COMMODITY STRATEGY RESEARCH

RBC Capital Markets

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Oil Strategy: Phantom Liquidity & Implications for the Next Cycle

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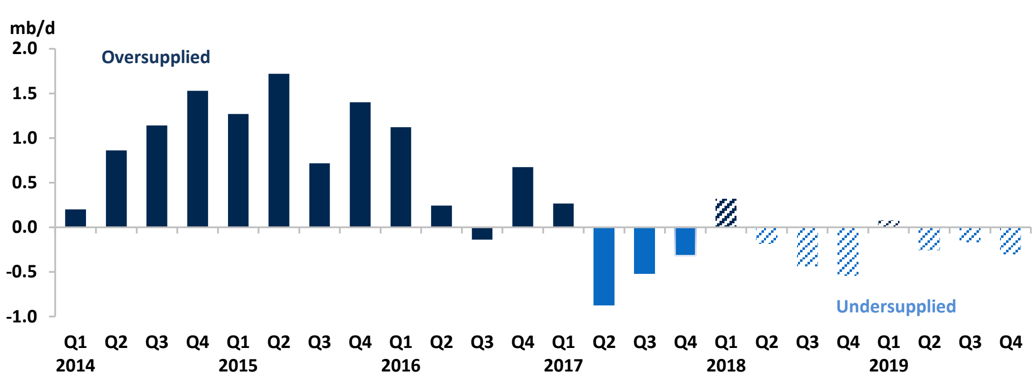
- **The Price Outlook:** We structurally believe that a cycle of firmer oil prices has kicked off. Our outlook is one of measured optimism paired with a degree of potential gap risk. We see the market as one that will ebb and flow between periods of equilibrium and deficit, rather than recent years in which varying degrees of oversupply perpetually plagued the space.
- We expect WTI and Brent to average $66 and $70/bbl this year, respectively followed by $64 and $68/bbl next year. Acute, spasmodic shocks could temporarily send Brent prices into the $75/bbl range or higher, particularly late in the summer when global demand peaks and supply disruption risks continue to mount. Such a rally would present the most meaningful window for producers to hit the reset button and smooth out future cash flows by layering in price protection at levels not seen in half a decade.
- **Structural Issues and the Global Investment Cycle:** The forward curve is undervalued. The term portion of the curve, which is anchored in the low to mid $50/bbl price environment, suggests that cheap, short cycle, US shale will be able to plug supply gaps over much of the next decade with limited participation from more expensive global greenfield projects.
- **Phantom Liquidity & the Pitfalls of Term Pricing**: The evolution of participants comprising the oil market has changed the way we think about liquidity, particularly in the dated portion of the forward curve. Deteriorating liquidity means that price discovery has worsened.
- Global producers who require price visibility for making investment decisions on long lead-time projects are unlikely to feel comfortable plowing billions of dollars into investments as long as the underpriced forward curve provides little economic incentive. In short, pricing through the dated portion of the forward curve is lying to us but tangible investment decisions are being made based on faulty term pricing.
- **Existential Threats and What Lies Ahead:** Investment in global upstream oil and gas has fallen precipitously since the downturn. This is not surprising given that investment decisions have been clouded by the onslaught of existentially threatening headlines of peak oil demand, electric vehicle growth and the rise of renewable energy. These factors are altering the shape of the next oil cycle from both an outright peak and tenor perspective.
- While a number of high profile pension funds have committed to trimming exposure to fossil fuels, we have not witnessed significant inflows of capital into the renewable sphere from traditional Wall Street sources. The degree to which the delta between private equity investment shifts between the two energy sectors warrants watching given the rate of change at which capital piles in could fortify the challenge from renewables, particularly as costs and technology continue to improve.

All values in USD unless otherwise noted.

Priced as of prior trading day's market close, ET (unless otherwise stated).

For Required Conflicts Disclosures, please see page 17.

Figure 1: Global Oil Supply and Demand Balance



Source: RBC Capital Markets, IEA, EIA, JODI, Petro-Logistics SA, Company and Government Reports

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Section 1: Oil Price Outlook

Calculated Optimism

The market will cycle between periods of equilibrium and deficit in the coming years, as opposed to the recent perpetual cycle of oversupply

We structurally believe that a cycle of firmer oil prices has kicked off. Our oil market outlook is one of measured optimism paired with a degree of potential gap risk. Erratic upside volatility may ensue as global fundamentals reach the healthiest state in several years come this summer. More importantly, our view hinges on the notion that a firming price floor will limit potential risk to the downside. We see the market as one that will cycle between periods of equilibrium and deficit, rather than recent years in which varying degrees of oversupply perpetually plagued the market. We view near term dips as key buying opportunities given the firming fundamental framework, particularly as geopolitics play an increasingly large needle-moving role as global storage shock absorbers are eradicated. Intermittent outages can create temporary regional deficits that, at a minimum, will solidify the price floor for prolonged periods.

Global inventories have largely reverted to historical levels when measured by most metrics, but the market has encountered transient pockets of oversupply throughout the first several months of this year in price sensitive regions like the North Sea. US refinery maintenance season peaked in February and will taper in the coming weeks and thus we deem the recent instances of localized oversupply to be seasonal rather than structural. While market participants often consider the health of global balances at a holistic level through a binary lens, regional pockets of over and undersupply can emerge, and although we believe that prices are headed higher, we expect near term price action will be lumpy as the market navigates through the asymmetric pace of these regional cycles. For example, even mainstream headlines such as the dynamic between two major storylines like the bearish US production growth or the bullish demise of Venezuela story can provide disproportionate and erratic price action over the coming quarters. The relative pace at which the two variables interact is integral to how prices gyrate over the near term.

Figure 2: Global Oil Demand Seasonality

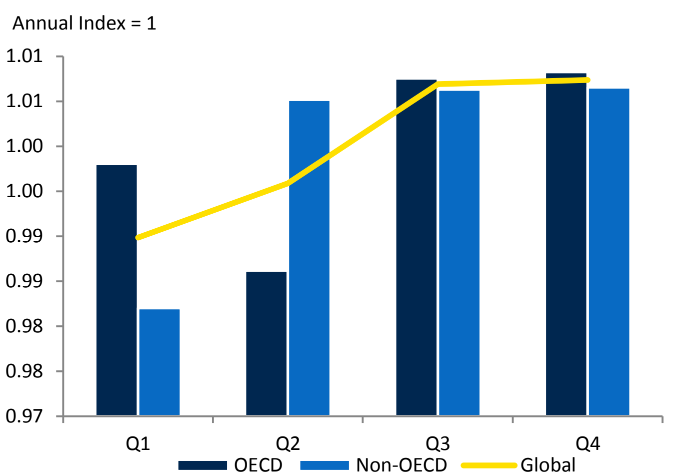
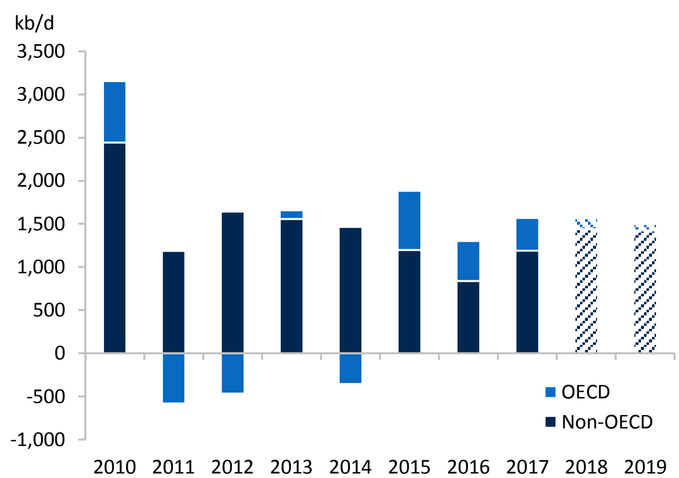


Figure 3: Global Oil Demand Growth



Source: RBC Capital Markets, EIA, JODI, IEA, government sources

The market is fraught with a meaningful amount of spike risk. Intermittent supply outages can potentially shock prices materially higher depending on the nature of each outage, with acute, spasmodic shocks potentially sending Brent prices into the $75/bbl range or higher. Such a rally would present the most meaningful window for producers to hit the reset button and smooth out future cash flows by layering in price protection at levels not seen in half a decade. Such a scenario may be magnified late in the summer when global demand peaks on

