

Oil & Gas: 2016 E&P Outlook

Other than O&G price recovery, what will be the new story? M&A, technology or output decline?

Stock selection

Preferred

APC,CNQ,APA,EOG, COP,
DVN, HES, NBL, OXY, MRO,
LPI, KOS, BCEI

Least preferred

MUR, ECA, PXD

The combination of the current petroleum product price pall, inventory overhang, changing global macro, and for 2016, the return of Iran to the global oil market, reduced upstream cap-ex, and lower hedged output and production cash flows, does not portend a rosy 2016 E&P cash flow growth outlook or offer much holiday cheer.

Other than declining output, which is more likely oil than natural gas in the US, the Street understanding upstream operations better, or a substantial increase in public company M&A, what will be the new E&P investor theme or catalyst for 2016? How about fiscal prudence? Rational industry spending behaviour should cause:

1. A 500,000-750,000 Bbl/d drop in US shale oil output in 2H16 from its peak.
2. More judicious public M&A.
3. And no 'spending bailouts' (JV capital, expanded bank credit lines or public market access).

What could hurt a potential oil price recovery other than a slowing global GDP and nominally higher US interest rates?

4. Better well designs or new technology breakthrough for non-sweet spot shale conversion to further reduce horizontal shale well costs.

So, for 2016 it's a short story list rather than unabridged non-fiction, but it requires investor conviction. In the past, E&P had multi-year growth themes: 3D seismic and bright spots, deep or tight conventional gas, shale gas (pre-Appalachia), Hansel & Gretel growth (buying the assets of bigger companies or smaller E&Ps to add mass), synergistic M&A (cost savings), international exploration (conventional, and shales), CBM (domestic and international), product output changes (balanced, gas or oil and related strategy shifts), and of course technology implementation (LWD, MWD, deviated/ horizontal drilling and fracking). All of these themes were predicated upon the use of new CDS/OFS technologies and incremental capital. The shales have been bigger, given 'democratized growth via technology', 'up for grabs' resources, and lots of low cost capital availability.

Unfortunately, the investment community apparently failed to take into account industry cyclicality. Stocks were treated like tech growth stories. Now, given long dated PUD and resource inventories, the industry has to post one last dramatic quarter of reserve impairments and focus on returns.



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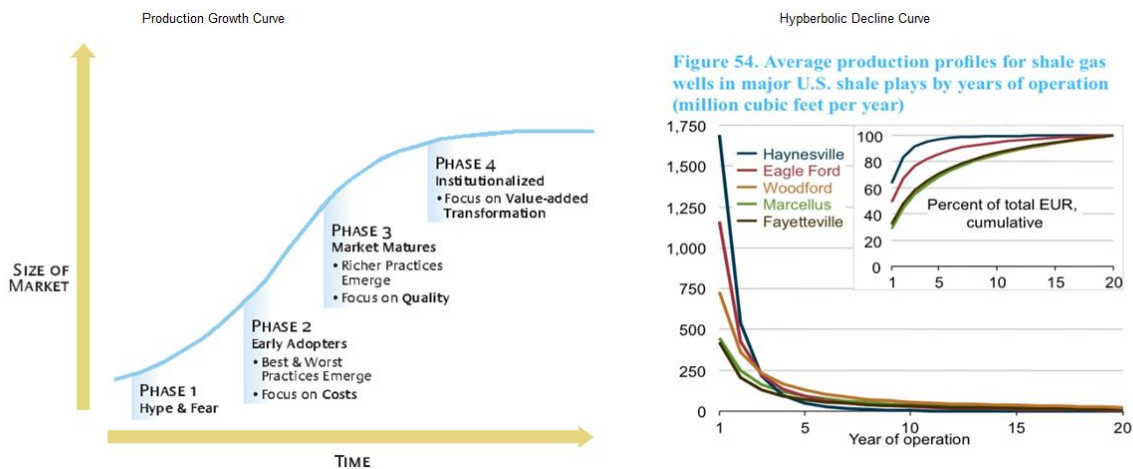
It may always be darkest before the dawn, but vs. prior industry nadirs, the recovery for E&Ps may not be that far off, provided that the industry is prudent with its reinvested cash flows.

When E&P management teams sell volume growth, it's always the next well IP or estimated improvements in projected decline curves, well RORs or EURs. Why? The Street buys growth and likes to calculate captive M&A resource value for any E&P, which we call 'spreadsheet math'.

What was the basic tenet that the Street seemingly overlooked with this approach or E&P management teams with that sales pitch?

1. Industry cyclicality.
2. Time value of money.
3. The amount of external capital needed to fuel volume and reserve growth.
4. The need to balance hyperbolic IP well decline rates, with contango forward future market curves.
5. And a more labour and completion intensive E&P business model, which also requires new GTP facilities, that are primarily being built via MLP companies.

Yes, the shales are 'quasi-manufacturing', but a true manufacturer's product growth cycle (lower left) is very different than one in a self-depleting commodity with hyperbolic decline rates (lower right). With most wells getting such a large portion of their ultimate reserve recovery upfront, having product prices be weak really ruins returns. That said, CDS (contract drilling services) and OFS (oilfield services) costs have come down, but we believe that product price assumptions remain too high and that the Street and industry only look at oil. It forgets about natural gas and BOE output or that the E&Ps will eventually have to find the next 'shale oil sweet spot'. One shouldn't ignore the fact that the natural gas assets still represent a significant part of many E&P's output stream or that many of these companies have written down billions of prior investments which were previously the volume growth story or stock catalyst. All E&Ps have done is switch from local to global markets (gas to oil).



Right now, the Street is extremely pessimistic about the E&P sector. We believe that the Street has overlooked several factors which will cause the E&P industry to ultimately 'self correct'. They are:

People

Product cycle times

Resource maturation and a lack of 'stacked tails'

Reduced cap-ex effect and minimization of external capital access

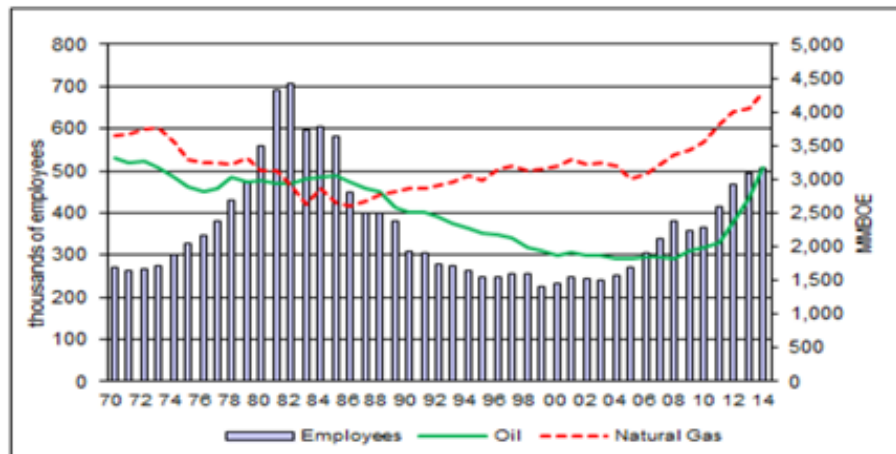
The loss of 'drop down financings' and private equity capital

Where could we be wrong with our positive 2016 perspective? Another iterative improvement in OFS completion technologies that causes fracs to be fully effective in each interval or for new well designs to improve non-sweet spot fairways at lower CWCs.

People, matter in Oil & Gas. There is 'age dispersion' which reflects cyclicity of industry hiring that is overlooked

Depending upon the news report, anywhere between 200,000 and 250,000 workers will become redundant during the current industry downturn. The most recent annual government employment data for the industry is 2014. There were about 500,000 US Oil & Gas workers (bars). That is less than the 700,000 peak in 1981. Back then, it took four years to remove that many workers from the US industry, but now that attrition will happen in less than a year. Why was the headcount decline so dramatic and severe? The hyperbolic well declines and contango futures market we mentioned previously. If G&G and field workers aren't adding new wells to the producer category, they are essentially redundant costs. It's the nature of a faster cycle time shale projects with lower near-term pricing. So, the easiest and hardest decision is to cut overhead given reduced cash flow and under-hedged output.

