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Oil Price Regression Analysis, Fourth Edition

"What drives oil prices?" and, "where are oil prices heading?" are two of the most frequently asked questions by energy investors around the world. In this report, our 4th edition, we update our Oil Regression Model to incorporate the latest data since our last report in March 2012.

What drives oil prices? We think the combination of our Global Real GDP Index, OECD stock (1-quarter lag) levels and North American (US and Canada) oil production offers the 'best fit' and the most efficient multi-regression model to explain the movement of oil prices during 2000-2013. From our analysis, we construct the following model with an adjusted R-square of 0.922 and F-statistic of 219.3. This suggests the model can explain 92.2% of Brent oil price movement during 2000-2013 with a 99% confidence level.

Y = 0.626X1 - 0.106 X2 - 0.01 X3 + 203.83

Where Y = Brent Prices ($/bl), X1 = Global Real GDP Index, X2 = OECD Stock 1-Quarter Lag (mmbls) X3 = North American (US and Canada) Oil Production (mb/d)

How has the model changed? The global real GDP index remains the most important driver in this year's model. On the other hand, the US dollar no longer contributes any real significance to our multi-regression model. We have also found that North America oil production offers a better benefit to the model than non-OPEC production, while OPEC production's significance continues to deteriorate. Finally, we fine-tune the model by replacing OECD stock with the same data series but on a one-quarter lag.

Where are oil prices heading? Based on Barclays Economics Research's current GDP growth forecast of 3.4% as well as our estimate of OECD stock levels and North America production, our model suggests Brent should average approximately $119/bl in 1Q14 and $110/bl for FY 2014. However, QTD prices have come in lower due to the market's increasing concerns about China and India's growth outlook.

What are the implied market assumptions behind our model? We believe 1) there is a strong correlation between global real GDP and oil demand; 2) the US and Canada currently account for the bulk of the global oil supply growth and thus yields a closer prediction of Brent prices than Non-OPEC supply; 3) OECD stock serves as a proxy for the global oil and supply demand balance, particularly when combined with production data.

Risks and uncertainties to our regression model: We believe that our model is a useful tool to identify and better understand the drivers behind Brent oil price movement, as well as an interesting guide for estimating future price performance. However, we do not suggest that our model's variables will continue to drive oil prices indefinitely. In addition, forecast assumptions and the accuracy of the input variables will have a direct impact on the model's effectiveness to successfully estimate future oil prices.

SECTOR UPDATE

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Expected Brent Prices Will Remain Range Bound, Averaging Between $100-$110 Per Barrel

"Where are oil prices heading from here?" has been one of the most frequently asked questions by energy investors throughout the decades given the strong underlying correlation between the performances of oil prices and the oil shares. Answering this seemingly simple question inevitably leads to the follow up question "what drives oil prices?" If we cannot isolate and identify the primary drivers behind oil price movements, the probability of accurately and consistently predicting oil prices over an extended period of time seems slim. Unfortunately, the answer to both questions is not obvious due to the sheer size and complexity of the global market. To further complicate the task at hand, the lack of transparency and accuracy of industry data for oil demand, supply and inventory creates significant noise in our analysis. Short-term oil prices have also often been driven by other macroeconomic factors outside the oil market's demand and supply balance. Moreover, the ever changing dynamics of the global oil market implies that the drivers will likely evolve constantly rather than remain stagnant.

Although we agree that oil price forecasting is an inexact science, we still think that a systematic approach through applying regression analysis between oil prices and a large group of potential variables is a reasonable and sensible first step. In this report, our fourth edition, we update our Oil Price Regression model to incorporate the latest data since our last report in early 2012. According to our analysis, we believe a combination of the global real GDP index, the OECD stock level (with 1-quarter lag) and North America (US and Canada) crude oil/condensate production offers the "best fit" and the most efficient model to explain the movement of oil prices since the start of this millennium.

Based on Barclays Economics Research team's current GDP growth forecast of 3.4% and our estimate of North America oil production and levels of OECD total inventories, our regression model suggests 2014 Brent prices could average approximately $110/bl, in line with our expectation that the global oil market could be largely range bound between $90 - $120/bl and average $100-$110/bl on a rolling 12-month basis. However, it is important to note that our model essentially implies a steady political risk premium level and does not necessarily capture other factors such as market sentiment. For instance, one factor potentially causing a discrepancy between actual QTD Brent prices of $108/bl and our model's prediction of $119/bl for 1Q14 is investor concerns over China's GDP outlook and corresponding oil demand. While our 2014 Brent price forecasts are based on the assumption that global real GDP will grow 3.4% year-over-year, the World Bank currently forecasts global growth of 3.2% year-over-year. Aside from considering forecast assumptions and the effects that large swings in the geopolitical landscape can have on Brent prices (which our model does not capture), we also want to remain cognisant of the many variables that can and will affect Brent prices. Our focus is simply to provide the most important variables as a platform for which investors can model Brent price performance.

Since this report is our fourth edition in the last decade, we think it is worth making several observations. First, not surprisingly, the global real GDP index has been the most important driver in all of our models throughout the last decade. Secondly, the accuracy and efficiency of our model seems to be improving as demonstrated by the higher adjusted R-square and fewer variables, as well as the models' predicted values compared to the actual subsequent results. Thirdly, this is the first time that North America oil production (US and Canada only) has made it into our final multi-regression model, reflecting the rising importance of the North America oil production growth. Fourthly, the US dollar value does not make it into the final model in this year's edition. Lastly, our model seems to suggest a shift in market sentiment from previous concerns that we were facing a resource constrained market to the belief that we are potentially encountering a resource abundance market.

The Multi-Regression Model

According to our multi-regression analysis, we believe the combination of the following three variables – global real GDP index, OECD stock (1-quarter lag), and North America (US and Canada) crude oil production – produce the most statistically meaningful relationship and offer the 'best fit' and the most efficient model when analysing Brent prices. Our model's three variables can explain 92.2% of the oil price movement between 2000-2013 with a 99% confidence level.

Although forecasting oil prices is as much an art as it is science, we think the most sensible and systematic first step to approach the task is through multi-regression analysis. As an initial step, we first collected data sets of variables that we think the market has reasonable expectation or reliance upon when determining oil prices price. Next, we ran single-regression analysis of the independent variables to identify the metrics that have the highest correlation against Brent prices on a stand-alone basis. Finally, after numerous iterations testing different combinations of the statistically meaningful independent variables, we concluded with the following multi-regression model that we believe best explains the movement in oil prices since 2000.

Y = 0.6263 X1– 0.1063X2 – 0.0099 X3 + 203.83

Y = Brent Price ($/bl)

X1 = Global Real GDP Index (PPP-Weighted) (1Q60 with a Base of 100)

X2 = OECD Stock (1-quarter lag, mmbls)

X3 = North America (US and Canada only) crude oil production (mb/d)

In our opinion, the multi-regression model suggests the following underlying market assumptions and beliefs:

- Global real GDP is one of the most important drivers of oil consumptions
- OECD stock serves as a proxy for the global oil and supply demand balance, particularly when combined with North American production data.
- North American, specifically US and Canadian, crude oil production has an increasing role in determining oil prices given the continued strength in production growth. We believe North American (US & Canada) production is a better variable within our model than non-OPEC supply because US and Canadian production have accounted for the majority of non-OPEC production growth.
- Market sentiment has begun to shift from the previous view that we were facing a resource constrained market to the current belief that we are potentially encountering a resource abundant market.

In comparison, our 2012 regression model was as follows:

Y = 0.4851 X1 – 0.9339 X2 – 0.0572 X3 – 7.0733 X4 + 433.67

Y = Brent Price ($/bl)

X1 = Global Real GDP Index (PPP-Weighted) (1Q60 with a Base of 100)

X2 = FX Composite Index (1Q00 with a Base of 100)

X3 = OECD Stock (mmbls)

X4 = Non-OPEC Production (mmb/d)

Despite the reduction in the number of variables from four to three, our new model's adjusted R-square improved to 0.922 compared to 0.893 in our 2012 model, while the F-statistic improved to 219.2 from 98.7 previously.

Figure 1: Comparison of Past Model Predictions and Actual Prices

Model	Published Date	Adjusted R-Square	Predicted 1-Year Average[3]	Actual
2004[1]	Jul-04	0.559	26	42
2010[1]	Feb-10	0.798	89	80
2012[2]	Mar-12	0.893	110	112
2014[2]	Mar-14	0.922	110	?

[1] WTI Cushing is the basis of the model

[2] Brent is the basis of the model

[3] 2004 model predicted WTI price for year-end 2004. 2010, 2012 and 2014 models predictions were for annual averages.

Source: Barclays Research

Figure 2: Multi-Regression Analysis Output (Full Model)

Full Model Output	2004 Model	2010 Model	2012 Model	2014 Model
Multiple R	N/A	0.902	0.950	0.963
Adjusted R-Square	0.559	0.798	0.893	0.922
Standard Error	0.286	11.523	9.806	9.314
F-Statistic	3.48	53.664	98.689	219.151
Observations	18	41	48	56

Source: Barclays Research

Figure 3: Variable Use In Current and Previous Multi-Regression Models

	Model			
Variables	2004	2010	2012	2014
Economic Indicators				
GDP		x	x	x
% Change in GDP	x			
Production Metrics				
North America Production				x
Non-OPEC Production			x	
Inventory and Demand Metrics				
OPEC Utilization		x		
% Change in OPEC Utilization	x			
OECD Stock			x	
OECD Stock (one-quarter lag)				x
% Change in OECD Stock	x			
FX				
FX Composite			x	
% Change in FX Composite	x			
Others				
US Crude Imports		x		
Global Demand Growth / Non-OPEC Supply Growth	x			

Source: Barclays Research

Figure 4: Multi-Regression Analysis Output (Independent Variables)

2014 Model	Global Real GDP	OECD Stock (1-qtr lag)	North America Production
	Index	mmbls	mb/d
X Coefficient	0.626	-0.106	-0.010
Std Error	0.046	0.018	0.002
T-Stat	13.632	-5.806	-4.583
P-Value	0.000	0.000	0.000

2012 Model	Global Real GDP	FX Composite	OECD Stock	Non-OPEC Production
	Index	Index	mmbls	mmb/d
X Coefficient	0.485	-0.934	-0.057	-7.073
Std Error	0.068	0.431	0.020	1.886
T-Stat	7.164	-2.165	-2.928	-3.751
P-Value	0.000	0.036	0.005	0.001

2010 Model	Global Real GDP	OPEC Utilization	US Crude Imports
	Index	%	mmb/d
X Coefficient	0.445	211.889	-12.230
Std Error	0.040	57.886	4.738
T-Stat	11.020	3.660	-2.581
P-Value	0.000	0.001	0.014

2004 Model	Change in OECD Stock	Global Demand Growth / Non-OPEC Supply	Change in Global GDP Growth Rate	Change in USD vs Other Currencies	Change in OPEC Utilization Rate
	%	%	%	%	%
X Coefficient	-4.267	0.002	7.295	-0.685	0.503
Std Error	2.265	0.017	7.472	0.755	1.553
T-Stat	-1.884	1.158	0.976	-0.907	0.324
P-Value	N/A	N/A	N/A	N/A	N/A

* Our 2004 model was meant to predict the percentage change of oil prices. Our 2010, 2012 and 2014 models have been meant to predict the actual crude prices.

Source: Barclays Research

Figure 5: Sensitivity of Brent Price to Changes in Factors

	% Change in Factor	% Change Brent Price	% Change in Factor	% Change Brent Price
Global GDP	1.0%	4.4%	5.0%	22.1%
OECD Stock (qtr-lag)	1.0%	-4.3%	5.0%	-21.4%
North America Production	1.0%	-1.1%	5.0%	-5.3%

Source: Barclays Research

Where Should Oil Prices Trade According To Our Model?

Based on Barclays Economics Research team's current annual GDP growth forecast of 3.4% as well as our estimate of OECD stock and North American production growth rates, our regression model suggests Brent prices could average approximately $119/bl in 1Q14 and $110/bl in 2014, in line with our previous expectation that the global oil market could be largely range bound between $90-$120/bl and on a rolling 12-month basis, between $100-$110/bl over the next 1-2 years. It is also important to note that our model has implied a steady political risk premium level. Accordingly, any sudden large swing in the geopolitical environment will result in our model either overstating or understating actual oil prices. Five major geopolitical areas to watch for are Ukraine, Iran, Iraq (specifically for the upcoming parliament elections), Libya and Nigeria.

The recent escalation of Ukraine-Russia tensions and the possibility of sanctions or other multilateral actions against Russia following Russia's military action in Crimeria may eventually result in a higher political premium to our Brent price predictions. As our emerging markets and commodities research teams have pointed out in their report, *Ukraine and Russia political Update: Assessing the Potential Damage*, Russia is one of the top three oil producers globally (produces more than +10 million b/d) and any disruption in the country would affect the global economy through increased global energy prices.

Outside of Ukraine-Russian developments, we think the recent implementation of a six-month deal between Iran and six world powers will continue to capture investor attention. We believe increased development of Iranian crude oil and the resumption of crude export levels to pre-sanction levels would likely not occur until a permanent deal has been reached (if one is reached), during which Iran would also face technical challenges of restarting shut-in production. Nonetheless, we believe that in the interim, Brent prices could trade on perceived increases and decreases in the probability that sanctions on Iran will be permanently removed. During 2013, Iran exported approximately 1 million b/d compared to 2.5 million b/d prior to the placement of US and EU sanctions.

Iraq oil production averaged 3.6 million b/d in February compared to a recent low of only 2.8 million b/d in September 2013.. The focus this year will be the parliamentary elections which are scheduled to be held in Iraq on April 30, 2014. Depending on the outcome of competition among the Shi'ite Arabs, Sunni Arabs and Kurds, we estimate Iraq could see a swing of 500 mb/d (000s/d) to 1 million b/d in its production. Increasing violence ahead of the elections is also a risk factor in production and exports. In Libya, continued violence has prevented the country from exporting almost any crude volumes, compared to historic levels of approximately 1.4 million b/d. The end of a blockade on oil ports by rebels and the reopening of Libya's eastern oil export terminals could lead to resumption of exports closer to historic levels. In Nigeria, oil theft and corruption remains rampant. Production has been below 2 million b/d over the past year, significantly lower than its 2.53 million b/d target for 2013 and 2.39 million b/d target for 2014. Political tensions between President Goodluck Jonathan's People's Democratic Party and the increasingly powerful opposition All Progressives Congress could also cause further problems. The Presidential polls slated for February 14, 2015 and state elections scheduled for February 28, 2015 looks to be a particularly tumultuous race and areas where political unrest appears to be rising could become key flashpoints for oil.

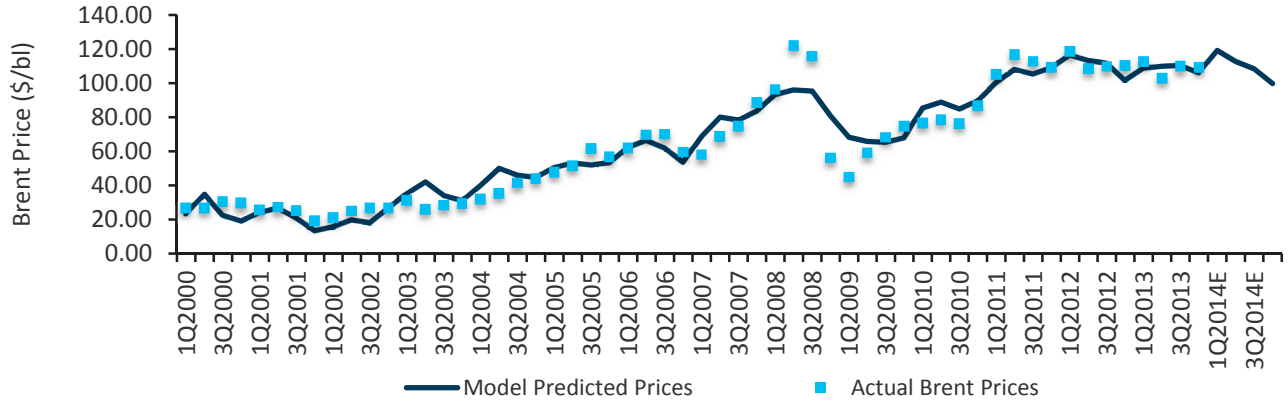
As a side note, we think our ***Global Oil Choke Points*** report (published March 20, 2012) and accompanying ***Major Oil Choke Points, Oil Flows & Pipelines*** map could serve as useful reference tools for investors as they evaluate continued geopolitical uncertainties.

Figure 6: Regression Model Brent Price Estimate (Based on Current 2014 Assumptions)

	Global Real GDP	Y/Y GDP Growth Rate	OECD Stock (qtr lag)	North America Prod (US & Canada)	Model Predicted Brent Prices
	Index	%		mmb/d	$/bl
1Q2014E	756	3.5%	4,149	11,873	119
2Q2014E	761	3.4%	4,237	11,923	113
3Q2014E	769	3.3%	4,295	12,223	108
4Q2014E	777	3.5%	4,378	12,698	100

Source: Barclays Research, Barclays Economics Research, IEA, EIA, NEB, BP Statistical Review

Figure 7: Model Predicted Brent Price vs. Actual Brent Price: 1Q00-4Q14E



Source: Barclays Research, Bloomberg

Figure 8: Regression Model Estimates: 1Q00-4Q05

	Model Predicted Prices	Actual Brent Prices	Variance (Model - Actual)	Variance (V$ / Actual)
	$/bl	$/bl	$	%
1Q2000	23	27	-4	(13%)
2Q2000	35	27	8	30%
3Q2000	22	30	-8	(26%)
4Q2000	19	30	-11	(36%)
1Q2001	24	26	-2	(7%)
2Q2001	27	27	-1	(3%)
3Q2001	21	25	-4	(17%)
4Q2001	13	19	-6	(31%)
1Q2002	16	21	-5	(26%)
2Q2002	20	25	-5	(22%)
3Q2002	18	27	-9	(33%)
4Q2002	27	27	0	0%
1Q2003	35	31	4	12%
2Q2003	42	26	16	61%
3Q2003	34	28	6	20%
4Q2003	31	29	2	6%
1Q2004	40	32	8	25%
2Q2004	50	35	15	41%
3Q2004	46	42	4	11%
4Q2004	45	44	1	1%
1Q2005	50	48	3	6%
2Q2005	53	52	2	3%
3Q2005	52	62	-10	(16%)
4Q2005	53	57	-4	(6%)

Source: Barclays Research, Bloomberg

Figure 9: Regression Model Estimates: 1Q06-4Q14E

	Model Predicted Prices	Actual Brent Prices	Variance (Model - Actual)	Variance (V$ / Actual)
	$/bl	$/bl	$	%
1Q2006	62	62	0	0%
2Q2006	66	70	-3	(5%)
3Q2006	62	70	-8	(12%)
4Q2006	54	60	-6	(10%)
1Q2007	69	58	11	18%
2Q2007	80	69	11	16%
3Q2007	78	75	3	5%
4Q2007	84	89	-5	(6%)
1Q2008	93	96	-3	(3%)
2Q2008	96	122	-26	(21%)
3Q2008	95	116	-21	(18%)
4Q2008	81	56	24	43%
1Q2009	68	45	23	52%
2Q2009	66	59	7	11%
3Q2009	65	68	-3	(4%)
4Q2009	68	75	-7	(9%)
1Q2010	85	77	9	11%
2Q2010	89	79	10	13%
3Q2010	85	76	8	11%
4Q2010	90	87	3	3%
1Q2011	100	105	-5	(5%)
2Q2011	108	117	-9	(7%)
3Q2011	105	113	-8	(7%)
4Q2011	109	109	0	(0%)
1Q2012	117	119	-2	(2%)
2Q2012	113	109	5	4%
3Q2012	112	110	2	2%
4Q2012	102	110	-9	(8%)
1Q2013	109	113	-4	(4%)
2Q2013	110	103	7	7%
3Q2013	110	110	0	0%
4Q2013	106	109	-3	(3%)
1Q2014E	119	?	?	?
2Q2014E	113	?	?	?
3Q2014E	108	?	?	?
4Q2014E	100	?	?	?
2000-2013 Avg				**1%**

Source: Barclays Research, Bloomberg

What Drives Oil Prices?

