Energy Tidbits

April 23, 2023

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Permian DUCs Down to June 2014 Levels, When Permian Oil Production was 1.59 mmb/d, 28% of 5.69 mmb/d in March 2023

Welcome to new Energy Tidbits memo readers. We are continuing to add new readers to our Energy Tidbits memo, energy blogs and tweets. The focus and concept for the memo was set in 1999 with input from PMs, who were looking for research (both positive and negative items) that helped them shape their investment thesis to the energy space, and not just focusing on daily trading. Our priority was and still is to not just report on events, but also try to interpret and point out implications therefrom. The best example is our review of investor days, conferences and earnings calls focusing on sector developments that are relevant to the sector. Our target is to write on 48 to 50 weekends per year and to post by noon MT on Sunday. The Sunday noon timing was because PMs said they didn't have research to read on Sundays and Sundays are a day when they start to think about the investing week ahead.

This week's memo highlights:

1. Big negative revision to Permian DUCs brings it down to June 2014 levels when Permian oil production was 1.59 mmb/d or 28% of 5.69 mmb/d in March 2023 (Click Here).

2. Baker Hughes expects a huge number of LNG export project FIDs in 2023 thru 2026 (Click Here).

3. SLB [Schlumberger] expects a big, broad long-cycle capex around the world would suggest a much stronger long-term oil supply picture than most expect (Click Here).

4. Freeport LNG back to normal in April with >2 bcf/d of natural gas deliveries to their facilities (Click Here).

5. Chile President Boric announced the "Chilenization" of the Lithium industry (Click Here).

6. Pease follow us on Twitter at [LINK] for breaking news that ultimately ends up in the weekly Energy Tidbits memo that doesn't get posted until Sunday noon MT.

7. For new readers to our Energy Tidbits and our blogs, you will need to sign up at our blog sign up to receive future Energy Tidbits memos. The sign up is available at [LINK].

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Natural Gas – 75 bcf build in US gas storage; now 488 bcf YoY surplus

It's April so it's the normal natural gas injection season absent some unusual event. For the week of Apr 14, the EIA reported a +75 bcf build (vs expectations of a 69.75 bcf build), compared to the +53 bcf build reported for the week of Apr 15 last year. This compares to last week's build of +25 bcf, and the 5-year average build of +41 bcf. Total storage is now 1.930 tcf, representing a surplus of +488 bcf YoY compared to a surplus of +460 bcf last week and is +329 bcf above the 5-year average vs +295 bcf above last week. Below is the EIA's storage table from its Weekly Natural Gas Storage Report [LINK].

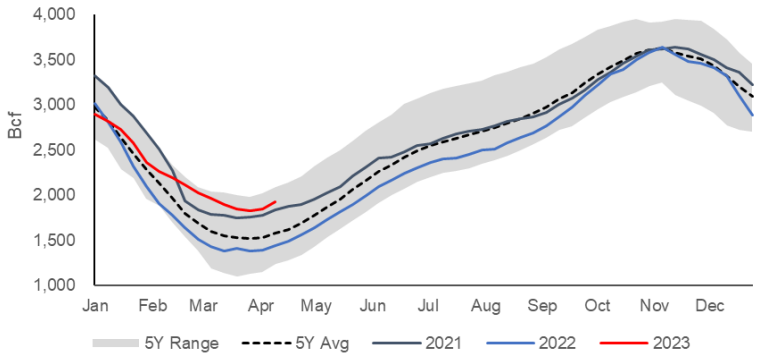
US gas storage 488 bcf YoY surplus

Figure 1: US Natural Gas Storage

	Stocks billion cubic feet (Bcf)				Year ago (04/14/22)		5-year average (2018-22)	
Region	04/14/23	04/07/23	net change	implied flow	Bcf	% change	Bcf	% change
East	363	345	18	18	237	53.2	280	29.6
Midwest	450	427	23	23	302	49.0	339	32.7
Mountain	84	80	4	4	89	-5.6	91	-7.7
Pacific	83	74	9	9	169	-50.9	178	-53.4
South Central	949	929	20	20	645	47.1	714	32.9
Salt	266	261	5	5	199	33.7	225	18.2
Nonsalt	684	667	17	17	446	53.4	489	39.9
Total	1,930	1,855	75	75	1,442	33.8	1,601	20.5

Source: EIA

Figure 2: US Natural Gas Storage - Historical vs Current



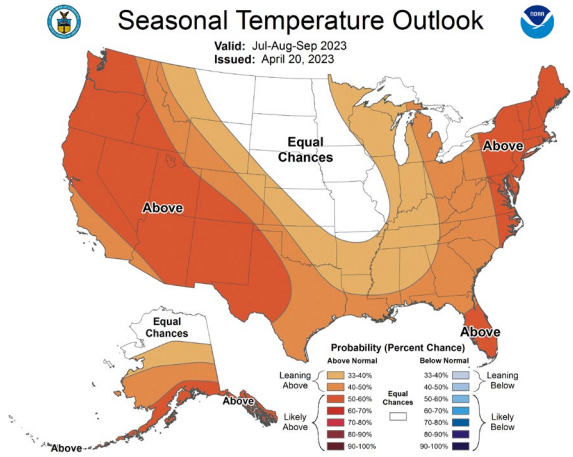
Source: EIA, SAF

Natural Gas – NOAA's still calls for a warmer than normal summer in the US

On Thursday, the NOAA released a monthly update to its seasonal temperature forecasts [LINK] and NOAA still calls for a warmer than normal temperatures across most of the US for their summer (Jul/Aug/Sep) outlook. We recognize that weather forecasts, even near term, are far from 100% accurate but a warm summer should provide some support for natural gas prices. We tweeted [LINK] "*Support for summer HH #NatGas prices. @NOAA forecasts warmer than normal JAS temperatures on both populous east, west, and southern coasts. But comp to last summer is that JAS 2022 was the hottest in 129 yrs. #OOTT.*" Even though it should be a warmer than normal summer, the YoY comparison last summer will be to the summer 2022 being the hottest summer on record in 129 years. Below is NOAA's Apr 20 temperature probability map for the summer months.

NOAA forecasts hot summer

Figure 3: NOAA JAS Temperature Probability Forecast

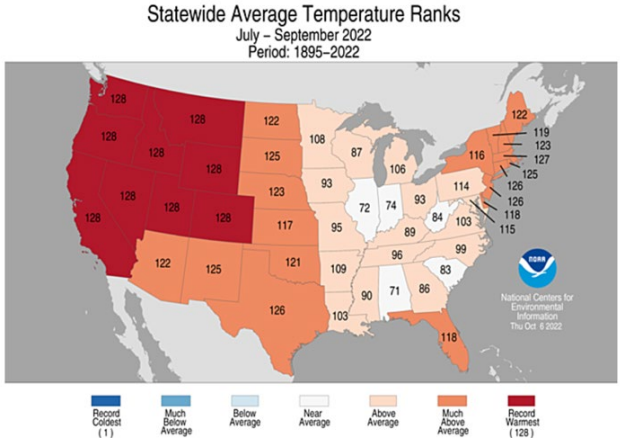


Source: NOAA

But JAS 2023 will be comp'd vs JAS 2022 hottest summer on record in the US

A warm summer 2023 will provide support for natural gas but the weather driven element of natural gas demand will be less YoY vs summer 2022 because summer 2022 was the hottest summer on record. Here is what we wrote in our Oct 16, 2022 Energy Tidbits memo. "*It was an excellent summer for weather related natural gas demand in the US. It couldn't' be better. On Thursday, NOAA issued its recap of US climate for September. September was the 5th hottest in the 128-years of recording [LINK],. And July-September was the hottest summer on record. [LINK]. Below are graphics depicting the state average temperature ranks for September and for July-September."*

Figure 4: US Statewide Average Temperature Ranks July – September 2022



Source: NOAA

Natural Gas – EIA, US shale/tight natural gas forecast +7.0% or +6.17 bcf/d YoY in May

Shale/tight gas production

The warm winter was the biggest negative to natural gas prices so far in 2023, but then there was also the negative that continues to be the very strong growth in US natural gas production driven by the major shale/tight plays. Remember also that the top US shale/tight oil plays are oil wells that produce associated NGLs and natural gas i.e., so as the Permian, Bakken, Eagle Ford and Niobrara go on oil production, natural gas production in these plays go the same. On Monday, the EIA released its monthly Drilling Productivity Report Apr 2023, and the key takeaway is that May 2023 would be the 12th consecutive month of growth for US shale/tight natural gas, albeit the last few have been more modest MoM growth but growth, nonetheless. The DPR [LINK] is the EIA's forecast for oil and natural gas production from the major shale/tight oil and gas basins for the current month (in this case Apr) and the next month (in this case May). (i) Shale/tight natural gas is forecasted to have 12 months of consecutive growth and has been breaking out since last April, as increasing US LNG export capacity out of the Gulf Coast is driving natural gas growth in Louisiana and Texas. US shale/tight natural gas was 96.202 bcf/d in Mar and Apr is forecasted to be 96.834 bcf/d (96.622 bcf/d previously) with May production forecasted to be 97.166 bcf/d. (ii) As for the May forecast, the largest increases are seen in the Haynesville (+0.094 bcf/d MoM), Permian (+0.077 bcf/d MoM), Eagle Ford (+0.055 bcf/d MoM) and Appalachia (+0.048 bcf/d MoM). (iii) Total US shale/tight natural gas production is expected +6.166 bcf/d YoY for May. All shale/tight plays are up YoY, aside from Appalachia and Niobrara, with the most notable YoY increases being the Permian +2.644 bcf/d YoY, Haynesville +1.958 bcf/d YoY, and Eagle Ford +0.872 bcf/d YoY; with Haynesville and Permian acting as key shale/tight plays feeding growth US LNG exports. (iv) Later in the memo, we note the North Dakota comments on Feb oil production being up MoM and March expected to be down MoM. So we suspect that the EIA DPR's estimate fo the Bakken in March could be revised lower. (v) Remember US shale/tight gas is ~90% of total US natural gas production. So, whatever the trends are for shale/tight gas are the trends for US natural gas in total. Below is our running table showing the EIA DPR data for the shale/tight gas plays, and the MoM changes in major shale/tight natural gas production. Our Supplemental Documents package includes the EIA DPR.

Figure 5: MoM Change – Major Shale/Tight Natural Gas Production

mmcf/d	Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	May YoY	May YoY %	May less Apr
Anadarko	6,275	6,554	6,658	6,715	6,708	6,832	6,997	6,981	6,847	6,870	6,933	6,941	807	13%	8
Appalachia	35,155	35,121	35,332	35,486	35,577	35,434	35,417	35,279	35,018	34,879	35,233	35,281	-195	-1%	48
Bakken	3,088	3,086	2,915	3,191	3,156	3,246	3,323	3,308	3,160	3,126	3,121	3,159	83	3%	38
Eagle Ford	6,538	6,671	6,985	7,101	7,220	7,311	7,390	7,365	7,232	7,048	7,211	7,266	872	14%	55
Haynesville	15,023	15,261	15,643	15,835	15,878	16,083	16,257	16,440	16,471	16,690	16,727	16,821	1,958	13%	94
Niobrara	5,195	5,205	5,212	5,223	5,062	5,074	5,124	5,211	5,156	5,186	5,173	5,185	-2	0%	12
Permian	20,227	20,373	20,417	20,584	20,930	21,143	21,268	21,615	22,112	22,403	22,437	22,514	2,644	13%	77
Total	91,501	92,271	93,162	94,135	94,531	95,123	95,776	96,199	95,996	96,202	96,834	97,166	6,166	7%	332

Source: EIA, SAF

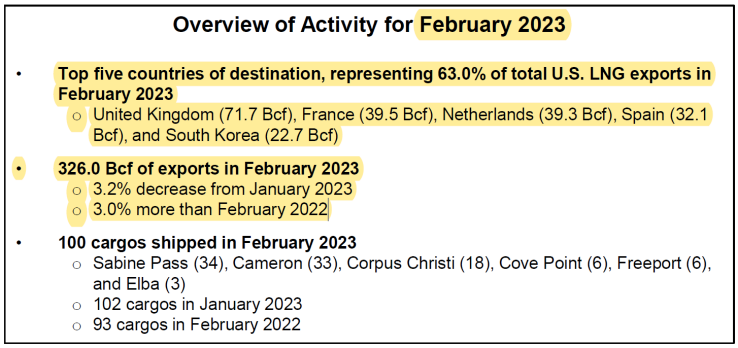
Natural Gas – US LNG Exports up +6.67% MoM to 11.6 bcf/d in Feb

Feb 2023 US LNG Exports

As a reminder the US Dept of Energy posts monthly US LNG export data two weeks before the EIA (part of the US Dept of Energy) posts US LNG export data in its monthly Natural Gas Monthly report (next report is Apr 28). Normally, any differences in data points are due to rounding. The DOE report is better as it provides detailed information on LNG imports and exports including LNG volumes to the top US export countries. The US Department of Energy reported the February LNG export actuals on Monday [LINK]. On Wednesday, we tweeted [LINK] *"US #LNG exports Feb/23 of 11.64 bcfd, +3% YoY, +7% MoM. #FreeportLNG restart approval was late Feb. Feb/23 top 5 export markets: UK, France, Dutch, Spain, Korea.*

Feb/22 top 5 export markets: Turkey, France, Spain, Dutch, Korea. This DOE LNG data is 2 wks before @EIAgov. #OOTT." February saw 326.0 bcf (11.6 bcf/d) of LNG exports, up +6.67% MoM from 10.9 bcf/d in Jan and up +2.54% YoY from 11.3 bcf/d in Feb 2022. The top 5 countries with export deliveries from the US were the UK (71.7 bcf), France (39.5 bcf), Netherlands (39.3 bcf), Spain (32.1 bcf), and South Korea (22.7 bcf), representing 63.0% of total US LNG exports. There has been a shift in the over the last year in top 5 exports with the energy crisis in Europe and the geo-political impacts from the Russian invasion of Ukraine when we look at the top export destinations from a year ago. There was 316.4 bcf of exports in February 2022 and the top five export countries were: Turkey (43.7 bcf), France (39.6 bcf), Spain (39.4 bcf), Netherlands (31.6 bcf), and South Korea (27.5 bcf), representing 57.5% of total US LNG exports throughout the month. Below is part of the graphic from our tweet showing the top 5 export countries in Feb 2023. Our Supplemental Documents package includes excerpts from the DOE LNG Monthly.