Total US Extraction Employees vs. Production



Source: API, EIA and SG Cross Asset Research/ US Equity

1962-1989 data based on U.S. Dept of Labor Statistics, "National Employment Hours and Earnings" using Standard Industry Classifications (SIC)

1990-present data reclassified to 2002 NA Industry Classification System (NAICS)

Source: API, EIA, SG Cross Asset Research/US Equity

The lines on the graph above represent US **oil** and with **natural gas** output converted to BOE. Note that from the early 1970s to late 1980s US oil and natural gas output declined even with an improvement and then a decline of headcount. But, by the late 1980s natural gas output began to rise, while oil continued to decline until 2008.

Industry headcounts declined from 1981 until 2004. The fact that natural gas output could increase while the workforce shrank points to the efficacy of new CDS (contract drilling services) and OFS (oil field services) technologies being deployed which brought production from deep gas drilling, vertical onshore fraced reservoirs, seismic bright spots reservoirs, and 3D seismic, and horizontal multistage shale well drilling.

With oil, output stabilized in the late 1990s and the new millennium from DeepH2O and Alaskan activity but didn't rise until horizontal shale exploitation began (Bakken, Eagle Ford and then Permian) and the workforce increased.

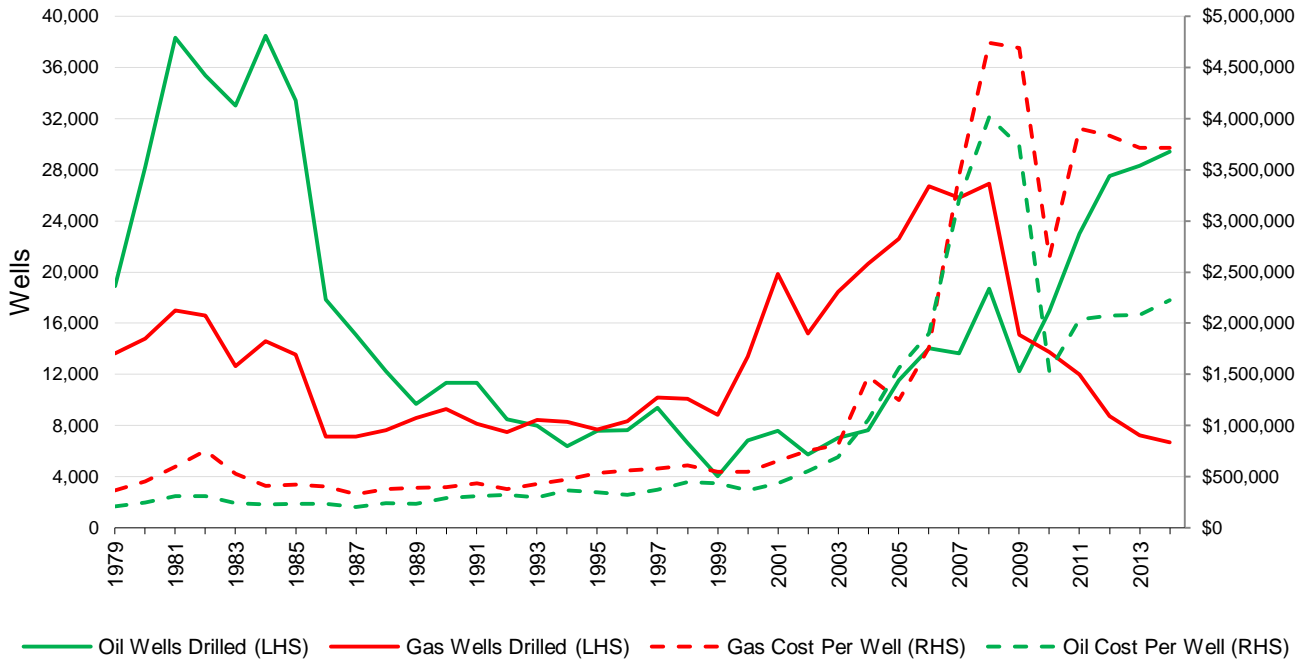
Companies that downsize today will be faced with several strategic or managerial issues in the future. Can they bring workers back easily? What about age dispersion of technical workers (geosciences and engineering)? The industry had a large hiring gap between the early 1980s and the start of the shales, so there is age dispersion within companies. Technical workers are largely bifurcated into two groups, baby-boomers who largely entered post the 1973 Arab Embargo (workers in their 50s or 60s) and the group of workers brought in during the recent boom (20s and early 30s) .

So, when companies reduce G&G worker headcounts, how much basin or petrophysical knowledge will they be losing and will they be forced to outsource? Will there be a technology offset? For field workers, i.e. roughnecks who have been displaced, they simply may not come back once they matriculate to other industries with similar skill requirement, such as construction, which also may not be as remotely located.

Well Cycle Times and output management

The graphs on the next page show the onshore oil and natural gas well counts on the left vertical axis. On the right vertical axis is the cost per well for oil and natural gas wells. It's clear that costs have risen since the conventional era because wells today aren't as likely to be vertical, but horizontal, and have much more expensive completions.

Oil and Gas Well Counts and Costs



Source: API, Spears & Associates, and SG Cross Asset Research/Equity

In the part of the cycle where industry drilling activity falls dramatically because of product price collapse, CDS and OFS costs drop towards cash breakeven rather than replacement cost economics. No doubt, the upstream companies have and will benefit from this 25-30% drop. Why has it been so good? More efficient crews have been retained post layoffs, and almost all wells are pad based. Companies aren't really delineating resource plays anymore and they've slowed their pace of drilling and well completions to 'do more with less'.

Most of the oil shale plays are only a few years in duration. So the fields will still have mid 20s to mid 30s output decline rates, given high IP declines. The E&Ps haven't stacked enough 'well tails' of older wells at the lower slope of the curve to mitigate reduced reinvestment. So, E&Ps, which sold growth, will now have to stretch their lower oil cap-ex and production cash flows. They may be hard pressed to maintain output unless they opt to outspend cash flow and that is the genesis of our comment on prudence. If the companies or Street continue to fund deficit spending, the concern about technology adding more production will cast a further pall on the stocks and delay the recovery in stock prices.

Deficit funded growth

Upstream volume and reserve growth is easy for an E&P when there is resource access and the companies outspend cash flow, and the Street has forgotten how these companies funded their volume growth.

The table below shows the collective costs incurred by the E&Ps by subsector (Large, Mid, Small and Canadian Senior). It is followed by the percentage of costs incurred that were beyond cash flow. So, a positive percentage means that the subsector outspent their cash flow by the number indicated. When there is a negative, it's because the subsector has been

free cash flow positive. Clearly, there are many positive numbers; more for the Mid and Small Cap E&Ps.