Although we believe that oil price forecasting is an inexact science, we think a systematic approach by evaluating the correlation between oil prices and a large group of potential drivers through regression analysis is a sensible and reasonable first step.

Single-Regression Analyses of Potential Variables

In the global market, there are numerous variables that seemingly drive day-to-day oil prices, of which some may be good indicators of future pricing trends, while others may have no statistically meaningful relationship. It is also important to keep in mind that the variables driving oil prices today may deviate in the future due to combination of shifts in political, economic, and market sentiment over time.

First, we identified variables (and different combinations of variables) that we think the market observes and could potentially have a relationship with oil prices. Although the lack of transparent and accurate industry data (both in demand and supply) as well as the complexity and scale of the global market adds complication in this task, we have chosen metrics that could be easily quantified and collected on both a historical and future basis from relatively trustworthy sources. Below are some of the variables we tested.

Figure 10: Variables Sampled and Tested in Single-Regression Runs

Variables	Unit
FX Composite Index	Index
Global Real GDP	Index
Non-OECD Demand	mmb/d
Non-OPEC Production	mmb/d
North America (US & Canada) Crude Oil Production	mb/d
North America (US & Canada) / Non-OPEC Production	%
North America (US & Canada) Produduction / OPEC Production	%
US Crude Oil Production	mb/d
US Net Crude Imports (Imports - Exports)	mb/d
US Net Product Imports (Imports - Exports)	mb/d
US Crude Exports	mb/d
US Product Exports	mb/d
US Net Crude Oil / Net Product Imports	%
Unemployment Rate	%
OECD Stock	mmbls
OECD Stock / Demand	# of days of stock
OPEC Idle Capacity	mmb/d
OPEC Utilization	%
OECD Demand	mmb/d
Non-OECD Demand	mmb/d
Total Demand	mmb/d
OPEC Production	mmb/d
Non-OPEC Production	mmb/d
Total Production	mmb/d
US Crude Inventory	mmbls

Source: Barclays Research, Barclays Economics Research, IEA, EIA, BP Statistical Review, Pacific Exchange Rate Service

Note: FX Composite Index refers to changes in USD vs. multiple currencies that we tested using a base index of 100 starting in 1Q00. Global Real GDP uses a base index of 100 starting in 1Q60.

Next, we conducted single-regression analysis on Brent price versus our group of potential variables. In addition to testing Brent prices against the variable's nominal value, we also ran regressions on derivatives including the variable's absolute change from quarter-to-quarter, as well as its percentage change from quarter-to-quarter. On a stand-alone basis, we identified 26 regressions that produced a statistically meaningful correlation with Brent prices on a dollar per barrel basis. During our single-regression run analysis, we required a p-value of less than 0.05 and T-stat of greater than 2.0.

To help explain our choice of test parameters, our individual regressions are designed to test whether there is a correlation between Brent and a specific variable, not necessarily the direction of the relationship. In our final multi-variable regression, the direction and coefficient of a specific variable will matter, but as a preliminary step, we are only concerned with whether or not the variable is correlated with Brent price. Thus, these individual regressions are two-tailed tests. Assuming a two-tailed test, more than 50 degrees of freedom (we use 56 observations in our analysis), and a p-value of 0.05 (implying each tail includes a p-value of 0.025) the critical value of a t-distribution is approximately ~2.0. Selecting a p-value of 0.05 implies we want a confidence level of at least 95% that our null hypothesis (i.e. a relationship between our selected variable and Brent prices exists) is true.

Figure 11: Single Regression Output

	Multiple R	R-Square	Adjusted R-Square	P-Value	T-Stat
Global Real GDP Index	0.936	0.875	0.873	0.000	19.465
Global Real GDP Index (1-qtr lag)	0.933	0.871	0.869	0.000	19.101
Non-OECD Demand	0.921	0.847	0.845	0.000	5.627
OPEC Supply	0.911	0.831	0.828	0.000	16.277
Total Demand	0.895	0.801	0.797	0.000	14.725
Total Supply	0.893	0.798	0.794	0.000	14.600
FX Composite (RMB)	0.887	0.787	0.783	0.000	(14.120)
FX Composite (EUR, GBP, JPY, RMB)	0.865	0.748	0.743	0.000	(12.660)
U.S. Product Exports	0.826	0.682	0.676	0.000	10.753
U.S. Crude & Product Exports	0.819	0.670	0.664	0.000	10.475
FX Composite (EUR, GBP, JPY, RMB, FRF, DEM)	0.809	0.654	0.647	0.000	(10.098)
OECD Stock (1-qtr lag)	0.765	0.585	0.577	0.000	8.725
OECD Stock / Demand	0.757	0.572	0.565	0.000	8.503
OECD Stock	0.753	0.567	0.559	0.000	8.416
US Crude Inventory	0.716	0.513	0.504	0.000	7.538
Non-OPEC Supply	0.684	0.468	0.458	0.000	6.889
FX Composite (BRL, INR, KRW, RMB)	0.662	0.439	0.428	0.000	(6.498)
Net Imported Product (Imports - Exports)	0.566	0.320	0.307	0.000	(5.042)
North America (US & Canada) Crude Production	0.547	0.300	0.287	0.000	4.807
Unemployment Rate	0.542	0.294	0.281	0.000	4.737
OECD Demand	0.531	0.282	0.268	0.000	(4.601)
US Crude Exports	0.415	0.173	0.157	0.001	3.356
North America (US & Canada) / Non-OPEC Crude Production	0.370	0.137	0.121	0.005	2.924
Net Crude Imports / Net Product Imports	0.335	0.113	0.096	0.011	(2.617)
Net Crude Imports (Imports - Exports)	0.314	0.099	0.082	0.018	(2.433)
US Crude Production	0.281	0.079	0.062	0.036	2.156

Source: Barclays Research

Multi-Regression Model

After testing all of the single-regression variables, we ran numerous multi-regressions using different combinations of independent variables to create a 'best fit' model to explain the movement of oil prices during 2000-2013. According to our multi-regression analysis, we believe the combination of the following three independent variables – global real GDP index, OECD stock on a 1-quarter lag and North America (US and Canada) crude oil production – are the main drivers of oil price movements during our timeframe.

On a single-regression basis, global real GDP index, OECD stock on a 1-quarter lag basis and North America (US & Canada) production showed a strong statistical relationship with Brent prices. More importantly, when we combine the three variables together, the collective ability to explain Brent prices improved significantly from our variables' abilities to explain Brent prices on an individual basis. To illustrate, our adjusted R-square in our multi-regression improved to 0.922 from the stand-alone model of 0.873 for the global real GDP index, 0.577 for OECD stock on a 1-quarter lag and 0.287 for North America (US & Canada) crude production.

Figure 12: Single Regression Output for Variables in Multi-Regression Model

	Multiple R	R-Square	Adjusted R-Square	P-Value	T-Stat
Global Real GDP	0.936	0.875	0.873	0.000	19.465
OECD Stock (one-quarter lag)	0.765	0.585	0.577	0.000	8.725
North America Production	0.547	0.300	0.287	0.000	4.807

Source: Barclays Research

Throughout our analysis, we required a p-value of less than 0.05 and a corresponding T-statistic of greater than 2.0 in order to deem a relationship between the dependent variable (Brent prices) and the independent variables statistically meaningful. We also considered the adjusted R-square when determining the effectiveness of the relationship. We looked for adjusted R-square values closes to 1.0 and an F-statistic of at least 2.84 (the F-statistic was only considered in the multiple regression and not the single regression runs). We use an F-statistic threshold of 2.84 based on the parameters of 0.05 significance level, 3 regression degrees of freedom, and 52 residual degrees of freedom. One caveat to our search for an adjusted R-square value closest to 1.0 is that we did not want to inundate our model with too many variables. We believe that when we construct a model with many variables, the adjusted R-square will inevitably inch closer to 1.0, regardless of the individual contribution a variable may have towards our model. If we were to include too many variables, we also run the risk of double counting an individual variable's benefit. To avoid this outcome, we tried to select only variables that can provide us with different information, or reinforce the strength/weakness of another relationship. Most importantly, we were looking for individual variables that clearly demonstrated their ability to strengthen our final model.

Based on our regression analysis, we have constructed the following model:

Y = 0.6263 X1– 0.1063X2 – 0.0099 X3 + 203.83

Y = Brent Price ($/bl)

X1 = Global Real GDP Index (PPP-Weighted) (1Q60 with a Base of 100)

X2 = OECD Stock (1-quarter lag, mmbls)

X3 = North America (US and Canada only) crude oil production (mb/d)

In comparison, our 2012 regression model was the following:

Y = 0.4851 X1 – 0.9339 X2 – 0.0572 X3 – 7.0733 X4 + 433.67

Y = Brent Price ($/bl)

X1 = Global Real GDP Index (PPP-Weighted) (1Q60 with a Base of 100)

X2 = FX Composite Index (1Q00 with a Base of 100)

X3 = OECD Stock (mmbls)

X4 = Non-OPEC Production (mmb/d)

Although the number of variables used in our new model has decreased to three from four in our 2012 model, our new model's adjusted R-square improved to 0.922 compared to the 2012 model at 0.893, while the F-statistic improved to 219.2 from 98.7 previously.

Figure 13: Multi-Regression Analysis Output (Independent Variables)

2014 Model	Global Real GDP	OECD Stock (1-qtr lag)	North America Production
	Index	mmbls	mb/d
X Coefficient	0.626	-0.106	-0.010
Std Error	0.046	0.018	0.002
T-Stat	13.632	-5.806	-4.583
P-Value	0.000	0.000	0.000

Source: Barclays Research

Figure 14: Multi-Regression Analysis Output (Full Model)

Full Model Output	2004 Model	2010 Model	2012 Model	2014 Model
Multiple R	N/A	0.902	0.950	0.963
Adjusted R-Square	0.559	0.798	0.893	0.922
Standard Error	0.286	11.523	9.806	9.314
F-Statistic	3.48	53.664	98.689	219.151
Observations	18	41	48	56

Source: Barclays Research

Figure 15: Variables Used In Current and Previous Multi-Regression Models

	Model			
Variables	2004	2010	2012	2014
Economic Indicators				
GDP		x	x	x
% Change in GDP	x			
Production Metrics				
North America Production				x
Non-OPEC Production			x	
Inventory and Demand Metrics				
OPEC Utilization		x		
% Change in OPEC Utilization	x			
OECD Stock			x	
OECD Stock (one-quarter lag)				x
% Change in OECD Stock	x			
FX				
FX Composite			x	
% Change in FX Composite	x			
Others				
US Crude Imports		x		
Global Demand Growth / Non-OPEC Supply Growth	x			

Source: Barclays Research

What is the Implicit Meaning of the Model?

In our analysis, we try to ask ourselves what the model is actually telling us about the relationship between our identified drivers and Brent oil prices. We also want to make sure that our model explains Brent prices, and not that Brent prices explain our variables. Lastly, we asked ourselves to provide logical and qualitative reasoning for why certain variables explain Brent prices, to ensure that the strength of a regression is not a coincidental result.

Global Real GDP Index

As in all of our previous models, global real GDP index remains the most important driver for worldwide oil prices. We believe this outcome is logical because global GDP is one of the most significant drivers for worldwide oil demand. Based on our regression analysis, global real GDP index as a function of global oil demand reported an adjusted R-square of 0.873. As global GDP improves, we expect to see accelerating crude and refined product sales, leading to an increase in oil prices all else equal.

OECD Stock (1-Quarter Lag), North America (US and Canada) Production

OECD stock (1-quarter lag and North American (US and Canada) production both show a negative correlation with oil prices. We believe these two factors are supplementary. On a stand-alone basis, we believe OECD stock is a proxy of the net global oil supply and demand balance. Rising inventories (seasonally adjusted) implies supply is running ahead of demand, which should lead to a lower oil price and vice versa.

Our initial theory for testing OECD stock on a quarter lag (and not relying on only real-time OECD stock) was that we felt investors might wait for published values of OECD stock to confirm or alter their views on Brent prices. The IEA publishes OECD stock levels two months after they have occurred (i.e. in March, January OECD levels will be released), so investors must wait approximately one quarter before they can react to OECD data for any given month. The use of real-time OECD stock in our model would suggest that the Brent oil market already reacts to real-time changes in OECD stock, and that investors do not react much to the delayed release. However, we found that using real-time OECD stock instead of OECD stock on a 1-quarter lag lowers our adjusted R-square from 0.922 to 0.913.

We think the inclusion of a production variable in our model helps supplement OECD stock because crude production growth, combined with OECD inventories, gives us a better idea of how tight or loose the oil market is. For instance, rising OECD inventories combined with rising production provides more confirmation of loose market conditions. However, the relationship can become even more nuanced and give us an idea of how quickly demand is increasing or decreasing. To illustrate, rising OECD inventories combined with increasing production may indicate a loose market, but rising OECD inventories combined with decreasing production indicates an even looser market.

During our analysis, we searched for the best production variable to use. We considered OPEC production, non-OPEC production, and North American (US and Canada) production, among other variations. We found that non-OPEC production was a better fit in our multi-variable model than OPEC production, but that North America (US and Canada) production was an even better fit. These results were unsurprising to us since over the past several years, North American shale production has become one of the driving forces behind global crude supply. Between 2008 and 2013, US and Canada crude production increased 45% (assumes 1Q08 average of 7.9 mmb/d and 4Q13 average of 11.4 mmb/d). Non-OPEC supply increased 9% during the same time period (assumes 1Q08 average of 48.9 mmb/d and 4Q13 average of 53.5 mmb/d), while OPEC supply decreased 1% (assumes 1Q08 average of 37.3 mmb/d and 4Q13 average of 37.0 mmb/d). To put these trends into another prospective, US and Canada oil production has accounted for 84% of the global oil production growth since 2008 (the combination of non-OPEC and OPEC supply grew from

86.2 mmb/d in 1Q08 to 90.4 mmb/d in 4Q13, while US and Canada production grew from 7.6 mmb/d in 1Q08 to 11.4 mmb/d in 4Q13). Because the growth in North American production is primarily responsible for the growth in non-OPEC supply during the past several years, and this trend has captured the full attention of the market, we think it makes sense that using North American production yields more accurate Brent price predictions than using non-OPEC supply.

Based on our analysis in 2012, we were already beginning to suspect that OPEC production was becoming less important as a driver in predicting Brent prices than it may have been in years past. In our regression analysis, we considered different time periods to observe changes in relationships over time. If we look at the single regression analysis for 48 quarters between 2000 and 2011, we get an adjusted R-square of 0.770. When we extend our data so that it includes data from 56 quarters between 2000 and 2013, our adjusted R-square becomes 0.828. This outcome could suggest that OPEC supply's relationship with Brent prices has strengthened slightly over the past two years, but this could also partly be due to a larger amount of observations that we are using compared to our analysis in 2012.

Nevertheless, our analysis of non-OPEC supply results has led us to believe it might be a better fit than OPEC supply. Using data from 48 quarters between 2000 and 2011, the adjusted R-square for a regression between Brent and non-OPEC supply is 0.282. Increasing our data set to span between 2000-2013, our adjusted R-square increases to 0.458. While both OPEC and non-OPEC supply showed stronger relationships to Brent when our observations spanned 2000-2013, versus 2000-2011, we think that investors increasingly focus on the change in non-OPEC supply, and that the incremental strength in non-OPEC's relationship with Brent prices is more meaningful for predicting Brent prices going forward.

The primary driver of non-OPEC supply during the past few years has been strong North American crude production, specifically US and Canadian production. In our analysis, we isolated this component of non-OPEC supply to see how our model would change. An individual regression of non-OPEC supply and Brent prices between 2000-2013 yielded an adjusted R-square of 0.458, while a regression of North America (US and Canada) crude oil supply and Brent yielded an adjusted R-square of 0.287. However, the magnitude of change in the adjusted R-square of US and Canada crude production between the two time periods, 2000-2011 and 2000-2013, was even greater than the magnitude of change we observed in non-OPEC production regressions. See figure 16 for comparisons.

The use of US and Canadian crude production instead of non-OPEC production boosted our model's adjusted R-square to 0.922 from 0.906. Furthermore, using US and Canadian production instead of non-OPEC supply increased the T-statistic of the other variables in our model as well.

We believe geopolitical developments and their effect on OPEC supply continues to be very important. On an incremental basis however, we believe the production growth in North America has overshadowed OPEC supply in importance and may be a better indicator of Brent prices in the near future. In summary, our model seems to suggest a shift in overall market sentiment from previous concerns that we were facing a resource constrained market to the current view that we may be potentially encountering a resource abundant market.