Anxiety surrounding US production growth is legit, but the market needs additional barrels come summer to prevent overtightening

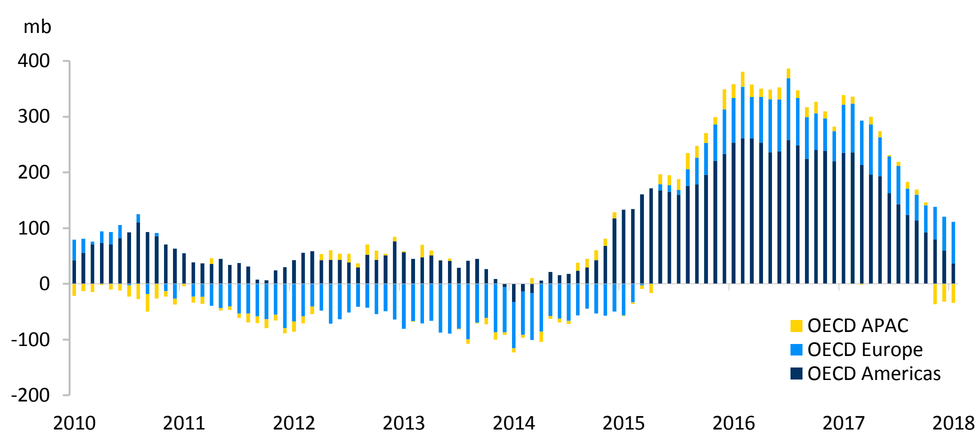
a seasonal basis and supply disruptions continue to mount. While the concept of over tightening the market has entered conversations, OPEC has made it excruciatingly clear that it will not leave any room for ambiguity or misinterpretation as the cartel has suggested that it would rather over tighten the market rather than the alternative. The first quarter is typically the weakest on a global demand basis, and although the drop in production in Venezuela has been absorbed by the storage surplus amassed over recent years, the full brunt of missing Venezuelan crudes will only become magnified with the passage of time given that there is no silver bullet to right the ship in Caracas.

While anxiety surrounding the market's ability to absorb US production growth is legitimate, we are less concerned about the outright levels because it is becoming increasingly clear that the market can not only absorb the growth, but even perhaps require the additional US volumes in order to prevent over tightening the market come summer. The lumpy rate of output growth from the US, Canada, Brazil and portions of the Former Soviet Union can create temporary and transient pockets of imbalance, but localized price adjustments will be largely arbitraged away throughout the year by resolute pockets of demand given our view that sizable stock draws will persist over the coming quarters.

The market's absorption rate of the marginal barrel is the measure for whether prices will rally higher or run lower

Market participants often look at global supply and demand fundamentals in individual silos. US production figures are often discussed in isolation. Same with Chinese demand growth data. While these figures are clearly important, we see the interplay, or holistic picture between these variables as the most telltale sign of price trajectory. In short, it boils down to the market's ability to absorb the incremental barrels. The market's absorption rate of the marginal barrel at any given time is the measure for whether prices will rally higher or run lower. Physical barrels in the North Sea have had difficulty clearing in the first six to eight weeks of this year as refiners geared up for maintenance season, but this has improved markedly of late. West African crudes are moving to Asia at the same breakneck speed that cleared up the Atlantic Basin and elevated the Brent term structure into backwardation last summer. China continues to anchor both global oil demand growth and the broad rebalancing act as domestic crude imports were elevated to 9.6 mb/d in January, which registers as the highest levels on record. The key test will be the state of Atlantic Basin crudes as Asia Pacific works its way through peak regional maintenance this month. Nigerian barrels, like Qua Iboe and Bonny Light, barrels which we have often dubbed as a key barometer for the health of the global oil market are clearing the market at the highest rates since oil prices first collapsed back in 2014.

Figure 4: OECD Storage Surplus/Deficit to Seasonal Norms



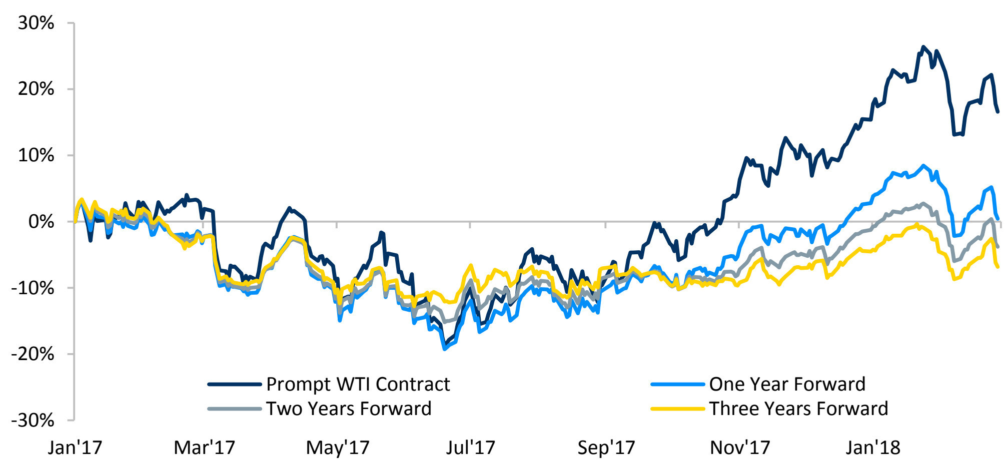
Source: RBC Capital Markets, EIA, IEA, Euroilstock, PAJ, Country & Gov't Reports

Toppy investor positioning warrants watching as subtle shifts in sentiment can have an outsized impact on price

In a convoluted market proliferated by a series of moving variables, we believe that the seeds have been planted for a multi-year constructive cycle. And the narrowing degree of broad market polarization among investors suggests a largely conforming view. Toppy investor positioning always warrants caution, but much of the bearish short cycle capital has bled out with investor shorts reaching the lowest level in years. This has been replaced with a parade of stickier passive length given that the WTI roll yield recently turned positive for the first time in several years. In other words, even though positioning looks lengthy, we are less concerned about a sudden wave of financial outflows as long as the market remains in backwardation.

We remain cognizant that the lesson learned over recent years is that the herd mentality is strong and tourist traders cycling in and out of positions can make for violent price swings even if prices have found an elevated base floor of support in the $55-$60/bbl range for WTI. We see WTI and Brent averaging $66 and $70/bbl this year, reflecting a revision higher of some $8/bbl for both crudes. We see prices for next year averaging $64 and $68/bbl, respectively (see page 14 for full price forecasts).

Figure 5: WTI Performance Indexed to Jan 2017



Source: RBC Capital Markets, Bloomberg

Section 2: Structural Issues and the Global Investment Cycle

Front Rally, Back Empty…

While spot prices have rallied materially over recent months…the term portion of the curve has not participated

Despite spot oil prices rallying some $20/bbl from the mid-summer lows, term prices have failed to participate to the same degree. Calendar 2020 WTI pricing has inched slightly higher during that period to $53/bbl, while Calendar 2025 is trading lower relative to levels seen prior to the front led rally. The market has a natural tendency to fixate on spot oil prices, but the truth of the matter is that investment decisions for the overwhelming majority of global projects outside of short cycle shale are planned and budgeted based on the view of the forward looking, dated portion of the oil term structure. Low term prices means that many global projects will remain sidelined irrespective of spot pricing. We see the term portion of the forward curve vastly undervalued given that prices remain anchored to the low to mid $50/bbl range. The forward curve, in its current form is suggesting that low-cost, short-cycle projects can supply the market in the years ahead with minimal greenfield participation from traditional, higher cost global projects. Put another way, companies, irrespective of size or stature, require the visibility and comfort of stable and economic term prices in order to greenlight projects that will not bear fruit for several years following the finalizing of an investment decision. The forward curve currently suggests that the market's love affair with cheap, short cycle, US shale production will be able to largely fill global supply gaps for the imaginable future.