E&P Cap-Ex (\$ Millions) and Percentage of Deficit Spend

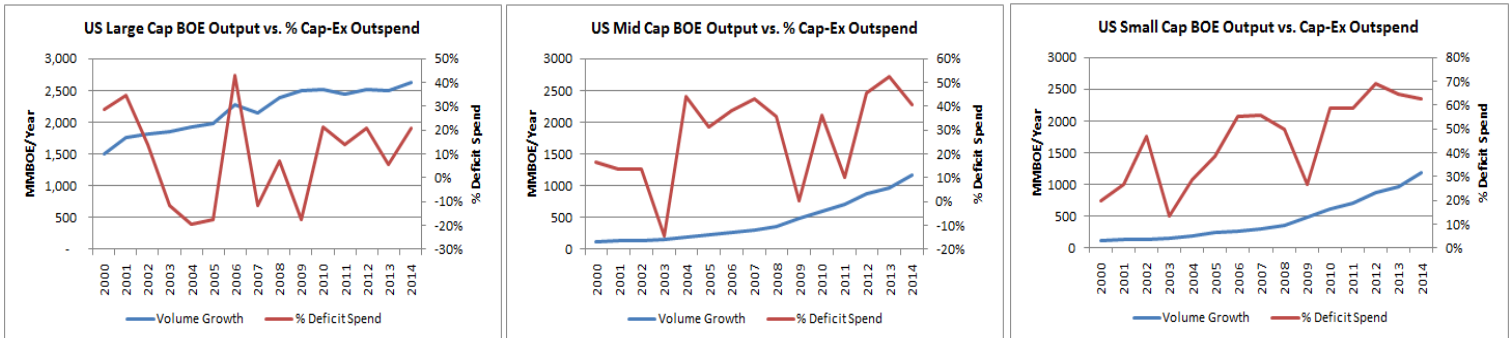
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
US Large Cap E&P	35,679	46,223	28,173	33,639	40,657	53,984	121,357	64,365	97,206	51,138	82,863	92,775	100,140	88,370	99,841
Percentage Outspend	29%	34%	14%	-12%	-20%	-18%	43%	-12%	7%	-17%	21%	14%	21%	5%	21%
US Mid Cap E&P	2,141	3,131	2,502	2,718	7,091	9,944	14,665	23,803	28,454	17,048	34,239	30,719	45,337	62,857	59,358
Percentage Outspend	17%	13%	14%	-14%	44%	31%	38%	43%	36%	1%	36%	10%	45%	52%	41%
US Small Cap E&Ps	1,726	2,656	2,530	2,833	4,567	6,771	11,958	16,557	21,380	8,766	14,029	20,733	30,170	30,932	32,019
Percentage Outspend	20%	27%	47%	13%	29%	39%	55%	56%	50%	27%	59%	59%	69%	64%	63%
Canadian Senior	6,381	7,380	18,472	10,745	19,739	19,512	23,838	18,943	19,072	15,175	19,804	21,607	18,955	12,896	26,403
Percentage Outspend	13%	29%	65%	8%	42%	11%	25%	-12%	-34%	-14%	23%	26%	23%	12%	50%
Total Spend	45,928	59,390	51,677	49,935	72,054	90,211	171,819	123,669	166,112	92,127	150,934	165,835	194,602	195,055	217,620
Percentage Outspend	26%	32%	34%	-6%	7%	-2%	41%	8%	13%	-9%	28%	20%	34%	30%	36%

Source: Factset and SG Cross Asset Research/US Equity

Another way to see the correlation is to look at the deficit spending percentage vs. production growth. Many E&Ps have switched to unconventional or shales which have faster project cycle times between well spud and production cash flow. Bigger companies will tend to have a slower production growth rate, given asset rationalizations and also longer project cycle times, i.e. DeepH2O. They'll register less deficit spending, on a percentage basis.

With both the Small and Mid Cap E&Ps, their production bases are less initially (please note that we used the same annual output scale). But they grow at a high rate because they are deploying so much capital beyond their production cash flow. So, it's clear that the Small and Mid Cap management teams took advantage of CDS/OFS working, available resources and also ready capital access. Will that be the same in a \$40 WTI and \$2/Mcf natural gas world when E&Ps have balance sheets which are getting more leveraged? Probably not. But, these graphs point to the obvious. Deficit spending led to meaningful volume growth. The graphs below depict annual MMBOE production, which includes asset sales, vs. deficit spending. Certainly, through 2014 every E&P spent more, but it was the mid and smaller E&Ps that took advantage of available capital to build a bigger production base.

Production vs. Capital Outspend



Source: Company Reports, and SG Cross Asset Research/US Equity

And company-specific deficit spending has been fairly consistent for many of the mid and small cap E&Ps over the last 15 years, but we don't see how it can persist.

Deficit Spending (Cap-ex - cash flow)