Figure 16: Single-Regressions Comparing Regional Production vs. Brent Prices

	OPEC Production			Non-OPEC Production			North America (US & Canada) Production		
Time Period	1Q00-4Q11	1Q00-4Q13	Variance	1Q00-4Q11	1Q00-4Q13	Variance	1Q00-4Q11	1Q00-4Q13	Variance
Multiple R	0.880	0.911	0.031	0.545	0.684	0.139	0.179	0.547	0.368
Adjusted R Square	0.770	0.828	0.058	0.282	0.458	0.176	0.011	0.287	0.276
Standard Error	14.350	13.891	-0.459	25.360	24.630	-0.730	29.765	28.252	-1.513
T-Stat	12.587	16.277	3.690	4.411	6.889	2.478	1.231	4.807	3.576
P-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.224	0.000	-0.224

Source: Barclays Research

Figure 17: Exchanging Non-OPEC Supply and North American (US and Canada) Crude Production - Impact on Final Model

Variables - GDP, OECD Stock (qtr-lag), Non-OPEC Production					
			Global Real GDP Index	OECD Stock (1-qtr lag)	Non-OPEC Supply
Multiple R	0.955		Index	mmbls	mmb/d
Adjusted R Square	0.906	X Coefficient	0.531	-0.055	-3.796
Standard Error	10.230	Standard Error	0.040	0.017	1.301
F-Statistic	178.694	T-stat	13.275	-3.253	-2.918
Intercept	157.6	P-Value	0.000	0.002	0.005

Variables - GDP, OECD Stock (qtr-lag), North America (US & Canada) Production					
			Global Real GDP Index	OECD Stock (1-qtr lag)	North America Production
Multiple R	0.963		Index	mmbls	mmb/d
Adjusted R Square	0.922	X Coefficient	0.626	-0.106	-0.010
Standard Error	9.314	Standard Error	0.046	0.018	0.002
F-Statistic	219.151	T-stat	13.632	-5.806	-4.583
Intercept	203.8	P-Value	0.000	0.000	0.000

Source: Barclays Research

Review of our Independent Variables

Global Real GDP Index

We used Barclays Economics Research team's proprietary PPP-weighted global GDP index in our regression analysis against Brent prices. We index the data and assume a baseline of 100 starting on 1Q60. We were not surprised by the high correlation between global GDP and Brent price. On a stand-alone basis, the global GDP index and Brent price produced the highest adjusted R-square among all variables tested as shown in Figure 18.

Figure 18: Global GDP Index vs. Brent Regression Analysis

Multiple R	0.936
Adjusted R Square	0.873
Standard Error	11.92
Observations	56
X Coefficient	0.363
Std Error	0.019
T-Stat	19.465
P-Value	0.000

Source: Barclays Research

Within our full multi-regression model, global GDP had the most statistically significant relationship to oil price. Our sensitivity analysis suggests that a 1% change in the global real GDP index will translate in a 4.4% change in Brent prices. Figure 19 summarizes our GDP index sensitivity analysis.

Figure 19: Global Real GDP Index Sensitivity Analysis

% Chg in Global Real GDP Index	Brent Model Prediction	% Chg Brent Price
10.0%	153.19	44.3%
5.0%	129.69	22.1%
2.5%	117.93	11.1%
1.0%	110.88	4.4%
0.0%	106.18	0.0%

Source: Barclays Research

OECD Stock (1-Quarter Lag)

OECD stock (1-quarter lag) is measured in millions of barrels and collected from the International Energy Agency's Monthly Oil Market Report. On a stand-alone basis, OECD stock showed an adjusted R-square of 0.577. Figure 20 details the stand-alone regression output between OECD stock and Brent price.

Figure 20: OECD Stock (1-Quarter-Lag) vs. Brent Regression Analysis

Multiple R	0.765
Adjusted R Square	0.577
Standard Error	21.75
Observations	56
X Coefficient	0.142
Std Error	0.016
T-Stat	8.725
P-Value	0.000

Source: Barclays Research

Within our full multi-regression model, OECD stock on a 1-quarter lag had the second most statistically significant relationship to oil price. When we include OECD stock (1-quarter-lag) into our multi-regression analysis, our adjusted R-square improves to 0.922, up from 0.875 when we include only global real GDP index and North American (US and Canada) crude production. According to our sensitivity analysis, a 1% change in OECD stock corresponds to an inverse 4.3% change in Brent price. Figure 21 details our sensitivity analysis between OECD stock and Brent price.

Figure 21: OECD Stock (1-Quarter Lag) Sensitivity Analysis

% Change in OECD Stock	Brent Model Prediction	% Chg Brent Price
10.0%	60.67	-42.9%
5.0%	83.43	-21.4%
2.5%	94.80	-10.7%
1.0%	101.63	-4.3%
0.0%	106.18	0.0%

Source: Barclays Research

North America (US and Canada) Crude Production

Our final driver, North American crude production, is measured in thousands of barrels per day. We collect the input data from two sources. For Canadian production, we use the National Energy Board's (NEB) estimated production of Canadian crude oil and equivalent. Note that the NEB's estimate for total production includes light crude oil, bitumen, condensate, and heavy crude oil. Bitumen accounts for approximately half of Canada's petroleum production. For US production, we use the Department of Energy's (DOE) monthly data for US field production of crude oil. We then add both sets of production data to create a proxy of North American production.

On a single-regression basis, North American crude production showed the lowest adjusted R-square of 0.287 of our model's variables, accompanied by a T-statistic of 4.807 and a P-value of 0.000. Although its individual adjusted R-square is noticeably lower than the adjusted R-square of the individual regression between Brent and OPEC, as well as Brent and non-OPEC supply, we found that North American production strengthened our final model more than non-OPEC and OEPC supply. Figure 22 illustrates the stand-alone relationship between Brent price and North American crude oil production.

Figure 22: North America Production vs. Brent Regression Analysis

Multiple R	0.547
Adjusted R Square	0.287
Standard Error	28.25
Observations	56
X Coefficient	0.020
Std Error	0.004
T-Stat	4.807
P-Value	0.000

Source: Barclays Research

When comparing the results of our three-variable model including the use of North American production to a two-variable model using only GDP and OECD stock (1-quarter lag), the adjusted R-square rises to 0.922 from 0.893 when we include North American production. Within our full multi-regression model, North American (US and Canada) production had the third most statistically significant relationship to oil prices. For every 1% change in North American (US and Canadian) production, we estimate an inverse 1.1% change in Brent prices. Figure 23 summarizes our North America production sensitivity analysis.

Figure 23: North America Production Sensitivity Analysis

% Change in North America Production	Brent Model Prediction	% Chg Brent Price
10.0%	94.93	-10.6%
5.0%	100.56	-5.3%
2.5%	103.37	-2.6%
1.0%	105.06	-1.1%
0.0%	106.18	0.0%

Source: Barclays Research

What Drivers Did Not Work?

In this section, we will outline results that we thought were surprising versus market expectation and current general consensus. We will also discuss variables that we have decided not to include in our final model. Among the independent variables that we identified as showing a statistical relationship with Brent price, we think investors may be surprised that some variables including our FX composites and OPEC supply did not make it into our final 'best fit' regression model.

FX Composite Index

Despite the inclusion of an FX composite index in our 2012 model, we are not entirely surprised that none of the several FX composites we tested made it into our final model this year. Prior to 2012, FX composites had not contributed significant value to our model.

Our FX composites use the exchange rates of foreign currencies relative to the US dollar. When our FX composite increases, more foreign currency is required to purchase one US dollar. During 2012, our model showed an inverse relationship between the USD and oil prices, suggesting that as the US dollar strengthened against other major currencies, global commodities priced in dollars became less affordable in other countries which could have led to lower oil demand outside of the US. The specific currencies included in our 2012 FX composite included the EUR, GBP, JPY and RMB, reflecting mostly developed countries and China. During 2012, this particular composite likely strengthened our model because China was accounting for the bulk of the world's oil demand growth, and our model was capturing the emergence of this trend. Correspondingly, a strong RMB (and weak USD) was a proxy of China's improving economic outlook which in turn linked closely to the country's oil demand growth.

Following 2012 however, the growth of China's oil demand has decelerated, and 2013 net crude demand was actually been surpassed by US net crude demand. According to the EIA, US oil demand in 2013 grew faster than China's for the first time since 1999; US oil demand rose by 390 mb/d during last year, while Chinese demand rose by 295 mb/d, the weakest demand increase in 6 years. According to Platts, some analysts expect China's GDP growth this year to be slower than 2013 as the government continues to prioritize economic structural reform over short-term acceleration. Although the RMB has continued to strengthen relative to the USD over the past two years, the trend is less indicative of China's oil demand which has generally been lackluster during the past year. it is possible that the relationship of the RMB versus the USD is less indicative of global oil demand and prices today than it was in 2012 or China's importance to the oil market is fading

Furthermore, FX composites historically have not contributed significantly to our models because the USD has usually shown weakness only when the US economy was weak, which would also imply lower US demand. The importance of a strong US economy (and corresponding USD) to oil demand is currently illustrated by the fact that the IEA hiked its oil demand forecast in mid-January based on a sharp jump in US demand for industrial fuels. Broadly speaking, the conflicting trends of a stronger USD suggesting stronger US oil demand and higher prices, and a lower USD leading to higher purchasing price for other countries and higher demand, make FX composites at best an unreliable factor in our model.

Nonetheless, we tested a variety of FX composites in our analysis to confirm our theories and ensure that a FX composite would not significantly contribute to our model. Our tests included the same FX composite we used in 2012 (consisting of EUR, GBP, JPY, RMB), but we also added a significantly different FX composite consisting of BRL, INR, KRW and RMB. While a composite of EUR, GBP, JPY and RMB primarily reflects OECD countries and China, we chose the collective group of Brazilian, Indian, South Korean and Chinese currencies as a

proxy for high-growth, emerging market demand for crude oil. We would have used BRIC, but we substituted Russia with South Korea because Russia is a major producer of oil, so the strength/weakness of the USD to the Ruble (RUB) is less important to them.

Most of our FX composites, when used in a model with the other variables (global GDP, OECD stock on a 1-quarter lag, North American crude production), lowered the adjusted R-square of our model. The exception was our emerging market FX composite which boosted our model's adjusted R-square to 0.939, but we were forced to reject it as a variable because the inclusion of the FX composite lowered the T-statistic of North American production to below 2.0 and increased its p-value above 0.05.

Figure 24: FX Composite Index Comparison – Single-Regression vs. Brent Prices

	FX Composite Index (BRL, INR, KRW, RMB)	FX Composite Index (EUR, GBP, JPY, RMB, FRF, DEM)	FX Composite Index (EUR, GBP, JPY, RMB)	FX Composite Index (RMB)
Multiple R	0.662	0.809	0.865	0.887
Adjsuted R-Square	0.428	0.647	0.743	0.783
Standard Error	25.291	19.865	16.947	15.585
T-Stat	-6.498	-10.098	-12.660	-14.120
P-Value	0.000	0.000	0.000	0.000

Source: Barclays Research

Global Real GDP Index (1-Quarter Lag)

Since global GDP numbers are typically released on a quarter lag versus the current period, we tested single-regression runs using our global GDP index on a 1-quarter lag, in addition to our tests of single regressions using a real-time global GDP index. On a single-regression basis, our global GDP index on a 1-quarter lag exhibited the second strongest (real-time global GDP was first) relationship to Brent oil prices with an adjusted R-square value of 0.869.

Within our final model, exchanging our real-time global GDP index with an index on a quarter lag weakened our adjusted R-square to 0.910 from 0.922. Using our GDP index on a quarter-lag also slightly lowered the T-statistic of each variable within our multi-variable model. The results confirmed our initial hypothesis that GDP on a real-time basis is currently a better predictor of Brent prices. The logic behind our initial hypothesis rests on our belief that even without published GDP numbers, the real-time effect of GDP growth or contraction is immediately felt throughout the global economy, and correspondingly, its demand for oil. We think real-time GDP's effect on the oil market is powerful enough that investors react less to data when it is eventually published. Our multi-variable regression results also could also suggest that the market is reasonably accurate at forecasting global GDP before the data is published, a reasonable thesis given the amount of economic data is available to investors.

OECD Stock

Similar to the delayed publication of global real GDP, the International Energy Agency has historically published OECD stock information based on a 1-quarter lag. Unlike global GDP however, the effects of real-time OECD stock may be less transparent than global GDP. Investors also have considerably more economic data points or tools to forecast global GDP compared to forecasting OECD stock. We assume that market participants would rely and act upon the latest data in their analysis of oil prices, suggesting a relationship between Brent prices and OECD stock data on a 1-quarter lag.

On a single regression basis, OECD stock yields an adjusted R-square of 0.559, barely lower than the adjusted R-square of 0.577 that OECD stock on a quarter lag yields. Within our multi-variable model, the impact of both variables becomes slightly more evident. The

adjusted R-square of our model using OECD stock on a quarter lag is 0.922 compared to 0.913, the adjusted R-square of our model when we use with OECD stock on a real-time basis. The use of real time OECD stock also decreases the T-statistics of the other variables within our model (albeit in a minor way).

In 2012, our analysis had shown that OECD stock on a real-time basis was a better fit for our 2012 model than OECD stock on a quarter-lag basis. The minor differences in our 2014 individual regressions and multi-variable regressions for OECD stock on a real-time and quarter-lag basis suggest that going forward, OECD stock is a variable we will want to actively test using both versions to determine which (if either) is best fitted for future models.

OPEC and Non-OPEC Production

In addition to the reasoning we provided in our earlier discussion of which set of production we thought would be best (non-OPEC, OPEC, North American), we were also forced to reject OPEC production from our final model because our multi-variable analysis using OEPC supply, GDP and OECD stock (1-quarter lag), produced a positive coefficient for OPEC supply. The model implies that OPEC supply rises, the price of Brent increases. While it is definitely true that OPEC supply has at times risen at the same time Brent prices were strengthening, we are not convinced of OPEC supply's causation of positive oil prices. A positive relationship could suggest that OPEC only increases production in a favorable environment. However, a favorable environment occurs when oil prices are higher. Therefore, we think that the positive correlation captures the trend of higher oil prices driving OPEC supply decisions, rather than OPEC supply driving oil prices.

Figure 25: OPEC Production Yields Positive Coefficient Within Model

			Global Real GDP Index	OECD Stock (1-qtr lag)	OPEC Production
Multiple R	0.958		Index	mmbls	mmb/d
Adjusted R Square	0.913	X Coefficient	0.344	-0.051	4.075
Standard Error	9.864	Standard Error	0.050	0.016	1.127
F-Statistic	193.488	T-stat	6.934	-3.100	3.617
Intercept	-72.493	P-Value	0.000	0.003	0.001

Source: Barclays Research

Since the qualitative reasoning behind a positive correlation between OPEC supply and Brent prices is not sufficient to explain OPEC supply's causation, we revert back to traditional supply and demand theories which suggest that all else being equal, a rise in OPEC supply should correspond with lower oil prices. Accordingly, our model would need to show an inverse relationship between OPEC supply and Brent prices for us to move forward with this variable.

The use of non-OPEC supply in our model instead of OPEC supply yields the appropriate negative coefficient we are looking for; the model suggests that as non-OPEC supply increases, Brent prices lower. However, the adjusted R-square of the model is 0.906, about 2% lower than the adjusted R-square 0.922 of our model when we substitute non-OPEC supply with North American (US and Canada) crude production. These results confirm our initial suspicions that North American production may currently be a more precise method of predicting Brent prices than broader non-OPEC production.

US Crude Imports and US Crude Exports

Due to the rate of domestic production growth, Investors have begun to increasingly question how quickly the US will back out imports of crude oil, and if US will back out imports of light oil altogether. In 1Q08, US crude production was slightly greater than 5 mmb/d. By 4Q13, average production was above 7.8 mmb/d. Corresponding shifts can be seen in US import levels. According to the DOE, the US imported an average of 2.3 million

b/d of light crude (31 API and above) in 4Q13, compared to 4Q12 average of 2.7 million b/d and full year 2012 average of 3.2 million b/d. In our initial analysis, we tested regressions of US crude imports and US net crude imports (imports – exports). Although US crude exports are very small (4Q13 average was 57 mb/d, based on the DOE's data of weekly US exports of crude oil) due to the status quo Export Ban, we still felt that using net imports yields a more precise measure of crude oil flow in and out of the country, and its relationship with Brent prices. Our analysis showed that on an individual regression basis, the adjusted R-square of net crude imports is 0.096, compared to the adjusted R-square of crude imports (not adjusted for exports) at 0.073.

When we added the US net crude imports to our model, the adjusted R-square increased slightly to 0.927 from 0.922. The increase in adjusted R-square is not great enough (less than 0.5% increase) for us to include the variable in our model. As we mentioned before, our objective is not to add every variable that will increase the adjusted R-square, but to find a few meaningful variables that clearly demonstrate their contribution towards predicting Brent prices. Furthermore, our four-variable model yielded a negative coefficient for crude imports. Qualitatively, we cannot explain this relationship because we do not believe higher US imports in a rising US oil production environment (and therefore US demand) should result in lower Brent prices. Accordingly, we rejected US crude imports from our model.

US crude exports have also become an active topic as domestic production has created structural gluts of supply within the US. According to Platts, some analysts believe the US could be exporting as much as 500 mb/d of crude by the end of 2014, the majority to Canada. Based on DOE data, the US exported an average of 57 mb/d during 4Q13. We ran individual regressions on US crude exports and US petroleum product exports. These sets of data were collected from the EIA. On an individual basis, US product exports yielded a fairly strong adjusted R-square of 0.676. However, we believe that ultimately, neither US exports of crude nor product should currently be included in our model both are a currently a function of Brent prices, and not drivers of Brent prices.

Theoretically, we believe US product exports will increase if Brent prices are strong because US refiners may be able to capture higher margins abroad, based on their ability to take advantage of cheaper US feedstocks. However, we cannot explain why Brent prices would increase or decrease based on the level of US product exports. This seems impossible since crude prices are an input of crack spreads, which in turn affect decisions to produce and export more yield.

The historical levels of US exports is likely too small to reasonably make strong conclusions in its relationship to Brent prices. The US Export Ban, enacted in the 1970s as a response to the Arab Oil Embargo, restricts the occurrence of US crude exports with few exceptions. If legislative changes were to occur, US crude exports could become an important variable towards explaining Brent prices (more US exports = lower Brent prices), but this likely would not be the case until we have had the opportunity to collect quality data for several years. As a side note, please see our recent *Crude Export Ban Conference Call Takeaways* to learn more about the different avenues through which legislative changes to the US Export Ban could take shape.

