



April 8, 2020

VIA EMAIL

Chairman Wayne Christian
Commissioner Christi Craddick
Commissioner Ryan Sitton
Railroad Commission of Texas
1701 North Congress Avenue
Austin, Texas 78711
RRCconference@rrc.texas.gov

Re: **Oil & Gas Docket No. OG-20-00003167** - To Consider the Motion for Commission Called Hearing on the Verified Complaint of Pioneer Natural Resources U.S.A. Inc. and Parsley Energy Inc. to Determine Reasonable Market Demand for Oil in the State of Texas

Dear Chairman Christian, Commissioner Craddick, and Commissioner Sitton,

I am the founder and president of Rapidan Energy Group, an independent energy consulting and market advisory firm based near Washington, DC, in Bethesda, Maryland. From 2001 to 2003, I served on the National Economic Council as Senior Assistant to the President and on the National Security Council, where I was Senior Director for International Energy. I am the author of *Crude Volatility: The History and the Future of Boom-Bust Oil Prices* (Columbia University Press 2017), an economic and historical review of oil market volatility with an emphasis on supply control.

I write in response to the Railroad Commission's notice dated April 2, 2020, regarding the above-referenced matter, in which the Commission invited members of the public to submit comments in advance of the Commission's meeting scheduled for April 14, 2020. I transmit with this letter a March 29, 2020 Rapidan Energy Group report on the global oil balance, together with an April 2, 2020 paper on the current oil market volatility that I authored for Columbia University's Center on Global Energy Policy, where I am a non-resident fellow. I submit these materials in the interest of contributing research and analysis of global oil market fundamentals and prices on behalf of myself and not for any client or other company.

I also wish to emphasize that neither my firm nor I take a position on the appropriateness of prorationing or any other regulation pertaining to oil and gas in the State of Texas.

If it would be helpful to the Commission, I would be pleased to testify at the April 14 meeting regarding the current state of the global oil market.

Sincerely,

Robert McNally



RAPIDAN
ENERGY GROUP

Rapidan's Short-Term Oil Balance Update

With Comparisons to EIA, IEA, and OPEC's Latest Outlooks

March 29, 2020



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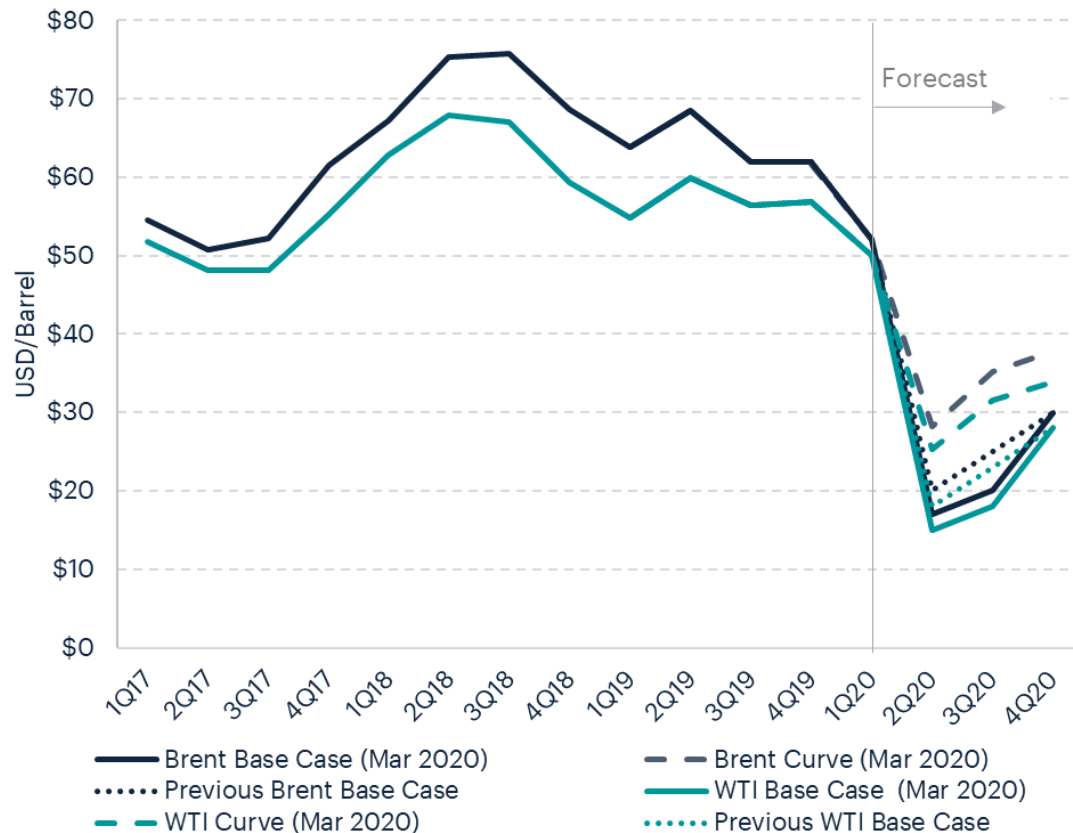
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- Our core view remains unchanged from our [first post-OPEC+ meeting client report](#) released at noon EST on March 6 (when Brent was still above \$45): **There is no floor in sight under crude prices due to the combination of a massive negative demand shock and unraveling producer supply restraint.** Moscow and Riyadh remain dug in, and even if they weren't, it is too late to avoid epic 2Q20 inventory builds. Crude prices are headed to the single digits (on a daily basis) as global supply surpluses test storage capacity in the coming months (if not weeks).
 - We now see 2Q20 demand imploding by 16 mb/d y/y. With OPEC+ ramping up production by 3.4 mb/d between 1Q20 and 2Q20, the combination will unleash the mother of all oil tsunamis - a quarterly surplus exceeding 20 mb/d.
 - Global stocks will build by a net ~2.5 billion bbls this year, approaching our estimated remaining global capacity of ~3.0 billion bbls (~1.5 bn bbls available for crude and ~1.5 bn bbls for products). Shut-ins have begun in Canada and elsewhere but are not nearly fast enough to prevent swelling inventories.
 - Brent averages \$17 in 2Q20 (down \$3 from our previous forecast) as ~20 mb/d of unwanted crude and products pour into shrinking storage capacity in tanks, ships, and pipelines.
- **An epic crude tsunami that will swamp storage and hammer oil prices is unavoidable, but we expect OPEC+ to reconvene by 2H20 and start to clean up the overhang.**
 - Both Riyadh and Moscow remain dug in and determined to maximize production and push barrels into a rapidly shrinking market. Despite boiling anger in US oil states, Riyadh won't blink until Moscow returns to the table and contributes substantial cuts.
 - We assess Saudi Arabia and UAE will come close to pushing their promised 12.3 and 4.0 mb/d, respectively, into the market in April, though distributing the barrels could be tempered by the unusually fast drop in refinery demand for crude, soaring costs for scarce tankers, and choked logistics and storage.
 - President Putin did not expect crude prices to plunge and stay below \$30 and is beginning to wince. However, Russia is unwilling to change course. We continue to expect sub-\$20 prices and a lingering bleak macro picture will convince Moscow to resume OPEC+ negotiations - eventually. Our base case assumes OPEC+ will return to its previous quotas and implement an additional 1.5 mb/d of cuts by July.

- **Demand outlook keeps getting bleaker: We slashed our 2020 global demand growth forecast by 4.7 mb/d, primarily on updated coronavirus-related impacts, and now see it contracting by 7.1 mb/d y/y.** Demand falls ~16.4 mb/d y/y in 2Q20, with the biggest impacts in the US, Europe, and India.
 - April is the worst month, with global demand collapsing by a mammoth 22 mb/d y/y. US and OECD Europe are down by 12 mb/d as social distancing peaks, with a ~70% decline in flights, 45% decline in gasoline demand, 35% decline in diesel, and a 20% decline in other products.
 - US demand falls by 5.2 mb/d in 2Q20 (2.1 mb/d for the year) as travel and trade plummet. As of March 28th, 26 states were under state-wide stay-at-home orders. These states account for 53% (~4.9 mb/d) of US gasoline demand.
- **US shale production falls by ~1.1 mb/d from Dec '19 to Dec '20. Output will decline slowly in 1H20 before falling more steeply (0.1-0.2 mb/d per month) beginning in June.**
 - Most companies are locked into service contracts or pipeline commitments, so drilling activity won't slow meaningfully for a couple of months.
 - We currently assume a 40% y/y drop in well completions in 2H20, with risk skewed toward a deeper drop and a steeper production decline.
- **Important bearish crude price risk: Aggressive Chinese stock building has helped tighten the market in recent years, but the pace could slow as Beijing worries about forex balances and upcoming foreign debt repayments.**
 - China will prioritize servicing the ~\$2.0 trillion of short-term external debt that is due in 2020. Beijing still views energy security as a top priority, but the pace of crude builds may slow (despite lower prices) as foreign currency outlays will be carefully monitored by the State Administration of Foreign Exchange regulator.
- **Despite a modest supply deficit in 4Q20, Brent only recovers to average \$30 due to the massive inventory overhang, relatively small OPEC+ cuts, and residual economic sluggishness.**
 - Global demand growth remains negative at -1.7 mb/d in 4Q20 as the global economy struggles to recover after a summer peak of COVID-19.
 - But the global balance returns to a supply deficit as non-OPEC production declines by 2.6 mb/d y/y (mainly US shale and high opex producers such as Canada, Brazil shallow-water, and China) and OPEC+ restrains production.

- We revised 2Q20 and 3Q20 Brent prices lower by \$3 and \$5, respectively, to \$17 and \$20.
- Our much-looser balance implies many more physical crude grades (particularly landlocked ones) will flip to negative prices and force shut-ins as storage fills.
- Brent averages \$17 in 2Q20 (daily/weekly prints in the single digits) as global stocks swell by 20 mb/d, straining storage capacity limits.
- By late-2Q20, sub-\$20 crude should force Moscow back to the negotiating table. Prices begin to rise in 3Q20 on an OPEC+ deal, COVID-19 peak, and declining US shale.
- Risk to our forecast is bi-directional:
 - Upside: an earlier OPEC+ deal; prorationing of US production or import restrictions (bullish WTI, bearish Brent); a prolonged production outage in Libya that extends past 2Q20; Iran resumes targeting Gulf oil infrastructure.
 - Downside: coronavirus fails to peak by 3Q20 (or multi-wave outbreaks); US-Iran deal results in return of 0.5-1.0 mb/d of Iranian production in 2020; China slows stockbuilding due to forex balance concerns; Russia refuses to rejoin OPEC+.