US Large Cap E&Ps	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Anadarko Petroleum	(6,692)	(873)	(503)	465	498	1,146	(27,515)	175	836	(302)	294	(2,393)	2,819	(461)	(4,735)
Apache Corporation	(519)	(423)	290	(273)	(31)	1,280	(986)	435	1,215	1,176	(9,840)	(558)	(3,586)	(1,028)	(2,966)
Chesapeake Energy	44	(629)	(380)	(1,105)	(2,315)	(4,938)	(4,058)	(3,969)	(9,551)	(2,065)	(8,261)	(7,233)	(8,346)	(1,650)	(1,037)
ConocoPhillips	(6,490)	(6,996)	(2,487)	4,287	5,921	7,062	(18,319)	8,673	4,246	2,179	4,224	6,644	(2,661)	(4,780)	(3,333)
Devon Energy	559	(4,070)	(1,833)	(4,026)	2,070	1,556	(1,644)	1,612	91	510	(784)	(444)	(3,068)	(359)	(5,899)
EOG Resources	331	26	11	(33)	(29)	524	(350)	(672)	(710)	(925)	(2,619)	(2,176)	(1,421)	229	303
Hess	993	(3,135)	512	287	113	(136)	(300)	(287)	(312)	346	(2,050)	(3,029)	(3,595)	(443)	(884)
Marathon	1,919	2,476	156	1,311	2,154	2,819	3,516	2,646	3,496	1,343	1,338	(2,142)	(2,116)	174	(598)
Murphy Oil	285	(14)	(64)	(125)	378	287	145	(290)	977	224	305	159	(958)	(1,094)	(754)
Noble Energy	(7)	(157)	(50)	61	40	(3,253)	(64)	274	(52)	282	(1,158)	(2,273)	(1,034)	(1,343)	(1,858)
Occidental Petroleum	(2,181)	1,433	1,102	1,625	2,640	1,466	(1,723)	3,608	3,049	3,356	793	1,102	4,419	6,645	1,992
Pioneer Natural Resources	134	(203)	(314)	7	(1,963)	117	(810)	(1,310)	(323)	127	7	(675)	(1,192)	(722)	(1,175)
Total	(10,279)	(15,941)	(3,966)	3,938	7,966	9,476	(52,180)	7,594	(7,010)	8,924	(17,751)	(13,018)	(20,740)	(4,833)	(20,943)
US Mid Cap E&Ps	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Antero Resources											(470)	(570)	(1,227)	(1,579)	(2,339)
Cabot Oil & Gas	10	(217)	58	91	50	(32)	(150)	(118)	(833)	11	(371)	(339)	(290)	(88)	(500)
California Resources Co												2,333	(359)	616	(170)
Cimarex Energy	37	47	(258)	55	56	(1,738)	(157)	(38)	(178)	103	149	(310)	(522)	(215)	(494)
Concho Resources					(1)	(40)	(1,095)	(12)	(799)	(319)	(1,690)	(613)	(1,566)	(407)	(1,217)
Continental Resources						123	35	(79)	(293)	(8)	(498)	(984)	(2,672)	(1,226)	(1,510)
Denbury Resources	(22)	(140)	9	31	22	(36)	(379)	(63)	149	(448)	(4,564)	80	(350)	(668)	287
EP Energy											45	(222)	(47)	(1,009)	(60)
EQT*	(460)	112	123	150	228	(108)	173	(65)	(138)	(69)	(589)	(248)	(158)	(306)	(1,007)
FCX (PF MMR & PXP)	277	274	455	90	(1,068)	610	1,072	(2,884)	1,040	2,293	4,092	4,519	(3,495)	(18,304)	1,588
Linn Energy (PF BRV)		2	1	1	(110)	(420)	(1,081)	(3,318)	(1,820)	(43)	(2,027)	(2,293)	(4,237)	(5,404)	(3,408)
Newfield Exploration	4	(434)	(496)	98	(832)	54	(582)	(1,388)	(1,434)	225	(397)	(1,022)	(584)	(871)	(844)
QEP Resources						72	75	188	(464)	188	(127)	(31)	(1,561)	(129)	(1,751)
Range Resources	39	34	(3)	(68)	(514)	(121)	(499)	(497)	(971)	(142)	(683)	(863)	(1,004)	(544)	(1,023)
SM Energy	(5)	(54)	(84)	(23)	(40)	27	(324)	(168)	(58)	1	(374)	(752)	(776)	(397)	(1,275)
Southwestern Energy	(98)	14	(5)	(38)	(43)	(92)	(346)	(720)	(393)	(89)	(202)	(211)	(312)	(39)	(4,951)
Ultra Petroleum	(16)	(31)	(37)	(28)	2	124	(82)	(304)	(203)	(117)	(829)	(554)	(114)	(511)	(804)
Whiting Petroleum	(89)	(22)	(105)	28	(442)	(845)	(161)	(197)	(632)	(291)	(76)	(639)	(858)	(1,188)	(4,442)
WPX Energy											(378)	(91)	(1,662)	(434)	(214)
Total	(355)	(421)	(347)	389	(3,120)	(3,099)	(5,617)	(10,331)	(10,236)	(97)	(12,363)	(3,154)	(20,626)	(32,882)	(24,135)
US Small Cap E&Ps	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Approach Resources				(2)	1	(41)	(20)	(85)	(42)	4	(49)	(210)	(219)	(183)	(223)
Bill Barrett Corporation			(148)	(147)	(255)	(157)	(260)	(199)	(175)	53	(11)	(502)	(562)	(191)	(414)
Bonanza Creek										9	14	(104)	(247)	(185)	(561)
Callon Petroleum	(60)	(104)	(55)	(32)	(9)	(7)	(52)	(177)	(160)	70	(52)	(31)	(54)	(166)	(283)
Carizzo Oil & Gas	4	(16)	(5)	(3)	(46)	(70)	(135)	(149)	(410)	(36)	(224)	(402)	(496)	(424)	(640)
Clayton Williams	(9)	(47)	(24)	43	(253)	(22)	(107)	1	45	(33)	(80)	(128)	(285)	(63)	(154)
Cobalt International								(110)	(107)	(749)	(110)	(158)	(527)	(538)	(937)
Comstock Resources	28	(145)	(3)	57	(34)	(146)	46	(53)	245	(123)	(320)	(757)	(290)	(228)	(194)
Diamondback Energy										9	5	(46)	(61)	(311)	(801)
Eclipse Resources													(185)	(974)	(840)
Energen Corporation	133	154	(132)	121	(89)	6	199	111	220	161	(39)	(386)	(490)	(211)	(307)
Exco Resources	14	30	(8)	15	(215)	(209)	(1,599)	(2,328)	(647)	(193)	(455)	(750)	(63)	(941)	(83)
Goodrich Petroleum	(4)	(20)	(5)	(3)	(20)	(135)	(211)	(230)	(301)	(101)	(203)	(198)	(115)	(176)	(239)
Gulfport Energy	8	9	4	6	12	16	42	69	131	54	(13)	(92)	(651)	(714)	(974)
Halcon Resources				0	(108)	8	(10)	(321)	(5)	14	4	8	(4,252)	(1,881)	(1,103)
Jones Energy											(83)	(219)	(294)	(266)	(258)
Kosmos Energy									(44)	(483)	(612)	(231)	(93)	(46)	(54)
Laredo Petroleum									(468)	(238)	(332)	(387)	(581)	(356)	(814)
Magnum Hunter Resources					(0)	(0)	(9)	(40)	(15)	(13)	(156)	(803)	(892)	(384)	(418)
Matador Resources									(91)	(31)	(151)	(114)	(220)	(188)	(353)
Midstates Petroleum									18	(67)	(119)	(121)	(983)	(959)	(211)
Oasis Petroleum							4		(64)	(78)	(265)	(430)	(680)	(1,795)	(717)
Parsley Energy												(21)	(96)	(422)	(1,086)
Penn Virginia Corp	(23)	(162)	12	(19)	21	72	(109)	(217)	(228)	109	(284)	(290)	(193)	(670)	(518)
PDC Energy	(7)	(9)	6	(24)	21	(26)	(118)	(388)	(99)	69	(201)	(315)	(471)	(216)	(399)
Petroquest Energy	(22)	(22)	(369)	(18)	(19)	(105)	(27)	(37)	(123)	104	12	(87)	(50)	(239)	(78)
Quicksilver Resources	(142)	(17)	(38)	(92)	(134)	(95)	(325)	(590)	(1,691)	(16)	(320)	(334)	(160)	(106)	(103)
Resolute Energy								(89)	(68)	(18)	(9)	(130)	(422)	(402)	(47)
Rex Energy								(13)	(16)	(81)	(25)	(139)	(209)	(171)	(230)
Rice Energy (Rice B & MJV)				2	4	6	(13)	(16)	(81)	(25)	(139)	(142)	(211)	(471)	(1,221)
Rosetta Resources		186	47	136	48	(874)	(51)	(82)	23	38	(158)	(180)	(233)	(1,282)	(658)
RSP Permian												(50)	(95)	(157)	(1,494)
Sanchez Energy									(1)	(2)	(19)	(126)	(190)	(969)	(1,017)
SandRidge Energy					33	56	83	(855)	(1,367)	(933)	(2,327)	(1,239)	(3,015)	(524)	(770)
Stone Energy	(70)	(355)	44	47	(100)	(14)	(183)	(44)	(1,959)	49	(61)	(177)	6	(162)	(490)
Swift Energy	(40)	(146)	(88)	(46)	0	22	(150)	(240)	(80)	50	(163)	(219)	(414)	(230)	(366)
Warren Resources	(20)	(24)	(31)	(47)	(31)	(74)	(76)	(139)	(67)	15	16	(27)	(5)	5	(389)
W&T Offshore	97	129	32	66	72	93	(1,010)	214	6	119	(116)	(143)	(156)	(94)	(135)
Total	(346)	(706)	(1,192)	(380)	(1,302)	(2,617)	(6,620)	(9,258)	(10,656)	(2,362)	(8,217)	(12,165)	(20,773)	(19,920)	(20,043)
Canadian Seniors	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Canadian Natural Resources	(1,427)	(684)	(3,738)	(45)	(1,814)	278	(6,019)	2,752	3,171	2,603	371	(925)	(1,120)	321	(2,038)
Encana	100	252	(7,908)	(314)	(3,598)	597	632	115	1,557	1,969	(1,004)	(879)	(243)	(284)	(10,273)
Talisman Energy	4	(1,867)	(440)	(836)	(636)	(3,012)	(440)	(716)	104	(1,278)	(3,187)	(3,114)	(2,057)	(1,585)	(893)
Total	(817)	(2,171)	(12,058)	(813)	(8,343)	(2,221)	(5,961)	2,245	6,576	2,055	(4,488)	(5,567)	(4,383)	(1,548)	(13,204)
72 Company E&P Total	44,826	33,011	21,904	75,243	95,367	123,330	50,486	118,590	100,170	58,563	(76,902)	62,297	(6,875)	(56,500)	(68,424)

Source: Factset and SG

What happens when the growth stops, product prices drop and operating margins contract? Impairments

The table below shows reserve and asset impairments for E&Ps since 2012. The current year has YTD quarters. We realize that these impairments may reflect natural gas or much older oil projects, but collectively, they equal about thirty percent of total cap-ex. So, what does this really mean? E&P are making greater operating margin assumptions or booking too many PUDS. And we note that the industry has never taken this many, on a dollar basis, in 25 years.