How Well Did Our Previous Model Predict Oil Prices?

We think it may be interesting to revisit our previous oil price regression model to see how it predicted oil prices two years ago. (Please refer to our 3rd edition of our *Oil Price Regression Analysis* report published in March 30, 2012). Although we fine tuned our 2012 model to include North American crude production instead of non-OPEC production and removed the FX composite, we believe our old model could have similarly been used to analyze Brent prices with impressive results.

Our previous oil regression model was the following:

Y = 0.4851 X1 – 0.9339 X2 – 0.0572 X3 – 7.0733 X4 + 433.67

Y = Brent Price ($/bl)

X1 = Global Real GDP Index (PPP-Weighted) (1Q60 with a Base of 100)

X2 = FX Composite Index (1Q00 with a Base of 100)

X3 = OECD Stock (mmbls)

X4 = Non-OPEC Production (mmb/d)

As seen in the table below, our previous oil price predictions were higher on average by $2.5/bl compared to actual Brent prices for the full year 2012. Unfortunately, given the recalibration and weighting of the global GDP index by our Barclays Economic Research team since our last oil price regression report, we are unable to compare the variance between actual and estimated oil prices in 2013, nor forecast 2014 prices using our old multi-regression model. Applying the actual GDP, non-OPEC supply, OECD stock and FX composite, oil price would have been predicted to be $105/bl in 1Q12, $112/bl in 2Q12, $112/bl in 3Q12, and $109/bl in 4Q12.

Figure 26: FX Composite Index Comparison – Single-Regression vs. Brent Prices

	Model Predicted Oil Price			Variance
	Now*	Was**	Actual Brent Price ($/bl)	(Est. Oil $ vs. Brent)
1Q10	83	83	77	(6)
2Q10	80	80	79	(2)
3Q10	89	89	76	(13)
4Q10	92	92	87	(5)
1Q11	99	99	105	6
2Q11	106	106	117	11
3Q11	113	113	113	0
4Q11	110	110	109	(1)
1Q12	105	109	119	10
2Q12	112	109	109	(0)
3Q12	112	110	110	0
4Q12	109	110	110	1

Source: Barclays Research, Bloomberg. Note: Variance compares the "Was" model predicted oil price to actual crude prices.

* Based on our 2012 model, the prices represent our predicted oil prices using actual GDP, OECD stock, non-OPEC production, and FX rates.

** Based on our 2012 model, the prices represent our predicted oil prices using our prior input estimates as published in our 2012 report.

Risks and Uncertainties in Our Regression Model

We believe that our model is a useful tool to identify and better understand the drivers behind the oil market movement, as well as an interesting guide for estimating future oil price direction. However, we do not suggest that these factors will continue to drive oil prices indefinitely. In addition, the accuracy of the input variables will have a direct impact on the model's effectiveness to successfully estimate future oil prices.

Regression Methodology

Understanding Our Approach

First, we gathered a set of reasonably quantifiable and available variables that we believed could have an impact on the Brent price. We tested each potential independent variable, on an absolute and percentage change basis, against the Brent price in a single-regression analysis. We used quarterly data from 1Q00 through 4Q13, rather than annual data, to ensure an adequate set of observations. Using this time period, we had 56 observations in each single regression as well as our final multi-regression.

Through the single regression analysis, we identified the variables that exhibited a meaningful statistical relationship with Brent prices. We evaluated the importance of these variables within our multi-regression model. Through trial and error, we added and removed single variables from our multi-regression to find the 'best fit' model. After several tests between the variables and the Brent price, we established a final multi-regression model which includes the three independent variables: global real GDP index, OECD stock levels on a quarter-lag, and North American (US and Canada) crude production. It is important to understand that the coefficient, T-stat, and P-value metrics in the multiple regression output represent the relationship with the dependent variable *given* all other independent variables. Therefore, the addition or removal of a single variable not only changes the effectiveness of the model (adjusted R-square), but can improve or weaken the other independent variables. For example, in our final three-variable model, the coefficient, T-statistic and P-value of GDP is 0.626, 13.632, and 0.000, respectively. If we eliminate North American production so that our model includes only two variables, the coefficient, T-statistic and P-value of GDP becomes 0.475, 12,678, and 0.000, respectively. These results suggest that the inclusion of North American production as a variable increases GDP's own relationship with the Brent prices.

To evaluate the effectiveness of the regression models, we required the following criteria to deem the model viable: P-value < 0.05, T-stat > 2.0, an adjusted R-square > 0.70, and a F-statistic > 2.84. The required F-statistic is found using an F-distribution table. Based on the degrees of freedom within our model (regression degrees of freedom = 3; residual degrees of freedom = 52) and a 5% required P-value, the F-statistic should be greater than 2.84. Please refer to Figure 27 on the next page.

Figure 27: F-Distribution Table

F-Distribution: 5% Significance Level

Degrees of Freedom$_2$ \ Degrees of Freedom$_1$	1	2	3	4	5	6	7	8	9	10	12	15	20
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.95	248.01
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66
inf	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57

Source: Statsoft.com

Defining Regression Terms

- Adjusted R-Square: Adjusts the R-square for the number of independent variables and the number of observations in the model. The adjusted R-square penalizes the model for adding additional independent variables or having too few observations. The closer the value is to one, the better the independent variables explain the variation in the dependent variable.
- Coefficients: Measures how strongly each independent variable is correlated with the dependent variable. This value can be thought of as the beta of the independent variables. The coefficients are used to create the multi-regression equation. The positive or negative sign of the coefficient also informs us of the direction of an independent variable's relationship with the dependent variable.
- F-Statistic: Measures whether all of the independent variables, together, have an effect on the dependent variable. The required F-statistic for a given model is determined using an F-distribution table. Since we established a 5% significance level for the P-value, we used a 5% significant F-distribution table. The required F-stat is found using the degrees of freedom. Within our model, the regression degrees of freedom is three, while the residual degrees of freedom is 52. We establish that the F-statistic must be at least 2.84 for a statistically meaningful multiple regression model.
- Multiple R (Correlation Coefficient): This metric measures how tight the data clusters around the regression line. As the Multiple R approaches one, the dataset becomes more linear.
- P-Value: Explains the percentage likelihood that the coefficient for the given independent variable emerged by chance and does not describe a true relationship. In other words, the P-value represents the likelihood of the regression results being a coincidence. We required a P-value of less than 0.05 (or 5%) within our analysis.
- R-Square (Coefficient of Determination): This value measures the variation accounted for by the independent variables divided by the total variation. In other words, the R-square tries to convey how well the independent variables explain the variation in the dependent variable.
- Standard Error: An estimate of the standard deviation of the given model.
- T-Stat: A measure of the coefficient divided by the standard error of the independent variable. Within our analysis, we required a T-stat in excess of 2.0.

Other Definitions

- b/d = barrels per day
- mmb/d = million barrels per day
- mmbls = million barrels

Production Changes/Additions Since Our November 2013 Report

We update our comprehensive proprietary upstream project database in this report. Figure 25 shows the changes from our last report, PC Oil Roadmap: *Eagle Ford Regional Economic Analysis*, dated November 27, 2013. We made a total of 73 changes to the database and the net impact has raised the estimated peak production run-rate over 2010-2014+ by 1,489 mboe/d. We added 13 new projects in the database and changed the timing, peak or ownership details of 60 projects.

Figure 28: Global Major Oil Project Start-Up Run Rate

Rate of New Major Project Start-Ups (Based on Start-Up Years)

	Current Report			Previous Report		
Start-Up Year	Oil mb/d	Gas mmcf/d	Oil Equivalent mboe/d	Oil mb/d	Gas mmcf/d	Oil Equivalent mboe/d
2010	3,143	12,394	5,209	3,143	12,394	5,209
2011	3,129	5,290	4,011	3,129	5,290	4,011
2012	1,702	5,467	2,613	1,837	5,467	2,748
2013	4,444	17,081	7,291	5,263	14,639	7,703
2014+	32,735	95,122	48,589	30,728	94,946	46,552
Total (mboe/d)	**45,153**	**135,354**	**67,712**	**44,100**	**132,736**	**66,223**

Rate of New Major Project Start-Ups (Based on Start-Up Years)

	Current Report			Previous Report		
Rolling 3-Yrs Average	Oil mb/d	Gas mmcf/d	Oil Equivalent mboe/d	Oil mb/d	Gas mmcf/d	Oil Equivalent mboe/d
2010	3,937	10,712	5,722	3,940	10,712	6,083
2011	3,992	10,853	5,800	3,995	10,853	5,934
2012	2,658	7,717	3,944	2,703	7,717	3,989
2013	3,092	9,279	4,638	3,409	8,465	4,821
2014	4,042	13,691	6,323	3,941	13,600	6,208

Source: Company Data, Barclays Research

Figure 29: Changes in March 2014

			Start-Up Year		Peak Year		Peak Prod'n	
Project	Country	Change	Prior	Current	Prior	Current	Prior	Current
Aasta Hansteen Gas Field	Norway	Change in start-up year	2020	2017	2021	2018	130	130
Acacias/CPO-09 (heavy oil)	Columbia	New project	--	2016	--	2017	50	50
ACG West Chirag Oil Project	Azerbaijan	Change in peak production	1Q14	1Q14	2016	2016	140	231
ACG West Chirag Oil Project	Azerbaijan	Change in start-up year	2013	1Q14	2016	2016	140	140
Angola LNG	Angola	Change in start-up year	2014	2013	2015	2015	175	175
Aspen	Canada	Change in peak production	2020	2020	--	--	80	135
Atlantis Phase 2	United States	Change in start-up year	2015	2014	2016	2015	50	50
Badra Future Phases	Iraq	New project	--	2017	--	2020	--	110
Badra Phase 1	Iraq	Change in start-up year	2015	2014	--	2015	60	60
Big Foot	United States	Change in start-up year	2014	2015	2015	2016	79	79
Bonga SW/Aparo	Nigeria	Change in peak production	2017	2017	2018	2018	203	225
Brazios 2 - Franco SW (P-75)	Brazil	Change in start-up year	2017	2016	2018	2017	163	163
Buzios 3 - Franco Sul (P-76)	Brazil	Change in start-up year	2018	2017	2019	2018	163	163
Buzios 4 - Franco NW (P-77)	Brazil	Change in start-up year	2019	2017	2020	2018	163	163
Caorioca - Lapa Field	Brazil	Adding production and ownership details	--	2016	--		148	148
Cepu Phase 1&2 (Banyu Urip)	Indonesia	Change in start-up year and peak production	2014	2015	2014	2015	203	203
Cepu Project	Indonesia	Change in start-up year	2015	2014	2016	2014	203	203
Chuandongbei	China	Change in start-up year	2014	2015			93	93
Clair Phase II (Clair Ridge)	United Kingdom	Change in peak production	2016	2016			120	137
Deep Water II SE	Brazil	New project	--	2020	--	--	--	--
El Merk (EMK) Block 208/405A	Algeria	Change in peak production	2013	2013	2014	2014	157	145
Foster Creek Phase F,G,H (CVE/COP JV)	Canada	Change in peak production	2014	2014	2018	2018	105	125
Gassi Touil Gas Project	Algeria	Change in ownership and production estimates	2013	2013			111	70
Gorgon LNG (Trains 1)	Australia	Change in peak production year	2015	2015	2015	2016	167	167
Gorgon LNG (Trains 1)	Australia	Change in start-up year	2014	2015	2015	2015	167	167
Gorgon LNG (Trains 2)	Australia	Change in start-up year (to reflect delay in Train 1)	2015	2016	2016	2017	142	142
Gorgon LNG (Trains 3)	Australia	Change in start-up year (to reflect delay in Train 1)	2016	2017	2016	2017	142	142
Gumusut/Kakap	Malaysia	Change in peak production	2012	2012	2015	2015	135	120
Gumusut/Kakap	Malaysia	Change in peak production and start-up year	2012	2013	2015	2015	120	135
Hebron	Canada	Change in peak production	2017	2017	2018	2018	134	150
Hibernia Southern Expansion	Canada	Change in start up and peak production year	2015	2014	2015	2014	55	55
Jack/St. Malo	United States	Change in start-up	2015	2014	2016	2016	64	177
Jack/St. Malo	United States	Change in start-up year	2014	2015	2015	2016	64	64
Jasmine	United Kingdom	Change in peak production year	2013	2013	--	2014	100	100
Juniper	Trinidad and Tobago	New project	--	2016	--	2017	92	92
Kashagan Phase 1	Kazakhstan	Change in start-up year	2013	2014	2014	2015	445	445
Kearl Phase 1	Canada	Change in peak production	2013	2013	2013	2014	110	110
Khurais Expansion	Saudi Arabia	New project	--	2018	--	2019	--	300
Kizomba Satellites Phase 2 (Block 15)	Angola	Change in start-up year	2018	2015	2019	2016	65	65
Knotty Head/Pony (Stampede)	United States	Change in peak production	2018	2018	2018	2018	100	87

Source: Company Data, Barclays Research

Figure 30: Changes in March 2014 (Continued)

			Start-Up Year		Peak Year		Peak Prod'n	
Project	Country	Change	Prior	Current	Prior	Current	Prior	Current
Libra	Brazil	New project	--	2020	--	--	--	--
Lula Sul Ext. / Sul de Lula Field (FPSO-68)	Brazil	Additional use of FPSO-68	2017	2017	2018	2018	56	56
Mafumeira Sul	Angola	Change in peak production	2015	2015	2015	2015	120	208
Malikai	Malaysia	Change in start-up year and production	2015	2017	--	2018	65	55
Marlim I Revitalization	Brazil	New project	--	2018	--	2020	--	--
Marlim II Revitalization	Brazil	New project	--	2020	--	2022	--	--
Mars B	United States	Change in start-up year	2015	2014	2016	2015	130	130
Narrows Lake Phase 1 (CVE/COP)	Canada	Change in peak production	2017	2017	2018	2018	50	45
NE de Tupi (P-72)	Brazil	New project	--	2018	--	2019	--	--
Norte Parque das Baleias (P-58)	Brazil	Change in start-up year	2013	2014	2014	2015	215	215
North Rankin 2	Australia/Timer Sea	Change in start-up year	2014	Oct-13	2014	2014	369	369
Oman Block 61 Development (BP/Oman)	Oman	New project	--	2017	--	2018	--	192
Papa-Terra Module 1 (P-61)	Brazil	Change in start-up year	2013	2014	2015	2015	149	149
Parque das Conchas (BC-10)	Brazil	Change in ownership (Petrobras sells stake to Shell & OGNC)	2009	2009	2010	2010	135	135
Parque das Conchas Phase 1 (BC10)	Brazil	Change in ownership (Shell sells partial stake to Qatar)	2009	2009	2010	2010	135	135
Parque das Conchas Phase 2 & 3	Brazil	New project	--	2013	--	2017	--	63
Petai/Siakap North	Malaysia	Change in start-up year	2015	2014	2016	2015	75	75
Point Thompson (North Slope)	United States	Change in start-up year	2020	2017	2022	2019	70	70
Point Thompson (North Slope)	United States	Change in start-up year	2017	2016	2019	2018	70	70
Rhourde Nouss-Quartzites Hamra Gas	Algeria	New project	--	2013	--	2014	55	55
Risha	Jordan	Change in ownership (BP returns stake to NPC)	2019	2019	--	--	111	111
Sabah Gas Kebabangan (KBB)	Malaysia	Change in start-up year	2015	2014	--	2015	218	160
Shah Deniz Phase-2	Azerbaijan	Change in ownership (Statoil farmdown)	2018	2018	2022	2022	275	275
Shaybah Crude Increment	Saudi Arabia	New project	--	2017	--	2018	--	250
Surmont	Canada	Change in peak production	2015	2015	2017	2017	83	109
Surmont Phase 2 (COP/TOT JV)	Canada	Change in peak production and peak production year	2015	2015	2017	2018	109	120
Valhall Redevelopment	Norway	Change in peak production year	2012	2012	2016	2017	50	50
West Qurna 1 (Phases 1-3)	Iraq	Change in ownership (XOM farmdown)	--	--	--	--	--	--
West Qurna 2 Future Phases	Iraq	Change in start-up year	2017	2020	--	--	1,500	1,500
West Qurna 2 Phase 1	Iraq	Change in start-up year	2013	2014	2014	2016	150	150
West Qurna 2 Phase 2	Iraq	Change in start-up year	2015	2017	2016	2019	150	150
Wheatstone LNG (Train 1)	Australia	Change in peak production	2016	2016	2017	2017	138	149
Wheatstone LNG (Train 2)	Australia	Change in peak production	2017	2017	2017	2017	138	149

