

Price forecast December 31, 2015



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Forecast commentary A difficult year

"Adversity is a fact of life. It can't be controlled. What we can control is how we react to it." - Unknown

The 2015 headlines documented at length the difficulty oil and gas producers have had adjusting to current prices and demand. This difficulty has translated into capital expenditure delays, asset sales, takeover bids, and more than 35,000 employees terminated. While we started 2015 hopeful that the decline in oil prices would result in an average WTI price of \$70/bbl US for 2016, we close out the year with a grimmer view of the future. We expect oil and gas will remain in a slump through 2016 as industry continues to grapple with oil oversupply globally and natural gas oversupply on this continent.

Adding to the pressures of oversupply and low prices, significant political changes at the federal and provincial levels has changed the tone of conversation around royalties, climate change policies and carbon taxing.

In many ways, industry is facing an environment that may become a new norm. While it is simple to be profitable when demand is high and prices hover around \$100/bbl, success and profitability in 2016 will require effort and strategy. It is clear that industry must – and is starting to – find the structures, solutions and efficiencies needed to survive in the current environment. We have mentioned in previous commentaries the expected decrease in capital costs of 20 per cent and efficient capital uses such as re-fracturing existing wellbores, which companies have implemented during this time of decreased activity.

When forecasting, we base our near-term expectations on the futures market and our long-term forecast on our internal view of the industry. In years where there are significant global pressures affecting the markets, such as 2015, it can be especially difficult to predict prices, every quarter can bring big swings in the market.

Our current price forecast still anticipates long term WTI price averages of \$80/bbl US, but we do not expect to reach that level until 2022. We are forecasting 2016 and 2017 to average below \$50/bbl US and then increase gradually to our long-term price. Our Edmonton Light price forecast anticipates an average 2016 price of \$51/bbl CAD, keeping in mind a low exchange rate is propping up Canadian oil prices. Our Western Canadian Select oil price is forecast at \$35/bbl for 2016, with the expectation that tighter differential between light and heavy oil we saw in 2015 will widen in 2016. We forecast a five-year average light/heavy differential of \$14/bbl US.

Even with oil drilling activity in Canada over the last year falling nearly 70 per cent from the previous year – to below 2009 levels – production has only recently started to drop off. This decrease in drilling rig utilization is expected to continue into 2016 with the Canadian Association of Oil Drilling Contractors anticipating a 22 per cent utilization rate. The United States has seen drilling activity similarly decrease, yet the resulting oil production has only begun to drop off in recent months.

At the end of 2014, the global oversupply of oil was estimated around 3 MMbbl/d. With recent estimates around 1.5 MMbbl/d, the oversupply has halved but, given the low prices, this is not as steep of a decline as expected. Oil production from OPEC countries has held and additional volumes from Iran are expected this year as sanctions lift.

Figure 1: World production share



Source: EIA, data to November 2015

Demand for oil has increased by just under two per cent this past year, most likely due to the drop in prices making consumption more affordable, but this trend is not expected to continue into the next year. The International Energy Agency is forecasting a decrease in demand to 1.5 MMbbl/d, down from expectations of 1.8 MMbbl/d earlier in the year. Most of the growth in demand comes from Asia and Africa and this is not expected to change.

Figure 2: Demand growth by region



Source: EIA, November 2015 World Market Report

The futures market showed decreased optimism throughout 2015 with long-term expectations dropping every quarter. As the year progressed, industry witnessed the evaporation of optimism in medium- to long-term futures prices. Oversupply did not stop as quickly as some had hoped, diminishing the possibility of a quick recovery and trimming large value from the long term futures expectations. As we have spoken at length throughout the year, it has become more apparent to industry that the previous drilling activity in North America focused around tight oil sources was unsustainable. Not that industry can't drill this many wells effectively, but global oil demand does not align with the production growth. We expect, in the long term, these tight oil North American sources will become the volumes that can be added quickly when the global demand requires them. But this supply correction may not come in 2016.