E&P Impairments and Ceiling Tests (CT) 2012-3Q15

	2012 CT Impairment (\$)	2013 CT Impairment (\$)	2014 CT Impairment (\$)	1Q15 Impairments (\$)	2Q15 Impairments (\$)	3Q15 CT Impairment (\$)	YTD CT Impairments (\$)	3 3/4Total \$ Millions
US Large Cap E&Ps								
Anadarko Petroleum	389	794	836	3,718	117	1,545	5,380	7,399
Apache Corporation	1,926	356	4,989	7,220	3,700	6,088	17,008	24,279
Chesapeake Energy	3,655	546	88	4,976	5,015	5,416	15,407	19,696
ConocoPhillips	680	529	856	16	78	195	289	2,354
Devon Energy	2,024	1,976	1,953	5,460	4,168	5,851	15,479	21,432
EOG Resources	1,271	287	744	69	108	6,307	6,485	8,786
Hess	582	289	132	93	385	43	521	1,524
Marathon	371	96	132	9	44	1,089	1,142	1,741
Murphy Oil	200	22	51	-	-	2,301	2,301	2,574
Noble Energy	104	86	500	27	15	-	42	732
Occidental Petroleum*	1,710	621	7,379	310	-	3,290	3,600	13,310
Pioneer Natural Resources	533	1,495	-	138	-	84	222	2,250
Total	\$ 13,445	\$ 7,097	\$ 17,660	\$ 22,036	\$ 13,630	\$ 32,209	\$ 67,876	\$ 106,077
US Mid Cap E&Ps								
Antero	12	11	15	1	1,956	9	1,966	2,004
Cabot Oil & Gas	-	-	771	-	-	-	-	771
California Resources Co	-	-	3,402	-	-	-	-	3,402
Cimarex Energy	-	-	-	604	967	1,181	2,752	2,752
Concho Resources	-	65	447	-	-	8	8	520
Continental Resources	123	221	617	148	77	97	321	1,281
Denbury Resources	18	-	-	146	1,706	1,761	3,612	3,630
EP Energy	-	-	-	4	-	-	4	4
EQT Corp.	6	-	267	-	-	-	-	273
FCX	-	-	3,700	3,104	2,700	3,652	9,456	13,156
Linn Energy	422	828	2,304	533	-	2,300	2,833	6,388
Newfield Exploration	1,488	-	792	792	1,521	1,889	4,202	5,690
QEP Resources	133	93	1,143	20	1	15	36	1,405
Range Resources	125	52	28	12	515	15	538	744
SM Energy	209	173	85	56	13	63	131	597
Southwestern Energy	1,940	-	-	-	1,535	2,839	4,374	6,314
Ultra Petroleum	2,972	-	-	-	-	-	-	2,972
Whiting Petroleum	47	267	768	-	58	2,539	2,597	3,679
WPX Energy	288	1,055	107	-	-	-	-	1,450
Total	\$7,783	\$2,765	\$13,654	\$5,418	\$10,545	\$16,866	\$32,829	\$ 57,031
US Small Cap E&Ps								
Approach Resources	-	-	-	-	-	220	220	220
Bill Barrett Corporation	68	238	47	1	1	573	575	928
Bonanza Creek	1	168	168	6	15	187	187	355
Callon Petroleum	1	2	-	-	-	87	87	90
Carizzo	-	-	-	2	-	813	814	814
Clayton Williams Energy	6	90	12	-	-	3	3	111
Cobalt International	134	351	237	20	8	28	28	750
Comstock Resources	79	34	26	41	25	66	66	204
Diamondback Energy	-	-	-	-	323	274	597	597
Eclipse Resources	-	2	35	2	-	-	2	39
Energen Corporation	28	44	419	4	60	65	65	555
Exco Resources	1,347	109	-	276	394	339	1,010	2,466
Goodrich Petroleum	48	-	332	4	32	32	36	416
Gulport Energy	-	-	-	-	-	595	595	595
Halcon Resources	-	1,148	240	554	949	512	2,015	3,402
Jones Energy	19	14	-	-	-	-	-	33
Kosmos Energy	-	-	-	-	-	-	-	-
Laredo Petroleum	-	-	4	1	489	907	1,397	1,401
Magnum Hunter Resources	4	50	301	14	95	109	109	464
Matador Resources	63	21	67	67	229	286	582	667
Midstates Petroleum	-	453	86	175	498	487	1,160	1,700
Oasis Petroleum	4	1	47	5	20	1	26	78
Parsley Energy	-	-	-	-	-	-	-	-
PDC Energy	168	53	166	-	1	154	155	542
Penn Virginia	209	132	792	2	-	-	2	1,136
Petroquest	137	-	-	109	65	40	215	352
Resolute Energy	-	188	120	220	-	-	220	528
Rex Energy	21	32	133	7	118	139	264	449
Rice Energy	-	-	-	-	-	-	-	-
Rosetta Resources	-	-	-	798	245	-	1,043	1,043
RSP Permian	2	-	4	-	-	4	4	11
Sanchez Energy	-	-	214	441	469	455	1,365	1,579
Sand Ridge	316	26	193	1,084	1,489	1,075	3,648	4,183
Stone Energy	-	-	351	491	224	296	1,011	1,363
Swift Energy	-	47	445	503	261	322	1,085	1,577
Warren Resources	-	-	-	91	176	84	351	351
W&T Offshore	-	-	-	260	253	442	955	955
Total	\$2,654	\$3,036	\$4,371	\$5,178	\$6,316	\$8,396	\$19,890	\$ 29,951
Canadian Seniors								
Canadian Natural Resources	-	-	-	-	-	-	-	-
Encana	4,695	21	-	1,222	2,081	1,671	4,974	9,690
Talisman Energy	1,096	332	1,768	50	-	-	-	3,246
Total	\$5,791	\$353	\$1,768	\$1,272	\$2,081	\$1,671	\$4,974	\$12,936
Company Total	\$ 34,580	\$ 26,217	\$ 71,170	\$ 42,160	\$ 35,984	\$ 68,198	\$ 146,292	\$ 278,309

Source: Company Reports, SG Cross Asset Research; Companies in bold print followed by SG US Equity Research

What happens to balance sheets when E&Ps impair? More book leverage

The table below shows debt to book cap ratios for the last four quarters. The bulk of the leverage increase isn't added debt, but generally loss in book equity via impairments and ceiling tests. During the early 1990s, when interest rates were much higher, E&Ps had LTD/Book capitalization ratios for 50-65%, but had much greater debt services costs. Today, interest expense coverage costs may be lower, but many companies opted to use more leverage.

Debt to Book Cap

	12/31/2014	03/31/2015	06/30/2015	09/30/2015
APC	40%	47%	45%	48%
APA	29%	34%	35%	42%
CHK	39%	45%	53%	72%
DVN	30%	34%	37%	43%
EOG	25%	28%	27%	33%
HES	21%	22%	22%	23%
MRO	23%	24%	29%	30%
MUR	26%	24%	29%	36%
NBL	37%	35%	36%	39%
OXY	16%	17%	20%	22%
PXD	24%	24%	24%	23%
KOS	37%	38%	40%	41%
NFX	43%	43%	43%	55%
BCEI	53%	47%	49%	53%
CRC	71%	72%	73%	73%
LPI	54%	44%	42%	57%
CNQ-CA	33%	36%	37%	38%
ECA	49%	49%	50%	54%

Source: Factset

So, when assets get impaired and stock prices fall, if E&Ps can't monetize assets, they become more dependent upon their bank credit lines. Much like with the CDS wreck, banks didn't want to repossess houses and they certainly don't want to own oil and gas assets. So, depending upon the fiscal repair of their balance sheet, banks have either extended credit lines (termed out) or will be cutting if leveraged.

In the public domain, fiscal stress and excessive leverage will be manifested with the securitized debt 'cram-downs' that have been happening for the fiscally leveraged E&Ps. There may well be more, and they certainly haven't helped equity pricing.

We expect debt to book equity leverage for E&Ps to rise materially when E&Ps report their 4Q15 results given the likelihood of greater reserve impairments.

If E&Ps now are “long dated” development companies, why didn’t they hedge more?

The table below shows hedging for 2016 for oil, natural gas and BOE. Clearly, not many have set hedges or derivatives, and these statistics don’t reflect basis risk or transportation differentials. At the start of 2015, both oil and gas hedged volumes were higher and prices for oil were 40% higher for oil and double for gas. So the rhetorical question we ask above says it all.

Hedging is never a ‘profit center’, but a cash flow preserver. Clearly, the market either wasn’t liquid enough, too volatile or many management teams with hedging programs simply too slow since it often times has board level approvals. So, the manufacturers must learn to adjust to reduce cash flows. And that means that balance sheets will be more important as will the ability to service all debt.