Figure 6: Top 5 countries of destination for US LNG exports Feb 2023



Source: DOE

Figure 7: DOE Monthly US LNG Exports

(bcf/d)	2016	2017	2018	2019	2020	2021	2022	2023
Jan	0.0	1.7	2.3	4.1	8.1	9.8	11.4	10.9
Feb	0.1	1.9	2.6	3.7	8.1	7.4	11.3	11.6
March	0.3	1.4	3.0	4.2	7.9	10.4	11.7	
Apr	0.3	1.7	2.9	4.2	7.0	10.2	11.0	
May	0.3	2.0	3.1	4.7	5.9	10.2	11.3	
June	0.5	1.7	2.5	4.7	3.6	9.0	10.0	
July	0.5	1.7	3.2	5.1	3.1	9.7	9.7	
Aug	0.9	1.5	3.0	4.5	3.6	9.6	9.7	
Sept	0.6	1.8	2.7	5.3	5.0	9.5	9.8	
Oct	0.1	2.6	2.9	5.7	7.2	9.6	10.0	
Nov	1.1	2.7	3.6	6.4	9.4	10.2	10.1	
Dec	1.3	2.7	4.0	7.1	9.8	11.1	11.0	
Full Year	0.5	1.9	3.0	5.0	6.6	9.7	10.6	11.2

Source: DOE

Natural Gas – Natural gas deliveries to Freeport LNG averaged >2 bcf/d so far in April

Freeport LNG

US LNG exports will see an increase in March and then also again in April with the restart of Freeport LNG Freeport did not get the full approval for a restart until late Feb and so natural gas deliveries only ramped up in March before returning to full levels in the beginning of April. Bloomberg regularly reports on natural gas delivers (not LNG output) to all US LNG export facilities. Bloomberg reported natural gas deliveries to Freeport hit 1.94 bcf/d on March 31

and deliveries for March averaged 1.10 bcf/d. But for April, Bloomberg reports that natural gas deliveries to Freeport LNG have averaged >2 bcf/d.

Natural Gas – Hugely bullish Baker Hughes view for LNG FIDs thru 2026

Baker Hughes sees huge # of LNG supply FIDs thru 2026

The key reason why we highlight Baker Hughes views on LNG export projects is that they have been the dominant services company for LNG supply projects in operations and for any LNG supply projects being considered for FID. They are in the know and have that benefit of real conversations with all the major LNG supply players. Baker Hughes reported Q1 on Wednesday and we tweeted first on the release, but then on the Q1 call. (i) Early Wednesday morning, we tweeted [LINK] "*Bullish #NatGas #LNG for 2020s. "..the case for a multi-decade growth opportunity in gas is steadily improving as both a transition and destination fuel" @simonelli_l. He should have great insight given $BKR dominant position for LNG supply in operation & being planned. #OOTT."* A multi-decade growth opportunity!. (ii) But Baker Hughes CEO Simonelli's comments in the Q1 call Q&A were hugely bullish as he provided Baker Hughes estimates for LNG supply FIDs for 2023 thru 2026. We tweeted [LINK] "*Hugely bullish for #LNG #NatGas for 2020s! $BKR @simonelli_l expectations for LNG FIDs. 2023: 65-115 MTPA (8.6-15.1 bcfd). 2024: "approaching the same FID levels we see in 2023". 2025: 30-60 MTPA (3.9-7.9 bcfd). 2026; 30-60 MTPA (3.9-7.9 bcfd). #OOTT."* These numbers were in the Q&A and not in the prepared remarks, which is a good reminder why we like to listen to the Q&A. In the Q&A, Simonelli replied "*And there is still several more projects that we're tracking for FID this year. You've seen some of the external press around Rio Grande and what they're expecting from the FAC [ph], et cetera. And so we remain confident that this year, we'll see between 65 MTPA to 115 MTPA of FIDs in '23. And in terms of pipeline of opportunities, they continue to grow as well. I think a good example is Cheniere's 20 MTPA expansion that they've communicated at Sabine Pass. And so we're seeing a number of also international projects. So based on what we see today, there's a reasonable expectation that LNG FIDs in '24 could be approaching the same FID levels we see in 2023. Still early to call, but there are a number of projects that are moving towards that. And then it continues in '25 and '26, we also see a set of opportunities improving and with the potential for FID ranges between 30 MTPA to 60 MTPA each year. So again, the market is very active at the moment, and we like the position that we have and helping our customers."* Our Supplemental Documents package includes the Baker Hughes LNG comments in the Q1 release, the Q1 call mgmt. prepared comments and Q&A.

Natural Gas – India January natural gas production +2.43% YoY to 3.37 bcf/d

India natural gas production up +2.43% YoY

It looks like India's domestic natural gas production continues to be up modestly from the recent 2020/21 trough, but the growth is still very small. India natural gas production peaked in 2010 at 4.6 bcf/d. Its 2018-2019 production averaged 3.18 bcf/d, declining to 3.02 in 2019-2020 and then further declined to average 2.78 bcf/d 2020-2021. But then natural gas production returned to growth in 2021-2022 but that growth has mostly stalled or is modest at best. There was a small MoM gain in March 2023 on higher demand for products. On Thursday, India's Petroleum Planning and Analysis Cell released their monthly report for March's natural gas and oil statistics [LINK]. India's domestic natural gas production of 3.37 bcf/d was up +2.43% YoY in March from 3.29 bcf/d in March 2022 and was up +0.71% MoM from 3.34 bcf/d in February. Our Supplemental Documents package includes excerpts from the PPAC monthly.

Natural Gas – India Jan LNG imports up +10.99% YoY to 2.84 bcf/d, up MoM

India LNG imports +10.99% YoY

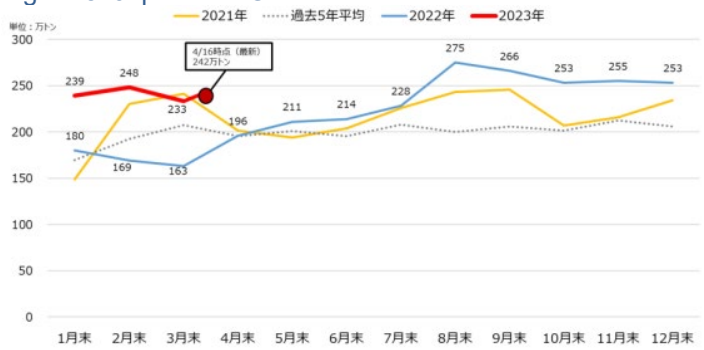
For the past several years, there has been increased India LNG imports whenever domestic natural gas production was flat or decreased. But the overriding factor in 2022 has been the sky-high LNG prices. India is always viewed as an extremely price sensitive buyer in terms of its LNG imports. We saw this in periods of low LNG prices such as June to Oct 2020 when India had a big ramp up in LNG imports. But with the sky-high LNG prices in 2022, India did their best to minimize LNG imports. However, now with the pull back in LNG prices, we are seeing some modest YoY increases in India's LNG imports. On Thursday, India's Petroleum Planning and Analysis Cell released their monthly report for March natural gas and oil statistics [LINK]. Over the past 3 years, India's LNG imports declined from a 2020-2021 peak of 3.84 bcf/d in Oct 2020 to just 2.85 bcf/d in Jan 2021 and lower in 2022. Additionally, March LNG imports were 2.55 bcf/d, down -10.32% MoM from 2.84 bcf/d in February and down -15.17% YoY from 3.00 bcf/d in March 2022.

Natural Gas – Japan's LNG stocks up +0.43% WoW to ~116 bcf

Japan LNG stocks +0.43% WoW

Japan had a mild winter with a hot March to end winter, so it was able to escape any weather-driven LNG shortages. It's shoulder season now so there isn't any strong weather related natural gas demand. LNG stockpiles held by Japanese power producers continue to exceed both last year's level and the seasonal average. Japan's METI weekly LNG stocks data was released on Wednesday [LINK]. LNG stocks on Apr 16 were 116.2 bcf +0.43% WoW from Apr 9 of ~115.8 bcf and well above the 5-year average of 94 bcf. Below is the LNG stocks graph from the METI weekly report.

Figure 8: Japan's LNG Stocks



Source: METI

Natural Gas – Japan LNG Imports down -12.0% YoY to 8.86 bcf/d in March

Japan Mar LNG imports -12.0% YoY

On Thursday, Japan's Ministry of Finance posted its import data for March [LINK] and pointed to a material YoY decline in LNG imports. The MOF reported Japan's March LNG imports were 8.86 bcf/d, which was -12.0% YoY. Notably, Mar 2023's imports of 8.86 bcf/d was the lowest LNG imports recorded for the month of March in the last decade. There is also the factor of the high LNG prices to end 2022 that would have impacted LNG imports in the proceeding months of 2023. In addition, Japan's thermal coal imports in Mar were -19.9% YoY, compared to +1.4% YoY in Feb. Japan experienced very hot temps in March, so there was no real urgency to import LNG or thermal coal. Below is our table that tracks Japan LNG import data.

Figure 9: Japan Monthly LNG Imports

bcf/d	2015	2016	2017	2018	2019	2020	2021	2022	22/21	2023	23/22
Jan	13.06	11.22	12.85	12.79	11.69	11.63	12.48	10.51	-15.8%	10.56	0.5%
Feb	13.26	12.30	13.36	14.23	12.61	10.99	13.84	12.19	-11.9%	10.98	-9.9%
Mar	12.60	12.62	12.61	12.28	11.30	11.16	11.04	10.07	-8.7%	8.86	-12.0%
Apr	10.56	10.21	10.52	8.97	9.00	8.31	7.96	8.92	12.0%		
May	8.91	8.55	9.66	9.92	8.62	7.09	7.67	8.92	16.3%		
June	10.61	10.02	9.90	8.88	8.32	8.42	9.13	9.29	1.7%		
July	10.77	10.19	10.19	10.55	10.56	9.35	9.58	9.54	-0.4%		
Aug	10.93	11.96	11.24	11.73	9.45	9.04	9.75	9.71	-0.4%		
Sept	11.06	10.67	9.31	10.04	10.30	10.41	8.66	8.52	-1.6%		
Oct	9.38	9.73	9.50	10.12	9.75	9.20	7.17	7.88	9.9%		
Nov	10.71	12.07	10.26	10.15	10.03	9.63	9.38	8.88	-5.4%		
Dec	12.51	11.69	12.31	11.23	10.54	11.96	10.89	9.39	-13.8%		

Source: Japan Ministry of Finance

Natural Gas – China natural gas production up +4.0% YoY to 23.4 bcf/d in March

China natural gas production +4.0% YoY

We have been highlighting a big change in China's natural gas and LNG dynamics over the past two years has been how China has been increasing its domestic natural gas production – increasing domestic natural gas production means less need for LNG imports. That has been compounded by China's increasing natural gas pipeline imports of cheaper Russian natural gas. These two items reduce the need for LNG imports. China continues to increase its domestic natural gas production in March 2023. On Monday, China's National Bureau of Statistics reported domestic natural gas production of 20.5 bcm (23.35 bcf/d) in Mar which is +4.0% YoY [LINK]. China does not provide the separate data for Jan vs Feb, so a MoM change is not easily determinable. March's data brings total YTD production to 59.5 bcm (23.34 bcf/d), reflecting a +4.5% YoY increase from 2022 YTD production of 56.8 bcm (22.29 bcf/d).

Natural Gas – China LNG imports down 7.08% MoM in March

China natural gas imports

No one should be that China's natural gas imports were down in March given the hot March to end winter. China's finalized natural gas import data for March was posted which provided the split of natural gas imports between pipeline imports and LNG imports. (i) Natural gas pipeline imports for Mar were down -8.11% MoM to 4.65 bcf/d and are -5.65% YoY from 4.93 bcf/d in Mar 2022. This is a stark contrast to Feb's +13.68% MoM increase in pipeline imports. (ii) LNG imports were down -7.08% MoM to 8.30 bcf/d in Mar but are up +4.56% YoY from 7.94 bcf/d in Mar 2022. This compares to Feb's -2.40% MoM decrease. (iii) Total natural gas imports (pipeline + LNG) were 12.95 bcf/d in Feb, down -1.05 bcf/d (-7.45%) MoM from 14.00 bcf/d in Feb but are up +0.08 bcf/d (+0.65%) YoY from 12.87 bcf/d in Feb 2022. We typically use bp's conversion factors, which are 1 million tonnes of natural gas = 41.071 bcf, and 1 million tonnes LNG = 48.028 bcf.

Natural Gas – Russia expects natural gas pipeline exports to China +0.7 bcf/d YoY

Russia gas pipeline exports to China

For the last few years, we have been highlighted the concern that the increasing Russia natural gas pipeline exports via the Power of Siberia would reduce China's need for LNG imports. Cheaper Russian natural gas from pipelines wins the day over more expensive LNG imports. Earlier this morning, we tweeted [LINK] "*Russian #NatGas pipeline exports to China will reduce any China need for increased #LNG imports in 2023. #Novak expects pipeline exports +50% in 2023 or +0.7 bcf/d from 15 bcm (1.45 bcfd) in 2022 to 22 bcm (2.13 bcfd) in*

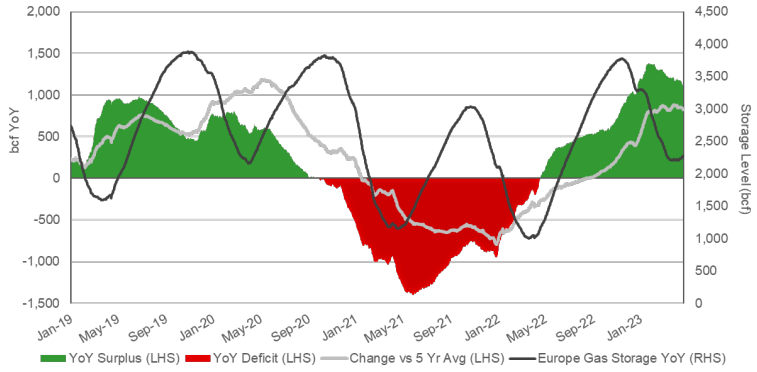
2023. #OOTT." TASS and other Russian media today reported on Russian Deputy PM Novak's comments on Russian TV and he expects Russian exports of natural gas pipeline gas to China to be +50% or +0.7 bcf/d YoY in 2023 to approx. 2.13 bcf/d. Our Supplemental Documents package includes the TASS report.