Source: Company Data, Barclays Research

Figure 31: Rate of OPEC and Non-OPEC Major Start-Ups, 2008-2021+ (Based on On-Stream Year)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021+
OPEC												
Oil (mb/d)	1,393	1,843	1,052	2,348	2,455	2,778	1,659	3,455	2,425	330	3,860	80
Rolling 3-year Average	1,940	2,154	1,429	1,748	1,952	2,527	2,297	2,631	2,513	2,070	2,205	1,423
change (+/-)	20%	11%	(34)%	22%	12%	29%	(9)%	15%	(4)%	(18)%	7%	(35)%
Gas (mmcf/d)	7,515	1,700	2,538	8,830	8,050	6,069	2,570	2,695	2,307	1,635	4,672	3,000
Rolling 3-year Average	4,859	5,426	3,918	4,356	6,473	7,650	5,563	3,778	2,524	2,212	2,871	3,102
change (+/-)	54%	12%	(28)%	11%	49%	18%	(27)%	(32)%	(33)%	(12)%	30%	8%
Equivalent (mboe/d)	2,646	2,126	1,475	3,820	3,797	3,790	2,087	3,904	2,810	603	4,639	580
Rolling 3-year Average	2,750	3,058	2,082	2,474	3,031	3,802	3,225	3,260	2,934	2,439	2,684	1,940
change (+/-)	28%	11%	(32)%	19%	23%	25%	(15)%	1%	(10)%	(17)%	10%	(28)%
Non-OPEC												
Oil (mb/d)	1,750	1,286	649	2,096	3,524	2,256	2,784	2,413	1,985	1,730	460	540
Rolling 3-year Average	2,001	1,841	1,228	1,344	2,090	2,625	2,855	2,484	2,394	2,043	1,392	910
change (+/-)	28%	(8)%	(33)%	9%	56%	26%	9%	(13)%	(4)%	(15)%	(32)%	(35)%
Total Gas (mmcf/d)	4,879	3,590	2,929	8,250	10,475	5,442	14,371	11,963	14,087	75	7,710	0
Rolling 3-year Average	5,853	5,427	3,800	4,923	7,218	8,056	10,096	10,592	13,474	8,708	7,291	2,595
change (+/-)	(1)%	(7)%	(30)%	30%	47%	12%	25%	5%	27%	(35)%	(16)%	(64)%
Equivalent (mboe/d)	2,563	1,884	1,137	3,471	5,270	3,163	5,179	4,407	4,333	1,743	1,745	540
Rolling 3-year Average	2,976	2,746	1,862	2,164	3,293	3,968	4,537	4,250	4,640	3,494	2,607	1,343
change (+/-)	17%	(8)%	(32)%	16%	52%	21%	14%	(6)%	9%	(25)%	(25)%	(48)%
Total OPEC & Non-OPEC												
Oil (mb/d)	3,143	3,129	1,702	4,444	5,979	5,034	4,443	5,868	4,410	2,060	4,320	620
Rolling 3-year Average	3,940	3,995	2,658	3,092	4,042	5,153	5,152	5,115	4,907	4,113	3,597	2,334
change (+/-)	24%	1%	(33)%	16%	31%	27%	(0)%	(1)%	(4)%	(16)%	(13)%	(35)%
Gas (mmcf/d)	12,394	5,290	5,467	17,081	18,525	11,512	16,941	14,658	16,394	1,710	12,382	3,000
Rolling 3-year Average	10,712	10,853	7,717	9,279	13,691	15,706	15,659	14,370	15,998	10,921	10,162	5,697
change (+/-)	18%	1%	(29)%	20%	48%	15%	(0)%	(8)%	11%	(32)%	(7)%	(44)%
Equivalent (mboe/d)	5,209	4,011	2,613	7,291	9,067	6,953	7,267	8,311	7,143	2,345	6,384	1,120
Rolling 3-year Average	5,726	5,804	3,944	4,638	6,323	7,770	7,762	7,510	7,573	5,933	5,291	3,283
change (+/-)	22%	1%	(32)%	18%	36%	23%	(0)%	(3)%	1%	(22)%	(11)%	(38)%

Source: Company Data, Barclays Research

Figure 32: Expected Oil & Gas Peak Production Regional Split (Based on On-Stream Year)

Regional Breakdown	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021+
Oil												
Africa	303	304	627	728	400	791	720	935	400	165	370	0
Asia/Pacific	246	178	64	209	56	498	138	293	0	0	8	0
Europe	51	0	50	145	435	205	386	162	340	0	0	0
FSU	100	206	103	260	943	588	500	0	355	1,260	0	0
Middle East	1,368	1,613	275	1,700	1,655	1,087	1,012	1,455	1,660	165	3,622	80
S. America	515	460	395	813	1,830	1,175	1,040	1,820	815	150	0	0
N. America	560	368	187	589	660	690	647	1,203	840	320	320	540
Total Oil, mb/d	**3,143**	**3,129**	**1,702**	**4,444**	**5,979**	**5,034**	**4,443**	**5,868**	**4,410**	**2,060**	**4,320**	**620**
Gas												
Africa	395	0	738	3,670	0	1,482	450	3,695	2,000	970	0	0
Asia/Pacific	2,305	1,029	1,440	4,285	2,625	5,238	7,133	4,284	4,383	0	1,034	0
Europe	620	0	0	990	1,625	360	493	1,095	2,160	0	0	0
FSU	95	1,350	870	2,819	1,973	97	6,603	2,424	7,209	0	4,950	0
Middle East	7,970	1,400	1,800	4,200	8,050	3,100	700	2,200	0	665	4,338	3,000
S. America	713	1,242	513	771	3,649	1,210	1,562	609	212	75	0	0
N. America	296	270	106	345	604	25	0	352	430	0	2,060	0
Total Gas, mmcf/d	**12,394**	**5,290**	**5,467**	**17,081**	**18,525**	**11,512**	**16,941**	**14,658**	**16,394**	**1,710**	**12,382**	**3,000**

Source: Company Data, Barclays Research

Figure 33: Estimated Peak Capacity Related to Major New Project Study

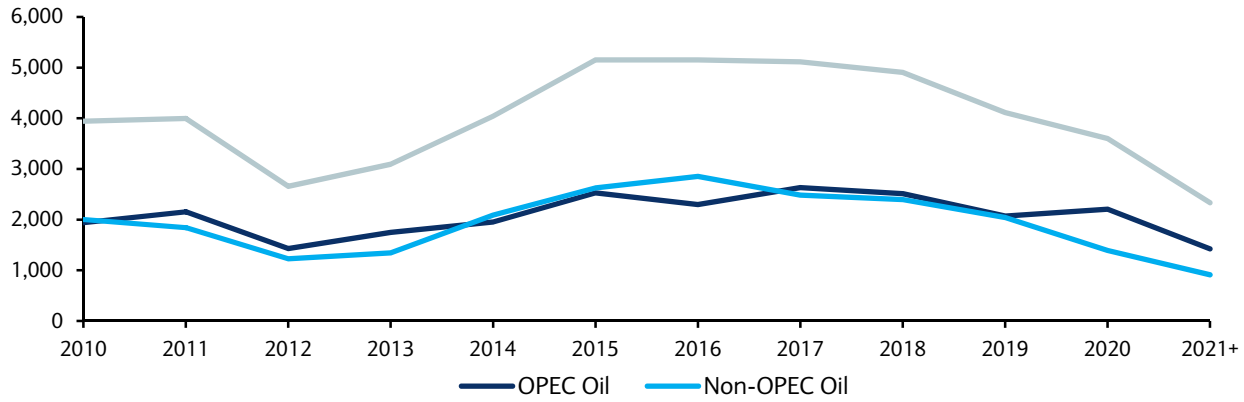
	2012 Start-up			2013 Start-up			2014 Start-up			2015 Start-up			2016 Start-up		
	Oil	Gas	Equivalent	Oil	Gas	Equivalent	Oil	Gas	Equivalent	Oil	Gas	Equivalent	Oil	Gas	Equivalent
BP	32	0	32	0	150	25	0	0	0	8	1	8	0	0	0
COP	0	0	0	76	178	106	94	248	135	186	343	243	322	309	374
CVX	67	0	67	107	638	213	155	414	224	176	948	334	93	1,709	378
E	72	256	114	63	882	210	126	76	138	240	8	241	105	260	148
HES	32	0	32	0	150	25	0	0	0	8	1	8	0	0	0
HSE	0	0	0	0	0	0	30	245	71	0	0	0	0	0	0
IMO	0	0	0	77	0	77	0	0	0	77	0	77	0	0	0
MRO	0	0	0	0	0	0	0	0	0	25	2	25	0	0	0
MUR	0	0	0	19	0	19	0	0	0	24	0	24	0	0	0
PBR	251	101	268	544	499	627	1,086	1,290	1,301	298	184	328	721	700	837
RDS/A	149	216	185	235	1,640	508	194	600	294	179	454	254	248	1,075	427
REP	30	159	57	30	44	37	38	212	73	86	0	86	35	13	37
STO	31	0	31	79	212	114	203	565	297	35	7	37	55	0	55
SU/PCA	0	0	0	163	0	163	13	32	19	0	0	0	0	0	0
TOT	40	483	120	55	454	130	210	677	323	262	8	264	264	78	277
XOM	133	0	133	208	459	285	192	763	319	339	503	423	260	803	394
Total	**836**	**1,215**	**1,039**	**1,655**	**5,305**	**2,540**	**2,340**	**5,123**	**3,194**	**1,942**	**2,458**	**2,352**	**2,101**	**4,947**	**2,926**

Source: Company Data, Barclays Research

Note: Oil is in mb/d; Gas is in mmcf/d; Oil equivalent is in mboe/d.

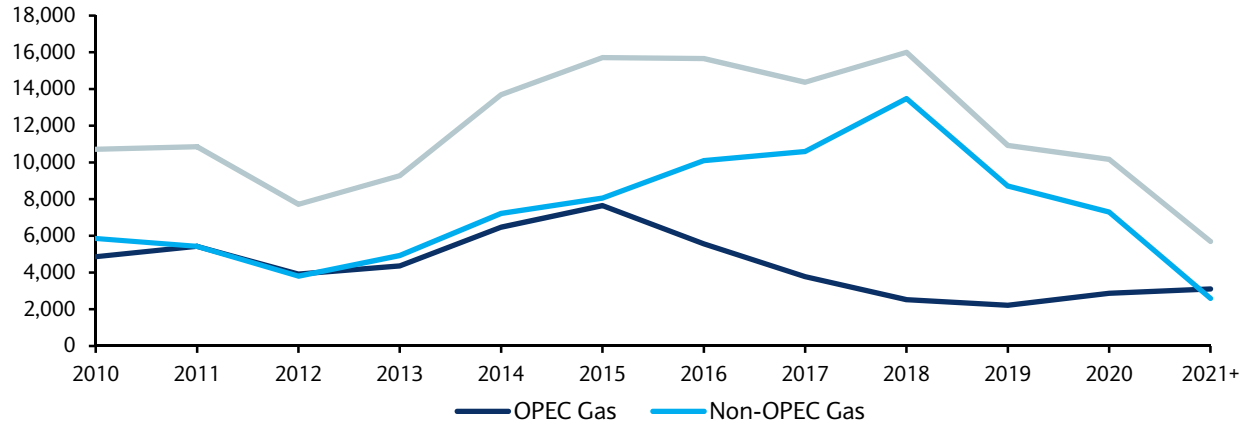
BP, E, RDS/A, REP, STO, & TOT are covered by Barclays Research Oil & Gas Team in Europe.

Figure 34: Rolling Three-Year Average New Major Oil Project Start-Up Rate (2010-2021E+)



Source: Company Data, Barclays Research

Figure 35: Rolling Three-Year Average New Major Gas Project Start-Up Rate (2010-2021E+)



Source: Company Data, Barclays Research

Figure 36: World Oil Demand and Supply, 2008-2014E (million b/d)

million b/d	2008	2009	2010	2011	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	FY14E
Demand															
OECD															
N. America	24.5	23.7	24.1	24.0	23.6	23.7	23.8	24.2	24.3	24.0	24.2	24.1	24.3	24.4	24.2
Europe	15.5	14.7	14.7	14.3	13.8	13.2	13.8	14.0	13.6	13.7	13.3	13.6	13.8	13.7	13.6
Pacific	8.4	8.0	8.2	8.2	8.6	8.9	7.9	8.1	8.7	8.4	8.8	7.8	7.9	8.5	8.3
Total OECD	***48.4***	***46.4***	***47.0***	***46.5***	***46.0***	***45.9***	***45.5***	***46.3***	***46.5***	***46.0***	***46.3***	***45.5***	***46.0***	***46.6***	***46.1***
Non-OECD															
FSU	4.2	4.0	4.1	4.4	4.5	4.3	4.5	4.9	4.8	4.6	4.4	4.6	4.9	5.0	4.7
Europe	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
China	7.5	7.9	8.9	9.3	9.8	10.0	10.0	10.1	10.2	10.1	10.3	10.3	10.4	10.5	10.4
Other Asia	9.7	10.1	10.7	11.0	11.3	11.7	11.7	11.3	11.7	11.6	12.0	12.1	11.7	12.0	11.9
Latin America	5.7	5.7	6.1	6.2	6.4	6.4	6.6	6.7	6.8	6.6	6.6	6.9	6.9	6.9	6.8
Middle East	6.8	7.2	7.3	7.4	7.7	7.5	7.9	8.4	7.7	7.9	7.7	8.1	8.5	8.0	8.1
Africa	3.2	3.4	3.5	3.4	3.7	3.8	3.8	3.7	3.8	3.8	3.9	3.9	3.8	3.8	3.9
Total non-OECD	***37.9***	***39.1***	***41.3***	***42.4***	***44.1***	***44.4***	***45.3***	***45.8***	***45.7***	***45.3***	***45.5***	***46.6***	***46.9***	***46.9***	***46.5***
Total Demand	**86.3**	**85.5**	**88.3**	**88.9**	**90.1**	**90.3**	**90.8**	**92.1**	**92.2**	**91.3**	**91.8**	**92.1**	**92.9**	**93.5**	**92.6**
% Growth Rate	**-0.8%**	**-0.9%**	**3.3%**	**0.7%**	**1.3%**	**1.3%**	**1.6%**	**1.7%**	**1.1%**	**1.4%**	**1.7%**	**1.4%**	**0.9%**	**1.4%**	**1.4%**
BioFuel Supply	**1.4**	**1.6**	**1.8**	**1.9**	**1.9**	**1.5**	**2.0**	**2.4**	**2.1**	**2.0**	**1.8**	**2.2**	**2.4**	**2.1**	**2.1**
Total Demand Excl BioFuel	**84.9**	**83.9**	**86.5**	**87.1**	**88.2**	**88.8**	**88.8**	**89.7**	**90.1**	**89.3**	**90.0**	**89.9**	**90.5**	**91.4**	**90.4**
% Growth Rate	**-1.2%**	**-1.2%**	**3.1%**	**0.7%**	**1.3%**	**1.5%**	**1.5%**	**1.4%**	**0.9%**	**1.3%**	**1.4%**	**1.2%**	**0.9%**	**1.4%**	**1.2%**
Supply (Excluding BioFuel)															
Non-OPEC															
OECD															
N. America	13.4	13.6	14.1	14.6	15.9	16.8	16.7	17.4	17.7	17.2	18.3	18.3	18.7	19.2	18.6
Europe	4.8	4.5	4.1	3.8	3.5	3.4	3.3	3.2	3.3	3.3	3.4	3.2	3.1	3.2	3.2
Pacific	0.6	0.6	0.7	0.6	0.6	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total OECD	***18.8***	***18.8***	***18.9***	***19.0***	***19.9***	***20.6***	***20.5***	***21.1***	***21.5***	***20.9***	***22.1***	***22.0***	***22.3***	***22.9***	***22.3***
Non-OECD															
FSU	12.8	13.3	13.5	13.6	13.6	13.8	13.8	13.8	14.0	13.8	14.0	13.9	13.9	14.1	13.9
Europe	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
China	3.8	3.8	4.1	4.1	4.2	4.2	4.2	4.0	4.2	4.2	4.3	4.3	4.3	4.3	4.3
Other Asia*	2.6	3.6	3.7	3.6	3.6	3.7	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Latin America*	3.7	3.9	4.1	4.2	4.2	4.1	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.3	4.3
Middle East	1.7	1.7	1.7	1.7	1.5	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.4	1.3	1.3
Africa*	2.6	2.6	2.5	2.6	2.3	2.2	2.3	2.4	2.4	2.3	2.5	2.5	2.5	2.5	2.5
Processing Gains	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2
Total non-OECD*	***29.4***	***30.9***	***31.7***	***32.0***	***31.5***	***31.7***	***31.7***	***31.6***	***31.9***	***31.5***	***31.9***	***31.9***	***32.1***	***32.3***	***32.0***
Total non-OPEC*	***48.3***	***49.8***	***50.7***	***51.0***	***51.5***	***52.3***	***52.2***	***52.7***	***53.4***	***52.7***	***54.0***	***53.9***	***54.3***	***55.2***	***54.3***
Total non-OPEC ex Angola & Ecuador, incl Indonesia*	***49.3***	***49.8***	***50.7***	***51.0***	***51.5***	***52.3***	***52.2***	***52.7***	***53.4***	***52.7***	***54.0***	***53.9***	***54.3***	***55.2***	***54.3***
OPEC															
Crude*	32.2	29.1	29.2	29.9	31.3	30.5	30.9	30.6	29.8	30.5	30.3	30.5	30.5	30.5	30.5
NGLs	4.9	4.9	5.6	5.9	6.3	6.3	6.4	6.5	6.4	6.4	6.5	6.5	6.6	6.6	6.5
Total OPEC*	***37.1***	***34.0***	***34.7***	***35.8***	***37.6***	***36.8***	***37.3***	***37.1***	***36.2***	***36.9***	***36.8***	***37.0***	***37.1***	***37.1***	***37.0***
Total OPEC Incl Angola & Ecuador, ex Indonesia*	***36.1***	***34.0***	***34.7***	***35.8***	***37.6***	***36.8***	***37.3***	***37.1***	***36.2***	***36.9***	***36.8***	***37.0***	***37.1***	***37.1***	***37.0***
Total Supply	85.4	83.8	85.4	86.8	89.0	89.1	89.5	89.8	89.6	89.5	90.7	90.9	91.4	92.3	91.3
% Growth Rate	0.9%	-1.9%	2.0%	1.6%	2.5%	-0.2%	0.8%	1.4%	0.2%	0.5%	1.8%	1.6%	1.8%	3.0%	2.0%
Memo:*															
Call on OPEC Crude	***31.7***	***29.2***	***30.2***	***30.1***	***30.5***	***30.2***	***30.2***	***30.5***	***30.3***	***30.3***	***29.5***	***29.5***	***29.6***	***29.6***	***29.6***
Estimated OPEC Crude Capacity	***35.3***	***35.0***	***35.2***	***34.4***	***35.0***	***35.0***	***35.3***	***35.0***	***34.8***	***35.0***	***34.7***	***35.1***	***35.0***	***35.0***	***35.0***
Est. Global Liquid Capacity	***88.5***	***89.7***	***91.5***	***91.3***	***92.7***	***93.6***	***93.9***	***94.2***	***94.6***	***94.1***	***95.1***	***95.5***	***95.9***	***96.8***	***95.8***
Est. Global Cap Growth Rate (%)	***0.6%***	***1.4%***	***2.0%***	***-0.1%***	***1.5%***	***0.8%***	***2.0%***	***2.2%***	***1.0%***	***1.5%***	***1.6%***	***1.7%***	***1.8%***	***2.2%***	***1.9%***
Call on OPEC Cap Utilization (%)	***90%***	***83%***	***86%***	***88%***	***87%***	***86%***	***86%***	***87%***	***87%***	***86%***	***85%***	***84%***	***84%***	***85%***	***85%***
OPEC Actual Utilization (%)	***91%***	***83%***	***83%***	***87%***	***89%***	***87%***	***88%***	***87%***	***86%***	***87%***	***87%***	***87%***	***87%***	***87%***	***87%***
Est. Global Cap Utilization (%)	***96%***	***93%***	***93%***	***95%***	***96%***	***95%***	***95%***	***95%***	***95%***	***95%***	***95%***	***95%***	***95%***	***95%***	***95%***
OECD Total Stock (mmbbls)	*4,227*	*4,231*	*4,244*	*4,142*	*4,212*	*4,247*	*4,238*	*4,282*	*4,149*	*4,149*	*4,237*	*4,295*	*4,378*	*4,469*	*4,469*
OECD Stock/Demand (# days)	*87*	*91*	*90*	*89*	*92*	*93*	*92*	*93*	*90*	*90*	*92*	*93*	*95*	*97*	*97*
Actual OECD Stock Changes (mmb/d)	*0.4*	*0.0*	*0.0*	*(0.3)*	*0.2*	*0.4*	*(0.1)*	*0.5*	*(1.4)*	*(0.2)*	*1.0*	*0.6*	*0.9*	*1.0*	*0.9*
Implied Stock Changes (mmb/d)	*0.5*	*(0.1)*	*(1.0)*	*(0.2)*	*0.8*	*0.3*	*0.7*	*0.1*	*(0.5)*	*0.2*	*0.8*	*1.0*	*0.9*	*0.9*	*0.9*
OECD Industry Commercial storage (mmbls)															
North America	*1,278*	*1,285*	*1,329*	*1,306*	*1,362*	*1,348*	*1,375*	*1,402*	*1,315*	*1,315*	*1,350*	*1,398*	*1,441*	*1,483*	*1,483*
Europe	*1,016*	*995*	*959*	*909*	*905*	*905*	*876*	*884*	*868*	*868*	*901*	*883*	*910*	*947*	*947*
Asia/Pacific	*407*	*383*	*391*	*392*	*397*	*413*	*410*	*413*	*382*	*382*	*392*	*411*	*424*	*436*	*436*
Total Commercial storage	*2,701*	*2,663*	*2,679*	*2,606*	*2,664*	*2,665*	*2,660*	*2,699*	*2,564*	*2,564*	*2,644*	*2,692*	*2,776*	*2,866*	*2,866*
Stock/Demand (# of days)	*56*	*57*	*57*	*56*	*58*	*58*	*58*	*59*	*56*	*56*	*57*	*58*	*60*	*62*	*62*
Est. Import (mmb/d)	29.0	26.8	27.3	26.6	25.1	24.3	24.0	24.1	23.9	24.1	23.0	22.3	22.6	22.6	22.6
Est. Import/Demand (%)	60%	58%	58%	57%	55%	53%	53%	52%	51%	52%	50%	49%	49%	49%	49%
Rolling 5 year average (mmbls)															
North America	*1,223*	*1,247*	*1,265*	*1,280*	*1,285*	*1,292*	*1,329*	*1,349*	*1,312*	*1,312*	*1,323*	*1,361*	*1,378*	*1,319*	*1,319*
Europe	*934*	*953*	*969*	*974*	*963*	*979*	*966*	*952*	*957*	*957*	*962*	*945*	*934*	*927*	*927*
Asia/Pacific	*419*	*413*	*404*	*403*	*396*	*391*	*407*	*419*	*394*	*394*	*395*	*407*	*415*	*389*	*389*
Total Commercial storage	*2,576*	*2,613*	*2,638*	*2,657*	*2,644*	*2,662*	*2,702*	*2,720*	*2,662*	*2,662*	*2,680*	*2,713*	*2,727*	*2,635*	*2,635*
Stock/Demand (# of days)	*51*	*52*	*54*	*55*	*56*	*56*	*57*	*58*	*57*	*57*	*57*	*58*	*59*	*57*	*57*
Est. Import (mmb/d)	29.4	29.7	29.2	28.7	28.0	27.4	26.4	27.3	26.8	27.0	26.3	25.5	26.4	25.9	26.0
Est. Import/Demand (%)	59%	59%	59%	59%	59%	58%	57%	58%	57%	58%	56%	56%	57%	55%	56%
Actual vs. Rolling 5-year aveage															
North America	*55*	*38*	*64*	*26*	*77*	*55*	*46*	*53*	*3*	*3*	*27*	*37*	*63*	*164*	*164*
Europe	*82*	*42*	*(10)*	*(65)*	*(58)*	*(74)*	*(91)*	*(68)*	*(89)*	*(89)*	*(61)*	*(62)*	*(23)*	*20*	*20*
Asia/Pacific	*(12)*	*(30)*	*(13)*	*(12)*	*1*	*22*	*3*	*(5)*	*(12)*	*(12)*	*(2)*	*4*	*9*	*47*	*47*
Total Commercial storage	*124*	*50*	*41*	*(51)*	*20*	*3*	*(42)*	*(21)*	*(98)*	*(98)*	*(36)*	*(21)*	*49*	*231*	*231*
Stock/Demand (# of days)	*4*	*5*	*3*	*1*	*2*	*2*	*1*	*1*	*(1)*	*(1)*	*(0)*	*0*	*2*	*5*	*5*
Est. Import (mmb/d)	(0.4)	(2.8)	(1.9)	(2.0)	(2.8)	(3.1)	(2.4)	(3.2)	(2.9)	(2.9)	(3.2)	(3.1)	(3.8)	(3.3)	(3.4)
Est. Import/Demand (%)	1%	-2%	-1%	-2%	-4%	-5%	-5%	-6%	-5%	-5%	-6%	-7%	-8%	-7%	-7%
Period End Oil Prices ($/Bls)															
WTI Cushing	$44.6	$79.4	$91.4	$98.8	$91.8	$97.2	$96.6	$102.3	$98.4	$98.4					
Brent	$41.8	$77.2	$92.6	$107.6	$111.9	$109.0	$102.2	$109.2	$110.8	$110.8					
OPEC Basket	$35.6	$77.1	$89.0	$106.8	$107.8	$106.8	$100.8	$105.6	$111.4	$111.4					