Hedges as % of estimated 2016 volume

	% of Estimated Oil Production	% of Estimated NA Gas
	2016	2016
Apache Corp.	0%	0%
Anadarko Petroleum	9%	2%
ConocoPhillips	0%	0%
Devon Energy*	0%	2%
EOG Resources	0%	0%
Hess Corp.**	0%	0%
Murphy Oil	21%	21%
Marathon Oil***	5%	0%
Noble Energy	22%	21%
Occidental Petroleum	0%	0%
Pioneer Natural Resources	85%	65%
Bonanza Creek Energy	31%	0%
CRC	17%	0%
Kosmos Energy	56%	NA
Laredo Petroleum	70%	68%
Newfield Exploration	71%	8%
Canadian Natural Resources***	0%	0%
Encana	59%	25%

Source: Company Reports, SG Cross Asset Research/Equity

* Does not include short calls

**Production Includes non-NA NGLs

***Includes all NGL

Production Estimates from FactSet as of 11/10

Source: SG Cross Asset Research/Equity, Company reports

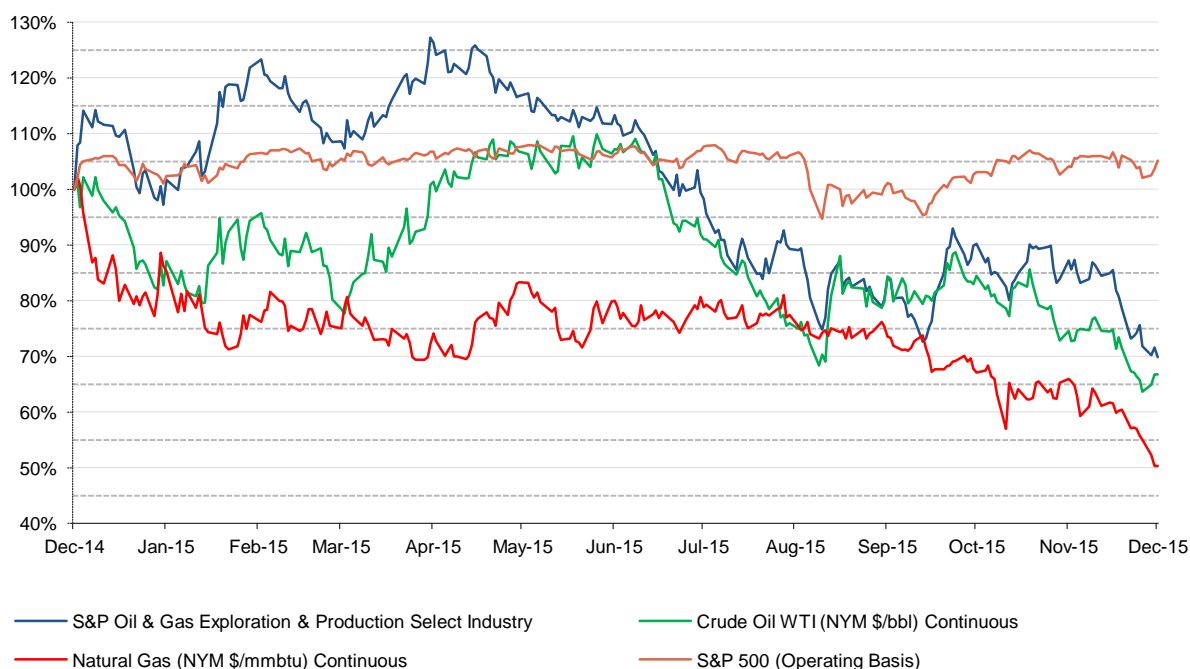
The need for investor patience and longer-term view for product pricing

In order for there to be E&P stock price improvements beyond the short-term industry headlines, more time has must elapse so the investment community can see shale oil output decline. Week-to-week, there is too much noise that is weather or activity related. Ultimately, reduced drilling should result in a slight uptick in gas output or declining oil output.

In our view, US natural gas prices won't get much of a reprieve unless the US suddenly gets "polar." We don't expect prices to improve until 2017 when there is more chemicals demand and greater exports (Mexican pipeline gas and LNG).

With oil, if Saudi Arabia has a sudden supply change epiphany and reduces its exports, the markets would react, but they otherwise need to accommodate Iran's return and the US oil output decline which should get more dramatic, from the shales, in 2H16.

Normalized 1-year price performance



Source: Factset, SG Cross Asset Research/Equity

Going forward, here are our product pricing assumptions (SG versus market)

	2016			2017		
	SGe	Market	% over mkt	SGe	Market	% over mkt
Brent	\$52.00	\$41.05	27%	\$67.00	\$48.35	34%
WTI	\$50.00	\$39.75	26%	\$65.00	\$45.20	44%
HH	\$2.75	\$2.22	24%	\$3.50	\$2.70	30%

Source: SG Cross Asset Research/Equity, Factset

[And that of the SG commodities team for reference here.](#)

2016 Street estimates will have to come down

On average DCF for the E&Ps we follow we expect it to be down 5% in 2016 vs. 2015. As the tables below show, our estimates for 2016 are under the Street, even using a commodity price deck that is at a premium to the current market. If prices do not materially improve soon, there may be more beginning of year estimate reductions ahead.

When E&Ps do report, we expect more impairments and ceiling tests. And note that the ones for 4Q15 might be substantially more than in 3Q15. Why? Companies will finally have their capital plans established and will have to change their PUD inventories to reflect the removal of uneconomic inventories and reduced capital spending.

2016 estimates

Our 2016e vs Street full-year estimates

Company	SGe 2016 EPS	SGe 2016 DCFPS	Street 2016 EPS	Street 2016 CFPS
Large Cap E&Ps				
Anadarko Petroleum	-\$2.40	\$7.32	-\$1.55	\$8.33
Apache Corp	-\$0.85	\$7.71	\$0.02	\$9.89
ConocoPhillips	-\$0.24	\$4.67	\$0.31	\$8.29
Devon Energy	-\$0.07	\$6.03	\$0.34	\$7.29
EOG Resources	-\$0.33	\$5.77	\$0.47	\$7.41
Hess Corp	-\$4.32	\$6.80	-\$3.79	\$9.39
Murphy Oil	-\$3.56	\$5.90	-\$2.28	\$8.31
Marathon Oil	-\$1.13	\$3.17	-\$0.76	\$3.47
Noble Energy	-\$0.64	\$4.02	-\$0.17	\$5.75
Occidental Petroleum	\$0.75	\$3.51	\$0.95	\$7.17
Pioneer Natural Res.	-\$0.70	\$10.50	\$0.08	\$11.88
Mid & Small Cap E&Ps				
Bonanza Creek Energy	-\$1.72	\$2.71	-\$1.46	\$2.76
California Resources Corp	-\$1.07	\$1.12	-\$0.84	\$1.54
Kosmos Energy	-\$0.34	\$0.88	-\$0.09	\$1.22
Laredo Petroleum	\$0.03	\$1.27	\$0.14	\$1.39
Newfield Exploration	-\$0.04	\$6.19	\$0.62	\$6.89
Canadian Seniors				
Canadian Natural Res. (CAD)	-\$0.62	\$3.75	\$0.14	\$5.10
Encana	-\$0.30	\$1.05	-\$0.09	\$1.40

Source: SG Cross Asset Research/Equity, Factset

2015 estimates

Our 2015e vs Street full-year estimates

Company	SGe 2015 EPS	SGe 2015 DCFPS	Street 2015 EPS	Street 2015 CFPS
Large Cap E&Ps				
Anadarko Petroleum	-\$2.39	\$5.55	-\$2.26	\$8.32
Apache Corp	-\$0.63	\$6.08	-\$0.58	\$8.62
ConocoPhillips	-\$0.87	\$3.22	-\$0.79	\$6.48
Devon Energy	\$2.49	\$11.56	\$2.51	\$12.33
EOG Resources	-\$0.01	\$5.47	\$0.11	\$7.17
Hess Corp	-\$3.86	\$7.31	-\$3.73	\$8.44
Murphy Oil	-\$3.59	\$6.05	-\$3.29	\$7.63
Marathon Oil	-\$1.19	\$2.05	-\$1.24	\$2.57
Noble Energy	\$0.06	\$4.58	\$0.10	\$5.62
Occidental Petroleum	\$0.31	\$2.97	\$0.30	\$5.70
Pioneer Natural Res.	-\$0.05	\$9.45	\$0.00	\$9.86
Mid & Small Cap E&Ps				
Bonanza Creek Energy	-\$0.37	\$4.23	-\$0.44	\$4.47
California Resources Corp	-\$0.85	\$1.33	-\$0.84	\$1.33
Kosmos Energy	-\$0.31	\$0.89	-\$0.20	\$0.88
Laredo Petroleum	\$0.26	\$1.95	\$0.26	\$1.79
Newfield Exploration	\$0.74	\$7.24	\$0.81	\$7.25
Canadian Seniors				
Canadian Natural Res. (CAD)	\$0.25	\$4.45	\$0.23	\$5.16
Encana	-\$0.18	\$1.47	-\$0.17	\$1.76