Natural Gas – Europe storage is now +20.15% vs 5-yr average, but within 5-yr range

Europe gas storage

The big global natural gas story for Q1/23 was how mild winters in Europe and Asia were the key reason why Europe made it through winter without a natural gas shortage. There was negligible weather driven demand for natural gas, which along with the continued industrial demand destruction, meant storage levels are at still at high levels. However, we are seeing a narrowing of the Europe gas storage surplus with the lower European natural gas prices and the impact of strikes impacting France LNG imports on and off over the past month. This winter (Nov 1/22) began with gas storage at 94.94% capacity, up 17.86% YoY and is now a YoY surplus of 27.02%. However, average temps remained a bit warmer this past week resulting in storage increasing slightly by +0.97% WoW to 57.13% on Apr 21. Storage is now +27.02% greater than last year levels of 30.11% and is +20.15% above the 5-year average of 36.98%. In addition, current storage is currently within the 5-year range, albeit at the top end of the range. Below is our graph of Europe Gas Storage Level.

Figure 10: Europe Gas Storage Level



Source: Bloomberg

Oil – US oil rigs up +3 rigs WoW to 591 oil rigs on April 21

US oil rigs up +3 WoW

Baker Hughes released its weekly North American drilling activity data on Friday. This week total US oil rigs were up +3 to 591 rigs as of April 21. The total US oil rig count is now at 591 rigs, up +42 YoY, +110 from the 2022 low of 481 rigs in January and +419 since the 2020 low of 172 rigs on Aug 14. Notably, on a per basin basis the Permian and "Others" both added +3 rigs to 354 and 81 oil rigs, respectively. In contrast, the Eagle Ford, Cana Woodford, and Mississippian each saw a -1 rig decline to 60, 27 and 1 rigs, respectively. US gas rigs were up +2 rigs WoW to a total of 159 rigs, an increase of +15 rigs YoY, which came to some surprise while continue to expect that US gas rigs will decline over the coming weeks. Below is our graph of total US oil rigs.

Figure 11: Baker Hughes Total US Oil Rigs

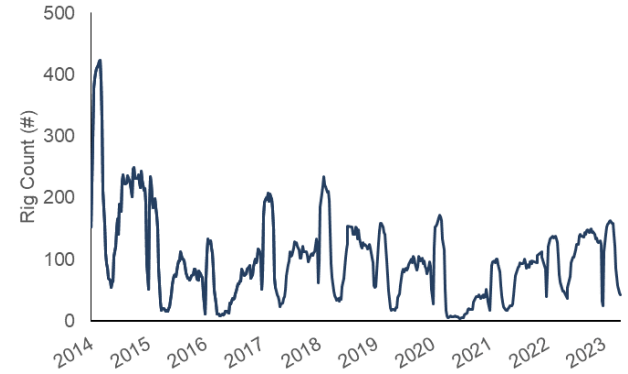
Source: Baker Hughes

Oil – Total Cdn rigs down -6 WoW to 105 total rigs, +4 rigs YoY

Cdn total rigs -6 WoW

Cdn drilling is now a few weeks into spring break up, which is the period of declining rigs that goes to the yearly trough in rigs. Traditionally, Cdn rigs hit their trough the last week of April or first week of May. So we could still see small weekly declines over the next week or two. Total Cdn rigs were down -6 WoW to 105 rigs as of Apr 21. Notably, the week of Apr 21 saw a -7 rig decline in AB and a +1 rig add in BC, with all other provinces flat WoW. There are now a total of 105 active rigs, +50 rigs vs the comparable Covid period of 55 rigs on Apr 23, 2021. Cdn oil rigs and gas rigs both fell by -3 rigs WoW to 42 and 63 rigs, respectively. Cdn oil rigs are now -6 YoY compared to 48 rigs last year while gas rigs are +10 YoY from 53 rigs. Below is our graph of total Cdn oil rigs.

Figure 12: Baker Hughes Total Canadian Oil Rigs



Source: Baker Hughes

Oil – US weekly oil production flat WoW at 12.3 mmb/d

US oil production flat WoW

The EIA estimates US oil production was flat WoW to 12.3 mmb/d for the week ended Apr 14 with the Lower 48 also flat at 11.9 mmb/d and Alaska down to 0.424 mmb/d. US oil production, based on the weekly estimates, was mostly range bound in 2022 between 11.9 to 12.1 mmb/d since the 2nd week of May. But this year production broke above 12.1 mmb/d to 12.2 mmb/d for the week ended Jan 6, and has remained at or above 12.2 mmb/d ever since.

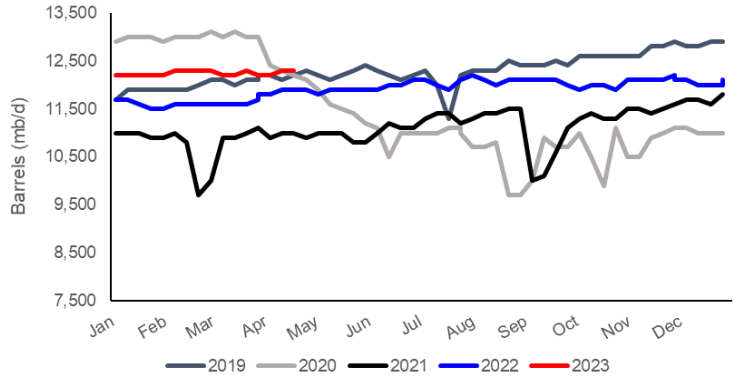
The first time since it touched 12.2 mmb/d since the pandemic was the 1st week of August in 2022. Total US production reached its highest level since March 13, 2020, this year on Feb 3 at 12.3 mmb/d. US oil production is up +0.400 mmb/d YoY at 12.3 mmb/d but is still down significantly at -0.800 mmb/d since the 2020 peak of 13.1 mmb/d on March 13.

Figure 13: EIA's Estimated Weekly US Oil Production

	Week 1		Week 2		Week 3		Week 4		Week 5	
Year-Month	End Date	Value	End Date	Value	End Date	Value	End Date	Value	End Date	Value
2021-Jan	01/01	11,000	01/08	11,000	01/15	11,000	01/22	10,900	01/29	10,900
2021-Feb	02/05	11,000	02/12	10,800	02/19	9,700	02/26	10,000		
2021-Mar	03/05	10,900	03/12	10,900	03/19	11,000	03/26	11,100		
2021-Apr	04/02	10,900	04/09	11,000	04/16	11,000	04/23	10,900	04/30	10,900
2021-May	05/07	11,000	05/14	11,000	05/21	11,000	05/28	10,800		
2021-Jun	06/04	11,000	06/11	11,200	06/18	11,100	06/25	11,100		
2021-Jul	07/02	11,300	07/09	11,400	07/16	11,400	07/23	11,200	07/30	11,200
2021-Aug	08/06	11,300	08/13	11,400	08/20	11,400	08/27	11,500		
2021-Sep	09/03	10,000	09/10	10,100	09/17	10,600	09/24	11,100		
2021-Oct	10/01	11,300	10/08	11,400	10/15	11,300	10/22	11,300	10/29	11,500
2021-Nov	11/05	11,500	11/12	11,400	11/19	11,500	11/26	11,600		
2021-Dec	12/03	11,700	12/10	11,700	12/17	11,600	12/24	11,800	12/31	11,800
2022-Jan	01/07	11,700	01/14	11,700	01/21	11,600	01/28	11,500		
2022-Feb	02/04	11,600	02/11	11,600	02/18	11,600	02/25	11,600		
2022-Mar	03/04	11,600	03/11	11,600	03/18	11,600	03/25	11,700		
2022-Apr	04/01	11,800	04/08	11,800	04/15	11,900	04/22	11,900	04/29	11,900
2022-May	05/06	11,800	05/13	11,900	05/20	11,900	05/27	11,900		
2022-Jun	06/03	11,900	06/10	12,000	06/17	12,000	06/24	12,100		
2022-Jul	07/01	12,100	07/08	12,000	07/15	11,900	07/22	12,100	07/29	12,100
2022-Aug	08/05	12,200	08/12	12,100	08/19	12,000	08/26	12,100		
2022-Sep	09/02	12,100	09/09	12,100	09/16	12,100	09/23	12,000	09/30	12,000
2022-Oct	10/07	11,900	10/14	12,000	10/21	12,000	10/28	11,900		
2022-Nov	11/04	12,100	11/11	12,100	11/18	12,100	11/25	12,100		
2022-Dec	12/02	12,200	12/09	12,100	12/16	12,100	12/23	12,000	12/30	12,100
2023-Jan	01/06	12,200	01/13	12,200	01/20	12,200	01/27	12,200		
2023-Feb	02/03	12,300	02/10	12,300	02/17	12,300	02/24	12,300		
2023-Mar	03/03	12,200	03/10	12,200	03/17	12,300	03/24	12,200	03/31	12,200
2023-Apr	04/07	12,300	04/14	12,300						

Source: EIA

Figure 14: US Weekly Oil Production



Source: EIA, SAF

EIA Jan actuals were +262,000 b/d vs EIA weekly estimates

As a reminder there is a sizeable difference between what the EIA looks as "actuals" for US oil production vs the EIA's weekly estimates noted above. Here is what we wrote in last week's (Apr 2, 2023) Energy Tidbits memo. *"On Friday, we tweeted [LINK] "US oil production stronger than most expect. Jan 23 was 12.462 mmbd,*

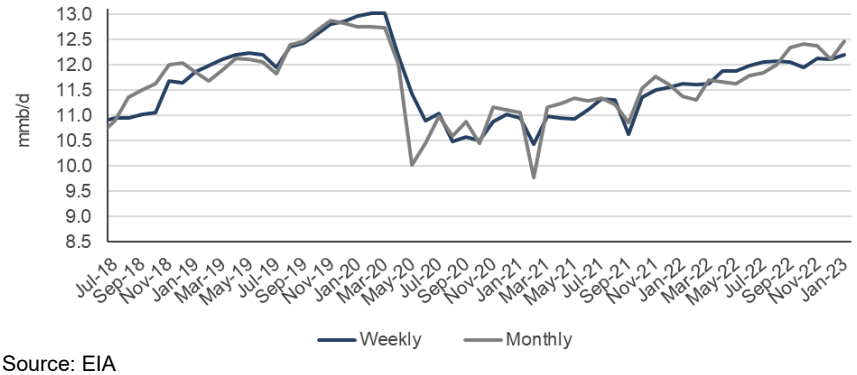
+1.093 mmbd YoY vs 11.369 in Jan 22. @EIAgov actuals from Form 914 today. Biggest YoY increases: New Mexico +0.449 YoY to 1.792 mmbd. Texas +0.384 YoY to 5.237 mmbd. Offshore GoM +0.206 YoY to 1.914 mmbd. #OOTT." On Friday, The EIA released its Form 914 data [LINK], which is the EIA's "actuals" for January US oil and natural gas production. There were two key takeaways from the EIA's weekly US oil production data for Jan – the actuals were 262,000 b/d more than the weekly estimates, and Jan was the highest US oil production since Covid at +1.093 mmb/d YoY to 12.462 mmb/d. There was a moderate MoM increase in US oil production in Jan. (i) Form 914 estimates total US oil production was up +347,000 b/d MoM to 12.462 mmb/d in January. The actuals for January were 262,000 b/d higher than the EIA's weekly estimates that worked out to 12,200 mmb/d. December actuals were adjusted higher to 12.115 mmb/d from 12.101 mmb/d in last months Form 914. (ii) This is the highest since Covid. There was a big MoM jump of +0.347 mmb/d vs Dec of 12.115 mmbd but remember Dec was hit by weather. Our Supplemental Documents package includes the New Mexico, Texas and offshore Gulf of Mexico tables attached to our tweet."

Figure 15: EIA Form 914 US Oil Production (thousand b/d)

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2023	12,462											
2022	11,369	11,316	11,701	11,668	11,629	11,797	11,844	12,002	12,337	12,417	12,379	12,115
2021	11,124	9,925	11,326	11,305	11,356	11,356	11,347	11,277	10,918	11,569	11,790	11,634
2020	12,852	12,842	12,797	11,914	9,713	10,442	11,006	10,577	10,921	10,457	11,196	11,168
2019	11,869	11,673	11,913	12,149	12,154	12,218	11,902	12,486	12,590	12,809	13,000	12,978
2018	10,001	10,281	10,467	10,500	10,435	10,641	10,897	11,392	11,443	11,509	11,886	11,945
2017	8,875	9,110	9,166	9,101	9,185	9,111	9,247	9,250	9,517	9,669	10,085	9,983

Source: EIA

Figure 16: EIA Form 914 US Oil Production vs Weekly Estimate



Source: EIA

Oil – North Dakota Feb oil production up +9.1% MoM

North Dakota oil production

As expected, North Dakota oil production in Feb was up another 9.1% MoM following the 10.7% MoM increase in Jan as North Dakota oil production was hit hard by cold winter and snowy weather conditions in Dec. Our Dec 18, 2022, Energy Tidbits highlighted the blizzard that hit North Dakota and how that had cut oil output by 200,000 to 250,000 b/d. However, North Dakota production was back above 1.00 mmb/d in Jan and again in Feb. On Thursday,

the North Dakota Industrial Commission posted its Director's Cut, which includes February oil and natural gas production data [LINK]. North Dakota Feb production was up +9.1% MoM to 1.157 mmb/d and is +6.3% YoY from production of 1.089 mmb/d in Feb 2022. Estimated well completions were 96 in January, an increase of +29 from 67 in January. Our Supplemental Documents package includes excerpts from the Director's Cut.