Source: IEA, Barclays Research

Figure 37: New Worldwide Major Upstream Projects

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Gas mmcf/d	BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
North America																					
Canada																					
Amauligak	2017		168	252	210		34	52*													
Aspen Phase 1-3	2020		135		135							100*									100
Athabasca Oil Sands Project (AOSP) Phase-2	September 2010/2011	2012	100		100		20						20			60*					
Birch Mountain Phase-1&2	2019	2024	80		80																
Borealis	2010	2015	100		100																
Carmon Creek Phase 1 & 2	2017	2018	80		80											100*					
Christina Lake Phase 2/2B (MEG)	2009	2014	57		57																
Christina Lake Phase 3A (MEG)	2016	2017	50		50																
Christina Lake Phase 3B (MEG)	2018	2019	50		50																
Christina Lake Phase 3C (MEG)	2020	2021	50		50																
Christina Lake Phase C,D,E (CVE/COP JV)	2011	2016	100		100			50													
Christina Lake Phase F (CVE/COP JV)	2016	2018	50		50			50													
Christina Lake Phase G,H (CVE/COP JV)	2017	2021	90		90			50													
Clyden								100													
Deep Panuke	Mid-2013	2014		300	50																
Firebag Stage 3 (SU)	Mid-2011	2013	63		63														100*		
Firebag Stage 4 (SU)	2013	2014	63		63														100*		
Firebag/Steep Bank Debottleneck	2013	2017	100		100														100*		
Fort Hills Phase 1	2017	2019	180		180														41*	39	
Foster Creek Phase A-C (CVE/COP JV)	October 2001	2008	60		60			50													
Foster Creek Phase D&E (CVE/COP JV)	2009	2012	60		60			50													
Foster Creek Phase F,G,H (CVE/COP JV)	2014	2018	125		125			50													
Foster Creek (Future Phases) (CVE/COP JV)	2018	2020	55		55			50													
Grand Rapids Phase A-C (CVE)	2018	2020	180		180																
Gregoire Lake Phase 1	2025	2026	60		60																
Gregoire Lake Phase 2	2029	2030	60		60																
Grouse (insitu heavy oil)	2018		50		50																
Hangingstone (SAGD) Phases 1-3	2015	2021	80		80																
Hebron	2017	2018	150		150		27											10	23		34*
Hibernia Southern Expansion	2Q14	2014	55		55													11			27*
Horizon Phase 1	Late 2008	2009	110		110																
Horizon Phase 2A & 2B	2015	2016	55		55																
Horizon Phase 3	2017	2017	80		80																
Jackfish Phase 1, 2, & 3	2008	2012	105		105																
Joslyn Mining Phase 1 & 2	2018	2020	100		100														37	38*	
Kearl Debottleneck	2017	2020	125		125							70									100
Kearl Phase 1	1Q13	2014	110		110							70									100
Kearl Phase 2 (Expansion)	End 2015	2016	110		110							70									100
Kirby North & South Phase I	2013	2015	80		80																
Kirby North Phase II	2023	2024	60		60																
Leismer Oil Sands Phase 1-3	2011	2015	50		50													100*			
Long Lake Phase-2	2018		60		60																
Long Lake Phase-3	2022	2024	60		60																
Long Lake Phase-4	2024	2026	60		60																
MacKay River (PetroChina)	2015	2024	150		150																
Millennium New Coker	2008	2009	90		90														100*		

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 38: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production			Working Interest (%)															
			Oil mb/d	Gas mmcf/d	BOE mboe/d	BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
North America																					
Narrows Lake Phase 1 (CVE/COP)	2017	2018	45		45			50													
Narrows Lake Future Phases (CVE/COP)	2019	2022	80		80			50													
Northern Light Oil Sands Mine	2016	2017	100		100															50*	
Parsons Lake			55		55			75*													25
Pelican Lake (CVE)	2013	2018	54		54																
Pike (Phase 1)	2016	2020	105		105	50															
Primrose North/South, East (heavy oil)	2010		120		120																
Primrose Expansion	2021	2022	50		50																
Saleski	2016	2017	110		110			100													
Sunrise Phase 1	Late 2014	2015	60		60	50					50										
Sunrise Phase 2	2019	2020	70		70	50					50										
Sunrise Phase 3	2022	2023	70		70	50					50										
Surmont (MEG)	2018	2019	100		100																
Surmont Phase 2 (COP/TOT JV)	2015	2018	120		120			50*												50	
Surmont Phase 3	2020	2022	135		135			50*												50	
Surmont Phase Future Phases	2025	2030	120		120			50*												50	
Telephone Lake (Phase A-B) (CVE)	2019	2023	90		90																
Thornbury 1-2	2016	2017	92		92			100*													
Tupper	Late 2008	2017		350	58									100*							
Umiak	2017		35		35			40													
Total Canada (mboe/d)			*5,467*	*902*	*5,617*	*153*	*131*	*886*	*--*	*--*	*100*	*377*	*20*	*58*	*--*	*140*	*--*	*70*	*459*	*346*	*560*
Mexico																					
Ayatsil	2013	2015	65		65																
Chicontepec Expansion (Pemex)	2009	2015	350		350																
Tsimin	2015	2017	100		100																
Total Mexico (mboe/d)			*515*	*0*	*515*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
United States - Alaska																					
Orion	2008	2009	55		55	26	1	36													36*
Point Thompson (North Slope)	2016	2018	70		70	32		5													61*
United States - Alaska (mboe/d)			*125*	*0*	*125*	*37*	*1*	*23*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*63*
United States - Others																					
Appomattox	2017		100		100											80*					
Atlantis North Expansion	April 2013	2020	68	45	75	56*															
Atlantis Phase 2	2014	2015	50		50	56*															
Bakken Expansion (HES)	2010	2015	105	90	120					80*											
Big Foot	2015	2016	75	25	79		60*									13		28			
Blind Faith	November 2008	3/2009	62	50	70		75*														
Buckskin							55*														
Caesar/Tonga	2012	2013	62		62		20														
Cardamom	Late 2013	2014	50		50											100*					
Chinook/Cascade	March 2012	2013	80	16	83										83*					17	
Eagle Ford (COP)	2011	2017	105	210	140			95*													
Eagle Ford (PXD)	2010	2013	38	13	50																
Genghis Khan	October 2007	2008	55		55					28							28				
Galapagos	June 2012	2013	45	90	60	56*															
Hadrian North	2017		100	100	117																50*
Hadrian South	2014	2015		300	50																47*
Jack/St. Malo	2014	2016	170	42	177		51*		1						13			23			1
Julia Phase 1 & 2	2016	2021	70		70													50			50*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 39: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production			Working Interest (%)															
			Oil mb/d	Gas mmcf/d	BOE mboe/d	BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
North America																					
Kaskida	TBA	TBA	140		140	100*															
Knotty Head/Pony (Stampede)	2018	2018	80	40	87		15			20*											
LaBarge Field Expansion	2020			2,060	343																100
Lucius	2H14	2015	100	85	114										10						15
Mad Dog II	2018	2018	65	390	130	61*	16														
Mars B	2014	2015	100	177	130											72*					
Perdido (Great White/Tobado/Silvertip)	March 2010	2012	98	194	130	28	38									33*					
Pinedale (Shell)	2009	2013	14	756	140											100					
Santa Cruz/Isabela (Noble Energy)	2011	2012	50	60	60	47															
Shenzi	March 2009	2009	75	50	83					28							28				
Stones Phase 1	2017		50		50				15				25		25	35					
Tahiti	May 2009	July 2009	125	70	137		58*											25		17	
Thunder Hawk	July 2009	2009	45	70	57				25					38*				25			
Thunder Horse Phase 1	End 2008	2009	250	200	283	75*															25
Tiber						62		18							20						
Vito	2018		100		100											55*		25*			
West Boreas, South Deimos																100*					
US - Others (mboe/d)			*2,526*	*5,132*	*3,392*	*598*	*364*	*133*	*23*	*152*	*--*	*--*	*13*	*21*	*114*	*488*	*39*	*171*	*--*	*37*	*549*
Total United States (mboe/d)			*2,651*	*5,132*	*3,517*	*635*	*364*	*156*	*23*	*152*	*0*	*0*	*13*	*21*	*114*	*488*	*39*	*171*	*0*	*37*	*612*
North America Total			*8,633*	*6,034*	*9,649*	*788*	*496*	*1,043*	*23*	*152*	*100*	*377*	*33*	*80*	*114*	*628*	*39*	*242*	*459*	*383*	*1,172*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 40: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
South America																					
Argentina																					
Vaca Muerta Shale JV	2013	2017	50	100	67		50														
Vega Pleyade	2014	2015	0	780	130															38	
Total Argentina (mboe/d)			*50*	*880*	*197*	--	*33*	--	--	--	--	--	--	--	--	--	--	--	--	*49*	--
Brazil																					
Albacora Extension	2011	2012	100		100										90*		10				
Aruana FPSO (BM-C-36)																					
Baleia Azul (Cid. Anchieta)	2012	2013	100	88	115										100*						
Baleia Franca and Cachalot (FPSO Capixaba)	July 2010	Dec 2010	100	113	119										100*						
Barracuda (infill)	2011	2011	50		50										100*						
Bauna & Piracaba (Cidade de Itajai)	February 2013	2014	80	71	92										100*						
Bonito	2019																				
Camarupim (Cidade de Sao Mateus)	June 2009	2009	35	353	94										75*						
Caorioca - Lapa Field	2016		140	50	148										45*		25				
Carcara	2018																				
Cernambi (BM-S-11)	2014	2015	150	212	185										65*						
Deep Water Sergipe	2018														60*						
Deep Water II SE	2020														60*						
Entorno de Iara (P-73)	2018																				
Espadarte Module I	2018																				
Espadarte Module 3	2020																				
Florim	2020																				
Frade	June 2009	2011	67	30	72		52*								30						
Buzios 1 - Franco 1 (P-74)	2016	2017	150	75	163										100*						
Buzios 5 - Franco Leste	2019	2020	150	75	163										100*						
Buzios 4 - Franco NW (P-77)	2017	2018	150	75	163										100*						
Buzios 2 - Franco SW (P-75)	2016	2017	150	75	163										100*						
Buzios 3 - Franco Sul (P-76)	2017	2018	150	75	163										100*						
Golfinho Module-3	2009	2011	100		100										100*						
Guaiama	2015	2016	100		100										100*						
Iara Horst (P-70)	2017	2018	150	212	185										65*						
Iara NW (P-71)	2018	2019	150	212	185										65*						
Jabuti - FPSO Cidade de Niteroi	February 2009	2009	100	124	121										100*						
Jubarte Phase-2 P-57	December 2010	2012	180	71	192										100*						
Jurua	2013																				
Jupiter	2019																				
Lula NE (Nordeste) Pilot Project (Tupi NE) (FPSO Cidade de Paraty)	2014	2015	120	175	149										65*						
Iracema Norte (FPSO Cid. Itaguai)	2015	2016	150	283	197										65*						
Iracema Sul (Lula Project) (FPSO Cidade de Mangaratiba)	November 2014	2016	150	283	197										65*						
Libra	2020														40*	20				20	
Lula Pilot (Cidade de Angra dos Reis)	October 2010	2012	100	177	129										65*						
Lula Alto	2016	2017	150	212	185										65*						
Lula Central	2016	2017	150	212	185										65*						
Lula NE Pilot (Cid. Paraty)	2013	2014	120	177	149										65*						
Lula Norte (FPSO-67)	2016	2017	150	212	185										65*						
Lula Oeste (FPSO-69)	2017	2018	150	212	185										65*						