Rapidan Energy Group's Brent and WTI Crude Price Forecasts



Rapidan Energy Group's Brent and WTI-Cushing Price Forecast						
	1Q20	2Q20	3Q20	4Q20	2019	2020
Brent	\$52	\$17	\$20	\$30	\$64	\$30
WTI	\$50	\$15	\$18	\$28	\$57	\$28
Brent-WTI	\$2	\$2	\$2	\$2	\$7	\$2

Source: Bloomberg, Rapidan Energy Group

Our Updated Global Oil Balance

March 29th update

(1) The global supply surplus surges by 20.1 mb/d in 2Q20 as daily Brent prices fall into the single digits. The annual surplus of 2.5 billion bbls will test global storage capacity (we estimate ~3.0 bn bbls is currently available, of which only 1.0 bn is for commercial crude).

(2) Global demand declines by 7.1 mb/d y/y due to coronavirus-related demand destruction and its economic ramifications. 2Q20 demand falls to a 16-year low. At the peak, demand collapses by ~22 mb/d y/y in April.

(3) Single digit crude prices force Russia back to the table in late-2Q20. Our forecast shows OPEC+ returning to previous quotas in 3Q20 and enacting 1.5 mb/d of additional cuts (i.e. OPEC's March 5th [proposal](#)).

(4) US shale production is crushed by single digit WTI prints and falls 1.1 mb/d between Dec '19 and Dec '20 – posting its first y/y decline since 2016.

Rapidan Energy Group's Oil Balance	2019				2020				Average		Y/Y Growth	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	2019	2020	2019	2020
Consumption (mb/d)												
OECD	47.6	46.9	48.1	47.7	43.9	36.8	46.3	46.6	47.6	43.4	-0.3	-4.2
United States	20.3	20.3	20.7	20.6	18.5	15.1	19.6	20.1	20.5	18.3	0.0	-2.1
Japan	4.1	3.4	3.4	3.8	3.8	3.1	3.4	3.5	3.7	3.5	-0.1	-0.2
Canada	2.5	2.4	2.6	2.5	2.3	2.0	2.5	2.5	2.5	2.3	0.1	-0.2
Mexico	1.9	1.9	1.9	1.9	1.9	1.6	1.9	1.9	1.9	1.8	0.0	-0.1
Other OECD	18.9	18.8	19.4	19.0	17.3	15.0	18.9	18.6	19.0	17.4	-0.2	-1.6
Non-OECD	51.5	52.3	52.6	53.2	48.1	46.0	51.3	52.6	52.4	49.5	1.1	-2.9
China	13.0	13.6	13.6	13.7	11.3	11.9	13.2	13.7	13.5	12.5	0.5	-1.0
India	5.1	5.1	4.8	5.0	4.7	3.7	4.6	5.0	5.0	4.5	0.1	-0.5
Brazil	3.0	3.0	3.2	3.2	3.0	2.7	3.1	3.1	3.1	3.0	0.1	-0.1
Russia	3.4	3.5	3.7	3.6	3.3	3.2	3.6	3.5	3.6	3.4	0.1	-0.2
Other Non-OECD	26.9	27.1	27.4	27.7	25.8	24.6	26.8	27.3	27.2	26.1	0.3	-1.1
Total World Consumption	99.1	99.2	100.6	100.9	92.0	82.8	97.6	99.2	100.0	92.9	0.8	-7.1
Supply (mb/d)												
OECD	31.0	31.2	31.4	32.7	32.9	31.9	31.2	31.1	31.6	31.8	1.6	0.2
U.S. Total Liquids	18.9	19.4	19.5	20.3	20.1	20.0	19.4	19.1	19.5	19.7	1.6	0.2
Crude	11.8	12.1	12.2	12.8	12.7	12.5	12.0	11.8	12.2	12.2	1.2	0.0
Lower 48	9.5	9.7	10.0	10.3	10.3	10.0	9.6	9.3	9.9	9.8	1.1	-0.1
GOM	1.8	1.9	1.8	1.9	1.9	2.0	1.9	1.9	1.9	2.0	0.1	0.1
Alaska	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.0	0.0
NGLs	4.7	4.8	4.8	5.0	4.9	4.8	4.8	4.8	4.8	4.8	0.4	0.0
Other US Liquids	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.5	2.6	-0.1	0.1
Mexico	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	-0.1	0.0
Canada	5.6	5.6	5.6	5.8	5.9	5.1	5.0	5.0	5.7	5.2	0.2	-0.4
Other OECD	4.5	4.3	4.3	4.7	4.9	4.8	4.8	5.0	4.5	4.9	0.0	0.4
Non-OECD	33.0	33.2	33.8	33.7	33.2	33.7	33.3	32.7	33.4	33.2	0.5	-0.2
Brazil	2.9	3.4	4.0	3.9	3.4	3.8	4.1	3.7	3.6	3.8	0.2	0.2
China	4.3	4.3	4.3	4.3	4.3	4.3	4.2	4.2	4.3	4.3	0.1	0.0
Russia	11.7	11.5	11.6	11.6	11.6	11.8	11.3	11.3	11.6	11.5	0.1	-0.1
Other Non-OECD	14.1	14.0	13.9	13.9	13.9	13.8	13.6	13.4	14.0	13.7	0.1	-0.3
Non-OPEC Supply	64.0	64.5	65.2	66.4	66.1	65.6	64.5	63.8	65.0	65.0	2.1	0.0
OPEC	36.2	35.6	35.0	35.8	34.1	37.3	34.0	33.9	35.5	34.8	-1.9	-0.7
Crude Oil Portion	30.7	30.1	29.5	29.8	28.7	31.7	28.5	28.4	30.0	29.3	-1.8	-0.7
Other Liquids	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	0.0	0.0
Total World Supply	100.2	100.1	100.2	101.7	100.2	102.9	98.5	97.7	100.5	99.8	0.2	-0.7
Implied Surplus	1.0	0.9	-0.4	0.8	8.3	20.1	0.9	-1.5	0.6	6.9		
OECD Commercial Inventory Change	0.1	0.1	0.1	-0.5	3.0	13.1	0.3	-1.4	-0.1	3.7		
OECD SPR, Non-OECD Commercial and SPR, Oil on water	0.9	0.8	-0.5	1.3	5.3	7.0	0.6	-0.1	0.6	3.2		
of which: non-OECD SPR	0.5	0.5	0.3	0.5	0.9	1.2	0.5	0.5	0.5	0.8		
OECD SPR	0.1	-0.1	0.0	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0		
Oil on water and other non-OECD	0.4	0.4	-0.8	0.9	4.5	5.6	0.1	-0.6	0.2	2.4		
Brent Forecast	\$64	\$68	\$62	\$62	\$52	\$17	\$20	\$30	\$64	\$30		
WTI Forecast	\$55	\$60	\$56	\$57	\$50	\$15	\$18	\$28	\$57	\$28		
Brent-WTI Spread	\$9	\$9	\$5	\$4	\$2	\$2	\$2	\$2	\$7	\$2		

May not sum due to rounding
Source: Rapidan Energy Group

Revisions to Our Global Oil Balance

March 29th vs. March 19th

- We revised down our 2020 global demand growth forecast by 4.7 mb/d, primarily on coronavirus-related impacts (both direct and lingering economic effects) and particularly from stricter stay-at-home measures enacted in the US, Europe, and India.
- The surging supply surplus and scarce storage capacity will force physical crude prices into single digits or negative prices. As a result, we've revised down higher-opex non-OPEC production by an additional 1.0 mb/d (primarily Canada, Brazil, China, and N. Sea).
- Our OPEC and Russian production forecasts are 1.5 mb/d and 0.2 mb/d lower, respectively in 3Q20 due to our expectation of a late-2Q20 OPEC+ deal. This is slightly earlier than our previous expectation. The higher 2Q20 surplus will put more pressure on Russia to come to the table.
- Our 2Q20 balance is now 10.2 mb/d looser due to the COVID-19 pandemic and related government intervention in the US, Europe and India.

Revisions to our March 19th Global Oil Balance	2019				2020				Average		Y/Y Growth	
Consumption (mb/d)	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	2019	2020	2019	2020
OECD	0.0	0.0	0.0	0.2	-1.7	-5.5	-0.9	-0.4	0.1	-2.1	0.1	-2.2
United States	0.0	0.0	0.0	0.0	-1.3	-2.8	-0.8	-0.3	0.0	-1.3	0.0	-1.3
Japan	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2	0.0	-0.1	0.0	-0.1
Canada	0.0	0.0	0.0	0.0	-0.1	-0.4	0.0	0.0	0.0	-0.1	0.0	-0.1
Mexico	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
Other OECD	0.0	0.0	0.0	0.2	-0.2	-1.9	0.0	0.0	0.0	-0.6	0.0	-0.6
Non-OECD	0.0	0.0	0.1	0.1	-1.5	-5.5	-1.8	-1.2	0.1	-2.5	0.1	-2.6
China	0.0	0.1	0.0	0.1	0.1	-1.0	-0.7	-0.4	0.1	-0.5	0.1	-0.6
India	0.0	0.0	0.0	0.0	-0.5	-1.5	-0.2	-0.2	0.0	-0.6	0.0	-0.6
Brazil	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.1	-0.1	0.0	-0.2	0.0	-0.2
Russia	0.0	0.0	0.0	0.0	-0.3	-0.4	-0.2	-0.3	0.0	-0.3	0.0	-0.3
Other Non-OECD	0.0	-0.1	0.1	0.0	-0.6	-2.2	-0.5	-0.3	0.0	-0.9	0.0	-0.9
Total World Consumption	0.0	0.0	0.1	0.3	-3.1	-11.0	-2.7	-1.6	0.1	-4.6	0.1	-4.7
Supply (mb/d)												
OECD	0.0	0.0	0.0	0.0	0.0	-0.5	-0.8	-0.8	0.0	-0.5	0.0	-0.5
U.S. Total Liquids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crude	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower 48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GOM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NGLs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other US Liquids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada	0.0	0.0	0.0	0.0	0.0	-0.4	-0.6	-0.6	0.0	-0.4	0.0	-0.4
Other OECD	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	0.0	-0.1	0.0	-0.1
Non-OECD	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.7	-0.7	0.0	-0.4	0.0	-0.4
Brazil	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	0.0	-0.2	0.0	-0.2
China	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
Russia	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	-0.1	0.0	-0.1
Other Non-OECD	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.3	0.0	-0.2	0.0	-0.2
Non-OPEC Supply	0.0	0.0	0.0	0.0	-0.1	-0.8	-1.5	-1.4	0.0	-1.0	0.0	-1.0
OPEC	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.1	0.0	-0.4	0.0	-0.4
Crude Oil Portion	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.1	0.0	-0.4	0.0	-0.4
Other Liquids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total World Supply	0.0	0.0	0.0	0.0	-0.1	-0.8	-3.0	-1.6	0.0	-1.4	0.0	-1.4
Implied Surplus	0.0	0.0	-0.1	-0.3	3.1	10.2	-0.3	0.1	-0.1	3.3		
OECD Commercial Inventory Change	0.0	0.0	0.0	-0.1	1.2	7.1	-0.2	0.0	0.1	1.3		
OECD SPR, Non-OECD Commercial and SPR, Oil on water	0.0	0.0	-0.1	-0.2	1.8	3.1	-0.1	0.0	-0.2	2.0		
of which: non-OECD SPR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
OECD SPR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Oil on water and other non-OECD	0.0	0.0	-0.1	-0.2	1.8	3.1	-0.1	0.0	-0.2	2.0		
Brent Forecast	\$0	\$0	\$0	\$0	\$0	-\$3	-\$5	\$0	\$0	-\$2		
WTI Forecast	\$0	\$0	\$0	\$0	\$0	-\$3	-\$5	\$0	\$0	-\$2		
Brent-WTI Spread	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		

May not sum due to rounding
Source: Rapidan Energy Group

(1) OPEC maxes production in 2Q20. Supply to the market will likely exceed production as Saudi Arabia and UAE have said they will draw from storage. However, supply may be tempered by rapidly falling refinery demand, costly tankers and soaring inventories.

