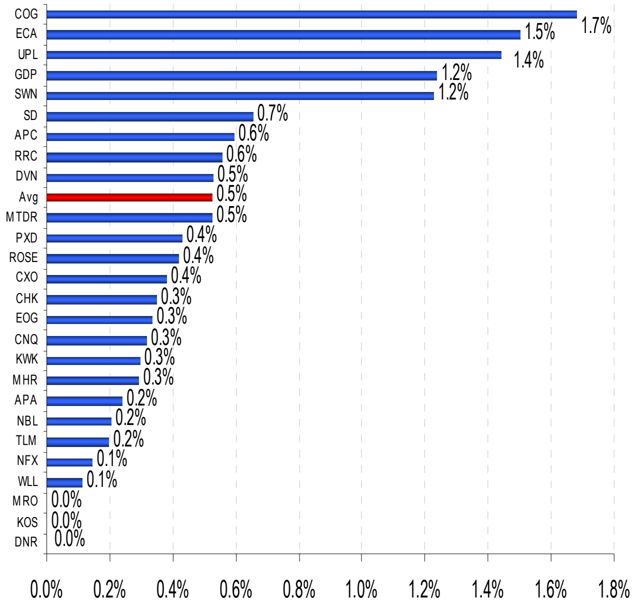
…Which should underscore a 0.7 Bcf/d increase in U.S. industrial natural gas demand this year, which is down from our previous forecast of a 0.9 Bcf/d increase and following a 0.5 Bcf/d uptick in 2012.

Figure 7. Historical and Projected Industrial Natural Gas Usage vs. Industrial Production



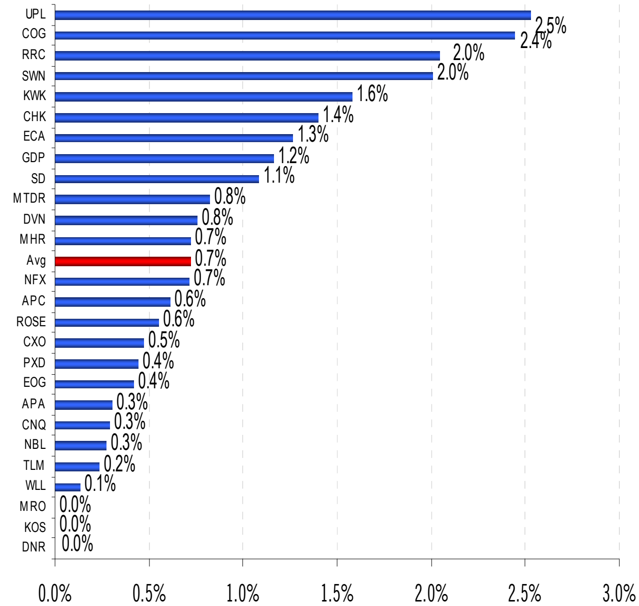
Source: Citi Research

Figure 8. 2013 CF Sensitivity per $0.10/Mcf Change in Natural Gas Price Forecast



Source: Citi Research

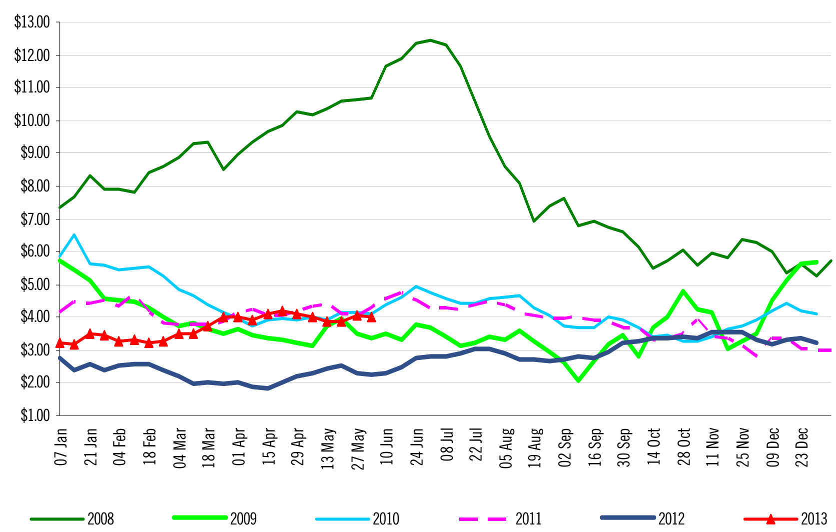
Figure 9. 2014 CF Sensitivity per $0.10/Mcf Change in Natural Gas Price Forecast