Source: SG Cross Asset Research/Equity, Factset

2015 Q4 estimates

Our 2015e vs OLD operating and Street 2015 4Q estimates

Company	SGe 4Q 2015 EPS	SGe 4Q 2015 DCFPS	Street 4Q 2015 EPS	Street 4Q 2015 CFPS
Large Cap E&Ps				
Anadarko Petroleum	-\$0.98	\$1.11	\$0.01	\$2.60
Apache Corp	-\$0.43	\$1.52	\$0.22	\$2.36
ConocoPhillips	-\$0.38	\$1.01	\$0.07	\$1.80
Devon Energy	\$0.74	\$2.44	\$0.78	\$3.22
EOG Resources	-\$0.34	\$1.12	\$0.28	\$2.20
Hess Corp	-\$1.38	\$1.27	-\$0.52	\$2.37
Murphy Oil	-\$0.97	\$1.39	-\$0.48	\$1.95
Marathon Oil	-\$0.36	\$0.58	-\$0.23	\$0.77
Noble Energy	\$0.00	\$1.20	\$0.26	\$1.16
Occidental Petroleum	\$0.03	\$0.69	\$0.21	\$1.64
Pioneer Natural Res.	-\$0.11	\$2.50	\$0.10	\$2.51
Mid & Small Cap E&Ps				
Bonanza Creek Energy	-\$0.08	\$1.11	-\$0.14	\$0.99
California Resources Corp	-\$0.24	\$0.33	-\$0.13	\$0.37
Kosmos Energy	-\$0.10	\$0.22	\$0.00	\$0.25
Laredo Petroleum	\$0.11	\$0.46	\$0.05	\$0.43
Newfield Exploration	\$0.05	\$1.52	\$0.46	\$2.17
Canadian Seniors				
Canadian Natural Res. (CAD)	-\$0.04	\$1.06	\$0.16	\$1.36
Encana	\$0.04	\$0.39	-\$0.20	\$0.22

Source: SG Cross Asset Research/Equity, FactSet

Consolidated Rating and Valuation Table

U.S. Large Cap	Ticker	12/17/2015	Rating	TP	DCFPS		EPS		P/DCFPS		Div Yield	TSR
		Closing Price			2015e	2016e	2015e	2016e	2015e	2016e		
Anadarko Petroleum	APC	\$46.73	BUY	\$91	\$5.55	\$7.32	(\$2.39)	(\$2.40)	16.4	12.4	2.4%	97.1%
Apache Corporation	APA	\$42.95	BUY	\$65	\$6.08	\$7.71	(\$0.63)	(\$0.85)	10.7	8.4	2.3%	53.7%
ConocoPhillips	COP	\$47.28	BUY	\$69	\$4.18	\$4.67	(\$0.87)	(\$0.24)	16.5	14.8	6.2%	52.2%
Devon Energy	DVN	\$28.98	BUY	\$64	\$11.56	\$6.03	\$2.49	(\$0.07)	5.5	10.6	3.3%	124.2%
EOG Resources	EOG	\$73.30	BUY	\$95	\$5.47	\$5.77	(\$0.01)	(\$0.33)	17.4	16.5	0.9%	30.5%
Hess Corp	HES	\$49.20	BUY	\$70	\$7.31	\$6.80	(\$3.86)	(\$4.32)	9.6	10.3	2.1%	44.3%
Murphy Oil	MUR	\$21.80	HOLD	\$32	\$6.05	\$5.58	(\$3.59)	(\$3.56)	5.3	5.7	6.4%	53.2%
Marathon	MRO	\$12.78	BUY	\$27	\$2.05	\$3.17	(\$1.19)	(\$1.13)	13.2	8.5	1.6%	112.8%
Noble Energy	NBL	\$31.22	BUY	\$44	\$4.58	\$4.04	\$0.06	(\$0.64)	9.6	10.9	2.3%	43.2%
Occidental Petroleum	OXY	\$66.42	BUY	\$84	\$2.97	\$3.51	\$0.31	\$0.75	28.3	23.9	4.5%	31.0%
Pioneer Natural Res.	PXD	\$130.51	HOLD	\$150	\$9.45	\$10.50	(\$0.05)	(\$0.70)	15.9	14.3	0.1%	15.0%
U.S. Mid Cap												
California Resources	CRC	\$2.00	BUY	\$6	\$1.33	\$1.12	(\$0.85)	(\$1.07)	4.5	5.4	0.0%	200.0%
Newfield Exploration	NFX	\$32.61	HOLD	\$39	\$7.24	\$6.19	\$0.74	(\$0.04)	5.4	6.3	0.0%	19.6%
U.S. Small Cap												
Bonanza Creek	BCEI	\$4.70	BUY	\$13	\$4.23	\$2.71	(\$0.37)	(\$1.72)	3.1	4.8	0.0%	176.6%
Kosmos Energy	KOS	\$5.13	BUY	\$10.5	\$0.89	\$0.88	(\$0.31)	(\$0.34)	11.8	11.9	0.0%	104.7%
Laredo Petroleum	LPI	\$7.88	BUY	\$14	\$1.95	\$1.27	\$0.26	\$0.03	7.2	11.0	0.0%	77.7%
Canadian Seniors												
Canadian Natural (C\$)	CNQ-CA	\$28.23	BUY	C\$40	\$4.45	\$3.75	\$0.25	(\$0.62)	9.0	10.7	3.3%	45.0%
Encana	ECA-CA	\$6.96	HOLD	C\$8.5	\$1.47	\$1.05	(\$0.18)	(\$0.30)	4.5	6.1	0.9%	66.1%