Rapidan Energy Group's OPEC Forecast	2019				2020				Average		Y/Y Growth	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	2019	2020	2019	2020
OPEC Crude Supply	30.7	30.1	29.5	29.8	28.7	31.7	28.5	28.4	30.0	29.3	-1.8	-0.7
Algeria	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0
Angola	1.4	1.4	1.3	1.4	1.4	1.4	1.3	1.3	1.4	1.3	-0.1	0.0
Congo	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0
Ecuador	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0
Equatorial Guinea	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Gabon	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Iran	2.7	2.4	2.2	2.1	2.0	2.0	2.0	2.0	2.4	2.0	-1.2	-0.4
Iraq	4.7	4.7	4.8	4.6	4.6	4.9	4.5	4.5	4.7	4.6	0.1	-0.1
Kuwait	2.7	2.7	2.7	2.7	2.7	2.9	2.6	2.6	2.7	2.7	-0.1	0.0
Libya	1.0	1.1	1.1	1.2	0.4	0.2	1.2	1.2	1.1	0.7	0.1	-0.3
Nigeria	1.7	1.7	1.8	1.7	1.7	1.8	1.8	1.8	1.7	1.8	0.1	0.0
Saudi Arabia	10.1	9.7	9.5	9.9	9.7	12.0	9.4	9.4	9.8	10.1	-0.5	0.3
United Arab Emirates	3.1	3.1	3.2	3.3	3.2	3.6	2.8	2.8	3.2	3.1	0.2	-0.1
Venezuela	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.9	0.7	-0.5	-0.1

May not sum due to rounding
Source: Rapidan Energy Group

(2) Shockingly lower prices than Moscow anticipated force Russia back to the table for an OPEC+ deal by 3Q20 (slightly earlier than expected last month due to the higher 2Q20 surplus). We expect OPEC+ will return to its previous quota and enact OPEC's March 5th proposal of 1.5 mb/d of additional cuts, which will be partially offset by Libya's return.

Revisions to our March 19th OPEC Production Forecast	2019				2020				Average		Y/Y Growth	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	2019	2020	2019	2020
OPEC Crude Supply	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-0.1	0.0	-0.4	0.0	-0.4
Algeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Angola	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Congo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecuador	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Equatorial Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gabon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iran	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iraq	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Kuwait	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Libya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saudi Arabia	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	0.0	0.0	-0.2	0.0	-0.2
United Arab Emirates	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	0.0	-0.1	0.0	-0.1
Venezuela	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

May not sum due to rounding
Source: Rapidan Energy Group

(3) Libya comes back online in 2H20. Fuel shortages, power outages, and economic decline force a resolution between Haftar and Tripoli.

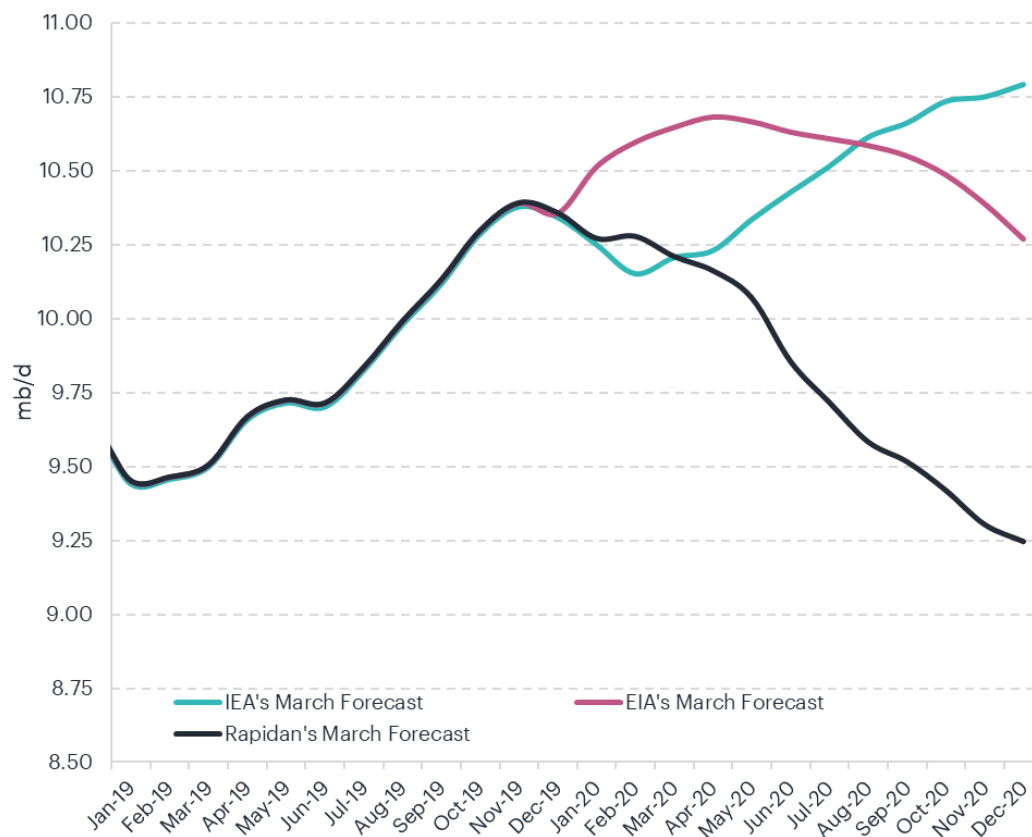
(4) We will update our Venezuela forecast and the impact of Rosneft's exit in a future note.

US Shale Production Plummets ~1.1 mb/d Between Dec '19 and Dec '20

Shale production collapses due to <\$20 WTI and reduced well completions

- US shale production will drift lower m/m in 1H20 before declining more steeply (0.1-0.2 mb/d per month) beginning in June.
- Large, visible declines in shale oil production are ~3 months away, as most companies are locked into service contracts or pipeline commitments.
- Storage scarcity could force producers to slow activity even more drastically than we forecast.
 - Pipeline owners are beginning to require customers to prove they have an end-user or storage for crude nominated in pipelines.
 - Cushing is already over halfway full ahead of record-setting surpluses next month.
- The crude price collapse has spurred US E&P companies to slash 2020 capex guidance by \$19.6 bn since early-March, but deeper cuts are still likely. Revised capex and budgets are based on WTI at \$30-35 the rest of the year - far more optimistic than our forecast.
- Production will decline sooner and faster than during past price downturns, due in part to steepening decline curves.
 - Crude production from the five primary oil basins would fall by nearly 4.5 mb/d in a year assuming zero new well completions - a 34% jump from 2019's base production decline.

US Lower 48 Onshore Crude Production Forecasts



Source: EIA, IEA, Rapidan Energy Group

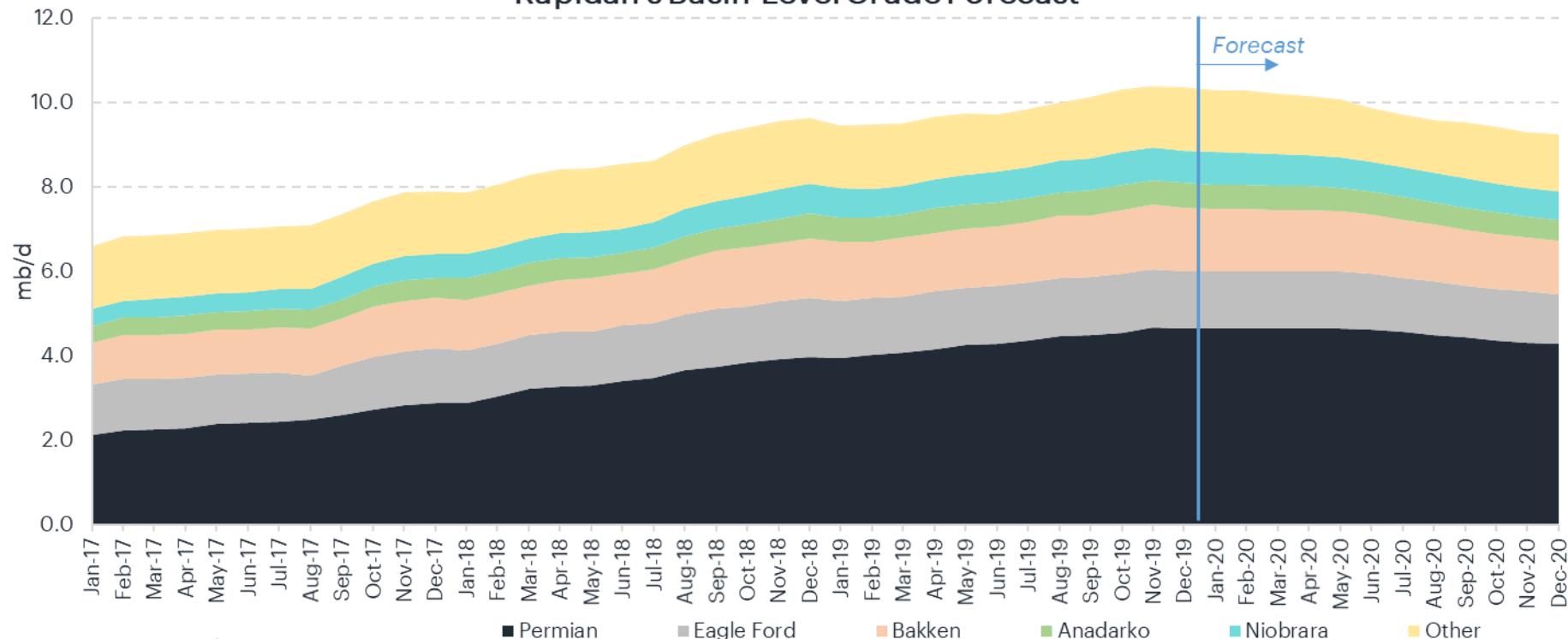
Rapidan Energy Group's Lower 48 Production Forecast