The forward curve is erroneously suggesting that US shale will be able to plug supply gaps for the foreseeable future

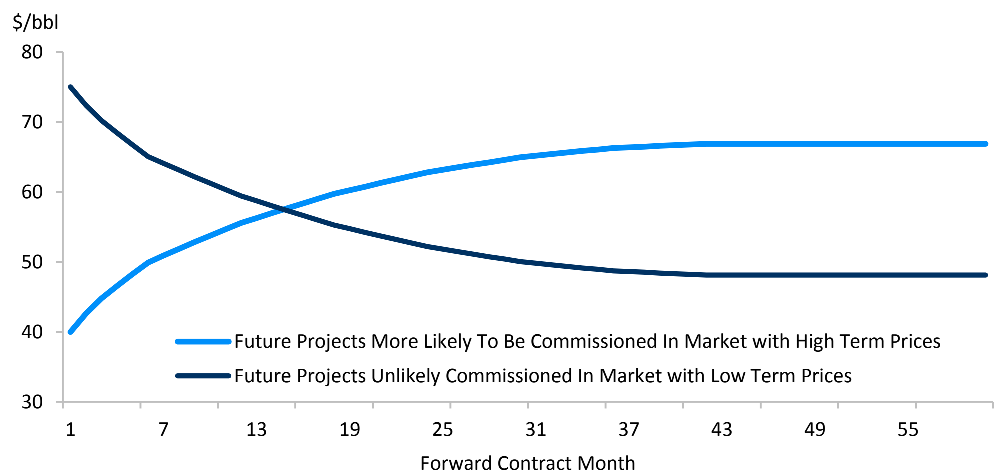
The Forward Curve has Encountered Four Distinct Cycles over the Past Several Decades

The market recognizes that the forward curve is not a forecast of future prices, but term pricing tells us two things: 1) Where one can buy or sell a barrel of oil today for future delivery and 2) The market's perception of the global marginal cost of future production. The past two decades have seen the long dated portion of the forward curve move through four distinct cycles (*See Oil's Forward Curve – A Brief History, page 7*), in which term prices oscillated through periods of stability, followed by episodes of variability where shocks to the market unmoored prices from prior expectations of the long term marginal cost of production. Market term structure will undoubtedly cycle through bouts of contango and backwardation over the coming years; but what happens in the event that the forward curve remains anchored near current levels? What if term prices remain fastened to the low $50/bbl level like the calendar strips beyond 2020 currently are? Do costly, long cycle global projects reach positive final investment decisions? Likely not.

Costly long lead time projects are unlikely to reach postive investment decisions if the forward curve remains anchored near current levels

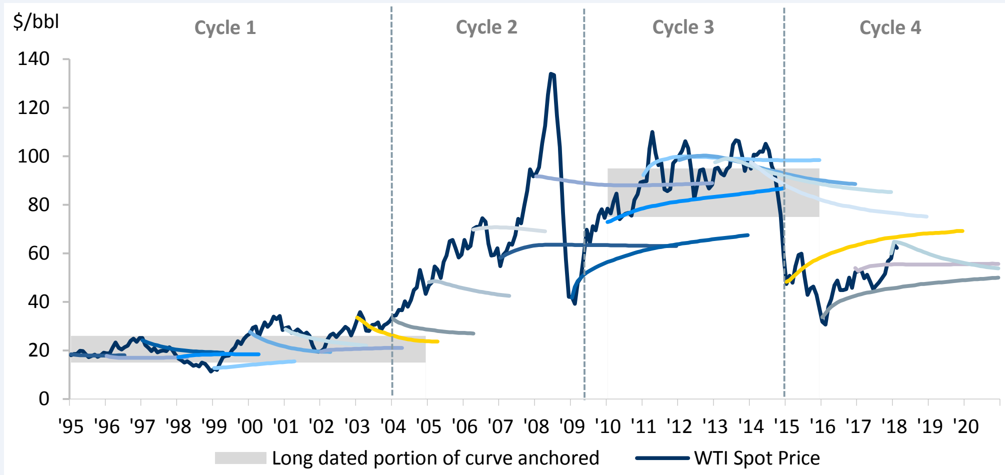
Even in the scenario in which spot prices remain firm, but forward prices for the next 24 to 60 months continue to languish in the low to mid $50/bbl price range, producers who require price visibility for making investment decisions on long lead-time projects are unlikely to feel comfortable plowing billions of dollars into investments. In other words, the vast majority of global projects are less elastic to spot prices and more sensitive to the term outlook. While the spot price collapse of recent years has sidelined material levels of CAPEX, persistently low term structure will keep much of it on the shelf irrespective of the spot price recovery. For example, a market in significant contango with spot prices at $50/bbl, but term prices at $75/bbl would, in our opinion, be more susceptible to the commissioning of future projects than a severely backwardated market with spot prices at $75/bbl and term prices at $50/bbl (see Figure 6).

Figure 6: Term Rather Than Spot Prices Are More Influential For Investment Decisions



Source: RBC Capital Markets

Figure 7: WTI Spot Price & Forward Curve*



Source: RBC Capital Markets, Bloomberg *Forward strip as of Jan 1 of each year

Oil's Forward Curve - A Brief History

It is key to note that visibility into the back end of the curve does little to indicate where future spot prices will trade given that the market will continue to weave between phases of contango and backwardation as warranted by physical and financial forces (see Figure 7).

First Cycle: Prior to 2004: Historically speaking, until the mid-2000s, prices would ebb and flow through periods of contango and backwardation, regardless of whether spot barrels were priced at $15/bbl or $25/bbl, the forward curve was anchored near the $20/bbl mark, which was, at the time, largely recognized as the marginal cost of producing a barrel of oil.

Second Cycle: 2004-2009: In what was unchartered territory at the time, long-term oil prices became unmoored from the $20/bbl level and the entire forward curve shifted higher alongside spot prices during the mid-2000s as peak oil fears ravaged the market and altered the perception of where the market should be pricing long-term oil. In other words, when the front end of the forward curve moved, the entire curve moved along with it. In other words, the market was constantly contemplating the marginal cost of future production.

Third Cycle: 2010-2014: Order was restored to the forward curve at the turn of this decade as dated prices became anchored once again, this time to the $70-$80/bbl mark, which at the time, was thought to be the cost of the marginal barrel stemming from various unconventional sources.

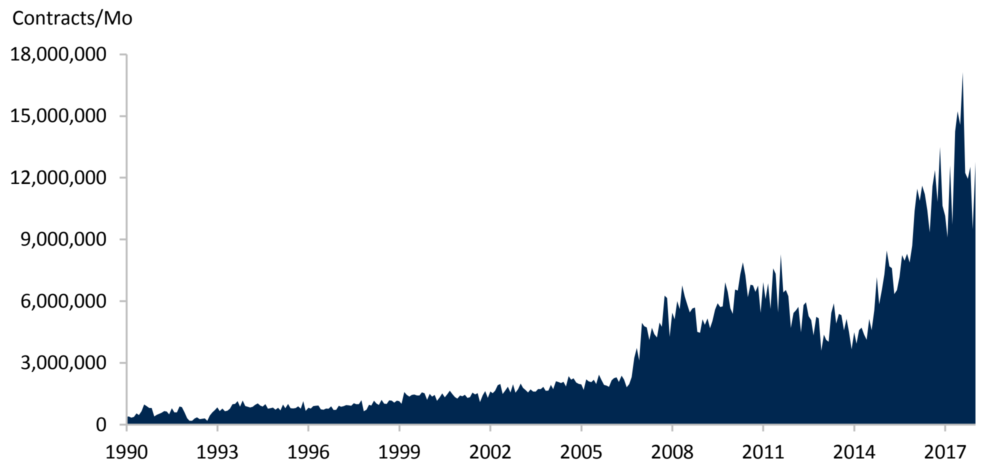
Fourth Cycle: 2015-Present: The oil price rout of the past several years is only the second cycle seen over the previous two decades to significantly unfasten the dated portion of the forward curve from the previous cycle. During this downturn, the entire forward curve shifted lower in anticipation of searching for the future marginal cost of a barrel of oil. While the latest episode has yet to play out, the term portion of the forward curve is currently anchored to the $50-$55/bbl range, at levels loosely economical for US shale. The curve is unlikely to unhinge from that level until further efficiency gains push the curve lower or until the US resource begins to show signs of peaking and the curve rises to the cost of the next marginal barrel.