Figure 17: North Dakota Oil Production by Month

(b/d)	2017	2018	2019	2020	2021	2022	2022/21	2023	2023/22
Jan	981,380	1,179,564	1,403,808	1,430,511	1,147,377	1,088,613	-5.1%	1,060,708	-2.6%
Feb	1,034,248	1,175,316	1,335,591	1,451,681	1,083,554	1,089,091	0.5%	1,157,303	6.3%
Mar	1,025,690	1,162,134	1,391,760	1,430,107	1,108,906	1,122,640	1.2%		
Apr	1,050,476	1,225,391	1,392,485	1,221,019	1,123,166	900,597	-19.8%		
May	1,040,995	1,246,355	1,394,648	859,362	1,128,042	1,059,060	-6.1%		
June	1,032,873	1,227,320	1,425,230	893,591	1,133,498	1,096,783	-3.2%		
July	1,048,099	1,269,290	1,445,934	1,042,081	1,076,594	1,072,632	-0.4%		
Aug	1,089,318	1,292,505	1,480,475	1,165,371	1,107,359	1,075,307	-2.9%		
Sept	1,107,345	1,359,282	1,443,980	1,223,107	1,114,020	1,121,063	0.6%		
Oct	1,183,810	1,392,369	1,517,936	1,231,048	1,111,910	1,121,754	0.9%		
Nov	1,194,920	1,375,803	1,519,037	1,227,138	1,158,622	1,098,389	-5.2%		
Dec	1,182,836	1,402,741	1,476,777	1,191,429	1,144,999	957,864	-16.3%		

Source NDIC, NDPA

North Dakota expects lower March oil production

As a reminder, last month North Dakota warned that March oil production would be down vs February. Here is what we wrote in our March 19, 2023 Energy Tidbits memo. "*We used to reference the local reporting on the monthly North Dakota press conference on the monthly Director's Cut for the local reporters insights but those webcasts are now posted so we just listen to the 30 min webcasts. There are always additional insights from the press conference and Q&A webcast [LINK]. At 12:15 min mark Director Lynn Helms said ".. and the last half of Jan and most of Feb pretty good weather. So like I said, we have about a 6% increase in oil production [in Jan), a little bit higher increase in gas production ….. Looking forward into Feb, the gas number look very strong and so we're expected Feb production to see another major increase. Unfortunately with the weather last week and with what's coming this week, March looks like it could be a bit of a struggle. It looks comparable to last Aug and to Jan, above a million barrels a day. But we are seeing impacts from difficult transportation for crude oil. Still a significant amount of crude oil is trucked from well sites to the pipeline transportation system. And so that causes some problems." Then in the Q&A, he gave more color when asked about the weather impact right now. At 19:25 min mark, Helms said "we're already experiencing a downturn from Feb and that's the result of what happened last week. You saw the maps when there was no travel advised on any highway in the state of North Dakota, anywhere. So crude oil transportation really took a hit. We haven't really fully recovered from that and now we're looking at, at least the western and southern parts of the state, another 1 to 3 inches of snow tonight and tomorrow. Of course that's going to slow things again."*

Oil – North Dakota crude by rail up MoM to 99,395 b/d in Jan

The North Dakota Pipeline Authority posted its monthly update "*April 2023 Production & Transportation"* [LINK]. Please note that we always go to the backup excel sheets from the

North Dakota CBR up MoM in Feb

North Dakota Pipeline Authority for more detailed numbers of crude by rail out of North Dakota. The NDPA Monthly Update (graph below) report only provides rounded numbers, and these rounded numbers are not accurate enough to match the graphs. In the backup excel, the NDPA estimates crude by rail in Feb was a low of 80,860 b/d and a high of 110,860 b/d for an average of 95,860 b/d. This is above the Jan average of 92,807 b/d and Dec 2022 average of 75,216 b/d. Below is a chart from the NDPA monthly update showing the crude by rail volumes since 2014. Our Supplemental Documents package includes excerpts from the NDPA monthly update.

Figure 18: Estimated North Dakota Rail Export Volumes

Source: North Dakota Pipeline Authority

Oil – EIA shale/tight oil forecast shows slight increase for Apr/May vs Dec/Jan/Feb

US shale/tight oil production

The EIA Drilling Productivity Report April 2023 [LINK] forecast for US shale/tight oil shows a MoM increase in Apr, followed by another increase (albeit to a lesser extent) in May after being fairly stuck throughout July-Oct. The DPR is the EIA's forecast for production for the major shale/tight oil and gas basins for the current month (in this case Apr) and the next month (in this case May). (i) Shale/tight oil was flat from July thru Oct, then increased in Nov, Dec, Jan, was flat in Feb and decreased slightly in Mar. Now the EIA is forecasting two consecutive MoM production increases in April and May. The EIA does not provide any explanations, but this makes sense as we would have expected that Apr/May would be higher than Dec/Jan as Dec/Jan are normally impacted by winter weather conditions. It will be a trend to watch. (ii) In our Mar 19, 2023, Tidbits, we noted that we wouldn't be surprised to see the EIA revise its Feb estimates upward for the Bakken and its March estimate for the Bakken downward given the comments we heard in the North Dakota Director's Cut monthly for March. Notably, April's DPR did in fact show a downward revision for the Bakken's Feb data and brough production down by -56,000 b/d to 1.122 mmb/d and brought March production down by -4,000 b/d to 1.141 mmb/d. (iii) The EIA now forecasts total US shale/tight oil in Apr at 9.277 mmb/d and May at 9.328 mmb/d. (iv) The growth in May is somewhat distributed across all basins although the Permian and Bakken are forecasted to have the largest MoM increases of +13,000 b/d and +17,000 b/d, respectively. Permian production for May is 5.694 mmb/d, vs 5.681 mmb/d in Apr and the Bakken is also forecasted to reach production of 1.176 mmb/d in May following an -84,000 decrease MoM in Feb. (v) Note that shale/tight oil is approx. ~75% of total US production, so whatever the trends are

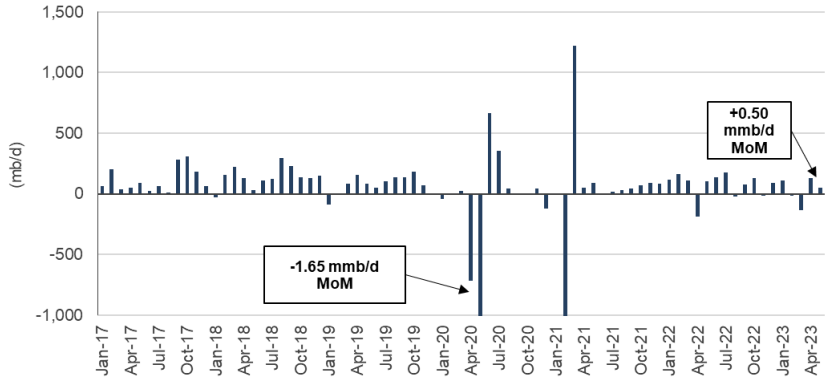
for shale/tight oil are normally the trends for US oil in total. Below is our table of running DPR estimates of shale/tight oil production and our graph of MoM changes in major shale/tight oil production.

Figure 19: MoM Change – Major Shale/Tight Oil Production

Thousand b/d	Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	May YoY	May YoY %	May less Apr
Anadarko	406	413	425	424	425	423	427	431	433	442	450	458	67	17%	8
Appalachia	124	130	128	120	120	122	126	136	137	138	149	150	36	31%	1
Bakken	1,178	1,173	1,136	1,183	1,168	1,182	1,200	1,206	1,178	1,145	1,159	1,176	4	0%	17
Eagle Ford	1,152	1,180	1,204	1,224	1,208	1,223	1,231	1,209	1,176	1,123	1,135	1,141	-8	-1%	6
Haynesville	36	37	37	37	37	37	37	37	37	37	37	37	2	6%	0
Niobrara	630	632	649	648	640	653	662	675	669	665	668	672	45	7%	4
Permian	5,232	5,367	5,329	5,347	5,403	5,460	5,542	5,605	5,652	5,596	5,681	5,694	563	11%	13
Total	8,758	8,932	8,908	8,983	9,002	9,100	9,224	9,299	9,282	9,146	9,277	9,328	709	8%	50

Source: EIA Drilling Productivity Report

Figure 20: MoM Change – Major Shale/Tight Oil Production



Source: EIA Drilling Productivity Report

Oil – EIA DUC's marginal decreases in March; big revisions to Permian Feb DUCs

DUCs down slightly in Mar

We are surprised that the big downward revisions to Permian DUCs didn't get much attention. We highlight this in a following item. We have been warning that we see a key risk to how much US oil production can sustainably grow in 2023 and beyond is the need to increase rig counts (not have less frac spreads) to replenish the inventory of Drilled Uncompleted wells at higher levels and the challenge for oilfield services to add capacity to increase frac spreads and completions. In our prior Energy Tidbits memos, we have highlighted how DUCs in the Permian are really about the same level as five years ago when Permian production was about half current levels. The biggest problem in the past with the EIA's Drilling Productivity Report [LINK] estimate of Drilled Uncompleted wells was that the data had been constantly revised and sometimes significantly. (i) On the potential plus side over the future years is that DUCs do not account for potential refracs ie. an added source of future fracs. (ii) However, in the coming years, we worry that there are more, lesser than expected DUCs that are lower quality. See the following item on this post Chevron's less than expected productivity in its 2022 Permian Delaware Basin wells. The Chevron issue is separate from the issue that there are a portion of the DUCs that will never be completed as there are drilled wells that don't look like they can justify the higher cost of frack/completion. (iii) However, the DUC estimates provide a clear picture of the trend that DUCs haven't really increased since Feb 2022. It's why there is the need for drilling rigs to pick up to replenish the

DUC inventory if the US is to have sustained strong oil growth in 2023 and beyond.. An exception to the generally unchanged DUC data is that Monday's DPR posted a significant revision and decreased DUCs in the Permian to 793 for Feb, which is down -251 from the previously reported 1,044 in the Mar DPR. This is the kind of revision we are talking about in the above comments. (iv) Drilled Uncompleted Wells were down -10 MoM (+383 YoY) in March to 4,676 DUCs, which compares to 4,293 DUCs in Mar 2022. Note that Feb's data (including the Permian) had a net downward revision of -87 to 4,686 from 4,773. (vi) But at 4,686 DUCs, it means that a total 4,188 DUCs were worked down since the Jun/20 peak of 8,874. The largest work downs are coming from the Permian (-541 YoY) and Eagle Ford (-229 YoY). With DUCs being worked down so significantly we will need to see rig counts go up to replenish DUCs in the near future. (vii) Note that shale/tight oil is approx. ~70% of total US production, so whatever the trends are for shale/tight oil are normally the trends for US oil in total. Below is our table of running DPR estimates of shale/tight oil production and our graph of MoM changes in major shale/tight oil production. Our Supplemental Documents package includes the EIA DPR.

Figure 21: EIA - Estimated Drilled UnCompleted Wells

Drilled Uncompleted	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Mar YoY %	Mar YoY
Anadarko	740	724	727	723	716	722	723	710	712	722	732	746	750	1%	10
Appalachia	471	497	526	524	529	562	576	597	620	631	662	704	706	50%	235
Bakken	426	429	425	427	426	474	494	501	528	552	579	609	608	43%	182
Eagle Ford	642	612	598	611	620	593	582	561	517	482	434	423	413	-36%	-229
Haynesville	395	419	441	466	483	513	535	558	595	624	662	707	719	82%	324
Niobrara	317	320	310	328	345	362	393	443	497	539	641	704	719	127%	402
Permian	1,302	1,294	1,244	1,218	1,180	1,117	1,097	1,051	1,068	1,079	1,042	793	761	-42%	-541
Total	4,293	4,295	4,271	4,297	4,299	4,343	4,400	4,421	4,537	4,629	4,752	4,686	4,676	9%	383

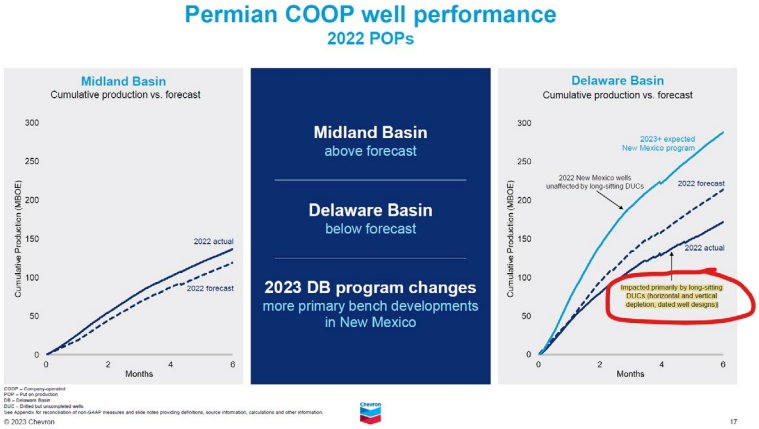
Source: EIA, SAF

What % of DUCs will disappoint like Chevron 2018/19 Permian DUCs did in2022

Here is what we wrote in our *March 5, 2023 Energy Tidbits memo on Chevron's DUCs issue in the Permian. "How can US shale oil growth not be less than expected, or certainly way more costly than expected, if the existing inventory of US DUCs (Drilled UnCompleted wells) not only includes wells that are likely to never be completed and also wells that are completed that will deliver significantly less than expected productivity? Maybe industry can make up for these lesser quality older DUCs, but that means growth will be more expensive as more wells will be needed. (i) On Thurs, we tweeted [LINK] "US shale #Oil growth less than expected? 1. Some DUCs were crappy wells & can't justify $MM for fracking. 2. Some older DUCs will deliver less results. See 👇$CVX Delaware underperformance driven by older 2018/19 DUCs completed in 2022. Surely this isn't unique to CVX. #OOTT." (ii) We have noted many times our view that there will be a percentage of DUCs that will never be completed. These are wells that were drilled that didn't find enough potential to justify the cost to frack and complete the well. (iii) Prior to Chevron's statements, we have not put a separate bucket of DUCs that, if and when completed, would be expected to deliver significantly less than expected productivity. (iv) It's hard to believe Chevron is unique and that other producers won't have some degree of similar impact as Chevron saying that it's older (2018/2019) DUCs delivering less than expected results are the reason why Chevron's overall 2022 Permian wells had lower productivity than planned. Because unless this older 2018/2019 DUCs*

underperformance was unique to Chevron, it points to US shale growth being less than expected. Chevron included the below graph that showed its less expected Permian well productivity in 2022 was due to a big miss on the Delaware wells, whereas the Midland beat expectations. Chevron graph blamed the significant Delaware underperformance on "Impacted primarily by long-sitting DUCs (horizontal and vertical depletion, dated well designs)". And then in the Q&A, Chevron said "And I want to point to the basis of design, because these -- the vintage of these wells where many of them were drilled in 2018 and 2019. They built a long inventory of DUCs into 2020, and it was only during 2022 that most of that DUC inventory got worked off." (v) So unless Chevron's significant underperformance of its 2018/2019 DUCs is unique to Chevron, it has to raise the question on what percentage of industry DUCs are likely to deliver significantly less than expected productivity. (vi) Please note this doesn't necessarily