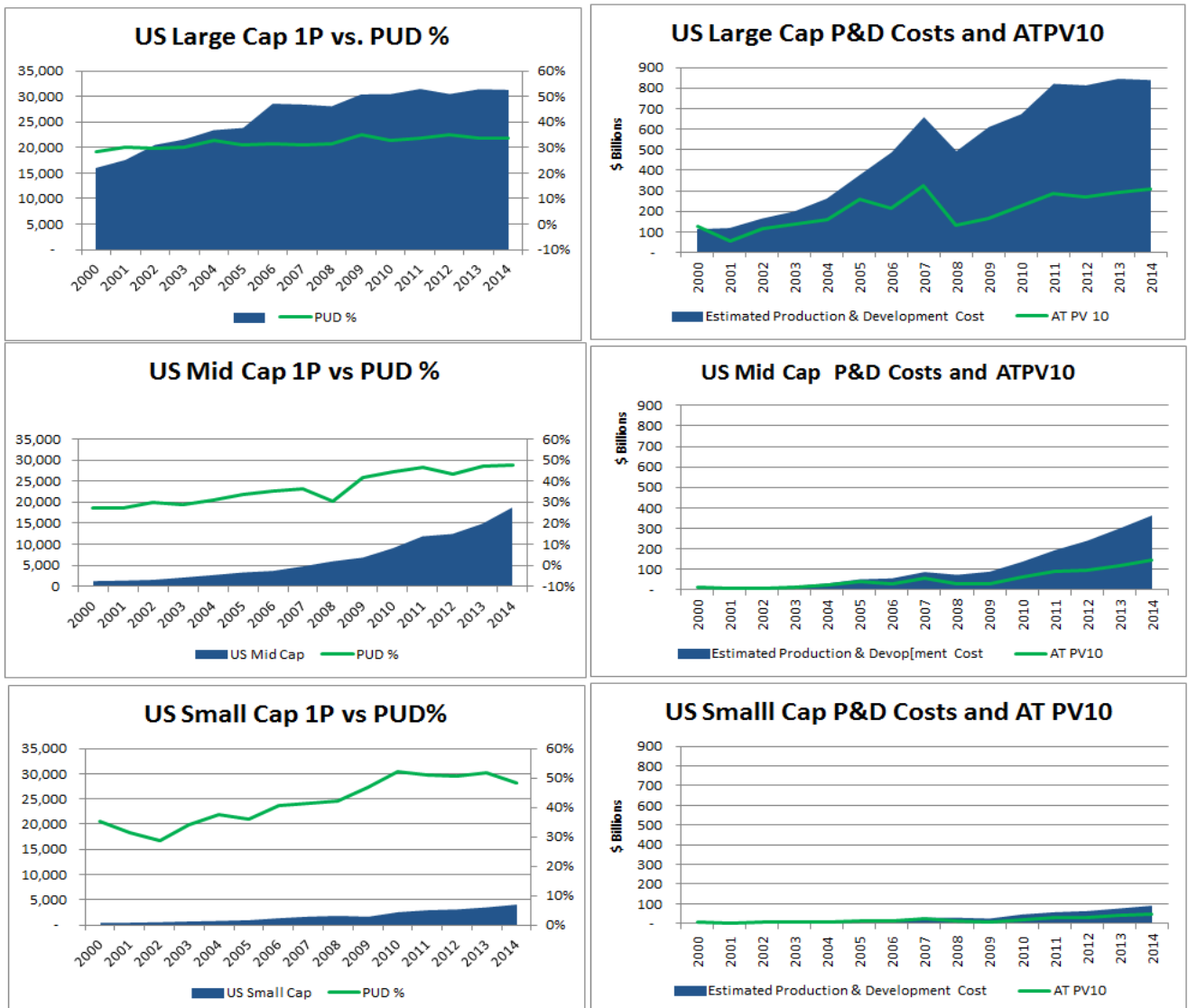
Source: SG Cross Asset Research/Equity

Reserves should drop 5% or more (company dependent), but estimated production and development costs and AT PV10s will decline, likely in lock-step

The graphs below show US Cap group reserves and PUDs on the left and estimated production and development costs for the proven reserves and ATPV10 value on the right. This comes from our finding cost report. Much like 2007-2009 when natural gas prices cratered, we expect reserves to decline at the margin, but for all cap groups to have more dramatic declines and also for PUDs to drop like they did for the Mid Caps in 2007.

And we do expect estimated production and development costs (blue area graph on right) and after tax PV10s to drop meaningfully, even with lower oilfield services costs. The Street may be disappointed by the degree of PV 10 decline, which might be as much as 25%.

Reserves, PUDs, Estimated Production & Development Costs and AT PV10s



Source: Company Reports and SG Cross Asset Research/US Equity

Conclusions

We've presented many observations and data as 'food for thought' for 2016. We note that we have 78% of our coverage universe BUY rated. Rational E&P spending behaviour should occur, by virtue of the fact that the industry can't continue to overlook obvious output growth roadblocks.

Few E&Ps have other sources of non-upstream profit and must live within cash flow. Management teams know that their bank credit lines might be their last fiscal lifelines, and thus they won't chase rate. Better capitalized E&Ps will have an easier time negotiating the price trough because they termed out their bank credit lines or issued public debt. Few E&Ps have good hedge positions, so cash flow will be the driver.

E&P cap-ex should be down 25-30% as recently announced by COP, but the vast majority of the E&Ps won't announce their 2016 cap-ex budgets until 2016. On average, as a consequence of lower cap ex, we currently have average E&P BOE output roughly flat, but quarterly, the changes will be more dramatic, and risk is likely to the downside as companies rush to balance cash flow and spending.

YoY Average Annual BOE Production Growth

	2016e/2015e
Apache Corp.	-3%
Anadarko Petroleum	-3%
ConocoPhillips	-3%
Devon Energy	3%
EOG Resources	1%
Hess Corp.	-1%
Murphy Oil	-9%
Marathon Oil	0%
Noble Energy	15%
Occidental Petroleum	1%
Pioneer Natural Resources	12%
Bonanza Creek Energy	5%
CRC	-4%
Kosmos Energy	18%
Laredo Petroleum	1%
Newfield Exploration	8%
Canadian Natural Resources	-1%
Encana	-12%
Group Total	0%

Source: SG Cross Asset Research/Equity

Year-end disclosures should be more 'extraordinary' than they were in 3Q given larger reserve impairments. Once these PUDs get written off, book leverage will be up, but what the Street might overlook is that it could be easier to conduct M&A. Why? Purchase premiums wouldn't be as large and there would be less risk of reserve writedowns since they had already occurred. So, purchases could buy captive resources, albeit at lower levels.

So, investors will need more time to elapse for E&P oil volume declines to get recognized on a corporate level. Management teams will likely tone down the growth mantra in their conference calls, and maybe visit fewer sellside venues. One E&P attended over 20 sell side conferences in

2015. Companies may still talk about projected IPs, well RORs or EURs, but that news may not garner the same Street following given the fiscal carnage from 2015 in the form of higher book leverage and reduced cash flows.

During 2016, we expect to see more public company M&A. Issuing stock helps repair the purchaser's balance sheet and in Darwinian times, E&Ps switch to survival mode. So, there will be mergers, opportunistic overtures (e.g. APC's approach to APA) and more rational industry behaviour, which won't be the growth, but realistic. That could well bring back investors, vs. technical traders or speculators.

APPENDIX

COMPANIES MENTIONED

Anadarko Petroleum Corp (APC.N, Buy)
 Apache Corp (APA.N, Buy)
 Bonanza Creek Energy Inc (BCEI.N, Buy)
 California Resources Corp (CRC.N, Buy)
 Canadian Natural Resources (CNQ.TO, Buy)
 ConocoPhillips (COP.N, Buy)
 Devon Energy (DVN.N, Buy)
 Encana Corporation (ECA.TO, Hold)
 EOG Resources Inc (EOG.N, Buy)
 Hess Corporation (HES.N, Buy)
 Kosmos Energy (KOS.N, Buy)
 Laredo Petroleum Holdings Inc (LPI.N, Buy)
 Marathon Oil (MRO.N, Buy)
 Murphy Oil (MUR.N, Hold)
 Newfield Exploration (NFX.N, Hold)
 Noble Energy (NBL.N, Buy)
 Occidental Petroleum Corporation (OXY.N, Buy)
 Pioneer Natural Resources (PXD.N, Hold)

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SG EQUITY RESEARCH RATINGS on a 12 months period

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Sector Weighting Definition on a 12 months period:

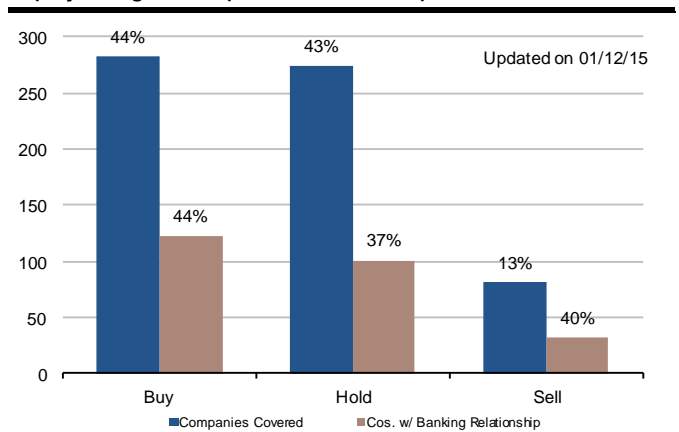
The sector weightings are assigned by the SG Equity Research Strategist and are distinct and separate from SG equity research analyst ratings. They are based on the relevant MSCI.

OVERWEIGHT: sector expected to outperform the relevant broad market benchmark over the next 12 months.

NEUTRAL: sector expected to perform in-line with the relevant broad market benchmark over the next 12 months.

UNDERWEIGHT: sector expected to underperform the relevant broad market benchmark over the next 12 months.

Equity rating and dispersion relationship



Source: SG Cross Asset Research/Equity

The Preferred and Least preferred stocks are selected by the covering analyst based on the individual analyst's coverage universe and not by the SG Equity Research Strategist.

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