	(mb/d)	2018	2019	2020	'19 Y/Y	'20 Y/Y
Lower 48 Avg Production		8.81	9.88	9.80	1.06	-0.08
Lower 48 Exit Rate Production		9.64	10.36	9.25	0.72	-1.11

Permian Production Declines ~8% (or 0.35 mb/d) Dec '19 to Dec '20

Declines accelerate in June as service contract obligations expire

Rapidan's Basin-Level Crude Forecast

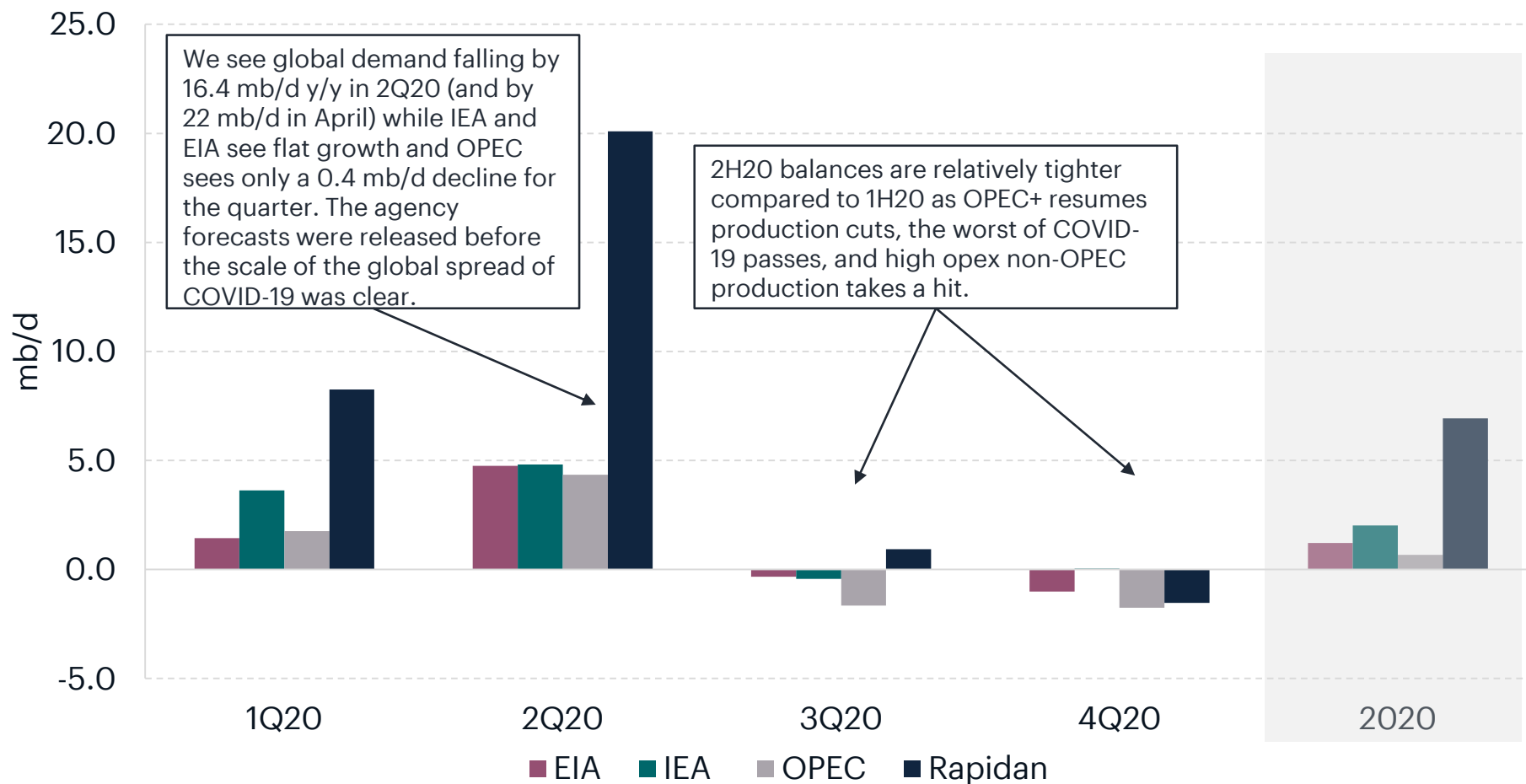


Rapidan Energy Group's US Basin-Level Crude Production Forecast

Average Production													Exit Rate Production			
(mb/d)	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2019	2020	2019 Y/Y	2020 Y/Y	2019	2020	2019 Y/Y	2020 Y/Y
L48 Onshore	9.47	9.70	9.99	10.35	10.25	10.03	9.60	9.32	9.88	9.80	1.06	-0.08	10.36	9.25	0.72	-1.11
Permian	4.01	4.24	4.44	4.62	4.65	4.65	4.50	4.33	4.33	4.53	0.82	0.21	4.64	4.28	0.65	-0.35
Eagle Ford	1.34	1.35	1.38	1.39	1.35	1.33	1.26	1.20	1.36	1.28	0.05	-0.08	1.37	1.18	-0.03	-0.18
Bakken	1.38	1.41	1.46	1.51	1.48	1.43	1.35	1.29	1.44	1.39	0.15	-0.05	1.50	1.27	0.09	-0.23
Anadarko	0.56	0.57	0.58	0.58	0.57	0.55	0.52	0.50	0.57	0.54	0.04	-0.03	0.58	0.49	0.00	-0.09
Niobrara	0.68	0.71	0.74	0.77	0.76	0.73	0.70	0.67	0.73	0.71	0.10	-0.01	0.77	0.66	0.06	-0.11
Other	1.49	1.43	1.40	1.48	1.45	1.34	1.28	1.34	1.45	1.35	-0.08	-0.10	1.49	1.36	-0.06	-0.14

Source: EIA, Rapidan Energy Group

Implied Global Supply Surpluses Assuming Rapidan's 2020 OPEC Production Forecast*



* 1Q20: 28.6 mb/d, 2Q20: 31.7 mb/d, 3Q20: 30.0 mb/d, 4Q20: 28.5 mb/d

Source: IEA, EIA, OPEC, Rapidan Energy Group



2020 Balance Comparison



Summary of 2020 Balances and Revisions

March 29th update

- (1) We revised down our 2020 global demand growth forecast by 4.7 mb/d due to worsening coronavirus spread. Agency reports were published prior to the announcement of stricter coronavirus responses. Our revisions are driven by lower US, Europe, and India forecasts, which assume a ~70% decline in flights, 45% decline in gasoline demand, 35% decline in diesel, and a 20% decline in other products during peak social distancing in 2Q20.
- (2) We now see stagnant non-OPEC supply growth this year compared to 1.8-2.2 mb/d growth forecasted by the agencies. Cratering crude prices and limited storage capacity will force shut-ins of high opex producers. We are lower than the agencies primarily on US shale (where we see 2H20 well completions falling by ~40% y/y) and Canada.
- (3) Our 2020 supply surplus is 4.9-6.2 mb/d higher than the agencies' due largely to our lower 2020 global demand growth forecast and looser 2019 baseline.

		2020 Quarterly Balance Summaries												
		March Forecast					Revisions to February's Forecast							
		2019	1Q20	2Q20	3Q20	4Q20	2020	2020 Y/Y	1Q20	2Q20	3Q20	4Q20	2020	2020 Y/Y
Global Demand	EIA	100.8	99.1	100.3	102.3	102.7	101.1	0.4	-1.2	-0.8	-0.3	-0.2	-0.6	-0.7
	IEA	100.0	96.7	99.2	102.0	101.7	99.9	-0.1	-2.2	-1.4	-0.3	-0.5	-1.1	-0.9
	OPEC	99.7	97.6	98.2	101.2	101.8	99.7	0.1	-1.9	-1.2	-0.4	-0.5	-1.0	-0.9
	Rapidan	100.0	92.0	82.8	97.6	99.2	92.9	-7.1	-3.1	-11.0	-2.7	-1.6	-4.6	-4.7
Non-OPEC Supply + OPEC NGLs	EIA	70.8	71.9	73.3	73.5	73.3	73.0	2.2	-0.2	0.1	0.1	-0.2	0.0	0.0
	IEA	70.5	71.6	72.3	73.1	73.3	72.6	2.1	0.0	0.0	0.0	0.1	0.0	0.0
	OPEC	69.3	70.7	70.8	71.1	71.7	71.1	1.8	0.1	-0.3	-0.5	-0.8	-0.4	-0.5
	Rapidan	70.5	71.6	71.1	70.0	69.3	70.5	0.0	-0.1	-0.8	-1.5	-1.4	-1.0	-1.0
US Crude + NGL Production	EIA	17.0	18.2	18.5	18.4	18.3	18.3	1.3	-0.1	-0.1	-0.2	-0.4	-0.2	-0.2
	IEA	17.0	17.7	18.0	18.2	18.5	18.1	1.1	0.0	0.0	0.0	0.1	0.0	0.0
	OPEC	17.0	17.7	17.9	18.1	18.0	17.9	0.9	0.1	-0.3	-0.5	-0.7	-0.4	-0.4
	Rapidan	17.0	17.6	17.4	16.8	16.5	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Call on OPEC	EIA	30.0	27.2	27.0	28.8	29.4	28.1	-1.8	-1.1	-0.9	-0.3	-0.1	-0.6	-0.7
	IEA	29.5	25.0	26.9	28.9	28.4	27.3	-2.2	-2.2	-1.3	-0.3	-0.6	-1.1	-0.9
	OPEC	30.4	26.9	27.4	30.1	30.2	28.7	-1.8	-2.0	-0.9	0.1	0.3	-0.6	-0.5
	Rapidan	29.5	20.4	11.7	27.6	29.9	22.4	-7.1	-3.1	-10.2	-1.2	-0.2	-3.7	-3.8
Implied Global Supply Surplus*	EIA forecast	-0.2	1.5	1.9	0.6	0.0	1.0		1.2	1.0	0.5	0.3	0.7	
	EIA Implied	-0.2	1.4	4.8	-0.3	-1.0	1.2		1.1	0.9	-1.2	-0.1	0.2	
	IEA	0.5	3.6	4.8	-0.4	0.0	2.0		2.2	1.3	-1.2	0.5	0.7	
	OPEC	-0.6	1.8	4.3	-1.7	-1.8	0.7		2.0	0.9	-1.6	-0.4	0.6	
	Rapidan	0.6	8.3	20.1	0.9	-1.5	6.9		3.1	10.2	-0.3	0.1	3.3	
OPEC Production	Rapidan	30.0	28.7	31.7	28.5	28.4	29.3	-0.7	0.0	0.0	-1.5	-0.1	-0.4	-0.4