Figure 22: EIA Form 914 US Oil Production



Source: Chevron

Plus CVX says more single and not multi bench development in the Delaware

Here is what we wrote in our March 5, 2023 Energy Tidbits memo on Chevron's other change in Permian Delaware oil drilling. "*Please note that having some percentage of less quality DUCs doesn't mean growth can't be achieved as producers can compensate by spending more and drilling more wells. Similarly, producers can compensate for developing less multi-bench areas in the Delaware developing more single bench areas. It will just cost more. One other Chevron investor day disclosure was CEO Wirth responding "We learn every year in the Permian. It's a great big basin. It's multiple basins. You have the Midland and the Delaware, and then you've got sub-basins within each of those. And there is not one game plan that applies everywhere. It's not a homogeneous geologic setting. There's a lot of heterogeneity. And where single bench may work in one area better than multiple bench, there's other areas where the reverse is the case." CEO Wirth didn't say specifically there will be less multi-bench development in the Delaware Basin, but that seemed to be the inference.*

Permian DUCs lowest since June 2014

Oil – Permian DUCs lowest since June 2014 when Permian production was 28% today

We recognize that frac completions are hugely better in 2023 than in 2014 and that most continue to believe there is mult-year growth for Permian oil production, but we continue to question how much sustainable growth there is given the low relative levels of DUCs and that Permian oil rigs at 354 are still well below the 493 peak in Dec 2018. And the comments by industry that many producers are now forced to work on Tier 2 and 3 quality lands. (i) Yesterday, we tweeted [LINK] *"Bullish for #Oil. How much sustainable Permian oil growth is there if Permian DUCs are lowest level in several yrs when Permian production was 1/3 today's b/d? ICYMI. @EIAgov revised its estimated Permian DUCs -251 to revised 793 DUCs. EIA estimates Mar is 761 DUCs. #OOTT."* (ii) We were surprised that the EIA's big downward revision to its estimates of Permian DUCs didn't get attention. The EIA made a big downward revision to its estimates of Permian Feb DUCs, down 251 from the last month's estimate of 1,044 to the new Feb 28 estimate of 793 DUCs. This is way down and the new DPR estimate for Permian DUCs at March 31 is 761 Permian DUCs. DUCs are the inventory that is there, alongside new oil wells being drilled, to fuel near term Permian oil growth. (iii) The latest Baker Hughes Permian oil rigs count is 354 Permian oil rigs, which is well below the peak of 493 Permian oil rigs in Dec 2018. (iii) The EIA Drilling Productivity Report estimates Permian oil production is was 5.69 mmb/d in March. (iv) The last time EIA Permian DUCs were this low was June 2014 and Permian oil production was 1.59 mmb/d at that time, which is 28% of March 2023 production. (v) When we see the low level of DUCs relative to Permian oil production and Permian oil rigs still well below peak Permian oil rigs, its easy to question how much sustainable Permian oil growth there is over the next few years.

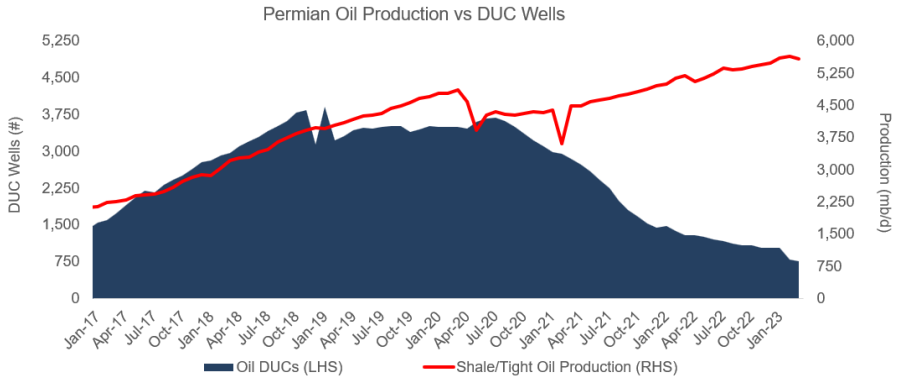
Figure 23: EIA Estimated Drilled UnCompleted Wells

Drilled UnCompleted Wells, EIA Drilling Productivity Report

											2023		
Drilled Uncompleted	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Anadarko	740	724	727	723	716	722	723	710	712	722	732	746	750
Appalachia	471	497	526	524	529	562	576	597	620	631	662	704	706
Bakken	426	429	425	427	426	474	494	501	528	552	579	609	608
Eagle Ford	642	612	598	611	620	593	582	561	517	482	434	423	413
Haynesville	395	419	441	466	483	513	535	558	595	624	662	707	719
Niobrara	317	320	310	328	345	362	393	443	497	539	641	704	719
Permian	1,302	1,294	1,244	1,218	1,180	1,117	1,097	1,051	1,068	1,079	1,042	793	761
Total	4,293	4,295	4,271	4,297	4,299	4,343	4,400	4,421	4,537	4,629	4,752	4,686	4,676

Source: EIA Drilling Productivity Report

Figure 24: EIA Estimated Drilled UnCompleted Wells vs Permian Oil Production



Source: EIA

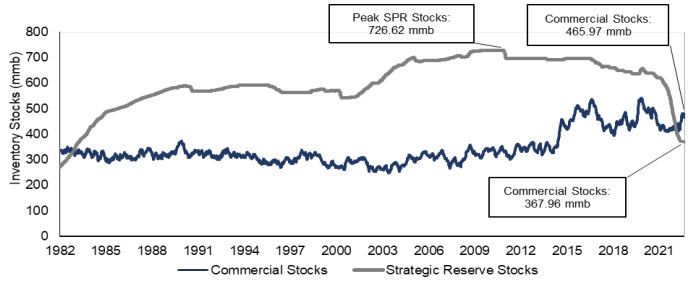
Source: EIA Drilling Productivity Report

Oil – US SPR reserves now -98.01 mmb lower than commercial crude oil reserves

US SPR reserves

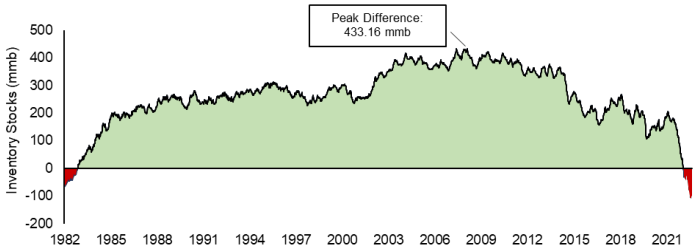
Oil in US Strategic Petroleum Reserves (SPR) moved below total US commercial crude oil reserves in the Sept 16 week for the first time since 1983, with the deficit narrowing this week due to the draw in commercial oil stocks exceeding that in the SPR. However, this week's data showed another SPR draw of -1.61 mmb compared to the -1.60 mmb draw last week and came after 10 consecutive weeks of no change up until the Jan 13 week. The EIA's weekly oil data for Apr 14 has SPR reserves at 367.96 mmb vs commercial crude oil reserves at 465.97 mmb. The last time the SPR was down at this level was on Nov 4, 1983, at 368.32 mmb. The below graphs highlight the difference between commercial and SPR stockpiles.

Figure 25: US Oil Inventories: Commercial & SPR



Source: EIA

Figure 26: US Oil Inventories: SPR less commercial



Source: EIA

Oil – Reminder US SPR going 26 mmb lower over the coming months

SPR going 26 mmb lower

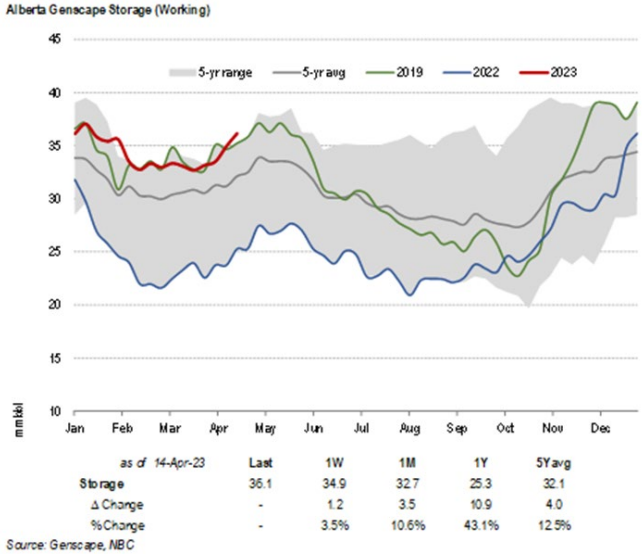
Here is what we wrote in our Feb 19, 2023 Energy Tidbits memo. "*On Monday, Bloomberg reported "The Biden administration plans to sell more crude oil from the Strategic Petroleum Reserve, fulfilling budget directives mandated years ago that it had sought to stop as oil prices have stabilized. The congressionally mandated sale will amount to 26 million barrels of crude, according to people familiar with the matter. The sale is in accordance with a budget mandate enacted in 2015 for the current fiscal year, said a spokesperson for the Department of Energy. The Energy Department has sought to stop some of the sales required by 2015 legislation so that it can refill the emergency reserve, which currently has about 371 million barrels. After this latest release, the reserve will dip to about 345 million." The last time the SPR was 345 mmb was in Aug 1983 at 345.7 mmb.*

Oil – Alberta oil storage now >5-yr average, adds to pressure on WCS-WTI differentials

WCS less WTI differentials

One of our favorite morning notes to read is the NBC Energy and FX Commentary as their focus is on commodities and not stocks. On Wed, they had a good reminder on Alberta oil storage and it reminds of a pressure right now on WCs-WTI differentials. NBC team wrote "*The latest Alberta storage data from Genscape/Woodmac posted a sizable ~3.5 MMb build over the last month, which lines up with ongoing oilsands maintenance and has led pipe exports down to 3.89 MMb/d from record levels of ~4.5 MMb/d eight weeks ago and 4.2 MMb/d four weeks ago. At the same time, rail exports have continued to set new 5-year seasonal lows at ~40-50 Mb/d. Storage now stands at 36.1 MMb and is just 3-4 MMb away from the prior peak levels with 3-5 weeks left in maintenance season, although we'll point out that PADD 2 ex-Cushing combined with Alberta storage still has roughly 9-10 MMb total of extra room from prior tank tops. So unless there is an unexpected egress constraint, we doubt that storage levels rise to a level that forces pricing wider on its own.*"

Figure 27: Alberta Genscape Storage (Working)



Source: Genscape, NBC

Oil – Cdn oil differentials narrowed slightly $0.40 to close at $15.00 on Apr 20

WCS less WTI differentials

We still think it's work watching to see if the OPEC+ voluntary cuts, effective May 1, impact global heavy/medium oil differentials. Normally, the first barrels cut by OPEC members like Saudi Arabia are medium/heavy barrels, which would tend to compete vs WCS. So less barrels OPEC medium/heavy barrels is normally a boost to WCS prices. Since the Apr 3 OPEC+ announcement, WCS differentials actually widened slightly. WCS less WTI differentials were $14.15 on March 31, which was the Friday before the Sun Apr 2 reports that OPEC+ was going to cut. The WCS less WTI differential widened to $15.40 on Apr 13, but narrowed $0.40 this week to close at $15.00 on Apr 20. For perspective, a year ago, the WCS-WTI differential was $12.50 on April 21, 2022. Below is Bloomberg's current WCS–WTI differential as of April 13, 2023 close.

Figure 28: WCS less WTI oil differentials including April 20 close

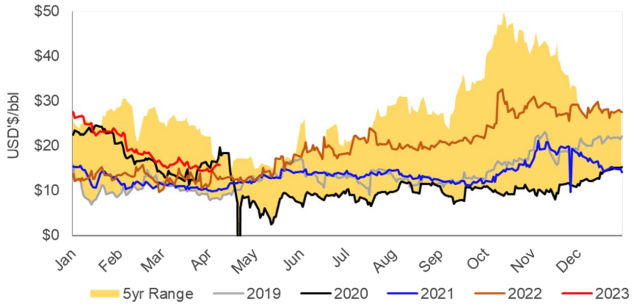
Source: Bloomberg

Oil – This is the season that normally sees narrowing of Cdn heavy oil differentials

WCS differentials normally narrow in spring

Unfortunately, there are often items like Keystone pipeline outage that impact Cdn heavy oil differentials. And the huge item, the release of mostly medium oil out of the SPR. It's not just unplanned events, but there are many items that impact Cdn heavy oil differentials, but we remind that we are just moving into the time of the year that normally sees Cdn heavy oil differentials narrow. This is the time of year, when refineries tend to maximize production of asphalt ahead of the annual summer paving season. As is said in Canada, there are two seasons in Canada – winter and paving season. Below is graph showing WCS-WTI differentials that shows this normal seasonal trend of narrowing WCS-WTI differentials from Feb thru May.

Figure 29: WCS less WTI oil differentials



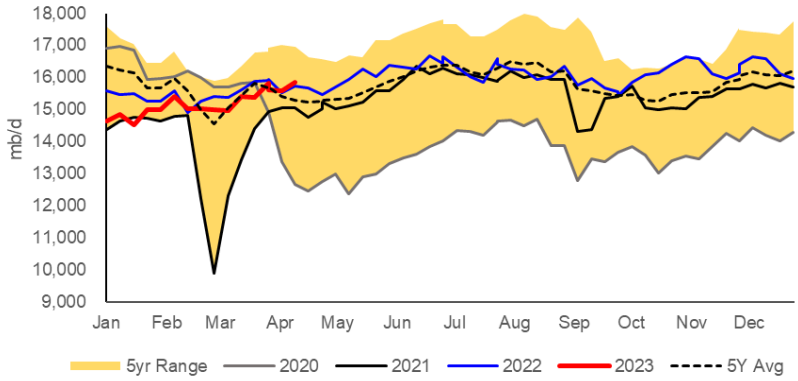
Source: Bloomberg

Oil – Refinery inputs up +0.259 mmb/d WoW to 15.844 mmb/d

Refiners switching to summer fuel blends

Refinery crude oil inputs increased this week following a WoW decline previously. There are always unplanned refinery issues, and we remind Feb/early March is normally when we see refineries move into turnaround/maintenance i.e., crude oil inputs seasonally decline as refineries switch to produce more summer blend fuels. And normally, refineries come out of turnarounds in late March/early April to start their ramp up in refining of summer blend fuels. On Wednesday, the EIA released its estimated crude oil input to refinery data for the week ended Apr 14. The EIA reported crude oil inputs to refineries were up +0.259 mmb/d this week to 15.844 mmb/d and are up +0.127 mmb/d YoY from 15.717 mmb/d for the week ended Apr 15, 2022. This week's refinery utilization was up +1.7% WoW to 91.0% and is flat YoY. Total products supplied (i.e., demand) increased WoW, up +0.262 mmb/d to 19.317 mmb/d, and Motor gasoline was down -0.417 mmb/d to 8.519 mmb/d from 8.936 mmb/d last week. The 4-week average for Motor Gasoline was up +0.308 mmb/d YoY to 8.974 mmb/d. The 4-week average of Total demand was up +0.489 mmb/d YoY to 19.862 mmb/d.

