COMPARATIVE ANALYSIS OF MONTHLY REPORTS ON THE OIL MARKET

SUMMARY FINDINGS FROM A COMPARISON OF DATA AND FORECASTS ON THE OIL MARKET BY THE INTERNATIONAL ENERGY AGENCY (IEA) AND ORGANIZATION OF THE PETROLEUM EXPORTING COUNTRIES (OPEC).

FEATUREING A COMPARATIVE ANALYSIS OF OIL INVENTORY DATA REPORTED BY JODI, THE IEA, OPEC AND SECONDARY SOURCES IN COLLABORATION WITH THE RAPIDAN ENERGY GROUP.

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1. NOTE BY THE SECRETARY GENERAL

The IEF conducts a comprehensive comparative analysis of the short-, medium-, and long-term energy outlooks of the IEA and OPEC, to inform the IEA-IEF-OPEC Symposium on Energy Outlooks that the IEF hosts in Riyadh as part of the trilateral work programme on a yearly basis.

To inform IEF stakeholders on how perspectives on the oil market of both organisations evolve over time more regularly, this monthly summary provides:

- Key findings and a snapshot overview of data points gained from comparing basic historical data and short-term forecasts of the IEA Oil Market Report and the OPEC Monthly Oil Market Report
- Features a comparative analysis of oil inventory data reported by JODI, the IEA, OPEC, and secondary sources in collaboration with the Rapidan Energy Group

Moreover, international developments this month that will have an impact oil market balances are as follows:

**OPEC/Non-OPEC Production Cuts**
- OPEC member countries and non-OPEC producers agreed to cut supply by 1.2 mb/d from 1 January for six months based on October 2018 levels.

**Canada Production Cuts**
- The province of Alberta announced that it would institute temporary production cuts starting in January to alleviate selling oil at unprecedented discounts.

**Saudi Arabia/UAE Production**
- Record high production from the UAE and Saudi Arabia in November raised OPEC crude output.

**OPEC Membership**
- Qatar, a member of OPEC since 1961, decided to leave the organization placing greater emphasis on natural gas production.

I trust this month’s analysis helps to sharpen focus on evolving short-term market perspectives.

Dr Sun Xiansheng
Secretary General
International Energy Forum
2. KEY POINTS

2.1 DEMAND

- The IEA revised its world demand growth rate down slightly, while OPEC's growth figures remained static for the first time this year. The IEA revised down its growth figure by 40 kb/d while OPEC growth stays the same as last month's assessment leading to a 230 kb/d difference in growth between the two organisations. The IEA's world demand growth projection amounts to 1.27 mb/d in 2018. OPEC's demand growth stays constant at 1.50 mb/d. The IEA and OPEC estimates for absolute world demand for December are 99.15 mb/d and 98.79 mb/d, respectively.

- The IEA's demand growth forecast for Non-OECD countries dips further in December and is at its lowest point this year while OPEC demand growth assessments remain the same. The decline is attributable to the IEA's revision in Non-OECD Middle East demand growth to -0.12 mb/d that compares to -0.08 mb/d last month. This has brought the IEA's Non-OECD growth assessment for December down to 0.89 mb/d. OPEC's Non-OECD demand growth projection remains the same at 1.06 mb/d. The IEA reports OECD growth at 0.38 mb/d up by 20 kb/d. OPEC's OECD demand growth projection stays the same at 0.44 mb/d. The IEA and OPEC now differ in their assessments on OECD demand growth by 60 kb/d.

2.2 SUPPLY

- The IEA and OPEC's Non-OPEC supply growth reaches its highest level in 2018. The IEA's December assessment for Non-OPEC growth is up by 100 kb/d for a total growth of 2.45 mb/d. OPEC's assessment for Non-OPEC growth is not far off and up by 190 kb/d for a total growth of 2.50 mb/d. In absolute values OPEC and the IEA estimate non-OPEC supply at 60.03 mb/d and 60.41 mb/d respectively.

- OPEC reports the highest monthly increase in Non-OECD supply growth. OPEC’s revised growth of 0.18 mb/d for December is up by 110 kb/d from the month before. This makes it the highest monthly increase in Non-OECD supply growth this year largely due to growth in Russia. The IEA growth figure stayed relatively stable increasing by 20 kb/d to reach 0.10 mb/d. The difference between the IEA and OPEC Non-OECD supply growth narrowed to 0.08 mb/d in December.