*Assumes Rapidan's OPEC Crude Forecast
Source: EIA, IEA, OPEC, Rapidan Energy Group

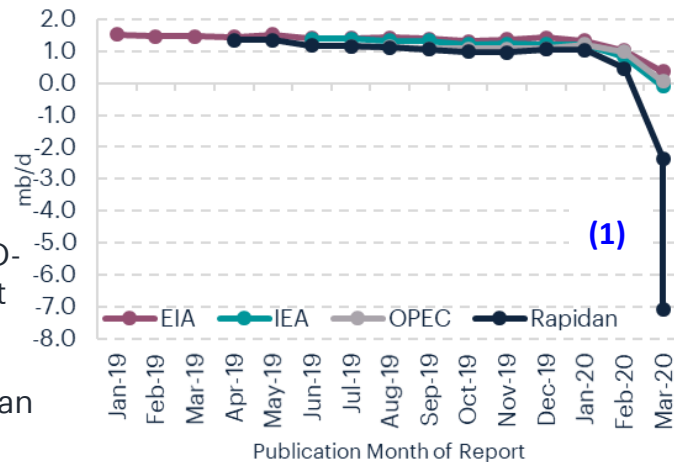
(3)

Evolution of 2020 Balances

March 29th update

(1) We now see a deeper impact on demand from travel bans, social distancing, and global economic and trade weakness. The agency reports were released before the scope of COVID-19 spread and government intervention was known.

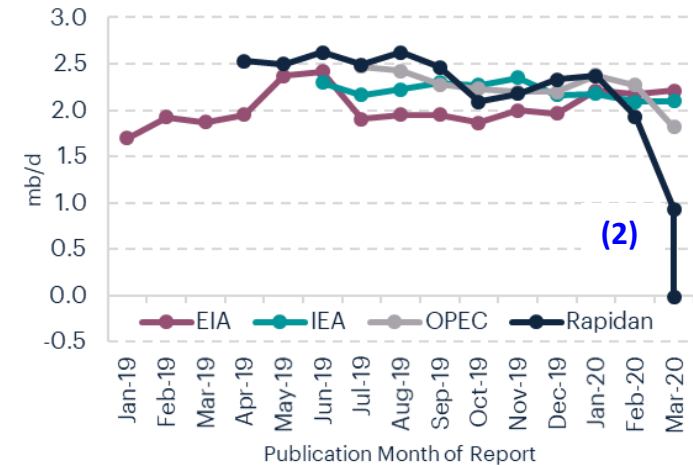
2020 Y/Y Global Demand Growth
Evolution of Monthly Forecasts



Source: EIA, Rapidan Energy Group

(2) We are ~1.0 mb/d lower than the agencies on US production and ~0.5 mb/d lower on Canada.

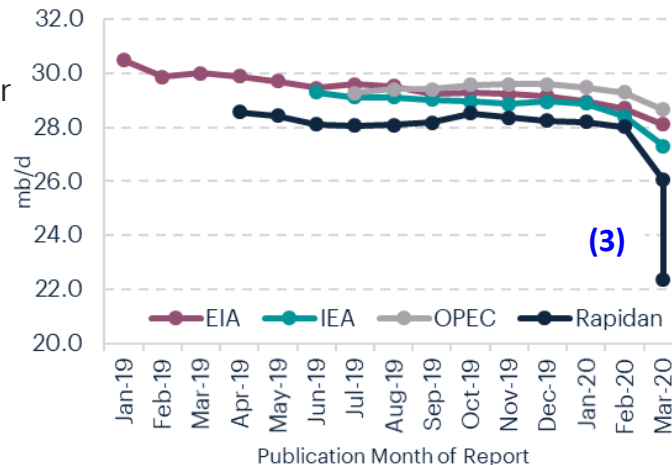
2020 Y/Y Non-OPEC Supply Growth
Evolution of Monthly Forecasts



Source: EIA, Rapidan Energy Group

(3) We have a lower call on OPEC compared to the agencies due to our weaker 2020 demand growth and looser 2019 baseline.

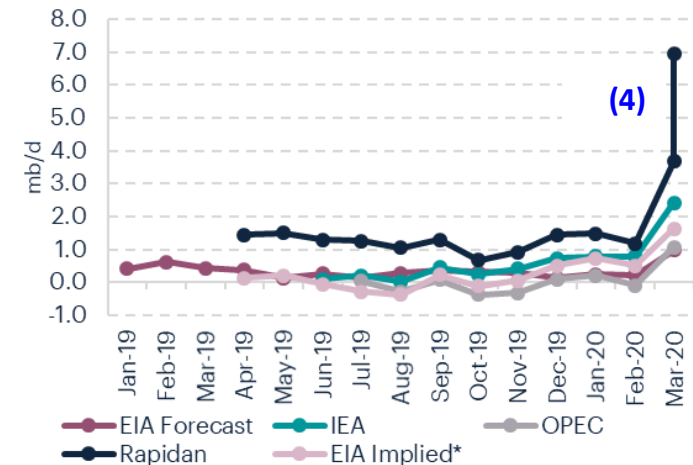
2020 Call on OPEC
Evolution of Monthly Forecasts



Source: EIA, Rapidan Energy Group

(4) The size of the surplus has now swelled so much that no reasonably likely policy reaction could prevent further price weakness as storage fills and shut-ins spread.

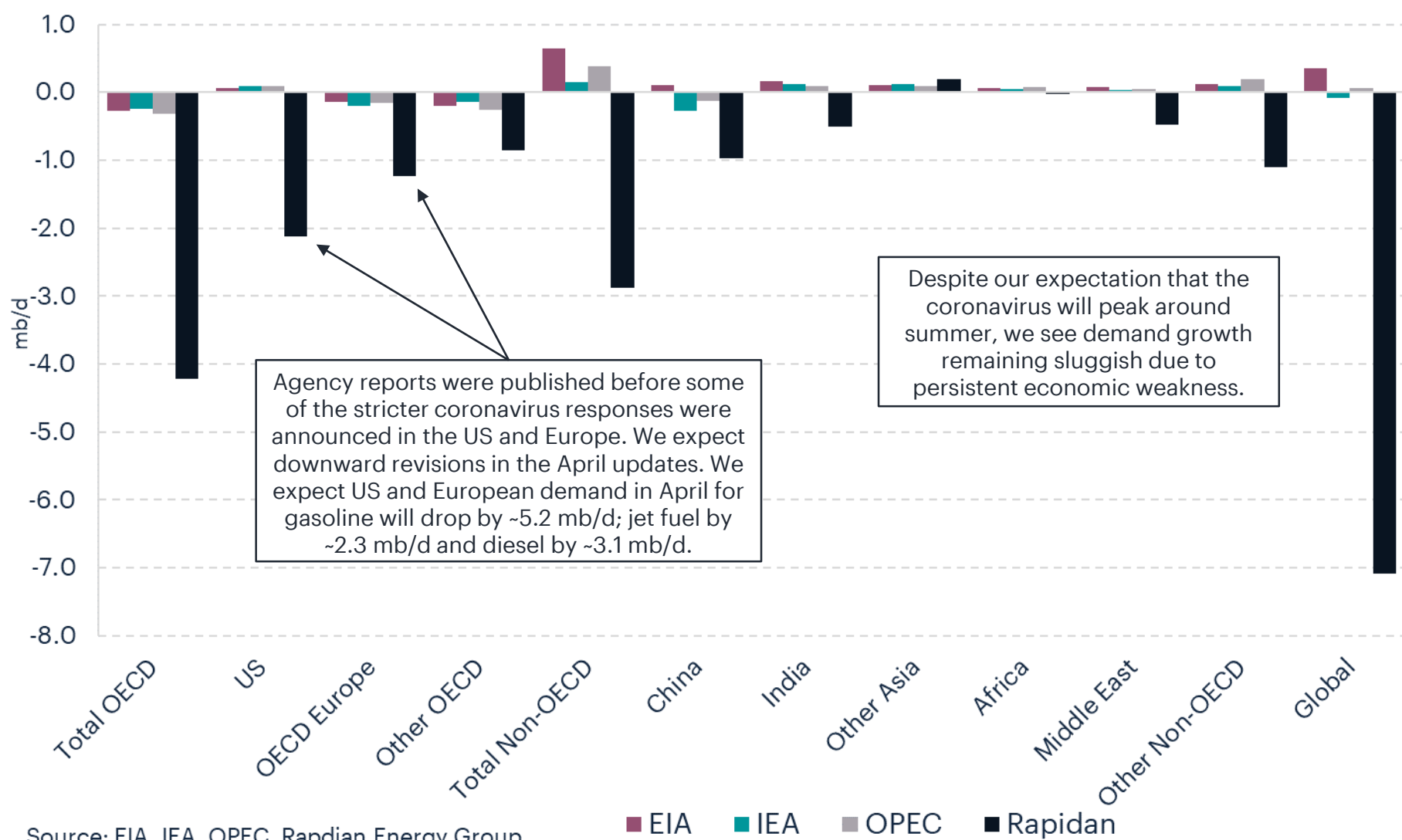
2020 Implied Global Supply Surplus
*Evolution Assuming Rapidan's OPEC Forecast