The gas industry also endured a dreary 2015. Gas drilling activity levels in Canada have dropped by 30 per cent from 2014 and the United States has continued the decrease as in previous years but at a more rapid pace (30 per cent reduction in 2015, compared to a 15 per cent reduction in 2014).

Decreased drilling activity has not lead to decreased production levels, with gas production trending upward for North America.

Figure 3: Canada marketable natural gas production





Figure 4: United States marketable natural gas production



Source: EIA, Data to September 2015

Natural gas prices in Canada have dropped off substantially since our last price forecast with British Columbia Station 2 prices especially hard hit as oversupply has crept into the natural gas system, and Canadian volumes, especially those at the end of the line in British Columbia, hit the hardest. This oversupply has pushed gas storage levels to a five-year high with a warm winter expected due to El Niño effects. We are forecasting a Henry Hub 2016 gas price of \$2.40/Mcf US, which is in line with the futures expectations over the last month. Our AECO forecast for 2016 is \$2.45/Mcf CAD, expecting the same Henry Hub to AECO differential of \$0.60/Mcf US that has been in-place historically.

Alberta's plans to speed its shift from coal power plants to natural gas may help with demand and boost prices but this transition is a long-term initiative. Looking ahead, we expect natural gas prices to be robust as our economy transitions to cleaner sources of energy, but this will require very large capital expenditures that will take several years to come to fruition.



Canadian domestic price forecast

Crude oil price and market demand forecast

► Forecast comments

- Edmonton Par is forecast as a differential to WTI. This • differential is based on Canadian Light Sweet Oil Index Futures which began trading in January 2014.
- The Edmonton crude oil price is used as the basis for the remaining Canadian crude reference points. Offsets are based on five-year historical averages with recent years weighted more heavily in the determination.



Year	WTI Cushing, OK (40 Deg. API)	WTI Cushing, OK (40 Deg. API)	Edmonton City Gate (40 Deg. API)	Edmonton City Gate (40 Deg. API)	Bow River Oil Hardisty, AB (25 Deg. API)	Heavy Oil Hardisty, AB (12 Deg. API)	Cost Inflation	CAD to USD exchange
	US\$/bbl	US\$/bbl	C\$/bbl	C\$/bbl	C\$/bbl	C\$/bbl		
	Real	Current	Real	Current	Current	Current	Rate	Rate
Historical								
2012	\$98.34	\$94.11	\$90.47	\$86.57	\$74.41	\$64.07	0.015	1.001
2013	\$100.76	\$97.91	\$96.08	\$93.36	\$76.29	\$65.49	0.009	0.972
2014	\$95.07	\$93.26	\$95.82	\$94.00	\$81.49	\$73.70	0.019	0.906
2015								
12 Months H	\$48.68	\$48.68	\$57.09	\$57.09	\$45.46	\$40.44	0.012	0.783
0 Months F	-	-	-	-	-	-	0.000	-
Avg.	\$48.68	\$48.68	\$57.09	\$57.09	\$45.46	\$40.44	-	0.783
Forecast								
2016	\$42.00	\$42.00	\$51.35	\$51.35	\$38.35	\$31.35	0.000	0.740
2017	\$47.50	\$48.45	\$56.50	\$57.65	\$44.35	\$37.25	0.020	0.770
2018	\$55.00	\$57.20	\$63.75	\$66.35	\$52.80	\$45.50	0.020	0.800
2019	\$62.50	\$66.35	\$73.15	\$77.65	\$63.85	\$56.40	0.020	0.800
2020	\$70.00	\$75.75	\$82.50	\$89.30	\$75.25	\$67.65	0.020	0.800
2021	\$75.00	\$82.80	\$88.75	\$98.00	\$83.65	\$75.90	0.020	0.800
2022	\$80.00	\$90.10	\$95.00	\$107.00	\$92.35	\$84.45	0.020	0.800
2023	\$80.00	\$91.90	\$95.00	\$109.15	\$94.20	\$86.15	0.020	0.800



Natural gas price and market demand forecast

► Forecast comments

- The AECO natural gas price is forecast based on historical differentials to Henry Hub and future contracts traded on the NGX based in Calgary.
- In contrast to other forecasts in the industry, Deloitte's long-term views consider two more years of growth in terms of real dollars.