Transient Liquidity – Beware of Air Pockets

Transient pockets of liquidity have been created with the majority of volumes artificially centered on near dated contracts

Liquidity for near-dated contracts has reached record levels with daily volumes routinely seven-times higher than the prior decade (see Figure 8). This is a function of an intensified level of participation from algorithmically generated funds and broad tourist traders. Alternatively, the liquidity in the forward curve beyond two to three years has yet to be tested since the market has not been called upon to absorb substantial and consistent longer-term hedge programs. In other words, transient pockets of liquidity have been created, with the majority of the volumes artificially centered on the near dated contracts.

Figure 8: WTI Volumes Traded Per Month



Source: RBC Capital Markets, Bloomberg

While traded volumes are near all time highs, there is a lack of liquidity in the term portion of the curve

Alternatively, liquidity in the term portion of the forward curve is not what it once was. While machine driven trading has pushed spot volumes to record levels, liquidity for contracts five years out are half of what it used to be (see Figure 9). Market makers will continue to show prices for producer and consumer hedging purposes for the longer-dated portion of the forward curve, but the deterioration of liquidity means that true price discovery has worsened over recent years. It is difficult to measure the sensitivity of prices, upward or downward, in relation to quantifiable volumes; but we are inclined to believe that sizable producer or consumer hedging programs can air pocket the dated portion of the market in either direction in a hurry given the lack of liquidity in the forward curve.

Deterioration of liquidity means that price discovery has worsened

The oil price collapse has changed how companies approach hedging strategies. Producer hedges are not as prolific as previously the case given that prices have, until recently, provided a dearth of economically feasible opportunities. In addition to less attractive outright price levels seen over recent years, a credit constrained environment means that the tenors are shorter-dated, with 6, 12, and 18-month strips being hedged rather than the 24 to 36-month terms that were previously a normal occurrence. Consumers like airlines have also shorted hedging tenors or even abolished risk management programs since the oil price collapse. Adding to the deterioration of liquidity, the past several years have featured a plethora of prominent specialist energy hedge fund exits from the market. On the contrary, the recent price recovery may present an opportune time for National Oil Companies to initiate hedging programs to smooth out future cash flows. The Mexican program is the largest sovereign oil hedge in the market, but the potential rise of others like Colombia, could add increased volatility to the market depending on size, tenor and transaction style.

Section 3: The Dilemma Between Tangible Decisions and Inaccurate Pricing

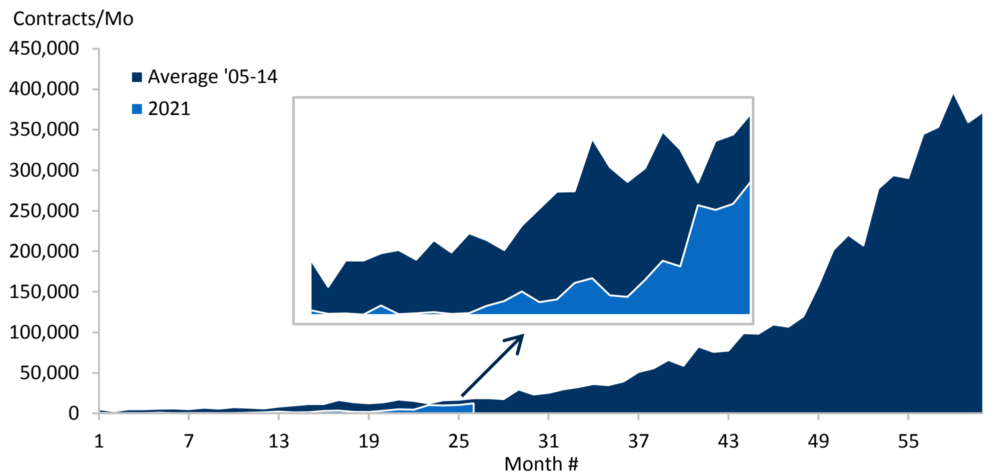
Phantom Liquidity - Is the Term Portion of the Forward Curve Lying to Us?

Liquidity is not an issue until it comes time to execute trades. Traders mark curves at the close of each trading session. This involves setting a mid-price, between the bid and offer for contracts throughout the term. The issue being that the curves are marked in the same fashion for highly liquid, near dated contracts as for thinly traded distant term contracts. In other words, the dated portion of the forward curve often reflects non-transaction focused pricing or what we call '*phantom liquidity*'.

The forward curve is lying to you…the market is being misled by '*phantom liquidity*'

Poor liquidity means that realized live pricing can air pocket in either direction come execution time. While liquidity is often nebulous, poor price discovery has tangible outsized implications for how we think about the next cycle given that capping longer-dated prices takes the wind out of the sails of investment decisions for many global projects. In simple terms, pricing throughout the dated portion of the forward curve is lying to us but tangible decisions on future investment are being made based on faulty term pricing.

Figure 9: Liquidity for December WTI Contract in Five Years Leading to Expiry*



Source: RBC Capital Markets, Bloomberg *Week 1 volume for the Dec 2021 contract starts Jan 2016

Lacking Visibility to Future Pricing

Tangible decisions on future investment are being made despite faulty term pricing

Higher cost global producers who require price visibility for making investment decisions on long lead-time projects are unlikely to commit significant capital to investments even in the hyperbolic scenario of extreme backwardation in which spot prices temporarily surge materially higher to $100/bbl if forward pricing continues to languish in the low-$50/bbl price range.

Efficiency gains, improved technology and cost savings, have changed the game of domestic production and can plug supply gaps over the near term, but the geology remains steadfast given that first year declines in US shale continue to ebb and flow in the 28% to 33% range. This means that while US shale can outrun near term supply shortages, broad based global decline rates become increasingly diluted with each additional US barrel that hits the market.

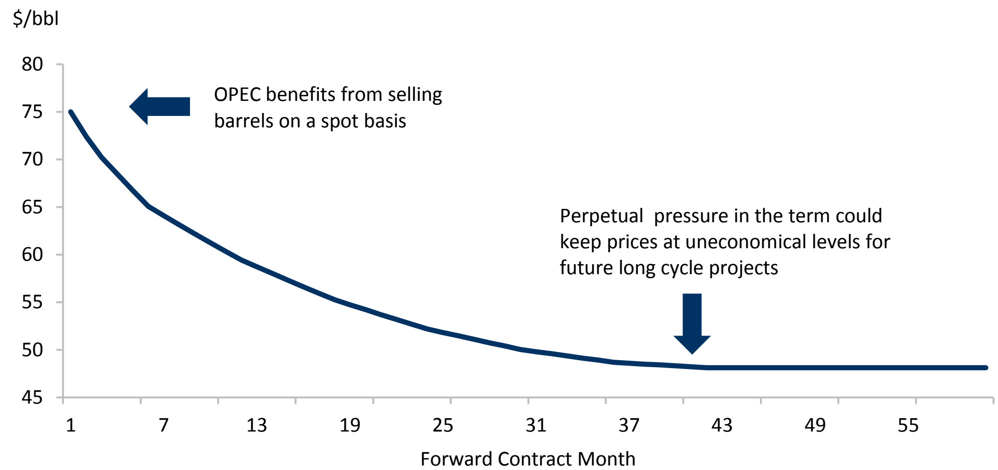
We remain bullish within a range rather than raging bulls, but we find it difficult to believe that the forward curve can remain suppressed near current levels over the course of the next cycle. Even if the economics of previously unfeasible ventures like deepwater developments are becoming increasingly attractive, the time lag between making an investment decision to initial production is typically measured in years. This can make for a drastically different fundamental backdrop by the time the barrels hit the market, particularly given that the outlook for energy policy has governments playing an increasingly larger role.

Who Benefits from a Firmly Backwardated Term Structure?

Low term pricing sidelines higher cost, longer dated projects, which will keep the market perpetually tight over the next cycle

As suggested, putting a cap on longer dated prices likely takes the wind out of the sails of future investment decisions for many global projects. This keeps higher cost, longer cycle non-OPEC projects sidelined, meaning that the market will be kept perpetually tight in the years ahead by ensuring that the only barrels that come online are short cycle shale projects and barrels from low cost, fiscally prudent OPEC producers who can capitalize by selling barrels on a spot basis.