Source: Citi Research

Composite spot cash prices have rebounded this year to well above year-ago levels following a normal winter and much colder-than-normal April and May.

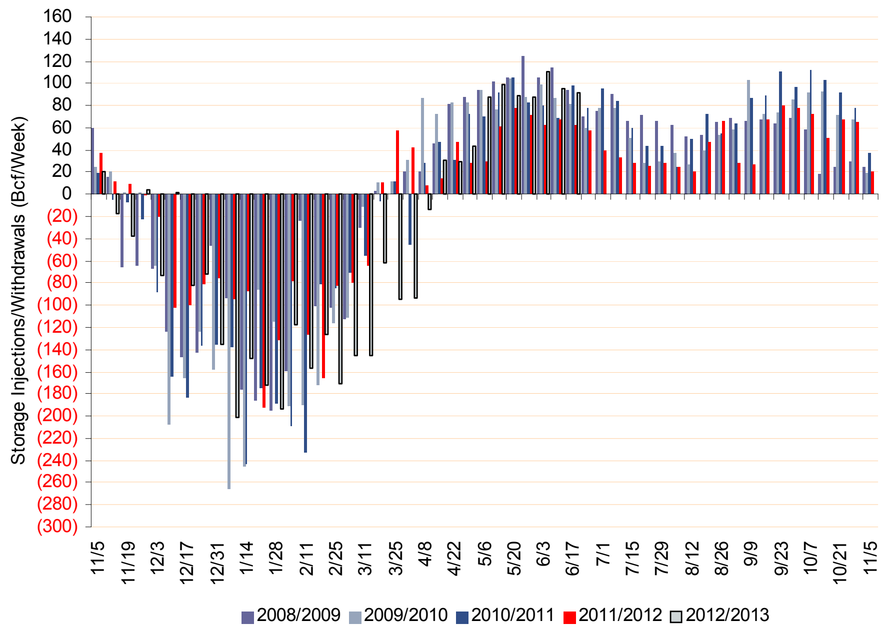
Figure 10. Composite Spot Natural Gas Price ($/MMBtu)



Source: Citi Research

A 91 Bcf injection into U.S. underground natural gas storage was reported for last week…

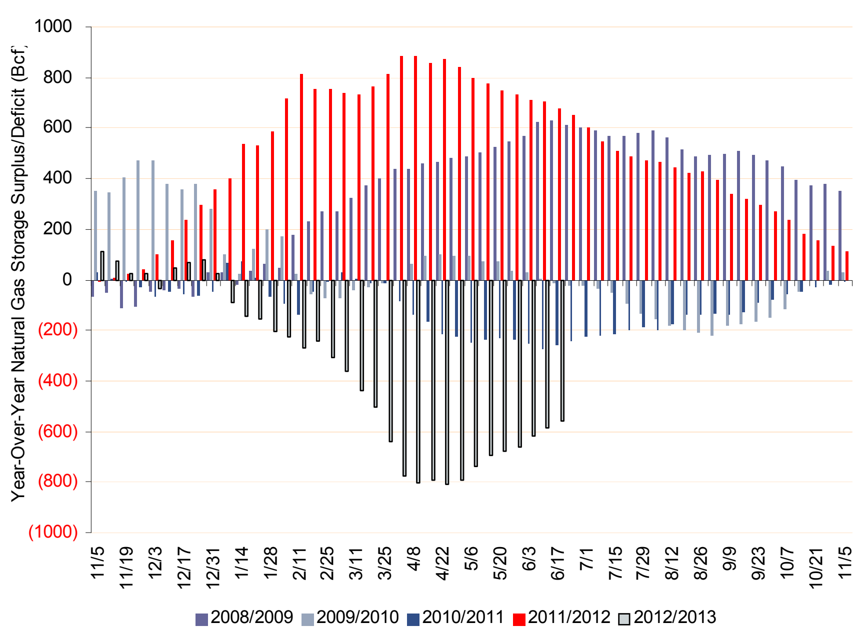
Figure 11. Natural Gas Storage Injections/Withdrawals