2.3 STOCKS

- The IEA and OPEC continue to report strong alignment on stock figures. The IEA reports 2872 mb in OECD stock that is 11 mb above the five-year average. OPEC’s assessment is not far off with 2883 mb in OECD stock that is 22 mb above the five-year average. The divergence between OPEC and the IEA stands at 11 mb for December. Total US crude inventories (excluding SPR) in December amount to about 441 mb according to the US Energy Information Administration (EIA). EIA reports U.S. crude oil inventories are about 7 percent above the five-year average for this time of year. OPEC reports US stock above the five-year average by about 23 mb based on September data.
### 2.4 SNAPSHOT (mb/d)

<table>
<thead>
<tr>
<th>Demand</th>
<th>IEA</th>
<th>Growth</th>
<th>Δ m/m</th>
<th>Non-OECD</th>
<th>Growth</th>
<th>Δ m/m</th>
<th>World</th>
<th>Growth</th>
<th>Δ m/m</th>
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<td>51.36</td>
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<td>Difference</td>
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<td>0.06</td>
<td>0.02</td>
<td>0.44</td>
<td>0.17</td>
<td>0.05</td>
<td>0.36</td>
<td>0.23</td>
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<tr>
<th>Supply</th>
<th>IEA</th>
<th>Growth</th>
<th>Δ m/m</th>
<th>Non-OECD</th>
<th>Growth</th>
<th>Δ m/m</th>
<th>NOPEC</th>
<th>Growth</th>
<th>Δ m/m</th>
<th>OPEC</th>
<th>Growth</th>
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<td>0.05</td>
<td>0.09</td>
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<td>0.01</td>
<td>0.08</td>
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<table>
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<tr>
<th>Stocks (mb)</th>
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<th>OPEC</th>
<th>US</th>
<th>OECD to 5-Year Average</th>
<th>US to 5-Year Average</th>
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<td>-</td>
<td>ff mb</td>
<td>-</td>
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</tr>
<tr>
<td>OPEC</td>
<td>2883</td>
<td>443</td>
<td>22 mb</td>
<td>23 mb</td>
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<tr>
<td>EIA</td>
<td>441</td>
<td>-</td>
<td>7% above</td>
<td>-</td>
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Data obtained from IEA Oil Market Report, 13 December 2018; OPEC Monthly Oil Market Report, 12 December 2018 and Energy Information Administration, Weekly Petroleum Status Report, 28 December 2018

*Totals in table may not exactly reflect content due to independent rounding.
3. GLOBAL ANALYSIS

According to the IEA, global economic growth is projected at 3.7% in 2018 and 3.5% in 2019. The decrease for 2019 is due to uncertainty about trade tensions and the impact of tighter monetary policies to investment. These concerns have been consistent over the past several months. OPEC reports the same growth for 2018 and 2019 and cites ongoing trade tensions, monetary tightening, and geopolitical challenges as reasons for limited upside in global growth.

3.1 DEMAND DATA

Absolute Demand

The IEA's estimate for global demand growth in December is 1.27 mb/d down by 40 kb/d from 1.31 mb/d in last month's report for an absolute demand of 99.15 mb/d in 2018. The outlook for global oil demand growth is largely unchanged since last month's report, at 1.3 mb/d in 2018 and 1.4 mb/d in 2019. Although oil prices have dropped, the impact may be offset by lower economic growth projections for countries such as Turkey and Venezuela.

OPEC's global demand outlook remains the same at 1.50 mb/d. OECD Americas and Other Asia which includes India, Indonesia, Singapore and Thailand are expected to lead demand growth in OECD and Non-OECD regions respectively. OPEC projects total global consumption at 98.79 mb/d for December unchanged from last month's report. OPEC-IEA divergence in overall world demand stands at 0.36 mb/d down from 0.40 mb/d in November.

OECD Demand

The IEA continues to see robust OECD oil demand growth at 0.38 mb/d, up slightly from last month’s figure of 0.36, anticipating total OECD consumption for 2018 at 47.80 mb/d. OPEC growth projection for the OECD region remains unchanged at 0.44 mb/d. OPEC total OECD demand is 47.86 mb/d, the same as last month. The divergence of OECD oil demand growth between the IEA and OPEC now stands at 0.06 mb/d. The IEA reports a 0.04 mb/d upward revision in OECD Americas demand growth from 0.44 mb/d in last month’s report to 0.48 mb/d, while OPEC’s estimate remains unchanged at 0.40 mb/d. OECD Europe demand growth moves slightly upwards at 0 mb/d from -0.01 mb/d according to IEA data. OPEC’s OECD Europe growth figure is also unchanged at 0.05 mb/d. The IEA’s and OPEC’s assessments for demand growth and absolute demand each differ by only 0.06 mb/d.

Non-OECD Demand

Both, the IEA and OPEC anticipate continued growth in non-OECD demand for this year at 0.89 mb/d and 1.06 mb/d respectively, with total non-OECD demand forecasts averaging 51.36 mb/d and 50.92 mb/d respectively. The IEA’s and OPEC’s assessments for 2018 non-OECD demand growth and absolute demand now differs by 0.17 mb/d and 0.44 mb/d, respectively.