Year	AB Ref. Avg. Price	AB AECO Avg. Price	AB AECO Avg. Price	BC Direct Station 2 Sales	NYMEX Henry Hub	NYMEX Henry Hub
	C\$/Mcf	C\$/Mcf	C\$/Mcf	C\$/Mcf	US\$/Mcf	US\$/Mcf
	Current	Real	Current	Current	Real	Current
Historical						
2012	\$2.25	\$2.50	\$2.39	\$2.29	\$2.88	\$2.75
2013	\$2.98	\$3.27	\$3.17	\$3.11	\$3.84	\$3.73
2014	\$4.22	\$4.59	\$4.50	\$4.16	\$4.48	\$4.39
2015						
12 Months H	\$2.52	\$2.69	\$2.69	\$1.81	\$2.63	\$2.63
0 Months F	-	-	-	-	-	-
Avg.	\$2.52	\$2.69	\$2.69	\$1.81	\$2.63	\$2.63
Forecast						
2016	\$2.25	\$2.45	\$2.45	\$1.70	\$2.40	\$2.40
2017	\$2.65	\$2.80	\$2.85	\$2.35	\$2.75	\$2.80
2018	\$2.90	\$3.00	\$3.10	\$2.60	\$3.00	\$3.10
2019	\$3.25	\$3.25	\$3.45	\$2.90	\$3.20	\$3.40
2020	\$3.50	\$3.45	\$3.75	\$3.20	\$3.35	\$3.65
2021	\$3.90	\$3.75	\$4.15	\$3.60	\$3.60	\$3.95
2022	\$4.15	\$3.90	\$4.40	\$3.85	\$3.70	\$4.15
2023	\$4.40	\$4.05	\$4.65	\$4.10	\$3.85	\$4.40

International price forecast

Crude oil price and market demand forecast

Year	Average WTI Spot	Brent Spot (38.3° API with 0.37% sulphur content)	Gulf Coast ASCI	Average OPEC Basket	Nigerian Bonny Light (33.4° API FOB)	Mexico Maya (21.8° API FOB)	Russia Urals (31.7° API FOB)
	US\$/bbl	US\$/bbl	US\$/bbl	US\$/bbl	US\$/bbl	US\$/bbl	US\$/bbl
	Real	Real	Real	Real	Real	Real	Real
Forecast							
2016	\$42.00	\$44.00	\$41.00	\$41.00	\$44.50	\$36.00	\$43.25
2017	\$47.50	\$49.50	\$46.50	\$46.50	\$50.00	\$41.50	\$48.75
2018	\$55.00	\$57.00	\$54.00	\$54.00	\$57.50	\$49.00	\$56.25
2019	\$62.50	\$64.50	\$61.50	\$61.50	\$65.00	\$56.50	\$63.75
2020	\$70.00	\$72.00	\$69.00	\$69.00	\$72.50	\$64.00	\$71.25
2021	\$75.00	\$77.00	\$74.00	\$74.00	\$77.50	\$69.00	\$76.25
2022	\$80.00	\$82.00	\$79.00	\$79.00	\$82.50	\$74.00	\$81.25
2023	\$80.00	\$82.00	\$79.00	\$79.00	\$82.50	\$74.00	\$81.25

Forecast comments

- International crude quality reference points for OPEC Basket, Venezuelan, Nigerian, UAE, Mexican, Chinese, Russian, and Indonesian crudes are now based on Brent in US dollars. For the purposes of this forecast Brent is receiving a premium to WTI on the world markets.
- Current forecasts for other Crude Oil reference points are based on historical trends to the WTI price.
- Brent, United Kingdom crude is based on 38.3°API with 0.37 percent sulphur content. Brent blend is a light sweet North

Sea crude oil that serves as an international benchmark grade.