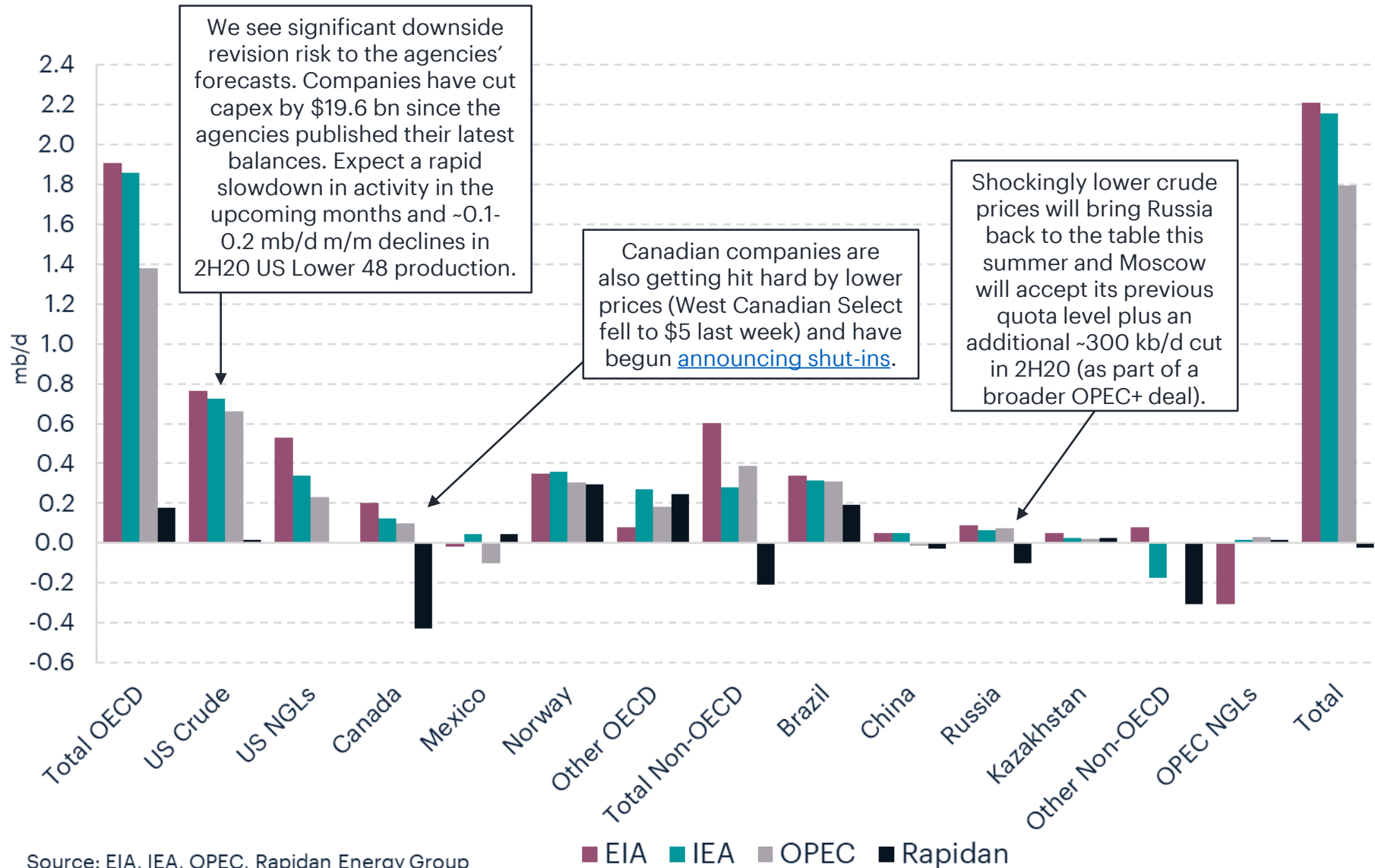
Source: EIA, Rapidan Energy Group

Composition of Current 2020 Global Demand Growth Forecasts

March 29th update



Source: EIA, IEA, OPEC, Rapidian Energy Group



Source: EIA, IEA, OPEC, Rapidan Energy Group

* Includes crude oil, condensates, NGLs, biofuels and nonconventional oils

Every non-OPEC country-level supply number in this report includes crude oil, condensates, natural gas liquids, biofuels (including fuel ethanol), and nonconventional oils and excludes processing gains.

Processing gains are aggregated and included in the global supply figure.

Schedule of Monthly Oil Market Balance Updates			
	<u>EIA</u>	<u>IEA</u>	<u>OPEC</u>
April	Tuesday, 7 th	Wednesday, 15 th	Thursday, 16 th
May	Tuesday, 12 th	Thursday, 14 th	Wednesday, 13 th
June	Tuesday, 9 th	Tuesday, 16 th	Wednesday, 17 th

OIL MARKET BLACK SWANS: COVID-19, THE MARKET-SHARE WAR, AND LONG-TERM RISKS OF OIL VOLATILITY

BY ROBERT MCNALLY
APRIL 2020

The shock oil markets have suffered from the coronavirus and the ensuing market-share war between Saudi Arabia and Russia has sent prices plummeting to levels not seen since 2002 and altered the outlook for supply and demand for the immediate future. The impact of both events on energy producers and consumers will not fade when the pandemic ends, however. Looking longer term, the world will either have to accept the need for swing producers—those capable of adjusting oil output to attempt to prevent large demand and supply shocks—or brace for perpetual, extreme oil price volatility that will severely destabilize the energy sector, economic growth, and geopolitics.

Why Oil Prices Collapsed and Where They Are Headed

This year's 60 percent collapse in oil prices was first set in motion by a growing awareness that the coronavirus would neither crest in February nor be contained to China as initially hoped. By the March 5 and 6 OPEC+ meetings, oil analysts were revising oil demand forecasts sharply down as barrel counters began to reckon with a widespread shutdown of economic activity and restrictions on travel.

Thus, as they prepared to convene in Vienna, Russia, Saudi Arabia, and 21 other members of OPEC+ found themselves facing an unexpected and rapidly snowballing oversupply unprecedented in modern times. While 22 members favored an immediate 1.5 million barrel per day (bpd) production cut, Moscow announced it preferred to wait until summer to assess demand impacts before deciding on cuts. OPEC+ decisions require consensus, especially among major producers, and Russia's opposition meant the meeting hit an impasse.

Russian Energy Minister Alexander Novak walked out of the OPEC headquarters in Vienna and announced quotas would expire at the end of the month, declaring that producers were free to produce without restraint starting in April.

On March 27, Russia's deputy oil minister explained why Moscow refused to contribute to a 1.5 million bpd OPEC cut, calling it only a "drop in the ocean."¹ Russia was correct that the oversupply spawned by collapsing demand required more than the 1.5 million bpd cut OPEC proposed on March 5. During past instances of massive demand declines, as in 1997–98 and

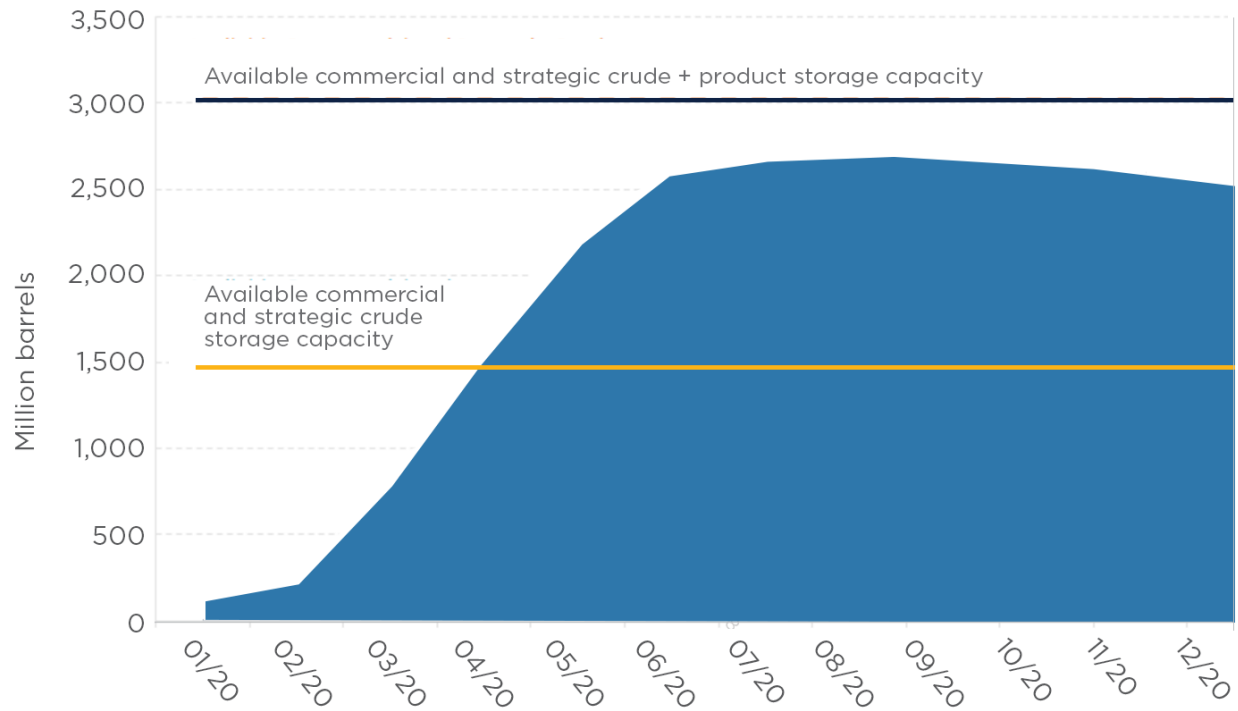
2008–09, several rounds of OPEC cuts were required. Between 1997 and 1998, OPEC agreed to 4.3 million bpd of cuts across three meetings. In the fall of 2008, OPEC agreed to a total of 4.2 million bpd of cuts, also over three rounds of meetings. In the current, unprecedented circumstances, even larger cuts would be required to prevent storage from filling up and prices crashing to levels where widespread, chaotic shutdowns became inevitable.

Turning to the present, the practical impact of Russia blowing up the OPEC+ meeting was to end production restraint as of April. In other words, the world shifted instantly to free-market mode, where all producers are price takers and will continue to pump as long as prices exceed lifting costs. For Middle East producers and Russia, lifting costs are \$10 per barrel or below. Saudi Arabia held the lion's share of spare production capacity—some 2.3 million bpd—which along with inventory drawdowns would enable the Kingdom to release a total of 12.3 million bpd into the market. Russia, UAE, Kuwait, and Iraq each have 200,000 to 300,000 bpd of spare production capacity and will probably increase production over the coming weeks as well. However, plummeting refinery demand and limited buyers could temper production ramp-ups.

Combined, the supply surge and demand implosion are unleashing the biggest oil tsunami in modern history. Demand could decline by over 16.0 million bpd year-on-year in the second quarter just as a torrential increase of around 3.4 million bpd of new supply is entering the market.² As a result, around 2.5 billion barrels of crude and products will be pushed into global storage in 2020, an unprecedented amount that will challenge onshore capacity that is already 73 percent full.