Figure 30: US Refinery Crude Oil Inputs (thousands b/d)



Source: EIA

Oil – US "net" oil imports down -1.743 mmb/d WoW to 1.723 mmb/d

US net oil imports

US "NET" imports were down -1.743 mmb/d to 1.723 mmb/d for the Apr 14 week. US imports were up +0.101 mmb/d to 6.294 mmb/d. US exports were up +1.844 mmb/d to 4.571 mmb/d. The WoW increase in US oil imports was driven mostly by "Others" while the Top 10 posted a decrease of -0.095 mmb/d. Some items to note on the by country data. (i) Canada was down this week -0.071 mmb/d to 3.519 mmb/d. (ii) Saudi Arabia was down -0.037 mmb/d to 0.339 mmb/d. (iii) Colombia was up +0.144 mmb/d to 0.303 mmb/d. (iv) Ecuador was down -0.111 mmb/d to 0.131 mmb/d. (v) Iraq was down -0.061 mmb/d to 0.180 mmb/d. (vi) Mexico was up +0.165 mmb/d to 0.615 mmb/d.

Figure 31: US Weekly Preliminary Oil Imports by Major Countries

(thousand b/d)	Jan 27/23	Feb 3/23	Feb 10/23	Feb 17/23	Feb 24/23	Mar 3/23	Mar 10/23	Mar 17/23	Mar 24/23	Mar 31/23	Apr 7/23	Apr 14/23	WoW
Canada	3,587	3,856	3,556	3,197	3,605	3,780	3,371	3,240	2,957	3,980	3,590	3,519	-71
Saudi Arabia	640	384	262	545	310	476	385	483	228	514	376	339	-37
Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0
Mexico	758	913	690	683	725	556	633	1,118	541	920	450	615	165
Colombia	216	70	143	284	143	222	294	244	269	71	159	303	144
Iraq	469	230	322	251	290	265	346	144	138	345	241	180	-61
Ecuador	243	207	156	145	97	55	46	0	118	80	242	131	-111
Nigeria	317	248	75	256	98	243	170	129	104	302	236	112	-124
Kuwait	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
Top 10	6,230	5,908	5,204	5,361	5,268	5,597	5,245	5,358	4,355	6,212	5,294	5,199	-95
Others	1,053	1,150	1,028	965	940	674	971	814	970	932	899	1,095	196
Total US	7,283	7,058	6,232	6,326	6,208	6,271	6,216	6,172	5,325	7,144	6,193	6,294	101

Source: EIA

Oil – Norway March oil production of 1.826 mmb/d, up +2.9% MoM

Norway oil production

The Norwegian Petroleum Directorate released its March production figures [LINK] and reported oil production of 1.826 mmb/d, up +2.9% MoM from 1.774 mmb/d in February and +4.8% YoY from 1.742 mmb/d in March 2022. February production actuals came in +0.2% (0.003 mmb/d) above the forecast volumes of 1.820 mmb/d. The NPD does not provide any explanations for the MoM changes. The theme for Norway through 2022 was that Norway oil production returned to growth because of the Johan Sverdrup oil field, and tax breaks from the government allowing increased capex in the energy sector. Norway oil production is

expected to be up modestly in 2023. Our Supplemental Documents package incudes the NPD release.

Figure 32: Norway March 2023 production

		Oil mill bbl/day	Sum liquid mill bbl/day	Gas MSm³/day	Total MSm³ o.e/day
Production	**March 2023**	**1.826**	**2.049**	**340.4**	**0.666**
Forecast for	March 2023	1.823	2.037	352.8	0.677
Deviation from forecast		0.003	0.012	-12.4	-0.011
Deviation from forecaset in %		0.2 %	0.6 %	-3.5 %	-1.6 %
Production	February 2023	1.774	2.003	354.5	0.673
Deviation from	February 2023	0.052	0.046	-14.1	-0.007
Deviation in % from	February 2023	2.9 %	2.3 %	-4 %	-1 %
Production	March 2022	1.742	1.946	338.4	0.648
Deviation from	March 2022	0.084	0.103	2	0.018
Deviation in % from	March 2022	4.8 %	5.3 %	0.6 %	2.8 %

Source: Norwegian Petroleum Directorate

Oil – South Sudan apparently still exporting oil thru Sudan

xxxxx

Last night, the reports were that the US had closed its embassy in Khartoum and all the diplomats and their families were safely on their way out of Sudan. As of our 7am MT news cut off, we have not seen any reports that oil exports out of South Sudan have been halted. Rather, the reports have been that South Sudan oil exports continue to be pipelined thru Sudan for exports to export ports on the Red Sea. South Sudan is part of OPEC+ and their commitment is to limit crude oil production to 124,000 b/d.

Figure 33: Oil fields and pipelines in Sudan and South Sudan

Source: Drilling Info International

Oil – Win/Win: Pakisan makes 1st purchase of discounted Russian oil

Pakistan to buy discounted Russian oil

On Thursday, Reuters reported [LINK] on what looks to be a win/win deal with Pakistan making its first purchase of discounted Russian oil. Russia needs more oil markets and Pakistan needs someone who will take its credit for oil deals. Reuters wrote "*First cargo to arrive next month: minister. Pakistan to import crude only, not refined oil. Islamabad wants purchases to reach 100,000 bpd. Energy makes up majority of Pakistan's import bill. Pakistan has placed its first order for discounted Russian crude oil under a deal struck between Islamabad and Moscow, the country's petroleum minister said, with one cargo to dock at the port of Karachi in May. Pakistan's purchase gives Russia a new outlet, adding to Moscow's growing sales to India and China, as it redirects oil from western markets because of the Ukraine conflict.As a long-standing Western ally and the arch-rival of neighbouring India, which historically is closer to Moscow, analysts say the crude deal would have been difficult for Pakistan to accept, but its financing needs are great. Discounted crude offers respite as Pakistan faces an acute balance of payments crisis, risking a default on its debt obligations. The foreign exchange reserves held by the central bank are scarcely enough to cover four weeks of controlled imports."* Our Supplemental Documents package includes the Reuters report.

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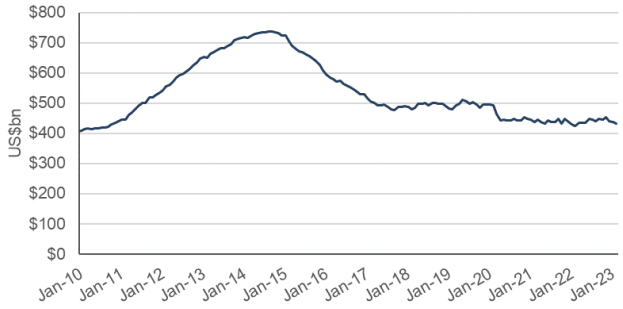
Oil – Saudi nest egg, small decrease in net foreign assets in February

Saudi net foreign assets

We continue to believe the #1 financial theme for Saudi Arabia in the 2020s will be their continued, and likely increasing, use of Other People's Money as they try to transition their country to MBS's Vision 2030. We believe this has been obvious with how Saudi Arabia's net foreign assets dropped by about $300 billion over seven years. We are surprised that markets and oil watchers didn't seem to pay attention to the Saudi net foreign assets data i.e., what we call their nest egg to help them thru the Energy Transition. Above $100 oil last year helped arrest the decline in the Saudi nest egg. But Saudi net foreign assets have dropped by $304.9 in the last 8 years, from is peak of $737.0b on Aug 31, 2014, to $433.0b on Feb 28, 2023. That is an average of $2.9b per month for the last 8 years. Oil prices remained relatively flat throughout the month with Brent crude averaging ~$82 in February compared to ~$83 in January. Saudi Arabia's net foreign assets on February 28 were down -$4.56b MoM to $433.0b vs $437.6b in January and $439.5b in December. Saudi Arabia is far from going broke but there has been a huge decline in the last 8 years, but it is still a very big nest egg. This net foreign asset depletion is why we have been highlighting that the primary financial theme for Saudi Arabia in the 2020s is getting Other People's Money (OPM) to fund as much of their Vision 2030 as possible. And no question, accessing OPM has helped to slow down and temporarily pause the decline in net foreign assets. Saudi Arabia's central bank (SAMA) doesn't provide explanations for the monthly swings. Below is our graph of Saudi Arabia net foreign assets updated for the January 31 data.

Figure 34: Saudi Arabia Net Foreign Assets



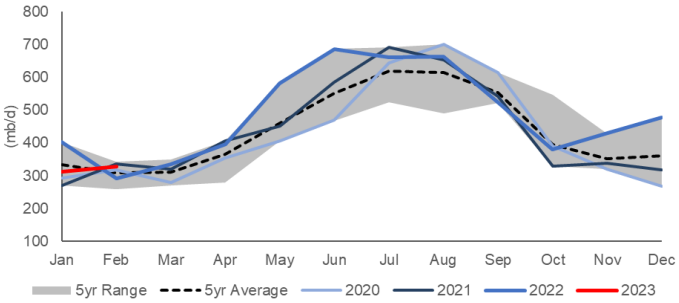
Source: Bloomberg

Oil – Saudi use of oil for electricity up small in Feb ie., less oil available for export

Saudi oil use for electricity in Feb

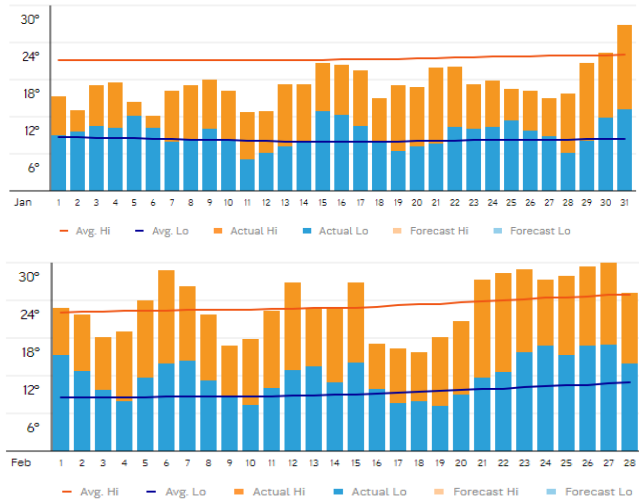
The key theme for winter months was that Saudi would be able to export more oil as it uses less oil for electricity vs the summer months. However, we expect this theme to reverse as the data starts to reflect electricity usage for warmer months in the spring and summer. With Feb being even closer to spring and the weather starting to warm up, it was no surprise that Saudi oil use for electricity was up small in February. Note that a normal peak to trough decline is ~400,000 b/d. If there is less oil used for electricity, then there is more oil for export and vice versa. There is one additional wildcard that imports isn't in the JODI data but could lead to more Saudi oil for export -the JODI data doesn't include how much Russian fuel oil Saudi imports. If Saudi imports more Russian fuel oil, it would mean Saudi refineries could produce at lower levels ie. use less oil. The JODI data for Saudi Arabia oil supply and demand for February was updated on Monday. Saudi used more oil for electricity in February vs January. The increased electricity usage was primarily driven by daily temperatures being at or above the average high throughout most of the month. In particular, temps throughout the last week of Feb were much warmer than normal. It is important to note that February experienced warmer temperatures than January and warmer weather means more air conditioning/electricity demand. Oil used for electricity generation in February was 329,000 b/d (vs February 2022 of 291,000 b/d) and January was 312,000 b/d (vs January 2022 of 402,000 b/d). Below are the AccuWeather Temp maps for Riyadh for February and January. We but look for oil used toward electricity to increase as we move closer to peak cooling season.

Figure 35: Saudi Arabia Direct Use of Crude Oil for Electric Generation



Source: JODI

Figure 36: Riyadh Temperature Recaps for January (top) and February (bottom)



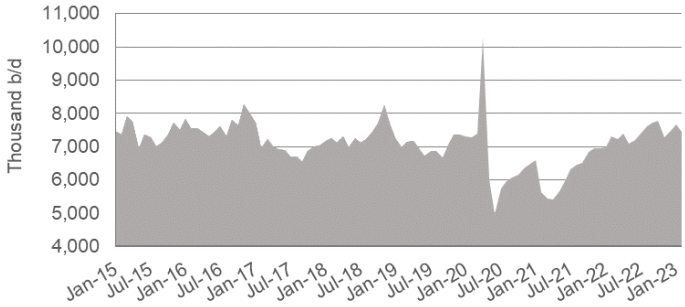
Source: AccuWeather

Oil – Saudi oil exports down -203,000 b/d to 7.455 mmb/d in February

Saudi oil exports fall in Feb

This month's JODI data is a good illustration to remind that Saudi can also build oil inventories and not just increase oil exports if they have a lesser need for domestic consumption. In Feb, refiner intake fell -134,000 b/d to 2.44 mmb/d, oil used for electricity increased by +17,000 b/d to 0.329 mmb/d and production declined slightly by -3,000 b/d MoM but remained relatively flat MoM at 10.450 mmb/d. So, in theory, Saudi Arabia could have more oil for export. But that wasn't the case as oil exports in March were 7.455 mmb/d, down 203,000 b/d MoM from 7.658 mmb/d in Feb. Normally, we have found that Saudi Arabia takes advantage of lesser need for oil for electricity in winter months as an opportunity to increase oil exports without increasing production. As noted below, there looks to be some missing barrels as, in theory, their oil inventories should have increased more than what was reported in the JODI data.