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 41: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
South America																					
Lula Sul (FPSO-66)	2016	2017	100	177	129										65*						
Lula Sul Ext. / Sul de Lula Field (FPSO-68)	2017	2018	50	35	56										65*						
Marlim Leste - P-53	November 2008	1H10	180	212											100*						
Marlim I Revitalization	2018	2020													100*						
Marlim II Revitalization	2020	2022													100*						
Marlim Sul Module 2 (P-51)	January 2009	2009	180	212	215										100*						
Marlim Sul Module 3 (P-56)	July 2011	2012	100	212	135										100*						
Maromba (FPSO)	2018	2020	100		100		30								70*						
Mexilhao (PMXL-1)	2011	2012		530	88										100*						
Norte Parque das Baleias (P-58)	2014	2015	180	212	215										100*						
Papa-Terra Module 1 (P-61)	2014	2015	120	177	149		38								63*						
Papa-Terra Module 1 (P-63)	December 2013	2015	140	35	146		38								63*						
Parque das Baleias (FPSO P-58)	2014	2015	180	212	215										100*						
Parque das Conchas Phase 1 (BC10)	July 2009	2010	100	212	135											50*					
Parque das Conchas Phase 2 & 3	Oct 2013	2017	63		63											50*					
Parque dos Doces	2017																				
Peregrino	2011	2012	100		100													60*			
Polvo	3Q07	2010	50		50																
Pre-salt EWT (2011)	2011		60		60										100*						
Pre-salt EWT (2012)	2012		80		80										100*						
Pre-salt EWT (2013)	2013		60		60										100*						
Pre-salt EWT (2014)	2014		100		100										100*						
Pre-salt EWT (2015)	2015		100		100										100*						
Roncador Module 3 (P-55)	December 2013	2015	180	212	215										100*						
Roncador Module 4 (P-62)	March 2014	2016	180	212	215										100*						
Sapinhoa (Guara) Phase 1 (Piloto de Guara) - FPSO Cidade de São Paulo	January 2013	2014	120	177	149										45*		25				
Sapinhoa Norte (Cid. Ilhabela)	September 2014	2016	150	212	185										45*		25				
Siri Field (Campos Basin)																					
Siri Jaqueta																					
Sul Pq. Baleias	2018																				
Tartaruga Verde e Mestica	2017																				
Tupi (NE de) P-72	2018	2019													65*						
Urugua Tambau (Cidade de Santos FPSO)	2Q10	2012	35	353	94										100*						
Total Brazil (mboe/d)			*6,300*	*7,240*	*7,291*	--	*178*	--	--	--	--	--	--	--	*5,646*	*99*	*131*	*60*	--	--	--
Bolivia																					
Margarita-Huacaya	2012	2014	15	425	86												38				
Margarita-Huacaya Phase II	2014	2016	0	425	71												38				
Total Bolivia			*15*	*850*	*157*	--	--	--	--	--	--	--	--	--	--	--	*59*	--	--	--	--
Columbia																					
Acacias/CPO-09 (heavy oil)	2016	2017	50		50																
Castilla Expansion	2011	2012	50		50																
Rubiales & Quifa Expansion	2010	2011	100		100																
Total Columbia			*200*	*0*	*200*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ecuador																					
Ishpingo-Tambococha-Tiputini	2018	2020	200	0	200																
Total Ecuador (mboe/d)			*200*	*0*	*200*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 42: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
South America																					
Peru																					
Block 67 Amazon	2014		100		100																
Cashiriari	2009			360	60																
Total Peru (mboe/d)			*100*	*360*	*160*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trinidad & Tobago																					
Juniper	2016	2017		550	92	70															
Mango	November 2007	2009		1,000	167	70															
Savonette	2009	2010		650	108	100*															
Serrette	2011			500	83	100*															
Trinidad Compression (BP)	2014			750	125	100*															
Total Trinidad & Tobago (mboe/d)			*0*	*3,450*	*575*	*498*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Venezuela																					
Carabobo Project 1 - Carabobo Block 1 North, Block 1 Central	2015		370		370												11				
Carabobo Project 3 - Carabobo Block 2 South, Block 3, Block 5	2017		400		400		34														
Delta Caribe LNG					0																
Faja II Heavy Oil	2017		155		155																
Junin Block 2 (PetroVietnam)	2018		200		200																
Junin 4 (PetroChina)	2014	2020	400		400																
Junin 5	2015	2020	240		240				40												
Junin 5 Expansion	2018		165		165				40												
Junin 6JV - Orinoco Heavy Oil Project (Russian companies)	2017	2019	450		450																
Mariscal Sucre LNG	2015	2017		927	155																
Orinoco Heavy Oil Project (ENI)	2015	2016	75		75				40												
Orinoco Heavy Oil Project (Future Phase)	2017	2020	165		165				40												
Perla (Cardon IV)	2015		140		140				33								33				
Petromacareo	September 2012	2020	200		200																
Total Venezuela (mboe/d)			*2,960*	*927*	*3,114*	--	*136*	--	*304*	--	--	--	--	--	--	--	*86*	--	--	--	--
South America Total (mboe/d)			*9,825*	*13,708*	*11,894*	*498*	*347*	*0*	*304*	*0*	*0*	*0*	*0*	*0*	*5,646*	*99*	*276*	*60*	*0*	*49*	*0*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 43: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Europe																					
Italy																					
Tempa Rossa	Early 2016	2016	50	8	51											25				50*	
Total Italy (mboe/d)			*50*	*8*	*51*	--	--	--	--	--	--	--	--	--	--	*13*	--	--	--	*26*	--
Netherlands, The																					
Groningen Standard Clusters	2006	2009		1,840	307											30					30
Total Netherlands (mboe/d)			*0*	*1,840*	*307*	--	--	--	--	--	--	--	--	--	--	*92*	--	--	--	--	*92*
Norway																					
Aasgard Subsea Compression	2015	2016	35	360	95																14
Aasta Hansteen Gas Field	2017	2018		780	130			10										75*			
Dagny	2017	2018	60	315	113																33
Edvard Grieg	4Q15	2016	90																		
Ekofisk South	2014		70		70			35*	12									8		40	
Eldfisk II	2015		80		80			35*	12									8		40	
Gjoa	4Q10			620	103											12		20*			
Goliat	2Q14	2016	70		70				65*									35			
Gudrun	2014		65		65													51*			
Hild	2016		56	145	80															51*	
Luva	2018	2019		600	100																15
Morvin	2010		51		51				30									64*		6	
Ormen Lange	September 2007	2009	35	2,385	433											17*		29			7
Skarv/Idun	2013	2014	85	390	150	24*										28		36			12
Smorbukk North-East	2011	2012			0			7	15									35		8	
Snøhvit	2007	2010		720	120													37*		18	
Statfjord Late Life	2007		80	315	133			15								9		44*			21
Svalin	2014	2015	50	300	100			0										57*			13
Sverdrup (PL501, PL265)	2018	2019	250	1,500	500																
Tor Redevelopment	2017		50		50			31													
Trestakk	2013		40	120	60				8									59*			33
Tyrihans	July 2009	2011	80	335	136				6									59*		23	12
Valemon	2014	2016/2017	20	370	82													64*		3	
Valhall Redevelopment	2012	2017	50		50	36*				64											
Volve	2008		50	30	55													60*			30
Total Norway (mboe/d)			*1,367*	*9,285*	*2,825*	*54*	--	*101*	*93*	*32*	--	--	--	--	--	*141*	--	*760*	--	*159*	*208*
United Kingdom																					
Clair Phase II (Clair Ridge)	2016		120	100	137	29*	19	24								28					
Corrib	2014			335	56											45*		37*			
Golden Eagle	2014	2016	50	120	70														27		
Harding Gas	2009			250	42	70															
Jasmine	November 2013	2014	20	480	100			37*	33												
Kessog	2014		50		50	50														50	
Kinnoull	2014	2015	50		50	77*			17												
Laggan/Tormore	2014	2018	10	500	93															60	
Mariner/Mariner East	2017	2021	52		52				29									65*			
Rosebank-Lochnagar	2018	2019	90	60	100		40*														
Schiehallion Redevelopment Project	2016	2016	160	240	200	33*										55					
South Hook LNG Terminal	2009																				24
Total United Kingdom (mboe/d)			*602*	*2,085*	*950*	*198*	*67*	*70*	*56*	--	--	--	--	--	--	*173*	--	*54*	*19*	*81*	--
Europe Total (mboe/d)			*2,019*	*13,218*	*4,132*	*252*	*67*	*171*	*149*	*32*	*0*	*0*	*0*	*0*	*0*	*419*	*0*	*814*	*19*	*266*	*300*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 44: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Gas mmcf/d	BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Africa																					
Algeria																					
Ahnet Tight Gas	2017			380	63															47	
Ain Tsila	2019		30	350	88																
Block 208	2007		100		100				25												
El Merk (EMK) Block 208/405A	2013		145		145			17	9												
Gassi Touil LNG	2013			420	70																
Manzel Lejmet East (MLE) Block 405b	2012		32	318	85																
MLE	2013			330	55				75												
Reggane	2017	2018	0	300	50												29				
Rhourde El Baguel (REB)	1Q03	2010	87		87	49*															
Rhourde Nouss-Quartzites Hamra	2013	2014		330	55																
Skikda Glik (LNG)	2013	2015		600	100																
Touat Gas Development	2016			430	72																
Takouazet	2012		50		50																
Total Algeria (mboe/d)			*444*	*3,458*	*1,021*	*43*	*--*	*25*	*79*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*15*	*--*	*--*	*30*	*--*
Angola																					
Angola LNG	2013	2015	63	670	175	14	36*		14											14	
BBLT Development Phase-2 (Block 14)	End 2006	2009	100		100		31*		20											20	
Block 15/06 (Eastern Hub) - Cabaca Norte, Cabaca SW e Mpungi	2013	2013	90		90				35*						5			5		15	
Block 18 West (BP)	2013		150		150	50*															
Block 31 Future Hub (BP)	2020	2021	150		150	27*												13			
Block 31 Central (BP)	2018	2019	150		150	27*												13			
Block 32 Kaombo Split Hub (AB32 Southeast Hub)	2016	2017	210		210															30*	15
Cravo-Lirio-Orquidea-Violeta (Block 17) CLOV	2014	2014	160		160	17												23		40*	20
Gindungo-Canela-Gengibre (Block 32)	2018	2019	200		200															30*	15
Greater Vanza/Longui Area					0		39*														
Kizomba Satellites Phase 1 (Block 15)	2012	2013	100		100	27			20									13			40*
Kizomba Satellites Phase 2 (Block 15)	2015	2016	65		65	27			20									13			40*
Lucapa	2020	2021	80		80		31*														
Mafumeira Norte	2009		57		57		39*														
Mafumeira Sul	2015	2015	208		208		39*														
Mavacola/Clochas	2012	2013	100		100	27			20									13			
Negage (Block 14)	2018	2019	50		50		31*		20											20	
Palas-Astrea-Juno (Block 31 Southeast)	2016	2017	150		150	27*												13		5	25
Pazflor (Block 17)	August 2011	2012	220		220	17												23		40*	20
Plutão/Saturno/Venus/Marte -1 (Block 31 NE)	January 2013	2014	150		150	27*												13		5	25
Sangos-N'Goma (Block 15/06, West Hub)	2012		90		90				35*						5			5		15	
Tombua and Landana	September 2009	2011	75		75		31*		20											20	
Total Angola (mboe/d)			*2,618*	*670*	*2,730*	*393*	*262*	*--*	*185*	*--*	*--*	*--*	*--*	*--*	*9*	*--*	*--*	*212*	*--*	*386*	*279*
Congo																					
Moho-Bilondo Phase 1 bis/Moho Nord	2015	2017	140		140		31*													54*	
Moho Nord II	2020	2021	140		140		32													54*	
Total Congo (mboe/d)			*280*	*0*	*280*	*--*	*88*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*150*	*--*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 45: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Africa																					
Egypt																					
Satis	2015					50*			50												
West Nile Delta Gas (WND)	2017			1,000	167	60*															
Total Egypt (mboe/d)			*0*	*1,000*	*167*	*100*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Equatorial Guinea																					
Aseng/Alen	2011	2014	84		84																
Belinda (Block O)	2013		80		80																
Total Equatorial Guinea (mboe/d)			*164*	*0*	*164*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ghana																					
Jubilee Phase 1	2010	2014	120		120																
TEN Complex	2017	2017	80		80																
Total Ghana			*200*	*0*	*200*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Libya																					
Further Waha Development	2015		98	12	100			16		8			16								
Mellitah Gas Processing Plant			98	967	259				50*												
Naafora Expansion	2014		130		130																
NC-186 (I/R)	2008		70		70												20			15	
NC-47	2017	2018	100		100																
NC-98	2017		80		80			16		8			17								
North Gialo	2017		100		100			16		8			17								
OXY/OMV Field	2009	2012	200		200																
Petro Canada Field	2009	2014	100		100														100*		
Repsol/YPF Field	2009	2012	100		100												100*				
Verenex Energy Area 47 Ghadames Basin	2015		50		50																
Zuetina Expansion	2014		50		50																
Total Lybia (mboe/d)			*1,176*	*979*	*1,339*	--	--	*45*	*130*	*23*	--	--	*46*	--	--	--	*114*	--	*100*	*11*	--
Nigeria																					
Agbami	July 2008	8/2009	250		250		67*								13			19*			
Akpo (OPL-246)	March 2009	2009	175	320	228										11					24*	
Bonga North/NW	2015		100	60	110				13							55*				13	20
Bonga SW/Aparo	2017	2018	225		225		20		9							38*				9	16
Bosi	2019	2020	135	140	158												44				56*
Brass LNG Project	2017	2018		1,800	300			17	17											17*	
Digi Long Term Project	2017	2020	70		70		40														
East Area NGL II	July 2008		50		50																51*
Egina	2017	2018	150		150										16					24*	
Erha North Phase 2	2016		60		60											44					56*
Escravos Gas Project - EGP3A	March 2010		43	395	109		40*														
Etim/Asasa Pressure Maintenance	2013		50		50																40*
Forcados-Yokri integrated project	2015			600	100											30					
Gas Supply Expansion Project (CVX)	2019			480	80		40*														
Gbaran Ubie Phase 1 (gas to LNG) liquid portion	June 2010	2011	70		70											40*					
Gbaran Ubie Phase 2+3	2016		90		90											30*				10	
LNG IPP Upstream	2018			700	117																40*
Nigeria LNG Train-6	December 2007	2010		720	120				10							26				15	
Nigeria LNG Train-7	2013			1,320	220				10							26				15	
Nigeria Satellite Phase 1	End 2012	2013	75		75																40*
Nigeria Satellite Phase 2	2015	2020	80		80																40*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 46: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Africa																					
NLNG Train 6 Gas Supply	2015			300	50			20													
Nnwa	2014				0		20*														
Nsiko	2017		100		100		95*														
Ofon II	2010		70		70															40*	
Ofon Phase II	2014	2015	60		60															40*	
OML 58 Upgrade Phase I	2012	2013		420	70															40*	
QGFE Dom Gas			15	300	65																40
Sonam Development (Gas Supply Extension)	2017		30	215	66		40*														
Southern Swamp	2015		0	510	85		0														20*
Uge	2016		110	20	113		20	20													20*
Usan	February 2012	2013	180		180		30														30
Usan Future Phases			50		50		30													20*	30
Usari Pressure Maintenace	2015		50		50																40
West Niger Delta LNG	Late 2006	2009		610	102																56*
Total Nigeria (mboe/d)			*2,288*	*8,910*	*3,773*	*--*	*530*	*84*	*121*	*--*	*--*	*--*	*--*	*--*	*82*	*343*	*70*	*47*	*--*	*326*	*547*
Mozambique																					
Mozambique LNG	2018		0	1,300	217																
Total Mozambique (mboe/d)			*0*	*1,300*	*217*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
Uganda																					
Albert Basin	2016		100		100																
Total Uganda (mboe/d)			*100*	*0*	*100*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
Africa Total (mboe/d)			*7,271*	*16,317*	*9,990*	*536*	*879*	*153*	*514*	*23*	*0*	*0*	*46*	*0*	*91*	*343*	*198*	*259*	*100*	*902*	*825*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 47: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Asia/Pacific Rim																					
Australia/Timer Sea																					
APLNG Train 1	Mid-2015	2017		750	125			38*													
APLNG Train 2	2016	2017		750	125			38*													
Browse LNG Phase 1 (Kimberley Hub)	2018	2019		1,601	267											28					
Curtis CMB LNG (Shell/PetroChina)	2016			987	165											50					
Curtis CMB plant (QCLNG - BG)	2015			1,134	189																
Gladstone LNG, T1 (GLNG)	2015			467	78																
Gladstone LNG, T2 (GLNG)	2016			467	78																
Gorgon LNG (Trains 1)	2015	2016	8	950	166		47*									25					25
Gorgon LNG (Trains 2)	Mid-2016	2017	6	815	142		47*									25					25
Gorgon LNG (Trains 3)	Early 2017	2017	6	815	142		47*									25					25
Ichthys LNG	2017	2018	113	1,334	335															30	
North Rankin 2	October 2013	2014	39	1,980	369	16	17									16					
NW Shelf Gas Train-5	September 2008	2010		570	95	16	17									16					
Pluto LNG Train 1	2012	2013	5	700	122											31					
Pluto LNG Train 2	2016	2017		700	117											31					
Pluto LNG Train 3	2020	2021		700	117											31					
Poseidon								60													
Prelude floating LNG (FLNG)	2017		34	480	114											100*					
Pyrenees	March 2010		96	60	106																
Scarborough	2016			1,190	198																50*
Sunrise LNG	2018	2019		840	140			30								27					
Turrum/Kipper/Tuna	2013	2017	35	375	98																50*
Van Gogh	2010	2010	50		50																
Wheatstone LNG (Train 1)	Late 2016	2017	15	804	149		65*														
Wheatstone LNG (Train 2)	Mid-2017	2017	15	804	149		65*														
Total Australia (mboe/d)			*422*	*19,274*	*3,634*	*73*	*484*	*136*	--	--	--	--	--	--	--	*603*	--	--	--	*101*	*260*
Bangladesh																					
Bibiyana	March 2007	2010		690	115		98*														
Bibiyana Expansion	2010	2013		410	68		98*														
Bibiyana Expansion	2014	2015	4	300	54		98*														
Total Bangladesh (mboe/d)			*4*	*1,400*	*237*	--	*233*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
China																					
Changqing Expansion	2010	2015	100	1,500	350																
Chuandongbei	2015			558	93		49*														
Dina Gas Field	June 2009		11	484	92																
Liwan/Liuhua Gas Development	2014	2017	0	500	83						49										
Jidong Nanpu, Bohai Bay	2009	2012	200		200																
Peng Lai 19-3, Bohai Bay	2011			400	67			49													
Peng Lai 19-3, Bohai Bay Phase II	2011	2015	150		150			49*													
Qinshui Basin CBM	2009	2015		435	73																
Sulige	2012			420	70															49	
Yuanba	2015	2016		329	55																
Total China (mboe/d)			*461*	*4,626*	*1,232*	--	*46*	*106*	--	--	*41*	--	--	--	--	--	--	--	--	*34*	--
India																					
Alshwariya/Bhagyam	2012	2013	50		50																
D1 and D3 field, D6 Block	2009			700	117																
D6 Satellite Field Development	2018			335	56																