Currently, only about 1.5 billion barrels of crude storage is available, and of that, about 1.0 billion barrels are located in commercial inventories—some of which may not be fully utilized due to strategic and financial decisions in the Middle East and China.³ In addition, about 1.5 billion barrels of product storage is available. April will be a particularly brutal month for oil markets as demand collapses by an estimated 22 million bpd year-on-year and OPEC+ opens the production taps, creating a global supply surplus of 26 million bpd. Cumulative stock builds could exceed tank tops in the coming months if not weeks, though the timing partly depends on how much crude refineries choose to process in the weeks ahead. (See Figure 1 and Table 1.)



Figure 1: Cumulative 2020 global stocks builds and storage capacity

Source: Rapidan Energy Group

Table 1: Global onshore oil storage capacity and utilization

		Commercial		Strategic		Total
	(mb)	Crude	Products	Crude	Products	
Total capacity	OECD	1,593	2,883	1,354	376	6,206
	Non-OECD	1,883	1,700	1,540	--	5,123
	Total	3,476	4,583	2,894	376	11,329
Available capacity	OECD	511	1,036	135	59	1,740
	Non-OECD	518	445	319	--	1,282
	Total	1,029	1,481	453	59	3,022
Current utilization	OECD	68%	64%	90%	84%	72%
	Non-OECD	72%	74%	79%	--	75%
	Total	70%	68%	84%	84%	73%

Sources: EIA, IEA, JODI, Rapidan Energy Group



At some point, collapsing oil prices will likely convince Russian President Vladimir Putin to contribute to supply management again. It would not be the first time Russia demurred only to later contribute cuts. Russia also balked at cuts in November 2014, triggering a market-share battle among producers that sent crude prices tumbling by 75 percent from the “new normal” of \$100 per barrel. Moscow blinked when Brent hit \$26 in February 2016 and agreed to cooperate with Saudi Arabia and 22 other producers in a successor to OPEC dubbed “OPEC+.”

While the most likely scenario may see Russia blinking at some point down the road, that will likely only occur after markets experience more crude price weakness. The first signs of diplomacy emerged on March 31, when the Kremlin announced President Trump and President Putin had agreed in a call the previous day that “current oil prices aren’t in the interests of our countries.”⁴ The White House reported the two leaders “agreed on the importance of stability in global energy markets.” US Department of Energy Secretary Dan Brouillette and Russian Energy Minister Alexander Novak reportedly planned to continue discussions.⁵ But there is no sign yet that Russia is prepared to contribute substantial production cuts. Since 2014, Russia has anticipated lower oil prices—although not *this* low—and prepared for them by liberalizing its currency and building up a war chest. For now, both Riyadh and Moscow remain opposed to making the large cuts needed to begin market rebalancing later this year.

As the Saudis and Russians square off, Secretary Dan Brouillette and Secretary of State Mike Pompeo are hearing an earful from an outraged domestic oil patch and are pressuring Riyadh to relent. On March 25, six irate oil-state Republican senators fired off a letter⁶ to Secretary Pompeo threatening Riyadh with an across-the-board rupture if the Kingdom does not “change course.” While preoccupied with large health and economic emergencies, President Donald Trump is slowly but steadily weighing into the fray. However, so far there is no indication Washington’s arm-twisting is likely to induce Saudi Arabia to cut production without a Russian contribution. Trump appears to understand that Russia’s contribution to supply management is necessary. On March 30, he told Fox News interviewers he planned raise the “crazy” oil war in the call with Putin noted above.⁷

Welcome Back to Free-Market Oil Prices

Zooming out, the present oil calamity will hopefully help illuminate some hard truths and promote more rational thinking about oil markets going forward.

First, oil is, and for the foreseeable future will remain, the lifeblood of modern civilization, because transportation depends almost entirely upon it. The transportation sector is vital for every other sector, from food supply to defense to industry and consumption. One cannot dishevel oil without disheveling economic and financial stability in producing and consuming countries alike. Electric cars and biofuels have competed with oil in transportation since the dawn of the automobile age and will continue to do so. One day, electricity or biofuels or hydrogen or something else may displace oil’s dominance as a transportation fuel—but energy transitions take decades if not generations.

Second, oil prices are naturally prone to wild boom and bust price swings. Oil’s intrinsic, extreme volatility arises from very low supply and demand elasticities and limited storage. Oil is a must-have commodity for which there are no scalable substitutes. On the supply side, oil



production requires long lead times and copious amounts of up-front capital. Once flowing, operating costs are low and shut in costs are high. Storage can help smooth out temporary imbalances in supply and demand, but storage is neither unlimited nor costless.

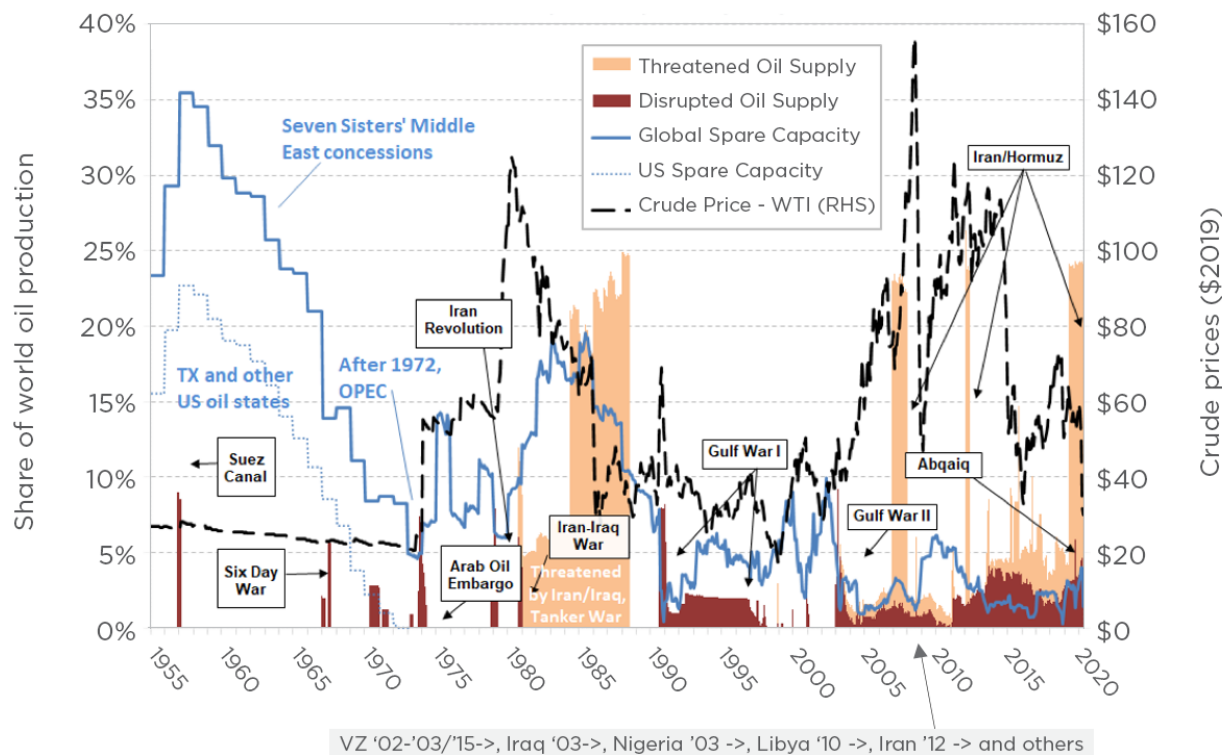
From these two realities comes the hard truth: Even the most free-market countries cannot tolerate boom and bust price cycles for a commodity that is tantamount to economic lifeblood.

Since the 1930s, the oil industry and governments agreed that oil supply must be managed by imposing quotas on crude oil production. It is of more than just passing historical interest that the United States was the first, and by far most successful, oil supply regulator. The last time huge demand collapses coincided with a supply surge was in 1930 and 1931, when the monster Black Giant field in east Texas started up in the teeth of the Great Depression. Oil prices fell to pennies on the barrel, which impelled Oklahomans and Texans—some of the most government-limiting, oil-producing people on earth—to first deploy armed soldiers to halt drilling and then impose decades of quotas that would make OPEC envious.

In other words, oil's violent price volatility forced some of the world's staunchest free-market proponents to resort to communist-style central planning. "I am opposed to too much government intervention in business," Texas Governor Ross Sterling admitted in 1931, "but conditions have changed ... it looks like we must have some government in business. We will have to forget what we used to believe improper." His counterpart in Oklahoma, Governor W.H. "Alfalfa Bill" Murray was more direct: "The price of oil must go [up] to \$1 a barrel; now don't ask me any more damned questions."

After the troops left the fields, Texas and other oil states imposed extremely strict quotas on oil producers for the next four decades. For 40 years, three voting commissioners on the Texas Railroad Commission (RRC) would meet in Austin, Texas, once a month to review the latest oil supply and demand data. They would determine a "call on Texas" supply, which in turn would be allocated to producers as a maximum allowable production level on a field-by-field, well-by-well basis. In the 1950s, Texas and other oil state regulators forced producers to shut in 20 percent of world production (and the Seven Sisters chipped in another 15 percent in the Middle East fields they ran) to keep prices stable. Over *one-third* of global oil production capacity was voluntarily shut down by regulators and a cartel to keep oil prices stable. Had they not done so, oil prices in the 1950s would have been savagely volatile instead of glacially smooth, as shown in Figure 2.



Figure 2: Oil disruptions, spare capacity, and crude prices

Source: Rapidan Energy Group, EIA, BP, St. Louis Fed, US Senate

Compare the RRC with its successor OPEC, whose founders deliberately tried to copy the RRC's methods. When OPEC or OPEC+ members are getting along, they meet only a couple times a year and set national-level production quotas that are loosely enforced.

Oil Glut Outpacing Policy Reaction, Likely Sending Crude Oil Prices Lower this Spring

Returning to the present, epic oversupply in the second quarter will likely drive crude oil prices to levels—in the teens to single digits, depending on the producer's grade and location—that rapidly force producers to shut in large amounts of production. The planet's storage capacity should be full by summer if not sooner. When there is nowhere left to burn or store oil, the price must fall to levels that penalize anyone who lifts a barrel out of the earth's crust. Relatively high-cost oil production will begin to shut down. In some places, such as Canadian oil sands, it already has. Marginal US wells and shale oil are the most likely to go next, along with North Sea, Brazil shallow-water, and Chinese production.

As in the past, this oil price bust has triggered pleas by oil operators for aggressive federal and state intervention. Most of the anger focuses on Saudi Arabia, as noted earlier. In the



United States, some oil companies have demanded anti-dumping investigations, a long process that is unlikely to succeed given low production costs in targeted producing countries. Beleaguered oil producers have sought a floor price on imports or import quotas during past crude price swoons, but to no avail. However, Trump is more comfortable with tariffs than his predecessors, and it is certainly possible he will intervene to support US producers, though there are no indications at present he will do so.