Figure 10: Low Term Oil Prices Prevents the Commissioning of Future Projects



Source: RBC Capital Markets

Backwardation breeds further backwardation

OPEC and other relatively low cost operators like pockets of the Former Soviet Union benefit from such a market given that barrels are largely sold on a spot or near dated basis. Simply put, these regions reap the benefit of higher spot prices with the visibility of greenlighting lower cost projects, even if the ramp up period lags that of shale. We are moving into a market where significant backwardation breeds further backwardation and this will be amplified when heavy hedging programs come to market from shale producers, or if National Oil Companies initiate financial hedging strategies. A steady bout of producer hedging can apply perpetual downward pressure on term pricing. If used strategically, it can be an alternate way for low cost producers to use derivatives as a combat tool to keep economically challenged, long cycle projects at bay.

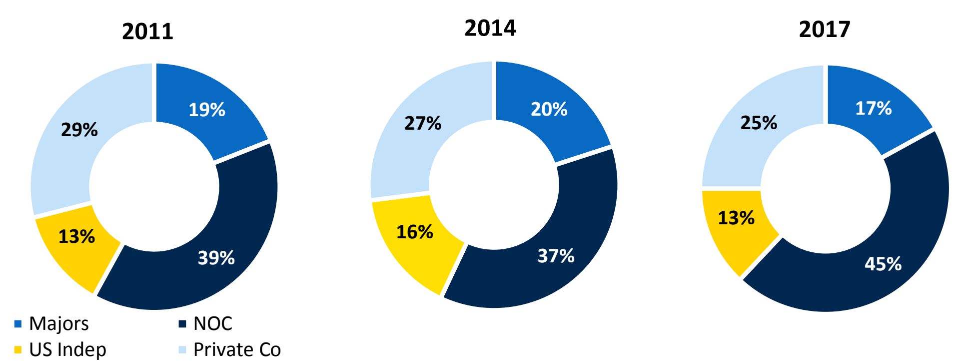
Section 4: What Lies Ahead…

What Does the Next Oil Cycle Look Like?

Since the oil price downturn, an increased share of global investment has fallen on state owned NOCs

The next several years presents a challenging environment for the oil patch given that governments across the spectrum are playing progressively larger roles in shaping energy policy and the future of fossil fuels. Additionally, traditional sources of capital markets financing are seemingly becoming increasingly meticulous with capital allocation, particularly given the rise of ESG (Environmental, Social and Governance) investing mandates. Since the oil price downturn, an increased share of the global upstream investment pie has fallen on the shoulders of government owned National Oil Companies to fill the investment void. Many emerging markets remain heavily dependent on energy revenue in order to fund social programs, military campaigns and economic development. Our figures show total annual E&P CAPEX spending was reduced by more than 40% from pre-downturn levels.

Figure 11: Global Upstream Oil and Gas Investment by Company Type*



Source: RBC Capital Markets, IEA, Company Reports, Government Sources *As a percent of global investment

While Majors, US Independents and Privates have all slashed CAPEX by nearly 50% from 2014 highs, National Oil Companies, traditionally the largest allocator of CAPEX on a global basis, cut budgets by less than 30% from pre-price collapse levels. NOCs made up nearly half of total global upstream investment last year. It is natural to expect countries heavily dependent on a consistent future stream of energy revenue to continue to make significant investments in the space in order to fund social and economic development. NOCs comprise nearly 60% of both global energy production and reserves. While capital expenditures across the board have been slashed by Global Majors, National Oil Companies, US Independents and private companies in wake of the downturn, private capital has been the most fleeting.

This is not particularly surprising given that investment decisions are being clouded by the onslaught of existentially threatening headlines of peak oil demand, electric vehicle growth and the rise of renewable energy. As such, payback cycles are shortening. Investment flow continues to gravitate towards a faster return on investment. This is why, in part, there has been an influx of majors making big investments back into US shale.

Figure 12: Global Upstream O&G Investment By Company Type

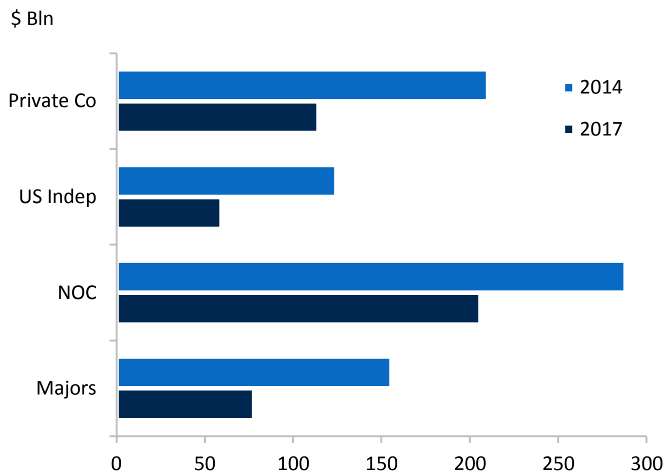
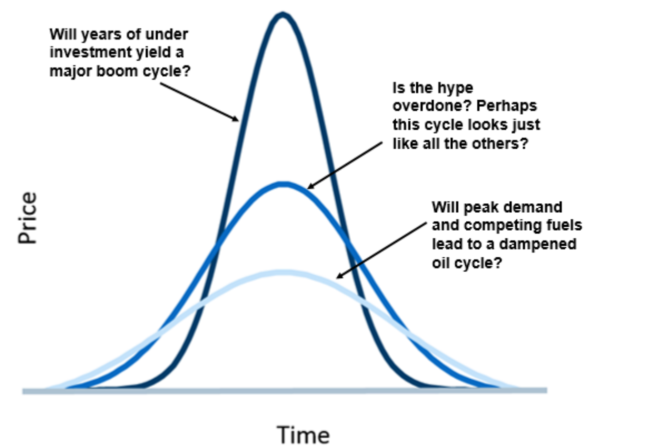


Figure 13: Shape of Next Oil Cycle…Remains Uncertain



Source: RBC Capital Markets, IEA, Company reports, Government sources

The rise of electric vehicles and competing fuel sources pose an existential threat that is altering the shape of the next oil cycle

Many market participants buy into the notion that the billions of dollars of sidelined CAPEX over recent years will, at some point in the near future, lead to a supply gap in the market. We also subscribe to that notion, but we are much more interested in the rate of change of the market's perception of how the supply gap cycle is being altered and the read through in determining the shape of the next oil market cycle.

In other words, the resilient and prolific nature of US shale has, and will continue to, bridge and dampen the upcoming global supply gap. Conversely, the rise of both electric vehicles and competing fuel sources are raising cries of a sunset industry, which is altering the shape of the next oil cycle from both an outright peak and tenor perspective. While producers and market participants care about the area under the curve as the time frame to capitalize on investment, the outright shape of the curve is highly impactful from the perspective of timing exit strategies.

Figure 14: New Investment in Renewable Energy by Source

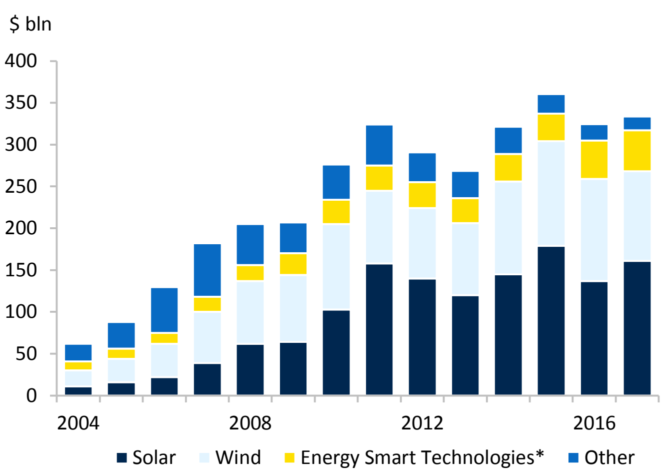
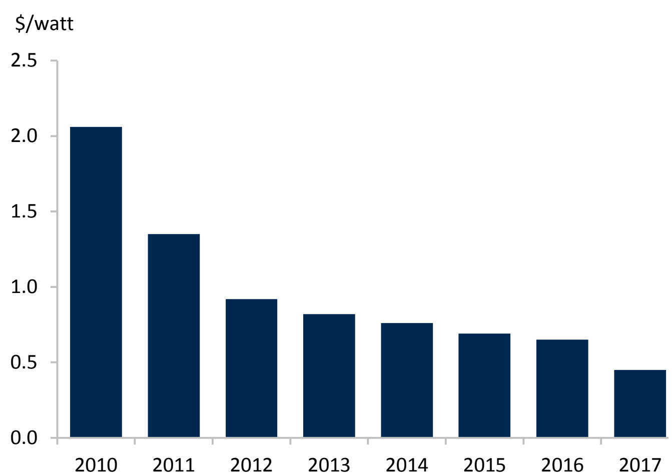