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 48: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Asia/Pacific Rim																					
KG-DWN-98/2 Gas Development	2017			850	142																
Mangala	2009	2010	125		125																
Total India (mboe/d)			*175*	*1,885*	*489*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indonesia																					
Caltex 3 & Suban 3	2015	2016	50		50			54*													
Cepu Phase 1&2 (Banyu Urip)	2015	2015	165	225	203																45*
Corridor Block PSC	2007	2012		400	67			54*													
Gendalo-Gehem Gas Development	2016		27	1,120	214		55*														
Donggi Senoro LNG	2015	2015	0	335	56																
Indonesia CBM	2013			630	105	38			38												
Jangkrik	2016	2016		300	50																
Kangean Block (TSB gas field and Pagerungan Oil)	2011		10	300	60																
Masela FLNG (Shell/Inpex)	2020	2021	8	334	64																
Natuna LNG	2018			1,100	183																76*
North Duri Field Area 12-14	November 2008	2018	70		70		100*														
Pangkak Phase 1&2	1H07	2009	31	150	56					75*											
Sisi Nubi	Late 2007			420	70															48*	
South Mahakam Phase 1/2	2013			330	55															50*	
South Natuna Sea - North Belut	2009	2010	18	329	73		25	40*													
Tangguh LNG Train 1, 2	June 2009	2011	41	1,014	210	37*															
Tangguh LNG Train 3	2018	2020		507	85	37*															
Total Indonesia (mboe/d)			*421*	*7,493*	*1,669*	*149*	*206*	*92*	*40*	*42*	--	--	--	--	--	--	--	--	--	*61*	*230*
Malaysia																					
Gumusut/Kakap	2013	2015	135		135			33						14		33*					
Guntong Hub	2006	2009	35	715	154																50*
Kebabangan & Kamunsu East Upthrown	2015	2017	130		130			30								30					
Kumunsu East	2016	2017	50	0	50			30													
Limbayong	2017		70		70			40													
Malikai	2017	2018	55		55			35								35*					
North Malay Development	2013	2015		300	50					50											
Petai/Siakap North	2014	2015	75		75			21						32*		21*					
PM-3 (Talisman)	July 2008	2010		300	50																
Sabah Gas Kebabangan (KBB)	2014	2015	22	825	160			30								30					
SK-309, SK-311 Gas Project	3Q09	2010		300	50									85*							
Telok	2013			370	62																50*
Ubah	2016	2017	40		40			35								35*					
Total Malaysia (mboe/d)			*612*	*2,810*	*1,080*	--	--	*223*	--	*25*	--	--	--	*85*	--	*180*	--	--	--	--	*108*
Myanmar																					
Zawtika	2013	2014		300	50																
Total Myanmar (mboe/d)			*0*	*300*	*50*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Papua New Guinea																					
PNG LNG	2014	2015	30	1,000	197																33*
Total Papua New Guinea (mboe/d)			*30*	*1,000*	*197*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*65*

Source: Company Data, Barclays Research. *Includes PCA projects

Figure 49: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Asia/Pacific Rim																					
Thailand																					
Arthit field, Phase 1	February 2008	2009	20	351	78		16														
Bongkot South	2012	2012	9	320	62															33	
JDA Phase-2	December 2008	2009		400	67					50*											
Muda (Block B-17)	February 2010	2010		335	56																
Platong Gas II Project	2011	2012	18	329	73		70*														
Total Thailand (mboe/d)			*47*	*1,735*	*336*	--	*64*	--	--	*33*	--	--	--	--	--	--	--	--	--	*21*	--
Vietnam																					
Block 48195152197 Gas Development (Block B)	2015	2016	5	490	86		43*														
Su Tu Trang/SU Tu Nau	2015		65		65																
Total Vietnam (mboe/d)			*70*	*490*	*151*	--	*37*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Asia/Pacific Rim Total (mboe/d)			*2,241*	*41,012*	*9,077*	*222*	*1,069*	*558*	*40*	*100*	*41*	*0*	*0*	*85*	*0*	*784*	*0*	*0*	*0*	*217*	*664*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 50: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Middle East																					
Bahrain																					
Awali JV (Oxy)	2010	2019	78	850	219																
Total Bahrain (mboe/d)			*78*	*850*	*219*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iran																					
Aghajari gas injection expansion	2011		50		50																
Azadegan (North)			60		60																
Azadegan (South) Phase-1	2008	2009	50		50																
Azadegan (South) Phase-2	2014	2015	110		110																
Band-Karkheh	2016		207		207																
Darkhovin/Darquain Phase-2	2008	2009	110		110				60												
Darquain Phase-3	2016		120		120				60												
Foroozan	2017		65		65																
Hengam	2010	2012	80		80																
North Pars	2014			2,400	400																
Paranj	2014		50		50																
Rag-e-Safid Expansion	2006	2007	60		60																
Salman	2008		50		50																
South Pars Phase 11	2020		72	1,338	295																
South Pars Phase 12 (Condensate)	Late 2013		80	1,000	247																
South Pars Phase 13 & 14 (Persian LNG)	2020		80	3,000	580											25	25				
South Pars Phase 19 & 20	2021		80	3,000	580																
South Pars Phase 15 & 16	2014	2015	90	2,000	423																
South Pars Phase 17 & 18	2014	2016	140	1,750	432																
South Pars Phase 4 & 5	August 2005	2Q07	80	2,050	422				60*												
South Pars Phase 6, 7, 8, and Aghajari	Mid-2009	2011	155	0	155													15			
South Pars Phase 9 & 10	2010	2013	80	1,750	372																
Tang-e-Bahir				350	58																
West Assaluyeh				500	83																
Yadavaran - Phase 1	2013		85		85																
Yadavaran - Phase 2	2017		100		100																
Total Iran (mboe/d)			*2,054*	*19,138*	*5,243*	--	--	--	*391*	--	--	--	--	--	--	*145*	*145*	*23*	--	--	--
Iraq																					
Akkas Gas Field	2016	2018	0	400	67																
Al-Ahdab	2011	2013	120		120																
Atrush Phase 1 & 2 (Taqa)	2015	2020	60		60								15								
Badra Phase 1	Early 2014	2015	60		60																
Badra Future Phases	2017	2020	110		110																
Basrah Gas Development	April 2013	2015		2,000	333											44*					
Gharaf Phase 1	Late 2013	2014	70		70																
Gharaf Phase 2	2016		160		160															25	
Halfaya Future Phase	2015		332		332															25	
Halfaya Phase 1	2011	2012	100		100															25	
Halfaya Phase 2	2013	2015	100		100															25	
Majnoon Debottleneck	2014		120		120											45*					
Majnoon Expansion Future Phases	2018		1,360		1,360											45*					
Majnoon Expansion Phase 1	2013		175		175											45*					
Majnoon Phase 2	2016		100		100											45*					
Mansuriya Gas Field	2016	2018		300	50																

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 51: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Middle East																					
Nahr Umar expansion	2013		70		70																
Najma	2015		110		110																
Nassiriya expansion	2013		65		65																
Qayara	2015		120		120																
Rumaila Field Phase 1	2011	2013	400		400	38															
Rumaila Field Phase 2	2014	2015	100		100	38															
Rumaila Field Phase 3	2015	2016	100		100	38															
Rumaila Field Phase 4	2016	2017	100		100	38															
Rumaila Field Phase 5	2017	2018	450		450	38															
Shaikan (Kurdish Region)	2013	2020	250		250																
Taq Taq (Kurdish Region)	2009	2013	70		70																
Taq Taq Expansion (Kurdish Region)	2011	2012	92		92																
Tawke (Kurdish Region)	2009	2013	50		50																
West Qurna 1 Future Phases	2020	2025	1,340		1,340											15					25*
West Qurna 1 Phase 1	2011	2013	300		300											15					25*
West Qurna 1 Phase 2	2015	2017	200		200											15					25*
West Qurna 1 Phase 3	2017	2020	100		100											15					25*
West Qurna 2 Future Phases	2020		1,500		1,500																
West Qurna 2 Phase 1	2014	2016	150		150																
West Qurna 2 Phase 2	2017	2019	150		150																
Zabair Phase 1	2011	2013	200		200				33												
Zabair Phase 2	2015	2016	100		100				33												
Zabair Phase 3	2017	2018	100		100				33												
Zabair Phase Future Phases	2020	2025	630		630				33												
Total Iraq (mboe/d)			*9,614*	*2,700*	*10,064*	*437*	--	--	*338*	--	--	--	*9*	--	--	*1,227*	--	--	--	*173*	*485*
Israel																					
Tamar Phase 1	March 2013	2015		1,200	200																
Total Israel (mboe/d)			*0*	*1,200*	*200*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jordan																					
Risha	2019			665	111																
Total Jordan (mboe/d)			*0*	*665*	*111*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Kuwait																					
Enhanced Oil Recovery (at Northen fields)	2013	2017	100		100																
Sabriya Field Expansion	2008	2009	50		50																
Sabriya GC-24	2010	2012	165		165																
Sabriyah & Umm Niqa II	2013		115		115																
Total Kuwait (mboe/d)			*430*	*0*	*430*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oman																					
Harweel/Qarn Alam	2010		80		80											34				4	
Kauther	1Q08	2009		706	118																
Mukhaizna EOR	2012		50		50											17				2	
Mukhaizna Expansion	2007	2012	140		140											17				2	
Oman Block 16 Development	2017			1,200	200	100*															
Oman Block 61 Development (BP/Oman)	2017	2018	25	1,000	192	60*															
Total Oman (mboe/d)			*295*	*2,906*	*779*	*315*	--	--	--	--	--	--	--	--	--	*60*	--	--	--	*7*	--
Qatar																					
Al Khaleej (EGU) Phase-2	December 2009	2012	100	1,250	308																80*
Al Rayyan	2010		50		50																
Al-Shaheen Expansion	2007	2009	260		260																

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 52: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Middle East																					
Al-Shaheen Increments	2011		80		80																
Barzan Phase I	2014	2015	85	1,400	318																10
Pearl GTL Phase-1	June 2011	2012	130		130											100*					
Pearl GTL Phase-2	2012	2013	130		130											100*					
Qatargas II Train-4	April 2009	2009	80	1,250	288																30
Qatargas II Train-5	September 2009	2010	80	1,250	288															17	18
Qatargas III	Mid-2010	2010	30	1,400	263			30													
Qatargas IV	February 2011	2012	70	1,400	303											30					
RasGas Train-5 (Ras Laffan)	Mid-2007	2009	45	740	168																30
RasGas Train-6 (Ras Laffan)	August 2009	2009	75	1,250	283																30
RasGas Train-7 (Ras Laffan)	1Q10	2010	75	1,250	283																30
Total Qatar (mboe/d)			*1,290*	*11,190*	*3,155*	--	--	*79*	--	--	--	--	--	--	--	*351*	--	--	--	*48*	*638*
Saudi Arabia																					
Dorra Gas Development JV (Saudi/Kuwait)	2015	2017		600	100																
Hasbah	2015			1,300	217																
Hawiyah NGL	2009	2010	300		300																
Khurais	June 2009	2011	1,200	300	1,250																
Khurais Expansion	2018		300		300																
Khursaniyah Gas Train Processing Karan	Late 2012			1,800	300																
Khursaniyah, Fadhili & Abu Hadriyah (Crude)	2008	2009	500		500																
Khursaniyah, Fadhili & Abu Hadriyah (NGL & Gas)	Early 2010	2011	300	300	350																
Manifa Gas Train Processing Arabiyah	2015	2016	65	1,200	265																
Manifa Oil Phase 1	2013	2014	450	0	450																
Manifa Oil Phase 2	2014	2015	450	0	450																
Nuayyim	August 2009	2009	100	100	117																
Shaybah Expansion	2009	2011	250		250																
Shaybah Crude Increment	2017		250		250																
Shaybah NGL Development	2014	2015	250		250																
Wafra Steamflood Stage 1 (Partitioned Zone)			80		80		50														
Total Saudi Arabia (mboe/d)			*4,495*	*5,600*	*5,428*	--	*40*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
United Arab Emirates																					
Asab 2 NGL	2011		71		71											15				15	
Bab Rumaitha/Al-Dabbiya (NE)	2013		75		75																
Lower Zakum Expansion	2016		125		125	15														13	
Nasr	2019		65		65	15														13	
Nasr/Umm Loulou	2010		190		190																
Onshore Gas Development Phase 3(OGD-3)	2010	2011	240	2,420	643																
Qusahwira/Bida al-Qemzau	2013		65		65																
Sarb	2019		100		100	15														13	
SAS Expansion (Sahil, Asab, Shah)	2012		95		95	10										10				10	10
Shah Gas	Late 2014		50	500	133																
Umm al-Lulu	2017		105		105	15														13	
Upper Zakum Expansion	2016	2018	200		200																28
Total UAE (mboe/d)			*1,381*	*2,920*	*1,868*	*67*	--	--	--	--	--	--	--	--	--	*20*	--	--	--	*72*	*65*
Yemen																					
Yemen LNG Train-1&2	October 2009	2010		1,140	190															40*	
Total Yemen (mboe/d)			*0*	*1,140*	*190*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*75*	--
Middle East Total (mboe/d)			*19,636*	*48,309*	*27,688*	*819*	*40*	*79*	*729*	*0*	*0*	*0*	*9*	*0*	*0*	*1,803*	*145*	*23*	*0*	*376*	*1,188*

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 53: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Former Soviet Union																					
Azerbaijan																					
ACG Phase-3 (Deepwater Gunashli)	April 2008	2009	282	350	340	34*	11			3								9			8
ACG West Chirag Oil Project	1Q14	2016	183	285	231	36*	11											9			8
Shah Deniz Phase-1	End 2006	2009	25	870	170	26*												26		10	
Shah Deniz Phase-2	2018	2022		1,650	275	29*												16		10	
Total Azerbaijan (mboe/d)			*490*	*3,155*	*1,016*	*321*	*65*	--	--	*9*	--	--	--	--	--	--	--	*135*	--	*45*	*46*
Kazakhstan																					
Aktote	2018		50	850	192			8													17
Kairan	2016		70		70			8													
Kalamkas	2016		80		80			8													
Karachaganak Phase-2 Train 4	2011	2012	56		56		20		33*												
Karachaganak Phase-3	2016		100	800	233		20		33*												
Kashagan Phase - 1	2014	2015	370	450	445				17*							17				17	17
Kashagan Phase - 2, 3, 4	2019	2022	1,260		1,260				17*							17				17	17
Khvalynskoye	2017			774	129															17	
Pearls (CMOC)	2015		50		50											55					
Tengiz Stage-2 (SGI/SGP)	September 2008	2009	260	480	340		50*														25
Tengiz Stage-3 (Future Growth Project)	2018	2019	275		275		50*														25
Total Kazakhstan (mboe/d)			*2,571*	*3,354*	*3,130*	--	*365*	*27*	*381*	--	--	--	--	--	--	*314*	--	--	--	*308*	*473*
Russia																					
Achimovsk	2006		56	803	190																
Arog	2012	2013	50		50												49				
Bolshekhetsky	2014		100		100																
Filanovsky	2015	2017	160	97	176																
Kamennoye	2009	2013	84		84	50															
Kharyaga	2007	2013	60		60													40		50	
Kovykta	2018			2,850	475	63*															
Novoportoskoye (West Siberia)	2016	2020	200		200																
Prirazlomnoye	Early 2013	2019	140		140																
Priobskoye expansion	2011		100		100																
Purovsky expansion	2013	2014		309	52																
Rospan Gas Expansion	2014			1,238	206																
Sakhalin I Phase-1 Arkutun-Dagi	2014	2015	90		90																30*
Sakhalin I Future Phases	2018	2019	30	800	163																30*
Sakhalin II LNG Train 1	April 2009	2009		640	107											30*					
Sakhalin II LNG Train 2	2009	2009		640	107											28*					
Sakhalin II Oil Expansion	2008	2009	150	200	183											55*					
Sakhalin IV					0	49															
Sakhalin V					0	49															
Salym Group (West Siberia)	November 2005	2009	150		150											50*					
Samburgskoye	2012			870	145				29*												
Shtokman LNG Train 1	2017	2018		1,650	275													24		25	
Shtokman LNG Train 2-4	2020			4,950	825													24		25	
Suzun	2015		88		88	50															
Termokarstovoye	2016		50		50															49	
Trebs & Titov	2013	2017	120		120																
Uvat (Eastern Hub)	2009		80		80	50															
Vankor	2009	2015	600		600																
Verkhnechonsk expansion	2011	2015	50		50	34															
Vladimir Filanovsky	2015	2016	115		115																

Source: Company Data, Barclays Research

* Includes PCA projects

Figure 54: New Worldwide Major Upstream Projects (continued)

Project/Field	Start-up	Peak Year	Peak Production Oil mb/d	Peak Production Gas mmcf/d	Peak Production BOE mboe/d	Working Interest (%) BP	CVX	COP	E	HES	HSE	IMO	MRO	MUR	PBR	RDS	REP	STO	SU	TOT	XOM
Former Soviet Union																					
Y. Korchagina, Russia	2010	2013	50	95	66																
Yamal (Bovanenkovo) Phase 1	2013	2015		1,451	242																
Yamal (Bovanenkovo) Phase 2	2016			5,803	967																
Yamal (Russkoye)	2015	2020	176		176	50															
Yaregskoye Expansion (SAGD Improvement)	2012	2017	53		53																
YK (Timan Pechura)	June 2008	2009	150		150			30													
Yuri Korchagin	April 2010	2010	50		50																
Yurubcheno-Tokhomskoye	2014		200		200																
Yurkharovskoye Phase 2	September 2008			670	112																
Yurkharovskoye Phase 3	2011			1,350	225																
Total Russia (mboe/d)			*3,152*	*24,416*	*7,221*	*530*	*--*	*45*	*43*	*--*	*--*	*--*	*--*	*--*	*--*	*237*	*25*	*288*	*--*	*330*	*76*
Turkmenistan																					
Galkynysh Phase 1	2013	2014		1,059	177																
Galkynysh Phase II	2018	2019		1,059	177																
Total Turkmenistan (mboe/d)			*0*	*2,118*	*353*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
Former Soviet Union Total (mboe/d)			*6,213*	*33,043*	*11,720*	*851*	*430*	*72*	*423*	*9*	*0*	*0*	*0*	*0*	*0*	*551*	*25*	*423*	*0*	*682*	*595*
Worldwide Total (mboe/d)			*55,838*	*171,641*	*84,150*	*3,966*	*3,327*	*2,076*	*2,181*	*317*	*141*	*377*	*88*	*165*	*5,851*	*4,627*	*682*	*1,821*	*578*	*2,875*	*4,744*

Source: Company Data, Barclays Research

* Includes PCA projects

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