According to the IEA, Chinese demand increased strongly in 3Q18 by 840 kb/d year-on-year (y-o-y) with the trend continuing in October with an estimated growth of 700 kb/d. Declining diesel demand due to stronger environmental policies is offset by strong kerosene demand from a booming aviation sector and an increase in gasoline demand. However declining car sales due to a government crackdown on peer-to-peer lending and increasing popularity of car-sharing services may affect future demand. Overall, the IEA estimates total oil demand growth in China to be 0.50 kb/d in 2018, followed by a slower growth rate of 0.45 mb/d in 2019. OPEC’s reports a similar increase in gasoline demand and cites the same decline in car sales. The organisation points to China’s growing petrochemical and refining expansions as the basis for upside potential, however. For 2018, OPEC expects China’s oil
Indian demand growth fell in 3Q18 according to the IEA due to high oil prices and a falling currency. More recently, lower oil prices have partly made up for some of the declines. Like China, India’s rising aviation sector has offset the decreasing demand for domestic kerosene. Overall, the IEA estimates demand growth for 2018 at 0.24 mb/d to reach overall consumption of 4.83 mb/d in 2018. Although the government is encouraging the replacement of kerosene in the residential sector, a booming aviation industry is keeping demand at stable levels. Meanwhile, OPEC’s Indian demand growth assessment also remains unchanged at 0.22 mb/d for total consumption to reach 4.75 mb/d in 2018. Demand for main products remains strong due to rising road construction and residential expansions. Projections for non-OECD Asia, as a whole, show growth at 0.83 mb/d according to OPEC and 0.88 mb/d according to the IEA.

See the following graph for the monthly revisions of IEA and OPEC annual estimates for 2017 and new estimates for 2018 demand.

### 3.2 SUPPLY DATA

#### Non-OPEC Supply

OPEC’s December assessment of total non-OPEC supply for 2018 stands at 60.03 mb/d. Supply growth has been revised up by 0.19 mb/d to 2.50 mb/d driven by expected growth in the US (2.19 mb/d), Canada (0.30 mb/d) and Russia (0.16 mb/d). Growing output from these countries is offset by declining production from Mexico (-0.14 mb/d), Norway (-0.11 mb/d) and Vietnam (-0.03 mb/d). US tight crude for 2018 is forecast to grow by 1.48 mb/d y-o-y to average 6.19 mb/d unchanged from last month’s assessment. Tight crude production growth from the Permian Basin is expected to reach 0.90 mb/d y-o-y for a total output averaging 2.81 mb/d. The Permian’s share of US tight crude growth in 2018 is around 61 percent.

The IEA forecasts 2018 non-OPEC supply at 60.41 mb/d with a y-o-y growth of 2.45 mb/d and the US as the catalyst for non-OPEC supply growth at 2.12 mb/d. The assessment has been revised upwards by 100 kb/d for December 2018, but is reduced in 2019 by 415 kb/d to account for the OPEC and Non-
OPEC production cut of 1.2 mb/d agreed in December. Supply growth in 2019 is expected to be 1.53 mb/d. This also takes into account production cuts from Canada, namely from the province of Alberta, which adjusted production by 325 kb/d to balance rising inventories and lack of evacuation capacity. Although the US shale sector generated free cash flow in 2018 for the first time ever, and OPEC Non-OPEC production cuts are likely to further bolster US supply, the IEA reports that infrastructure constraints will limit US supply growth in 2019 to 1.3 mb/d compared to 2.1 mb/d in 2018.

**OECD Supply**

OPEC and the IEA both forecast OECD growth at **2.29 mb/d** and **2.22 mb/d** with total supply reaching **28.00 mb/d** and **26.42 mb/d** respectively. The IEA's data shows OECD Americas liquids supply growth at 2.31 mb/d to reach 22.63 mb/d in total supply, while OPEC reports similar growth at 2.30 mb/d with total liquids supply reaching 23.80 mb/d in 2018. Growth within the region is led by the US for which OPEC revised its liquid supply forecast up to 2.13 mb/d to reach 16.54 mb/d in total while the IEA projects similar US growth by 2.14 mb/d to amount to 15.41 mb/d in total. OPEC reports a slight decline in OECD Europe supply growth at -0.04 mb/d for total production of 3.79 mb/d in 2018. The IEA's assessment for OECD Europe supply remains unchanged at 3.38 mb/d for a decline in yearly growth of -0.11 mb/d. For 2019, both the IEA and OPEC see the UK as the primary driver of OECD Europe supply with growth figures of 0.05 mb/d and 0.10 mb/d respectively.

**OPEC Supply**

OPEC reports total OPEC-15 preliminary crude oil production averaged **32.97 mb/d** in November 2018 according to secondary sources. This is a decrease of 11 kb/d over the previous month. Crude oil output increased mostly in Saudi Arabia, UAE and Kuwait, while production declined in Iran, Venezuela, Nigeria and Iraq. The IEA reports that historic high production from the UAE and Saudi Arabia in November raised OPEC crude output by 100 kb/d month-on-month to **33.03 mb/d**, more than compensating for production losses from Iran.