Figure 15: Multi Crystalline Silicon Module (Solar Panel) Price



Source: RBC Capital Markets, BNEF, FS-UNEP, Company Reports *Energy Smart Technologies = Advanced transportation, Smart grid technology, Digital energy, Energy efficiency, and Power storage

Figure 16: Investment in Renewables By Region, 2017

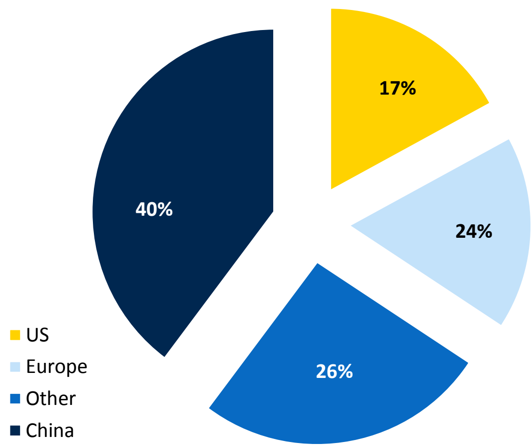
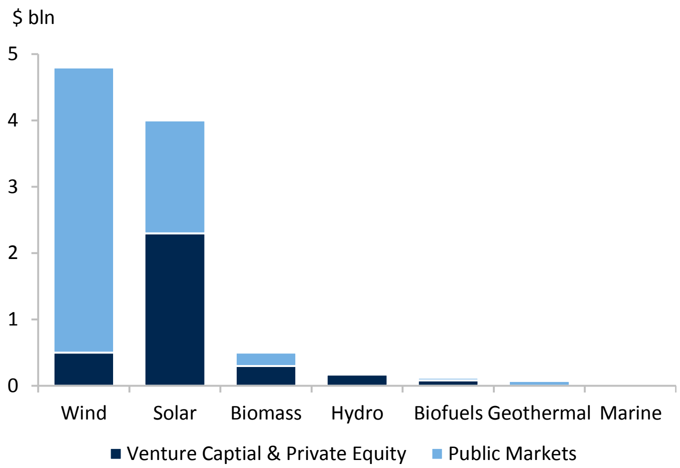


Figure 17: Public Markets & PE/VC Investments in Renewables*



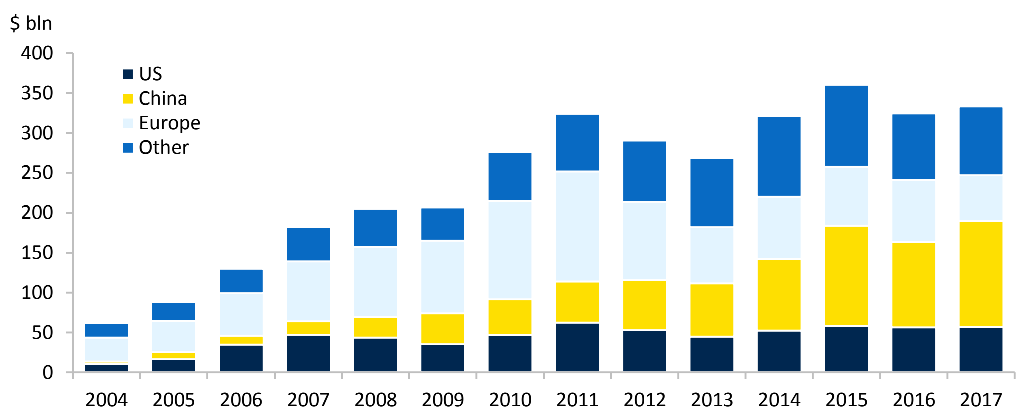
Source: RBC Capital Markets, BNEF, FS-UNEP, Company Reports *Denotes 2016 Investment Period

Years of depressed oil and natural gas prices have not stunted the growth trend in the renwable energy sphere

Challenge from Renewables is Inevitable and the Battle for Capital Ensues

While investment into fossil fuels has slowed markedly over recent years, capital put to work in the renewable energy sphere has maintained the growth trend seen over much of the past decade. This trend highlights several key takeaways. The first is that nearly half a decade of depressed oil and natural gas prices have not stunted global interest and investment into renewable energy. Second, at initial glance, it appears that the notional level of new investments in renewable energy has slowed slightly from the pace of annualized growth over previous years and while investment dollars can be lumpy, the notional value invested is not the end of the story. Global investment over the past two years is off the 2015 highs, but much of this can be attributed to the cost of renewables falling materially. For example, the average spot price for solar panels has plunged by nearly 80% since the turn of the decade (multi crystalline silicon module price). A slowing rate of growth does not necessarily translate into waning interest because falling costs simply mean more megawatts per dollar invested. In other words, a drop in pricing means greater energy intensity per dollar invested. And of course, regional politics can serve as both a tailwind and headwind to the velocity of capital deployed given that subsidies and tax credits remain integral to development of renewables in many jurisdictions.

Figure 18: New Investment in Renewable Energy By Region



Source: RBC Capital Markets, BNEF, FS-UNEP, Company Reports

Finally, the largest driver of capital into the renewables space has traditionally been asset financing, which comprises some two thirds to three quarters of annual new investment. Government and corporate research and development departments have also been key sources of investment. Traditional backers of oil and gas producers like private equity, venture capital and public markets have been slow to the renewables game. This collection of investors has only made up mid to high single digits as a percentage of annual renewable energy investment.

Traditional Wall Street sources have been slow to invest in the renewables game, but that has the capacity to change

A number of high profile pension and sovereign wealth funds have committed to trimming exposure to fossil fuels, and while the rhetoric has been part of a larger movement to tackle climate change, weak performance from the energy sector is also a likely culprit. The slower pace of investment into renewable energy from traditional Wall Street sources perhaps suggests that oil and gas producers do not appear to, at present time, be losing out on investment dollars to renewables. As suggested in Figures 12 and 17, new private spending in the oil and gas space continue to dwarf the dollars placed with renewables by a tremendous margin. The degree to which the delta between private equity investment shifts between the two energy sectors warrants watching over the medium term given the rate of change at which capital piles in could fortify the challenge from renewable energy, particularly as costs and technology continue to improve.

Figure 19: Oil Price Forecasts

Price Forecast ($/bbl)	2017					2018					2019				
	Q1	*Q2*	*Q3*	*Q4*	*'17 Avg*	*Q1*	*Q2*	*Q3*	*Q4*	*'18 Avg*	*Q1*	*Q2*	*Q3*	*Q4*	*'19 Avg*
WTI	$51.78	$48.15	$48.20	*$55.30*	**$50.85**	*$63.00*	*$65.50*	*$68.00*	*$67.00*	***$65.89***	*$61.00*	*$63.00*	*$65.00*	*$66.00*	***$63.77***
Brent	$54.61	$50.79	$52.17	*$61.46*	**$54.75**	*$67.00*	*$69.75*	*$72.00*	*$72.00*	***$70.21***	*$67.00*	*$68.00*	*$68.00*	*$70.00*	***$68.26***
WTI-Brent Spread	-$2.83	-$2.64	-$3.97	*-$6.00*	**-$3.90**	*-$4.00*	*-$4.25*	*-$4.00*	*-$5.00*	***-$4.31***	*-$6.00*	*-$5.00*	*-$3.00*	*-$4.00*	***-$4.49***

Source: RBC Capital Markets

Figure 20: Global Supply & Demand Balance (mb/d)