- United States Gulf Coast Argus Sour Crude Index (ASCI) is a blend of offshore Gulf Coast oil from Mars, Poseidon, and Southern Green Canyon.
- OPEC Basket represents the current grouping of crude oil prices from the OPEC member countries.
- Russia Urals 31.7°API is the FOB delivered price to the Mediterranean destinations.

Natural gas price and market demand forecast

Year	USD to GBP Exchange	USD to EUR Exchange	NYMEX Henry Hub	Permian Waha	San Juan Ignacio	Gulf Coast (Onshore)	Louisiana East Texas	Rocky Mtn. Opal	UK NBP
			US\$/Mcf	US\$/Mcf	US\$/Mcf	US\$/Mcf	US\$/Mcf	US\$/Mcf	US\$/Mcf
	Rate	Rate	Real	Real	Real	Real	Real	Real	Real
Forecast									
2016	1.550	1.100	\$2.40	\$2.20	\$2.20	\$2.30	\$2.35	\$2.25	\$5.40
2017	1.550	1.100	\$2.75	\$2.55	\$2.55	\$2.65	\$2.70	\$2.60	\$5.75
2018	1.550	1.100	\$3.00	\$2.80	\$2.80	\$2.90	\$2.95	\$2.85	\$6.00
2019	1.550	1.100	\$3.20	\$3.00	\$3.00	\$3.10	\$3.15	\$3.05	\$6.20
2020	1.550	1.100	\$3.35	\$3.15	\$3.15	\$3.25	\$3.30	\$3.20	\$6.35
2021	1.550	1.100	\$3.60	\$3.40	\$3.40	\$3.50	\$3.55	\$3.45	\$6.60
2022	1.550	1.100	\$3.70	\$3.50	\$3.50	\$3.60	\$3.65	\$3.55	\$6.70
2023	1.550	1.100	\$3.85	\$3.65	\$3.65	\$3.75	\$3.80	\$3.70	\$6.85

Forecast comments

• The NYMEX price is based on delivery at the Henry Hub in Louisiana, the nexus of 16 intra- and interstate natural

gas pipeline systems that draw supplies from the region's prolific gas deposits.

Major play comparison

Industry has long shared the theory that as oil and natural gas prices dropped, individual well productivity in the basin would increase due to operators targeting their best areas instead of pushing the boundaries of their plays. When we started to sort through the data on four major plays in Canada, we found that this was not necessarily the case. Instead, average well productivity has held relatively steady in the four major plays we reviewed. We hypothesize that this may be because technology has allowed companies to maintain strong productivity as development has expanded beyond the main geological fairway.

Below are a few plots comparing horizontal well yearly activity, well productivity, and development strategies of the following Canadian plays over time:

- Montney gas
- Cardium oil
- Southeast Saskatchewan Bakken oil
- Viking oil

Well activity per year (2005-2015)





Figure 6: Cardium oil horizontal well activity by year

Figure 7: Viking oil horizontal well activity by year



Figure 8: Bakken oil horizontal well activity by year



All of these plays have seen significant decreases in activity in 2015 compared to previous years. However the Bakken play had been decreasing in activity over the past few years while the other plays had been increasing. The Bakken we know has stepped out from the main pools, and is moving toward lower quality development, while plays like the Montney, Cardium and Viking still have many reaches to further develop.

Average well productivity per year (2005-2015)

Figure 9: Montney horizontal well mean first 3 month gas produciton



Figure 10: Cardium horizontal well mean first 3 month oil produciton



Figure 11: Viking horizontal well mean first 3 month oil produciton



Figure 12: Bakken horizontal well mean first 3 month oil produciton



In all the plays reviewed, average well productivity has stagnated in the last few years. We had expected, given the prevailing theory, the data would show that as commodity prices decreased between 2008 and 2012, well productivity would increase as operators high grade their opportunities. The same observation of stagnant productivity was observed by IHS, which reviewed major plays in the United States in the Daily Oil Bulletin, December 14.