Figure 37: Saudi Arabia oil exports (mb/d)



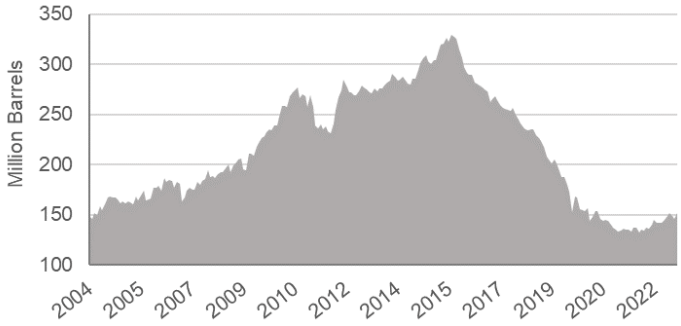
Source: JODI

Oil – Saudi oil inventories increased MoM, up +6.258 mmb to 151.912 mmb in Feb

Saudi oil inventory data

JODI doesn't provide data for Saudi fuel oil imports, which is a wildcard to the math and why Saudi refineries can produce at lower levels freeing up more Saudi oil for either oil exports or, in this case, building inventories. The JODI data also reported Saudi oil inventory increased +6.258 mmb MoM to 151.912 mmb as at Feb 28. If we do the math on the MoM changes in Saudi production, exports, oil used for electricity and oil into refineries, it would come out to a net inventory build of +8.876 mmb or +317,000 b/d. But the JODI data reported an inventory build of +6.258 mmb or +223,500 b/d MoM resulting in a significant difference in the math. In other words, the difference implies an unexplained draw of -2.618 mmb or -93,500 b/d in Feb. There is no explanation provided, but there is a missing net supply of 93,500 b/d or 2.618 mmb for the month of Feb. There were no revisions to the January data, and we will continue to check next month to see if any revisions are made to the Feb data.

Figure 38: Saudi Arabia Crude Oil Inventories (mmb)



Source: JODI

Oil – Houthis/Saudi negotiations to resume after Ramadan

Saudi/Houthi negotiations

Ramadan ended this week. The reports this week were that the Houthis and Saudi Arabia would be resuming their negotiations after Ramadan. Recall the first round of negotiations were believed to be positive. And this week, we saw prison exchanges of almost 1,000 prisoners. So there is clearly momentum to keep working towards a deal. We understand that there is this momentum, but we still don't have a sense of who will control what in Yemen post any deal. We haven't seen any discussion that a deal would see the return of the old North and South Yemen. But we still have trouble believing the Houthis and South Yemen groups could work collaboratively in a government, or the South would let the Houthis run both North and South, or the Houthis let the South control both the North and Salt. So we still don't know what type of Yemen will emerge from a deal, especially as it doesn't appear that any from South Yemen are directly involved in the Saudi/Houthi negotiations. And there has been no mention of reparations. We have trouble believing there won't be reparations of some sort, the question will be what the payments are called.

Oil – Iran warns Israel slightest move would see the "destruction of Haifi and Tel Aviv"

Iran warns Israel

We continue to believe the big wildcard to oil in 2023 is Iran's continued progress to develop its nuclear capability, the US and Israel know Iran is getting closer and closer, and does anyone think Israel just talk and warn, but not try to stop that ultimate progress? And if Israel does anything to stop that progress, what will Iran do in response? We think the ball is in

Israel and the US court. Iran is under sanctions, it is making progress on its nuclear. So, if nothing happens, Iran will just move towards having nuclear capability and the ability to have a bomb, if you believe the US, in a matter of several months. If so, doesn't that mean the ball is in Israel and the US court to decide if they will just talk or actually take action to prevent Iran from going nuclear. (i) On Tuesday, we tweeted [LINK] "*Time for #Oil risk premium? Gen Milley 03/29: only several mths for Iran to produce actual nuke bomb. Netanyahu 04/17: fighting any deal that will pave Iran's way to nuclear arms. Raeisi 04/18: slightest move "will be accompanied by the destruction of Haifa & Tel Aviv". #OOTT."* (ii) The US position has been about not letting Iran acquire a nuclear weapon. Whereas the Israeli position has been that Iran has to be stopped on the path to the bomb ie. before they have the bomb capability. On Monday, NDTV reported on Netanyahu's comments on Monday "Prime Minister Benjamin Netanyahu vowed Monday that Israel would continue its "*fight"* to prevent arch-foe Tehran from developing nuclear weapons, during a Holocaust ceremony attended by Iran's exiled crown prince. Recalling a recent visit to Berlin, Netanyahu noted that since Nazi-era Germany "*the world has changed, but the calls for our extermination have not ceased, and today come from the regime of horror in Tehran." "We are fighting resolutely against any nuclear deal with Iran that will pave its way to nuclear arms*," the Israeli premier said in a speech on the eve of Holocaust Remembrance Day. "And for the same reason, we are fighting resolutely against Iran's terror proxies around us," he said at the Yad Vashem Holocaust memorial in Jerusalem, warning of Israel's "crushing response" to any enemy approaches." (iii) Then on Tuesday, Iran's PressTV reported Iran President Raeisi warned ""*The enemies, especially the Zionist regime (Israel), have received this message that the slightest move against the country will evoke a severe response from the armed forces and will be accompanied by the destruction of Haifa and Tel Aviv," he added*." Our Supplemental Documents package includes the NDTV and PressTV reports.

> **US, *would only take [Iran] several months to produce an actual nuclear weapon***
> Here is what we wrote in our April 9, 2023 Energy Tidbits. "*One of the key highlights from RBC's Helima Croft's webcast was on Iran. The topic that got her most comments was Iran nuclear and how Iran has progressed farther and faster than most appreciate also on the track for a bomb deliverability system, and General Milley said they are months away from having the potential for nuclear bombs. Milley is Chairman of the Joint Chiefs of Staff and made his comments at the House Armed Services Committee hearing on March 29. The transcript of Milley's comments were [LINK] "Iran is taking actions to improve its capabilities to produce a nuclear weapon, should it make the decision to do so, while continuing to build its missile forces. From the time of a national decision, Iran could produce enough fissile material for a nuclear weapon in approximately 10-15 days and it would only take several months to produce an actual nuclear weapon. The United States remains committed, as a matter of policy, that Iran will not have a nuclear weapon. The United States military has developed multiple options for our national leadership to consider, if or when Iran decides to develop a nuclear weapon." This is different than what most expect on the bomb deliverability system. And it leaves Biden with less options such as can he do a sweetened deal, from Iran perspective, to get this to stop. But that would have problems getting support even from some Dems. So that leaves the Netanyahu wildcard. This isn't a big surprise as to the progress, when we saw the first US admission of Iran's progress. But also remember that was also when we saw*

the first US admissions that military options were on the table as opposed to the general all options."

US believes Iran has enough nuclear material for several nuclear weapons

Here is another item from our April 9, 2023 Energy Tidbits memo. "*General Milley's comments should not have surprised. Rather, two months ago, we saw similar comments from US envoy on Iran, Rob Malley. Here is what we wrote in our Feb 5, 2023 Energy Tidbits memo. "We still believe there is heightened risk to Iran in 2023 given there is no JCPOA, Iran continues to make strong progress towards having nuclear capability and Netanyahu has returned as Israel PM. We were reminded of this risk when US envoy on Iran, Rob Malley, was on BBC Hardtalk. (i). Iran's nuclear progress. On Monday, we tweeted [LINK] "Big 2023 #Oil wildcard - Israel/Iran nuclear risk. @BBCHARDtalk asks re @rafaelmgrossi that Iran has amassed enough nuclear material for several nuclear weapons, not just one. @Rob_Malley "yeah, i think what he says is accurate. More in this great @stephensackur interview. #OOTT." Malley said he agreed with the IAEA view that Iran has amassed enough material for several nuclear weapons. This is a big risk factor especially if Israel also believes this status. (ii) Biden has spelled out an option is military option. We also tweeted [LINK] "Specifics for once, not the normal all options are on the table "as #Biden said if that fails, other options, all options will be on the table. and he spelled out what one of those options would be, which was a military option" @Rob_Malley. Great interview @stephensackur #OOTT." This was not the normal quote from Biden officials. For example, Blinken this week used the standard all options are on the table and not specifically mention military options."*

Oil – Turkey still hasn't stopping exports of ~450,000 b/d Iraq/Kurdistan oil via Ceyhan

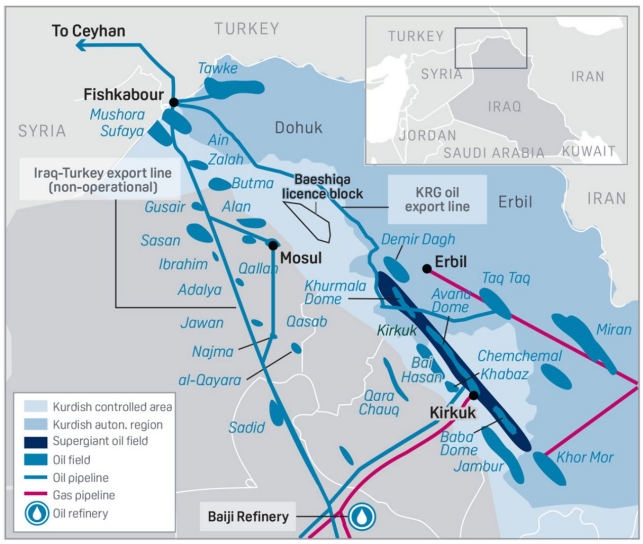
Turkey holds up Kurdistan oil exports

As of our 7am MT news cut off, we have not seen any reports indicating any movement by Turkey to allow the resumption of ~450,000 b/d of Iraq/Kurdistan oil exports via Ceyhan. Recall that Iraq/Kurdistan reached a deal and Kurdistan originally thought it would lead to a resumption of its oil exports to resume on Tues Apr 4. That still hasn't happened and there is no visibility to when it might happen. The hold up remains Turkey and it's really the same story as a week ago. On Apr 15, we tweeted [LINK] "*No visibility to when 450,000 b/d of Iraq/Kurdistan #oil exports via Turkey will resume. "Turkey is seeking in-person negotiations relating to the $1.5b if was ordered to pay Iraq in damages". Thx @RowenaCaine @warningforever @Ahmed_Rasheed_R @mahaeldahan. #OOTT."* Our tweet included the Reuters Apr 15 report "*Iraq's northern oil exports stuck on Turkey negotiations*". The key excerpt from Reuters was "*Pipeline operators have yet to receive any instruction to restart flows, a source familiar with the exports told Reuters on Friday on condition of anonymity. Two other sources told Reuters that Baghdad has yet to request Turkey reopens the pipeline. "Anything regarding the resumption of oil flows now is in the hands of Baghdad and Turkey, both sides have to reach an agreement to restart flows," said Lawk Ghafuri, head of foreign media affairs for the KRG. Turkey is seeking in-person negotiations relating to the $1.5 billion it was ordered to pay Iraq in damages, a separate source told Reuters. Iraq's state-owned marketer SOMO is waiting to finalise some technical issues essential to restarting flows with the KRG's ministry of natural resources, two Iraqi oil officials told Reuters."*

Iraq's court case win halted 370,000 Kurdistan & 75,000 b/d Iraq oil exports

Here is what we wrote in our March 26, 2023 Energy Tidbits memo. "*Breaking news yesterday that Iraq reportedly halted 445,000 b/d of crude oil exports thru its north on the export pipeline to Ceyhan, Turkey. Iraq won an arbitration with Turkey, which means that Turkey has to deal with Iraq's oil marketing arm for approval of all Iraq oil exports, including oil from Kurdistan. It's not clear how long it will take to get to a mechanism for Iraq dealing with Turkey on the oil exports. Don't know if's wishful thinking but Kurdistan media was pointing to not too long to get an understanding. Regardless, until Iraq resumes oil exports via Turkey, it means there will be ~445,000 b/d of crude oil off the market. Yesterday, we tweeted [LINK] Iraq reportedly halts 370 kbd KRG + 75 kbd federal oil thru export pipeline thru Turkey reports @Ahmed_Rasheed_R @RowenaCaine. Positive for #Oil until Iraq resumes northern exports ie. agrees on mechanism to export Iraq oil thru Turkey in line with its arbitration win. #OOTT." Yesterday, Reuters reported [LINK] "Iraq halted crude exports from the semi-autonomous Kurdistan region and northern Kirkuk fields on Saturday, an oil official told Reuters, after the country won a longstanding arbitration case against Turkey. The decision to stop shipments of 450,000 barrels per day (bpd) of crude relates to a case from 2014, when Baghdad claimed that Turkey violated a joint agreement by allowing the Kurdistan Regional Government (KRG) to export oil through a pipeline to the Turkish port of Ceyhan. Baghdad deems KRG exports via Turkish Ceyhan port as illegal. The International Chamber of Commerce ruled in favour of Iraq on Thursday, Iraq's oil ministry confirmed on Saturday. Turkey has informed Iraq that it will respect the arbitration ruling, a source said. Turkish shipping officials told Iraqi employees at the Ceyhan oil export hub that no ship will be allowed to load Kurdish crude without the approval of the Iraqi government, according to a document seen by Reuters. Turkey subsequently halted the pumping of Iraqi crude from the pipeline that leads to Ceyhan, a separate document seen by Reuters showed. On Saturday, Iraq stopped pumping oil through its side of the pipeline which runs from its northern Kirkuk oil fields, an official told Reuters. Iraq had been pumping 370,000 bpd of KRG crude and 75,000 bpd of federal crude through the pipeline, according to a source familiar with its operations. "A delegation from the oil ministry will travel to Turkey soon to meet energy officials to agree on new mechanism to export Iraq's northern crude oil in line with the arbitration ruling," a second oil ministry official said." Kurdistan region Prime Minister Masrour Barzani expects this to be quickly resolved. Yesterday Kurdistan 24 news reported [LINK] "Kurdistan Region Prime Minister, Masrour Barzani, on Saturday reiterated the Kurdistan Regional Government's (KRG) good relations with the Iraqi federal government. "Our recent understandings with Baghdad have laid the groundwork for us to overcome the arbitration ruling today," PM Barzani wrote in the tweet. "A team from the KRG will visit Baghdad for talks tomorrow to build on the goodwill of our discussions," Barzani added." Below is a Platts Northern Iraq's oil infrastructure map from 2020 [LINK].*

Figure 39: Northern Iraq's oi infrastructure map from 2020



Source: S&P Global Platts, PolGeoNow

Source: Platts

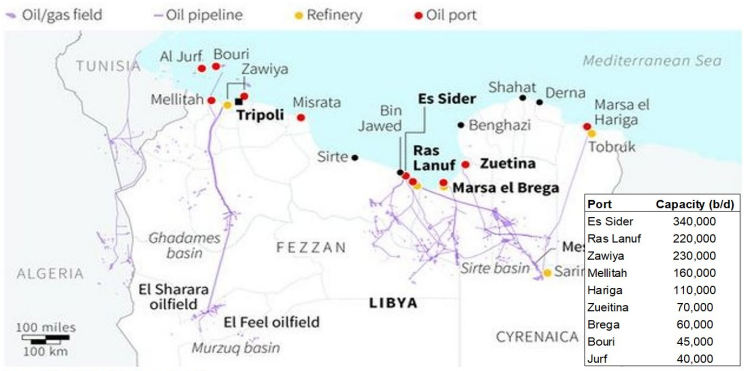
Oil –Libya NOC says oil production continues to be stable at ~1.2 mmb/d

Libya oil production 1.2 mmb/d

We have to give the Libya National Oil Corporation credit that it's been able to keep oil production pretty stable right around 1.2 mmb/d for the past six months or so. The Libya National Corporation tends to post a short oil production update on its Facebook [LINK]. The latest update was yesterday Sat Apr 23 and the Google Translate was "*Crude oil production reached 1.213 million barrels per day, and condensate production reached 50 thousand barrels per day during the past 24 hours*."