Global Supply & Demand Balance	2017					2018					2019				
mb/d	Q1	Q2	Q3	Q4	YoY	Q1	Q2	Q3	Q4	YoY	Q1	Q2	Q3	Q4	YoY
Demand															
OECD	46.6	46.8	47.4	47.2	**0.3**	*46.9*	*46.8*	*47.4*	*47.3*	***0.1***	*47.0*	*46.9*	*47.5*	*47.4*	***0.1***
Non-OECD	49.6	51.0	50.9	50.9	**1.2**	*51.1*	*52.1*	*52.3*	*52.8*	***1.4***	*52.3*	*53.5*	*53.8*	*54.2*	***1.4***
Total Demand	**96.2**	**97.9**	**98.3**	**98.0**	**1.6**	***98.0***	***98.9***	***99.7***	***100.1***	***1.6***	***99.3***	***100.4***	***101.3***	***101.6***	***1.5***
Supply															
OPEC Crude	32.5	32.6	33.1	32.7	**-0.2**	*32.5*	*32.3*	*32.4*	*32.0*	***-0.4***	*32.0*	*32.1*	*32.3*	*31.9*	***-0.2***
OPEC Other Liquids	6.8	6.9	7.0	6.9	**0.1**	*6.8*	*6.8*	*6.7*	*6.7*	***-0.2***	*6.7*	*6.7*	*6.8*	*6.7*	***0.0***
Non-OPEC Crude & Biofuels & Proc Gain	57.2	57.5	57.6	58.1	**0.8**	*59.1*	*59.6*	*60.2*	*60.8*	***2.3***	*60.7*	*61.4*	*62.2*	*62.7*	***1.8***
Total Supply	**96.5**	**97.0**	**97.7**	**97.7**	**0.7**	***98.3***	***98.7***	***99.3***	***99.5***	***1.7***	***99.4***	***100.2***	***101.2***	***101.3***	***1.5***
Stock Change	0.3	-0.9	-0.5	-0.3		*0.3*	*-0.2*	*-0.4*	*-0.5*		*0.1*	*-0.3*	*-0.2*	*-0.3*	
Call on OPEC	32.2	33.5	33.7	33.0		*32.1*	*32.5*	*32.9*	*32.6*		*31.9*	*32.3*	*32.4*	*32.2*	

Source: RBC Capital Markets, Petro-Logistics SA, IEA, EIA, JODI, company and government sources

Figure 21: Global Oil Demand (mb/d)

OECD Demand	2017				2018				2019						
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	YoY'17	YoY'18	YoY'19
US	19.83	20.31	20.23	20.12	20.03	20.36	20.42	20.38	20.12	20.48	20.53	20.48	0.13	0.17	0.10
Canada	2.35	2.34	2.50	2.45	2.38	2.35	2.51	2.45	2.38	2.36	2.52	2.46	0.03	0.01	0.01
Mexico	1.96	1.98	1.90	1.94	1.96	1.94	1.88	1.95	1.94	1.92	1.87	1.94	-0.09	-0.01	-0.02
Total North America	**24.14**	**24.62**	**24.63**	**24.51**	**24.37**	**24.64**	**24.82**	**24.78**	**24.45**	**24.75**	**24.91**	**24.87**	**0.07**	**0.18**	**0.09**
OECD Europe															
Germany	2.53	2.51	2.50	2.43	2.56	2.54	2.54	2.53	2.59	2.58	2.57	2.56	0.07	0.05	0.03
UK	1.53	1.59	1.61	1.58	1.54	1.58	1.61	1.59	1.54	1.59	1.61	1.60	-0.01	0.00	0.00
Other Europe	9.88	10.33	10.74	10.23	9.91	10.28	10.70	10.32	9.95	10.32	10.75	10.36	0.18	0.01	0.04
Total OECD Europe	**13.93**	**14.43**	**14.85**	**14.24**	**14.02**	**14.40**	**14.85**	**14.43**	**14.08**	**14.48**	**14.93**	**14.51**	**0.24**	**0.06**	**0.08**
OECD APAC	**8.56**	**7.76**	**7.90**	**8.40**	**8.53**	**7.75**	**7.77**	**8.10**	**8.45**	**7.64**	**7.66**	**8.01**	**0.01**	**-0.12**	**-0.10**
Total OECD Demand	**46.63**	**46.81**	**47.38**	**47.15**	**46.91**	**46.80**	**47.44**	**47.31**	**46.98**	**46.88**	**47.50**	**47.40**	**0.32**	**0.12**	**0.07**

Non-OECD Demand	2017				2018				2019						
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	YoY'17	YoY'18	YoY'19
South & Central America															
Argentina	0.75	0.77	0.78	0.75	0.73	0.76	0.76	0.76	0.73	0.75	0.76	0.77	0.00	-0.01	0.00
Brazil	3.01	3.05	3.17	3.14	3.02	3.08	3.19	3.16	3.06	3.14	3.22	3.21	0.02	0.02	0.05
Other South & Central America	2.69	2.76	2.74	2.71	2.73	2.75	2.76	2.66	2.76	2.79	2.78	2.70	0.00	0.00	0.03
South & Central America	**6.45**	**6.57**	**6.68**	**6.60**	**6.47**	**6.59**	**6.70**	**6.58**	**6.55**	**6.69**	**6.76**	**6.68**	**0.02**	**0.01**	**0.08**
Middle East															
Iran	1.84	1.82	1.83	1.91	1.92	1.87	1.90	1.97	1.95	1.90	1.94	2.01	0.03	0.06	0.04
Saudi Arabia	2.88	3.35	3.57	3.02	3.04	3.45	3.62	3.17	3.12	3.53	3.70	3.25	-0.06	0.12	0.08
Other MidEast	3.20	3.29	3.29	3.06	3.21	3.34	3.44	3.27	3.29	3.42	3.52	3.35	0.02	0.10	0.08
Middle East	**7.92**	**8.46**	**8.69**	**8.00**	**8.17**	**8.65**	**8.97**	**8.41**	**8.36**	**8.84**	**9.16**	**8.60**	**-0.01**	**0.28**	**0.19**
Emerging APAC															
China	12.42	12.64	12.11	12.65	12.76	12.86	12.60	13.23	13.08	13.28	13.03	13.61	0.59	0.40	0.39
India	4.58	4.82	4.67	4.91	4.94	5.10	4.85	5.22	5.19	5.43	5.18	5.53	0.17	0.28	0.30
Other	8.54	8.77	8.72	8.64	8.79	8.92	8.99	9.05	9.05	9.17	9.25	9.30	0.30	0.27	0.26
Emerging APAC	**25.54**	**26.23**	**25.50**	**26.19**	**26.50**	**26.88**	**26.43**	**27.49**	**27.32**	**27.87**	**27.45**	**28.44**	**1.07**	**0.96**	**0.95**
Africa	**4.42**	**4.31**	**4.24**	**4.44**	**4.52**	**4.40**	**4.32**	**4.55**	**4.58**	**4.48**	**4.40**	**4.64**	**0.06**	**0.10**	**0.08**
Non-OECD Europe	**0.71**	**0.74**	**0.75**	**0.76**	**0.75**	**0.75**	**0.76**	**0.77**	**0.77**	**0.79**	**0.86**	**0.78**	**0.02**	**0.02**	**0.04**
FSU	**4.59**	**4.73**	**5.02**	**4.92**	**4.68**	**4.79**	**5.11**	**4.97**	**4.76**	**4.86**	**5.21**	**5.05**	**0.07**	**0.07**	**0.09**
Total Non-OECD Demand	**49.62**	**51.04**	**50.88**	**50.89**	**51.09**	**52.06**	**52.29**	**52.77**	**52.35**	**53.53**	**53.84**	**54.19**	**1.23**	**1.44**	**1.43**
Global Demand	**96.25**	**97.85**	**98.26**	**98.05**	**98.00**	**98.86**	**99.73**	**100.08**	**99.32**	**100.41**	**101.34**	**101.59**	**1.55**	**1.56**	**1.50**

Source: RBC Capital Markets, IEA, EIA, JODI, company and government sources

Figure 22: Global Oil Supply (mb/d)