Well productivity by fracture stages





40

80

30 to 40 stanes

Peak oil rate (bbl/d)

10 to 15 stages

160

640

320

15 to 20 stages

Figure 15: Viking peak oil rate by fracture stages

Probability

Figure 13: Montney peak gas rate by fracture stages

Figure 16: Bakken peak oil rate by fracture stages

20

5 to 10 stages

25 to 30 stages

10

0 to 5 stages

= 20 to 25 stages

Figure 14: Cardium peak oil rate by fracture stages



There are a variety of completion techniques employed across these plays so it is not feasible to compare them directly, but the graphs delineate whether the basic completion strategies are correlating to increased productivity. We have grouped the wells by number of fracture stages, which are roughly equivalent to the number of fractures applied over the length of the horizontal wellbore. Operators will often experiment with fracture stages to determine the optimum completion technique. It is generally held that the longer the horizontal length and the more fracture stages used, the greater the productivity of that well. The Cardium and Viking plays seem to correlate somewhat to this theory, but the Montney and Bakken do not have any correlation. Tonnage and fracture fluid have more effect in those plays than fracture stages alone.

Industry often talks about how it is drilling better and better wells, however, in this comparison we have found this is not necessarily the case. Canadian major plays are generally more mature, which can lead to stagnant productivity, and continuing to increase productivity with technology is not a realistic expectation on a broad scale. As we get into tough economic times, these plays require capital management and operating efficiencies to remain competitive.

Global trends Oil

World oil production



Source: U.S. Energy Information Administration, International Energy Statistics, Petroleum, Production

World oil reserves



Source: U.S. Energy Information Administration, International Energy Statistics, Petroleum, Reserves

World net oil (production minus consumption)



Overall, world oil production has steadily inclined since 2011, with most of the growth in North America. This increase is mainly from the tight oil formations such as the Bakken in North Dakota, the Niobrara in the mid-western states, and the Eagle Ford in Texas. Other regions have seen steady production with the exception of a small decline in production from Africa. Consumption has not kept pace with the growth in production over the last several years, which has led to the collapse in prices in 2015. With most regions seeing limited growth in consumption, this oversupply may continue for several years unless production falls. With the exception of North America, the balance between production and consumption in all the regions of the world has been quite consistent over the last several years. Central and South America may see this balance shift in the future as they have increased their oil reserves significantly since 2010.

Gas

World gas production

140.000 120,000 100,000 Billion cubic feet 80.000 rth Am 60,000 Europe 40.000 Middle East atin America 20,000 Africa Asia and Oceania 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2005

Source: U.S. Energy Information Administration, International Energy Statistics, Natural Gas, Production





Source: U.S. Energy Information Administration, International Energy Statistics, Natural Gas, Production

World net gas (production minus consumption)



Source: U.S. Energy Information Administration, International Energy Statistics, Natural Gas

World gas production has also increased year over year since 2009, with the largest production growth in the Middle East and North America. This large increase in production has not been offset by growth in consumption, which has slowed in the last three years. Global production currently exceeds supply. Europe has seen the greatest shift in supply and demand over the last three years, largely driven by a reduction in consumption since peaking in 2012. Similarly, the Middle East has seen increases in production outpace consumption, while Asia has seen the opposite, with consumption growing faster than production over the last several years. With most of the world's gas reserves located in Europe and the Middle East, these trends are likely to continue into the future.

Storage

US natural gas



The United States natural gas storage level dipped below the five-year average in March 2015 but returned to the average by May and now has even slightly surpassed those levels. With talk of another El Niño this year, storage levels have risen to above historic levels this winter season.

Source: U.S. Energy Information Administration, Weekly Natural Gas Storage Report

Rig counts

United States

After temporarily leveling off in the summer months, US rig counts have once again began to drop as oil prices have weakened even further. Oil rig counts have not been this low since 2010. Gas rig counts continue to be relatively steady as companies have been operating in a lower price environment for several years.