See the graph below for the monthly revisions of IEA and OPEC annual estimates for 2017 and new estimates for 2018 supply, and the tables for annual estimates for total supply.

IEA and OPEC supply see rising Non-OPEC supply growth

IEA and OPEC continue to see strong convergence on OECD/Non-OECD growth
3.3 STOCK DATA

OECD commercial stocks rose for the fourth straight month in October 2018, by 5.7 mb, to reach 2872 mb based on IEA data. Inventories were just 11 mb above the average at the end of October. According to OPEC, preliminary data for October showed that total OECD commercial oil stocks rose by 7.6 mb month-on-month to reach 2,883 mb and are 22 mb above the latest five-year average. Stocks have risen above the five-year average for the first time since February this year. While both organizations report closely aligned data on OECD stocks due to a continuous and reliable data stream and data harmonization efforts, comprehensive data on stock developments for non-OECD countries is still work in progress.

See the graphs below for monthly estimates of OECD total commercial oil stocks for 2017 and 2018.

IEA and OPEC data shows convergence on OECD stock draws
Comprehensive non-OECD stock data remains missing

IEA and OPEC report closely aligned OECD stock balances
Surplus stocks data rises to 11 mb and 22 mb

*monthly estimates rounded to the nearest barrel.
OECD and JODI non-OECD crude and product inventory data show a net 18.0 mb build in October

- The IEA's data shows OECD commercial inventories rose in October for the fourth consecutive month, by 5.7 mb to 2,872 mb. OPEC estimates total OECD commercial stocks built 7.6 mb in October to 2,883 mb. Both agencies now estimate that OECD stocks are back above the five-year average.

- JODI non-OECD* data for October imply crude stocks built by 6.5 mb and product stocks built by 10.7 mb. The largest crude build occurred in Angola (6.1 mb) and the largest product build occurred in Nigeria (4.0 mb).

- Together, the IEA's OECD commercial and SPR inventory data and JODI's non-OECD* data imply global crude and product stocks built by 18.0 mb in October. The data also implies inventories have increased by a net 20.9 mb between January and September.

- It is difficult to reconcile the differences in the IEA and OPEC’s global balances and inventory estimates due to incomplete and opaque data. While available data suggests global inventories built by 20.9 mb between 1Q18 and 3Q18, IEA’s balance implies inventories rose by a significant 179.0 mb while OPEC data implies a modest 3.8 mb build only. While data transparency efforts have progressed in recent years, some data in key regions remain opaque and unreliable. IEA’s Oil Market Report noted that Chinese custom data as well as estimates for crude production and refinery throughput imply a significant crude stock build of 20 mb during October. However, statistics from China Oil, Gas and Petrochemicals have not been published since May and Chinese data was not published in JODI for October or September.

* Non-OECD data is the aggregate of country-level data through JODI. Not all non-OECD countries report inventory data and the countries in the aggregate may vary monthly depending on regularity of individual country reporting.

### Global Inventory Changes

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<tr>
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<th>October 2018</th>
<th>3Q18</th>
<th>1Q18-3Q18</th>
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<tbody>
<tr>
<td></td>
<td>Crude (mb)</td>
<td>Products</td>
<td>Total (mb)</td>
</tr>
<tr>
<td>OECD Commercial (IEA)</td>
<td>46.4</td>
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<tr>
<td>OECD SPR (IEA)</td>
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<tr>
<td>Available JODI Non-OECD Data*</td>
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<tr>
<td>Total</td>
<td>48.0</td>
<td>-30.0</td>
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</tr>
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</table>

**IEA's Implied Global Supply Surplus**

- - - - - 117.9 - - 179.0

**OPEC's Implied Global Supply Surplus**

- - - - - 11.0 - - 3.8

*Aggregate of all non-OECD data available through JODI. Not all non-OECD countries report inventory data and the countries in the aggregate may vary monthly depending on regularity of individual country reporting.

Source: IEA, JODI, OPEC, Platts, Rapidan Energy Group
COMPARATIVE ANALYSIS OF MONTHLY REPORTS ON THE OIL MARKET | RIYADH, SAUDI ARABIA | DECEMBER 2018

MONTHLY CHANGE IN OECD AND NON-OECD* CRUDE + PRODUCT INVENTORIES

ACCUMULATIVE OECD AND NON-OECD* CRUDE + PRODUCT BUILDS SINCE END-2014

* Aggregate of all non-OECD data available through JODI. Not all non-OECD countries report inventory data and the countries in the aggregate may vary monthly depending on the regularity of individual country reporting.

Source: IEA, JODI, Rapidan Energy Group