Late last month, two Texas oil producers, Parsley Energy and Pioneer Natural Resources, asked the Texas RRC to dust off its authority and return to imposing quotas.⁸ Quota proponents hope state quotas will help convince Saudi Arabia and Russia to return to cooperating on supply management. Currently, quotas enjoy support neither from the necessary two of three RRC commissioners nor the bulk of Texas oil operators. However, if history is any guide, support for desperate measures like quotas will grow as crude prices fall toward zero and economic ramifications broaden. North Dakota already implemented a new regulation that will indirectly reduce the state's production by making it easier for producers to temporarily shut in marginal wells and delay completions.

Quotas or not, oil production in Texas and North Dakota will fall sharply as prices at the well fall below levels even the most efficient operators require to justify drilling and completions. Lower 48 crude production could fall by 1.0 million bpd or more year-on-year by December, while well completions could drop by 40 percent or more year-on-year in the second half of the year. US oil-weighted exploration and production companies have already slashed initial 2020 CapEx guidance by \$19.9 billion (around 29 percent) over the past few weeks.⁹

Meanwhile, as noted above, Trump's views on oil prices and swing production are apparently undergoing a shift. As he candidly admitted on March 19 and 30, until now he had viewed oil prices through the prism of the motorist at the pump: high oil prices were bad and required yelling at OPEC. But now that the US has become the world's biggest oil producer and a net exporter, the president sees some downsides from plummeting oil prices.

Should oil prices continue to fall, destroying larger swaths of US upstream investment, Trump will likely consider several options, none of which are mutually exclusive. First, entice or pressure Putin to return to the table via inducements or new costs like sanctions. Second, pressure Riyadh to reduce production regardless of Russia's willingness to contribute. Third, resort to trade protectionism that recent presidents have resisted.

Notwithstanding enormous but hard-to-measure demand destruction, it is difficult to imagine anything Trump or other policymakers can do at this stage to prevent a catastrophic inventory build and further crude price weakness.

The Economic Costs of Boom-Bust Oil Price Cycles

Oil price busts sow the seeds of future booms, and vice versa. Super low pump prices will encourage consumption once coronavirus-related travel restrictions are lifted, and could delay mass adoption of electric vehicles. Today's oil price bust will also drastically reduce investment in new oil fields. As a consequence, in a few years we are likely to be shocked by stronger-than-expected demand growth and ravaged supply. Oil prices will have to rise



sharply to enforce the iron law of economics that you can't consume what you can't produce (or are willing to remove from storage). As a result, oil prices could boom to well above \$100 later in this decade and peak only after they cause or contribute to a recession.

In the absence of a swing producer, inevitable imbalances in global oil markets—whether surpluses like now or deficits—could unleash wild oil price swings. Absent an effective swing producer, expect oil prices to swing between single digit shut-in and triple digit demand destruction levels.

Academic research has concluded that oil price volatility adversely impacts the micro- and macroeconomy.¹⁰ Large oil price changes slam households and firms with sudden changes in factor costs and revenue streams that make planning difficult, especially when purchasing or building long-lived equipment. For example, automaker and airline companies would decide to build and buy very different cars and airplanes depending on whether the oil price was expected to be closer to \$30 or \$100 per barrel.

At the macroeconomic level, unanchored oil prices create uncertainty, which delays investment. Oil price volatility can distort and disturb monetary policy making, misallocate investment, and cause sudden shifts in consumption. Most recessions since 1973 were preceded by oil price spikes. Academic research has found oil price *volatility*—sharp increases and decreases—harms investment, consumption of durable goods, aggregate economic output, equity returns, and trade for net oil importers and exporters alike.¹¹

While consumers and governments can use various tools to hedge against and mitigate oil price volatility, since the early 1930s the main tool employed to stabilize oil prices has been swing production. Swing producers stood ready and able to intervene quickly, in large amounts, and for long periods of time to prevent global supply and demand imbalances that spawn boom and bust price cycles. They anchored long-term oil prices, similar to a central bank's mission to anchor inflation expectations, so that consumers, producers, and governments could plan and invest.

As noted above, Texas RRC was the world's first great swing producer and OPEC was the second. Swing producers hold back production, creating spare capacity to inject when needed. Swing producers and their spare capacity constitute a public good that reduces the cost of oil price volatility. One study estimated the value of OPEC's spare capacity to the global economy to be \$200 billion per year.¹²

Who wins from perpetual oil price cycles? Savvy oil traders and storage owners, M&A attorneys and advisory firms, and astute oil market consultants. Large, integrated oil and gas companies will also be able to withstand the volatility more easily than smaller ones.

Everyone else suffers in an environment in which oil prices undergo frequent, large swings. Nearly every business, household, and government on the planet will suffer from reduced planning horizons, deterred investment, and increased unemployment. Monetary policy, defense planning, and budgeting will become tremendously more difficult.



Making the World Safe for Swing Production

The world is *not* going to enjoy frequent boom and bust oil price cycles. While there may be no choice but to accept them, some leaders may frantically search for an exit and look to encourage swing producers.

The United States can and should lead in making the world safe for swing production, first by examining its own history and then by taking a fresh look at how oil markets work. Doing so may lead to conclusions that are admittedly uncomfortable, especially for those strongly inclined to trust free markets over government intervention.

Whether or not the United States decides to return to supply management at home, it can and should have a seat at the table with major oil producers and exporters that share a common interest in preventing ruinous boom-bust oil price cycles. The International Energy Forum, a body including oil consuming and producing countries, is one already existing and suitable organization to host this discussion, as well as to promote some of the following ideas that could mitigate volatility:

- In addition to accepting supply management, officials could reduce unnecessarily large uncertainty that makes oil volatility worse by improving data. For years, oil experts have called for better data on inventories, trade, consumption, and production. The data exist but are not published, collected, and harmonized as they should be if we were serious about reducing volatility.
- Officials should ensure that well-regulated but robust and liquid financial markets remain available to producers and consumers so they can transfer price risk to those willing to bear it.
- Another good tool for managing volatility is inventories, both commercial and government-controlled strategic stocks for use in emergencies. The private sector has been understandably building a lot of new storage capacity since greatly fluctuating oil prices returned over 10 years ago. The record on strategic inventories has been more mixed. China is filling its strategic stocks precipitously. But in recent years the US Congress has decided to sell off the country's strategic oil reserves to pay for non-energy budgetary expenses. Fortunately, Trump has wisely called for a halt to strategic sales and instead has pushed to fill the Strategic Oil Reserve with low-cost barrels, a no-brainer step from a national security and budgetary perspective that Congress should support. Even if the US remains a large producer and net exporter, our national security and economy will remain vulnerable to major oil supply disruptions anywhere. Therefore, an ample emergency stockpile still makes sense.

Conclusion

The coronavirus and return to free-market oil prices are giving the world a rare taste of how oil prices behave when there is no swing producer and a large imbalance. Ultimately, we will conclude that unmanaged oil markets are not good for the energy industry, global economic growth, and geopolitical stability. The coronavirus will eventually pass, but ruinous boom-



bust oil prices will continue in the absence of an effective swing producer. Taming volatile oil prices will require a close look at lessons from the history of the oil market, a clear-eyed understanding of how the oil market works, and innovative and fresh approaches to both domestic and international energy policy.

Notes

1. Grant Smith, "OPEC Nations Howl for Mercy As Saudi-Russia Oil War Deepens," Bloomberg via Financial Post, March 27, 2020, <https://business.financialpost.com/pmn/business-pmn/opec-nations-howl-for-mercy-as-saudi-russia-oil-war-deepens>.
2. Estimates from Rapidan Energy Group. Author Robert McNally is founder and president of Rapidan in addition to being a non-resident fellow at the Center on Global Energy Policy.
3. Rapidan storage estimates.
4. Evgenia Pismennaya and Henry Meyer, "Trump Call to Putin Raises Russia's Hopes of End to Costly Oil War," *Bloomberg*, March 31, 2020, <https://www.bloomberg.com/news/articles/2020-03-31/putin-trump-agree-current-oil-prices-not-in-mutual-interest>.
5. "US, Russian energy chiefs to discuss oil market volatility," TASS, March 30, 2020. <https://tass.com/economy/1137795?fbclid=IwAR25egYQWNwHIKEvhH4dMpnNnuN9Zr-SsAOF3-cporcijJ3VeCM1LOQPbel>.
6. Senators' letter to Secretary Pompeo: https://www.energy.senate.gov/public/index.cfm?a=files.serve&File_id=36C4A67D-7C57-49B2-BEF2-4EB95E441B99.
7. Timothy Gardner and Darya Korsunskaya, "U.S., Russia agree to oil market talks as Trump calls price war 'crazy'," *Reuters* (March 30, 2020), <https://www.reuters.com/article/us-oil-opec-trump/trump-to-speak-with-putin-criticizes-russian-saudi-oil-price-war-as-crazy-idUSKBN21H216>.
8. David Wethe, "Two Oil CEOs Back Plan to Cut Texas Output After Crude Crash," *Bloomberg*, March 30, 2020, <https://www.bloomberg.com/news/articles/2020-03-30/pioneer-parsley-press-texas-for-meeting-to-cut-oil-output>.
9. Rapidan Energy Group estimates, based on company reports.
10. Axel Pierru, James L. Smith, and Tamim Zamrik, "Impact on Oil Price Volatility: The Role of Spare Capacity," *The Energy Journal* 39, no. 2 (2018): 174, <http://www.iaee.org/en/publications/ejarticle.aspx?id=3057>.
11. Jun E. Rentschler, "Oil Price Volatility, Economic Growth and the Hedging Role of Renewable Energy," Policy Research Working Paper 6603, The World Bank, <http://documents.worldbank.org/curated/en/466161468130801325/pdf/WPS6603.pdf>; Hui Guo and Kevin L. Kliesen, "Oil Price Volatility and U.S. Macroeconomic Activity," *Federal Reserve Bank of St. Louis Review* 87, no. 6 (November/December 2005): 669-83, <https://>



files.stlouisfed.org/files/htdocs/publications/review/05/11/KliesenGuo.pdf; Tom Doan, John Elder, and Apostolos Serletis, “Oil Price Uncertainty,” *Journal of Money, Credit and Banking* 42 (2006): 1137-1159.

12. Adam Sieminski, “The \$200 billion annual value of OPEC’s spare capacity to the global economy,” KAPSARC (2018), <https://www.kapsarc.org/news/the-200-billion-annual-value-of-opecs-spare-capacity-to-the-global-economy/>.

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