Source: Citi Research

…While the year-over-year deficit is now at 559 Bcf.

Figure 10. Year-Over-Year US Underground Natural Gas Storage Surplus/Deficit



Source: Citi Research

Figure 7. E&P Comp Table

Company	Share Price 6/18/2013	Citi Rating	Target Price	EV/(DACF) 2012E	EV/(DACF) 2013E	EV/(DACF) 2014E	Price/ NAV	MEV/BOE	Reserve / Prod	Production Growth 11/12E	Production Growth 12/13E	Production Growth 13/14E	% Prod N.Amer. Nat Gas 2013	EBITDA/ Fixed Charges 2013	Net Debt/Cap. 2013E	Net Debt/Cap. 2014E	Reserve Replace. Eff. (1) 2012
Anadarko Petroleum (APC)	87.00	Buy	105.00	6.7x	5.9x	5.2x	86%	21.03	10.2	7.7%	6.6%	6.2%	54%	13.2x	29%	24%	1.3x
Apache Corporation (APA)	87.12	Buy	95.00	4.6x	4.7x	4.7x	68%	16.45	11.0	4.1%	3.5%	6.4%	28%	44.7x	29%	29%	NA
Cabot Oil & Gas (COG)	72.17	Buy	80.00	21.4x	13.0x	8.8x	192%	25.60	16.2	42.3%	44.9%	25.9%	95%	18.1x	26%	19%	2.8x
Chesapeake Energy (CHK)	21.25	Neutral(H)	20.00	5.7x	5.7x	5.1x	56%	14.20	13.6	8.4%	(0.5%)	3.2%	73%	4.9x	44%	47%	NA
Cobalt International Energy (CIE)	26.64	Buy(H)	38.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N/A	N/A	NA
Concho Resources (CXO)	87.81	Buy	100.00	9.0x	8.1x	7.2x	160%	28.95	16.3	25.6%	16.1%	14.7%	39%	7.0x	51%	48%	1.8x
Denbury Resources (DNR)	18.31	Neutral	18.00	5.8x	7.2x	7.1x	92%	21.83	19.3	9.2%	(1.2%)	14.4%	6%	19.3x	32%	32%	NA
Devon Energy (DVN)	55.30	Neutral	55.00	5.6x	5.5x	5.5x	116%	9.43	12.5	3.7%	1.2%	4.7%	56%	11.9x	21%	21%	0.4x
EOG Resources (EOG)	135.02	Buy	155.00	7.0x	6.2x	5.8x	117%	23.15	13.3	10.3%	7.6%	10.2%	32%	29.5x	29%	30%	NA
Goodrich Petroleum (GDP)	12.60	Neutral	16.00	6.1x	7.5x	6.8x	NM	21.42	12.5	(21.7%)	(9.1%)	18.9%	67%	2.6x	93%	102%	NA
Kosmos Energy (KOS)	10.74	Buy	15.00	12.2x	7.4x	7.3x	153%	82.97	NA	NA	51.4%	17.0%	0%	16.4x	48%	51%	NA
Magnum Hunter (MHR)	3.73	Buy	5.00	8.8x	5.8x	6.0x	83%	30.92	27.6	140.6%	26.9%	15.9%	43%	2.0x	38%	42%	NA
Marathon Oil (MRO)	36.05	Buy	42.00	9.0x	5.2x	5.2x	129%	16.54	13.6	19.1%	7.6%	5.7%	12%	33.3x	16%	16%	2.5x
Matador Resources (MTDR)	11.52	Neutral (H)	10.00	7.4x	6.3x	6.1x	140%	39.94	8.3	27.9%	15.8%	22.2%	51%	17.5x	50%	55%	NA
Newfield Exploration (NFX)	23.94	Neutral	25.00	4.8x	4.6x	5.4x	94%	11.79	13.3	(0.5%)	(17.8%)	(7.2%)	43%	7.6x	50%	51%	NA