Canadian rig counts have been relatively steady for several months at just under 200 rigs. Like last year, the typical spike in rig counts seen in January and February is not expected to occur in 2016 as companies continue to cut capital budgets and reassess their strategies.

Middle Eastern rig counts have started to increase in the last few months as OPEC countries continue to pump oil at historic highs. The rest of the world continues to see decreased activity, with the largest drop in rigs seen in Latin America.











Source: Baker Hughes Incorporated, International RIg Count

Pricing philosophy

Price forecasting takes into account many variables that can influence future prices. Our experience tells us that we must continually review the forecasting tools we use to predict where oil and gas prices are heading. However, one constant influence on oil and gas pricing is the geo-political landscape. This impact is most accurately reflected in the financial industry's futures market for commodities, a main influence when Deloitte creates its price forecast. In other words, Deloitte looks to both the futures and the past when we create our forecasts.

This pricing philosophy challenges conventional thinking. The traditional view is based on the mean-reversion view of commodities presented by economists. Following this model, industry forecasts from 2000 to 2006 reflected a drop in prices over the long term from the current prices of the day – even though the futures market indicated otherwise. While the mean-reversion approach definitely has some merit, history has tended to reflect that the futures market is a more accurate barometer.

Client focused

At Deloitte, we believe it is part of our role to help our clients in both the oil and gas sector and the investment community make better long-term business decisions by providing them with the most accurate and realistic information. We understand that sound analysis of changing trends can influence decisions on mergers, acquisitions, divestitures and investments. One way we ensure our price forecasts are as accurate as possible, given the continuing impact of near-term volatility, is to review our pricing assumptions on a quarterly basis.

Our process

In preparing the price forecast, Deloitte considers the current monthly trends, the actual price and trends for the year-to-date and the prior year actual prices. The base forecast for both oil and gas is based on New York Mercantile Exchange (NYMEX) futures in U.S. dollars.

Crude oil and natural gas forecasts are based on yearly variable factors, weighted to a higher percent for the current data and then reflect a higher percent to prior year historical data for the later years. Gas prices have been determined independently from oil prices, but still reflect the current competitive nature of the two fuels and historical oil-to-gas ratios for the latter years of the gas forecast.

Deloitte prepares our price and market forecasts based on information we collect from numerous government agencies, industry publications, oil refineries, natural gas marketers and industry trends. Inflation forecasts and exchange rates are also an integral part of the forecast.

These forecasts are Deloitte's best estimate of how the future will look, and while they are considered reasonable, changing market conditions or additional information may require alteration from the indicated effective date.



Glossary



Some of the words, phrases and acronyms we use frequently when talking about pricing are listed below:

	5
AECO	Alberta Energy Company - historical name of a virtual trading hub on the NGX system
ANS	Alaska North Slope
ASCI	Argus Sour Crude Oil
AWB	Access Western Blend - Canadian condensate/ bitumen mix
BR	Bow River Crude Oil
CBOT	Chicago Board Of Trade
CGA	Canadian Gas Association
DCQ	Daily Contract Quantity
EIA	Energy Information Administration
FERC	US Federal Energy Regulatory Commission
FOB	Free on Board (shipper term)
IEA	International Energy Administration
LLB	Lloydminster Blend Crude Oil
LNG	Liquefied Natural Gas
MESC	Middle East Sour Crude
MSO	Mixed Sour Crude Oil
MSW	Canadian Light Sweet
NEB	Canadian National Energy Board
NIT	Nova Inventory Transfer
NYMEX	New York Mercantile Exchange
OECD	Organization of Economic Cooperation and Development
OPEC	Organization of Petroleum Exporting Countries
PADD	Petroleum Administration Defense District
USGC	US Gulf Coast
USWC	US West Coast
WCS	Western Canada Select Crude Oil
WTI	West Texas Intermediate
WTS	West Texas Sour

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