Non- OPEC Supply	2017				2018				2019						
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	YoY'17	YoY'18	YoY'19
US	12.67	12.97	13.14	13.90	14.05	14.45	14.54	15.02	15.23	15.47	15.66	16.11	0.64	1.34	1.10
Canada	4.92	4.47	4.87	4.92	5.16	4.86	5.33	5.29	5.45	5.14	5.61	5.57	0.33	0.37	0.28
Mexico	2.33	2.31	2.16	2.16	2.17	2.15	2.13	2.09	2.10	2.10	2.06	2.01	-0.23	-0.11	-0.07
Total North America	**19.93**	**19.76**	**20.17**	**20.98**	**21.38**	**21.46**	**22.00**	**22.40**	**22.78**	**22.70**	**23.33**	**23.69**	**0.73**	**1.60**	**1.32**
Argentina	0.59	0.56	0.58	0.58	0.56	0.62	0.60	0.61	0.55	0.61	0.60	0.60	-0.03	0.02	-0.01
Brazil	2.75	2.74	2.73	2.80	2.79	2.97	2.95	3.15	3.00	3.15	3.15	3.29	0.14	0.21	0.18
Colombia	0.85	0.86	0.86	0.86	0.86	0.85	0.82	0.82	0.85	0.84	0.82	0.82	-0.03	-0.02	-0.01
Other South & Central America	0.38	0.37	0.36	0.37	0.39	0.38	0.37	0.40	0.38	0.38	0.37	0.40	-0.01	0.02	0.00
Total South & Central America	**4.56**	**4.53**	**4.53**	**4.60**	**4.59**	**4.81**	**4.75**	**4.98**	**4.78**	**4.98**	**4.93**	**5.09**	**0.07**	**0.23**	**0.17**
Norway	2.08	2.00	1.89	1.87	2.02	1.95	1.84	1.90	2.01	1.94	1.83	1.89	-0.03	-0.03	-0.02
UK	1.06	1.04	0.97	0.98	1.12	1.16	1.11	1.13	1.11	1.16	1.10	1.12	-0.02	0.12	-0.01
Other OECD Europe	0.52	0.45	0.50	0.56	0.51	0.48	0.51	0.54	0.51	0.47	0.50	0.53	0.01	0.00	-0.01
Total OECD Europe	**3.66**	**3.49**	**3.36**	**3.41**	**3.65**	**3.60**	**3.46**	**3.57**	**3.62**	**3.57**	**3.42**	**3.53**	**-0.04**	**0.09**	**-0.04**
Azerbaijan	0.77	0.79	0.77	0.80	0.75	0.76	0.77	0.77	0.75	0.75	0.76	0.76	-0.05	-0.02	-0.01
Kazakhstan	1.83	1.84	1.82	1.85	1.95	1.95	1.94	2.02	2.03	2.02	2.01	2.11	0.17	0.13	0.08
Russia	11.09	10.96	10.92	10.96	11.09	11.00	10.95	11.01	11.13	11.08	11.05	11.13	0.02	0.03	0.08
Other FSU	0.55	0.60	0.44	0.49	0.59	0.60	0.55	0.58	0.58	0.63	0.63	0.66	0.04	0.06	0.05
Total FSU	**14.24**	**14.18**	**13.94**	**14.10**	**14.39**	**14.31**	**14.20**	**14.38**	**14.50**	**14.48**	**14.44**	**14.67**	**0.18**	**0.21**	**0.20**
Non-OPEC Africa	**1.68**	**1.69**	**1.72**	**1.74**	**1.79**	**1.81**	**1.82**	**1.78**	**1.79**	**1.84**	**1.89**	**1.83**	**0.09**	**0.09**	**0.04**
Non-OPEC Mideast	**1.24**	**1.25**	**1.25**	**1.26**	**1.33**	**1.31**	**1.34**	**1.32**	**1.34**	**1.34**	**1.40**	**1.37**	**0.00**	**0.08**	**0.04**
China	3.91	3.91	3.83	3.84	3.85	3.80	3.81	3.79	3.78	3.77	3.76	3.76	-0.11	-0.06	-0.05
India	0.87	0.86	0.86	0.83	0.86	0.89	0.90	0.89	0.89	0.90	0.92	0.93	0.01	0.03	0.03
Malaysia	0.71	0.69	0.69	0.67	0.68	0.69	0.69	0.67	0.67	0.69	0.70	0.67	-0.01	-0.01	0.00
Thailand	0.44	0.43	0.43	0.40	0.42	0.43	0.42	0.43	0.41	0.43	0.42	0.42	-0.03	0.00	-0.01
Other Non-OPEC Asia	1.78	1.74	1.75	1.71	1.73	1.58	1.68	1.67	1.69	1.68	1.67	1.67	-0.15	-0.08	0.01
Total Non-OPEC APAC	**7.70**	**7.62**	**7.56**	**7.45**	**7.54**	**7.39**	**7.49**	**7.45**	**7.44**	**7.46**	**7.47**	**7.44**	**-0.29**	**-0.12**	**-0.01**
Processing Gains	**2.27**	**2.46**	**2.27**	**2.26**	**2.29**	**2.39**	**2.39**	**2.45**	**2.33**	**2.46**	**2.47**	**2.53**	**0.04**	**0.07**	**0.07**
Global Biofuels	**1.93**	**2.49**	**2.82**	**2.35**	**2.09**	**2.48**	**2.74**	**2.49**	**2.11**	**2.54**	**2.81**	**2.57**	**0.05**	**0.05**	**0.06**
Total Non-OPEC Supply	**57.20**	**57.47**	**57.61**	**58.15**	**59.06**	**59.57**	**60.18**	**60.82**	**60.69**	**61.37**	**62.16**	**62.73**	**0.83**	**2.30**	**1.83**
Global Supply	**96.51**	**96.97**	**97.75**	**97.73**	**98.32**	**98.67**	**99.29**	**99.54**	**99.40**	**100.15**	**101.17**	**101.29**	**0.71**	**1.71**	**1.55**

OPEC Supply	2017				2018				2019						
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	YoY'17	YoY'18	YoY'19
Algeria	1.07	1.10	1.05	1.09	1.11	1.10	1.05	1.09	1.08	1.11	1.07	1.11	-0.03	0.02	0.00
Angola	1.63	1.69	1.66	1.65	1.58	1.62	1.64	1.63	1.61	1.67	1.67	1.68	-0.10	-0.04	0.04
Ecuador	0.56	0.51	0.55	0.55	0.53	0.53	0.54	0.54	0.55	0.51	0.53	0.54	0.00	0.00	0.00
Equatorial Guinea	0.13	0.11	0.13	0.12	0.12	0.11	0.13	0.11	0.13	0.11	0.12	0.11	-0.03	-0.01	0.00
Gabon	0.20	0.21	0.21	0.21	0.13	0.18	0.20	0.20	0.17	0.18	0.18	0.18	-0.02	-0.03	0.00
Iran	3.82	3.72	3.84	3.77	3.69	3.76	3.76	3.75	3.77	3.67	3.77	3.71	0.22	-0.05	-0.01
Iraq	4.55	4.57	4.56	4.49	4.51	4.55	4.59	4.52	4.59	4.62	4.63	4.54	0.10	0.00	0.05
Kuwait*	2.75	2.76	2.66	2.81	2.85	2.83	2.67	2.82	2.80	2.81	2.72	2.87	-0.13	0.05	0.01
Libya	0.67	0.70	0.96	1.07	1.06	0.96	0.92	0.89	0.96	0.94	0.93	0.91	0.47	0.11	-0.02
Nigeria	1.35	1.45	1.69	1.57	1.71	1.56	1.64	1.56	1.44	1.54	1.67	1.56	0.06	0.10	-0.06
Qatar	0.63	0.61	0.58	0.60	0.63	0.69	0.62	0.64	0.67	0.65	0.63	0.66	-0.03	0.04	0.01
Saudi Arabia*	9.86	10.03	10.09	10.02	9.85	10.01	10.18	10.01	9.99	10.14	10.20	10.13	-0.44	0.01	0.10
UAE	3.01	2.98	3.08	2.95	2.98	2.93	3.07	2.94	3.05	3.02	3.12	2.95	0.07	-0.03	0.05
Venezuela	2.24	2.18	2.10	1.80	1.69	1.50	1.40	1.30	1.20	1.10	1.00	0.95	-0.31	-0.61	-0.41
OPEC Crude Total	**32.47**	**32.61**	**33.14**	**32.69**	**32.45**	**32.33**	**32.42**	**32.02**	**32.01**	**32.07**	**32.25**	**31.89**	**-0.17**	**-0.42**	**-0.25**
OPEC Other Liquids	**6.84**	**6.89**	**7.00**	**6.89**	**6.81**	**6.78**	**6.70**	**6.70**	**6.70**	**6.72**	**6.76**	**6.67**	**0.06**	**-0.16**	**-0.03**
* Includes Neutral Zone															

Source: RBC Capital Markets, Petro-Logistics SA, IEA, EIA, JODI, company and government sources

Required disclosures

Conflicts disclosures

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