Noble Energy (NBL)	60.69	Buy	65.00	8.3x	7.0x	5.9x	53%	21.34	15.6	12.4%	16.9%	16.6%	26%	16.1x	32%	32%	0.6x
Occidential Petroleum (OXY)*	92.43	Neutral	82.00	7.0x	7.6x	7.3x	115%	22.49	12.7	5.8%	3.1%	3.0%	59%	67.8x	9%	9%	1.5x
Pioneer Natural Resources (PXD)	154.65	Buy	148.00	12.1x	10.1x	8.9x	122%	22.87	25.0	28.5%	13.9%	14.9%	35%	10.9x	32%	33%	1.1x
Quicksilver Resources (KWK)	1.93	Neutral	2.00	6.2x	6.6x	6.9x	193%	9.67	18.5	(12.7%)	(18.5%)	(4.7%)	79%	1.6x	333%	283%	NA
Range Resources (RRC)	79.46	Buy	95.00	17.4x	14.8x	11.2x	134%	14.85	28.0	35.9%	25.3%	22.5%	78%	6.4x	59%	58%	2.7x
Rosetta Resources (ROSE)	47.76	Buy	55.00	7.9x	6.5x	5.8x	86%	17.18	16.0	34.6%	42.1%	26.0%	37%	20.6x	48%	48%	3.0x
SandRidge Energy (SD)	4.97	Neutral	5.25	6.0x	5.8x	6.9x	99%	13.40	20.1	43.1%	(3.3%)	3.7%	53%	2.5x	55%	65%	0.7x
Southwestern Energy (SWN)	38.03	Buy	46.00	9.5x	8.1x	6.8x	137%	22.39	11.8	12.7%	12.7%	10.5%	100%	20.6x	33%	28%	NA
Ultra Petroleum (UPL)	22.12	Neutral	18.25	6.6x	9.0x	7.4x	195%	11.02	20.3	4.5%	(9.6%)	3.7%	97%	6.4x	124%	101%	NA
Whiting Petroleum (WLL)	48.66	Buy	52.00	5.3x	4.8x	4.1x	67%	20.56	13.9	21.6%	13.7%	12.6%	12%	19.6x	39%	38%	1.5x
U.S. Group Average (Ex Hi-Lo)				7.9x	7.0x	6.5x	116%	$22.50	15.9	9.8%	5.8%	7.7%	49%	15.1x	44%	44%	1.7x
Canadian Natural Res. (CNQ)	29.65	Buy	37.00	6.5x	6.0x	5.4x	84%	10.44	18.4	9.7%	5.1%	10.2%	27%	27.0x	31%	29%	1.3x
EnCana Corp. (ECA)	18.10	Neutral	20.00	4.2x	5.9x	5.6x	148%	10.03	10.7	(8.6%)	1.4%	5.8%	90%	5.2x	50%	54%	NA
Talisman Energy (TLM)	11.80	Neutral	12.50	5.0x	6.0x	5.6x	98%	18.30	8.0	0.1%	(9.1%)	1.4%	36%	10.3x	34%	37%	NA
Canadian E&P Average				5.3x	6.0x	5.5x	110%	$12.92	12.4	0.4%	1.8%	6.1%	51%	14.2x	38%	40%	1.3x
US & Canadian Average (Ex Hi-Lo)				7.6x	6.9x	6.3x	115%	$19.45	15.6	7.7%	5.1%	7.5%	49%	14.9x	44%	43%	1.6x

Source: Citi Research
*covered by Citi analyst Faisel Khan

Appendix A-1

Analyst Certification

The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc and its affiliates. No part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

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Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of Occidental Petroleum Corp

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