Figure 40: Libya Ports, Major oilfields and Terminals map

SAF Group Compiled Libya Ports & Terminals Status



Source: Bloomberg, HFI Research, SAF

Source: SAF Group

Libya sees low-risk development to go from 1.2 to 1.5 mmb/d in 2023

Here is what we wrote in our Feb 19, 2023 Energy Tidbits memo. "*We have been reporting on how Libya has surprisingly been able to keep oil production steady ~1.2 mmb/d. At the same time, we have always highlighted the big near term upside potential to its oil production if east vs west armed fighting can stay on the sidelines as that will see the return of foreign capital for both natural gas and oil. But even before foreign capital, the Libya National Oil Corporation has many low risk development opportunities to increase oil production. On Tuesday, the Libya Herald reported [LINK] on comments from one of Libya NOC's operating companies, Arabian Gulf Oil Company (AGOCO) Chairman Salah Gatrani. The Libya Herald wrote "The continuation of the Arabian Gulf Oil Company's (AGOCO) development operations at this pace will inevitably lead to Libya reaching a production rate of more than 1.5 million barrels of oil per day in 2023, AGOCO chairman Salah Gatrani said in an exclusive statement to Libya Herald. He said this was because of the stability witnessed by the country in general, and by the oil sector in particular. Therefore, he continued, the Gulf Company has developed its own plan within the efforts of the National Oil Corporation (NOC). Libya has been unable to maintain production beyond 1.2 million bpd. Gatrani was commenting to Libya Herald following Sunday's AGOCO's meeting on developing reserves and increasing oil production in the sector companies, attended by relevant AGOCO and NOC management. The AGOCO chairman said that his company has already begun to implement the plan prepared by the NOC to raise production and increase reserves." Our Supplemental Documents package includes the Libya Herald report."*

Oil – China GDP in March +4.5% YoY vs estimate of +4.0%

China GDP in March +4.5% YoY

On Monday night, China did its monthly bid dump of economic data. We were watching Bloomberg Markets Asia when the data was released. And we tweeted [LINK] on the breaking news "*not across the board but first look seems to be positive. china data just out. courtesy of Bloomberg markets asia. china press conference on the data has just begun so will get more color. @business. #OOTT."* And our tweet included the Bloomberg recap of key China March Activity data: GDP +4.5% YoY vs est +4.0%, Retail Sales +10;6% YoY vs est +7.5%, Industrial Production +3.9% YoY vs est +4.4%, and Fixed Assets Investments YTD +5.1% YoY vs est +5.7%. There was a range of other economic data, but the general takeaway from sellside analysts on Monday night was overall a positive indicator for China economy in March. And many of the sellsdie analysts increased their forecast for China GDP growth in 2023.

Oil – Still a big reduction in forecast China scheduled domestic air flights for April

China domestic flights

The Chinese mobility indicators continue to point to a stalling China recovery in April. On Monday, we tweeted [LINK] "*Stalling China recovery. China scheduled domestic flights +0.7% WoW for Apr 11-17 to 92,231 flights. Forecast to climb +9.8% to 101,235 for next 4-weeks, BUT well below 119,180 for next 4-weeks per Mar 28 schedule. Thx @BloombergNEF Claudio Lubis #OOTT."* China's scheduled domestic fights were +0.7% WoW, but the negative or the stalling of the China domestic air travel remains in that the scheduled next 4 weeks of domestic flights is 101,235, which is still well below the next 4 weeks flights forecast from March 28 for April of 119,180 flights. This big drop from the March

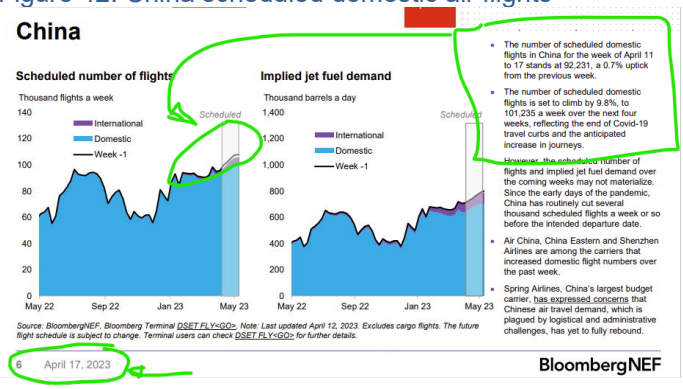
28 forecast for April flights is the negative as it is showing the recovery seems to be stalling out. BNEF wrote "*The number of scheduled domestic flights in China for the week of April 11 to 17 stands at 92 ,231, a 0.7% uptick from the previous week. • The number of scheduled domestic flights is set to climb by 9 .8%, to Scheduled 101,235 a week over the next four weeks, reflecting the end of Covid-19 travel curbs and the anticipated increase in journeys*." Our tweet included the BloombergNEF chart and our listing of WoW changes from the prior BloombergNEF reports.

Figure 41: China scheduled domestic flights from BNEF Aviation Indicators Weekly reports

Apr 11-17: +0.7% WoW to 92,231
Apr 3-10: -4.2% WoW
Mar 28-apr 3: +6.8% WoW
Mar 21-27: +1.5% WoW
Mar 14-20: -0.6% WoW
Mar 7-13 week: -0.8% WoW
Feb 27-Mar 3 week: -2.6% WoW
Feb 21-27 week: +0.0% WoW (note this was +0.01%)
Feb 14-20 week -0.5% WoW
Feb 7-13 week -0.7% WoW
Jan 31- Feb 6 week +10.9% WoW
Jan 24-30 week -9.2% WoW
Jan 17-23 week +7% WoW
Jan 10-16 week +20% WoW

Source: BloombergNEF

Figure 42: China scheduled domestic air flights



Source: BloombergNEF

Oil – China says May Day air travel has "generally returned" to 2019 levels

China May Day air travel

Earlier this morning, Xinhua (a Chinese state media) reported on the Civil Aviation Administration of China's forecast for the upcoming May Day holiday that runs from Apr 29 thru May 3. It sounds like domestic air travel is close but not quite to 2019 holiday levels and international air travel is not quite 30% of 2019 holiday levels. We say close but not quite as it described as "generally returned". Earlier this morning, we tweeted [LINK] "*China air travel up but "generally returned" infers not quite back to 2019. China May Day holiday Apr 29-May 3. China expects domestic air travel "has generally returned" to 2019 holiday levels, but international flights still only "about 30%" of 2019 level.#OOTT #JetFuel.*" Our Supplemental Documents package includes the Xinhua report. [LINK]

Oil – Cathay Pacific air travel up strong in March, but nowhere near pre-Covid levels

Cathay Pacific well below pre-Covid

On Thursday, Cathay Pacific reported its March traffic figures. [LINK]. The takeaway is that its flight continue to strongly increase post the relaxation of Covid restrictions, but it is nowhere near the pre-Covid levels. Cathy Pacific wrote "*Cathay Pacific Airways Ltd.'s passenger load factor climbed to an all-time high of 90.4% in March, with air travel in and out of Hong Kong continuing to rebound strongly while tickets remain in relatively short supply. The carrier's passenger traffic jumped more than 4,200% from March 2022 to 1.32 million, but that's still only about 45% of pre-Covid capacity. "We are actively working to add more flights to our schedule to satisfy customer demand," Chief Customer and Commercial Officer Lavinia Lau said in a statement Thursday."* Our Supplemental Documents package includes the Cathay Pacific release.

03/14, Cathay Pacific CEO noted restarting key international air flights

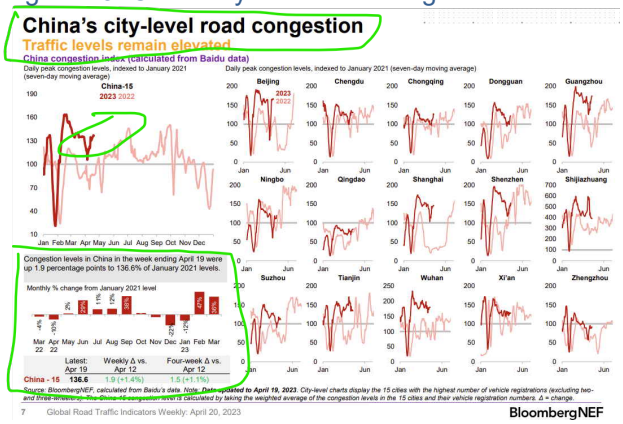
WE should start to see a big pickup in Cathay Pacific's international flights April, May and June. Herfe is what we wrote in our March 19, 2023 Energy Tidbits memo. "*On Tuesday night (North American time), the day after the China announcement on resuming issuing visas, Bloomberg TV interviewed Cathay Pacific CEO Ronald Lam. We are fortunate that Bloomberg's China Open and Asia Open shows run in the evenings MT. On Tuesday night, we tweeted [LINK] "China air travel. #CathayPacific CEO "seeing a lot of long haul travel resuming" ".. London route, which we are planning to resume, very soon, back to 4 to 5 daily, flight between Hong Kong & London...by summer season, starting the end of this month (March)" Thx @RishaadTV #OOTT. Note his reference to summer season restarting the 4 to 5 daily flights between Hong Kong and London is starting the end of this month. Our tweet included a 42-second clip of Lam's bullish viewon how they are seeing a lot of long haul travel resuming. Lam also highlighted the pickup in travel around Asia outside of China."*

Oil – China congestion up small after big bounce back last week

China road traffic congestion

It looks like the big nosedive in China traffic congestion two weeks ago was an aberration as last week, traffic congestion immediately recovered and was up small this week. On Thursday, we tweeted [LINK] *"#Gasoline #Diesel. @BloombergNEF road congestion - rebound as holiday season ends. China +1.4% WoW, well above Jan 2021. Asia Pacific excl China +9.9% WoW, well below 2019. EU +20.1% WoW, just below 2019. NA +15.1% WoW, well below 2019. #OOTT."* Two weeks ago, BNEF reported China traffic congestion nosedived 21.7% WoW, but then last week it more than recovered jumping up +27.5% WoW. This week, it was +1.4% WoW to 136.6% of January 2021 levels. Our tweet also included the below BloombergNEF graphic on China road congestion.

Figure 43: China city-level road congestion for week ended Apr 19



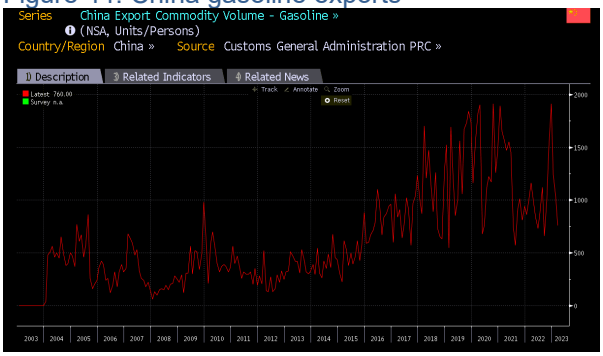
Source: BloombergNEF

Oil – China gasoline & diesel exports down in March

China gasolilne & diesel exports down

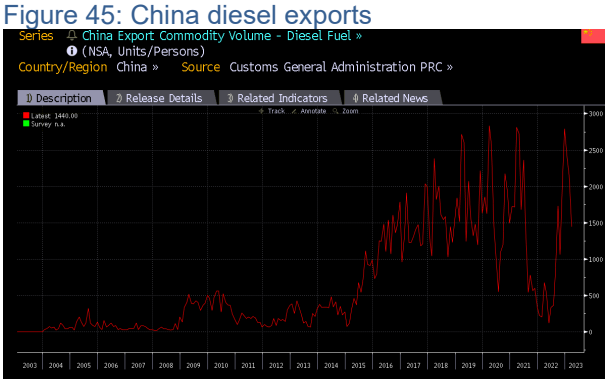
Also included in the China monthly data release on Monday nigh was gasoline and diesel exports. On Tuesday morning, we tweeted [LINK] "*Indicators China is recovering but still room to go. Exports of #Gasoline lowest since Sept, #Diesel lowest since Oct. "Gasoline consumption however appears to be on a much stronger footing than diesel" ie. industry recovery is lagging. Thx @business John Liu @sarahchen #OOTT."* China's gasoline and diesel imports were down due to keep more gasoline for China consumption. And gasoline seems to have recovered more than diesel, which would fit the thesis that manufacturing and industry still has a way to go in its recovery. Bloomberg reported on the China export data "*Refiners in China cut exports of gasoline and diesel in March as they prioritized domestic sales in a further sign of recovery in the world's largest crude oil importer. Gasoline exports eased to 760,000 tons last month, while flows of diesel fell to 1.44 million tons, reducing monthly totals to the lowest since September and October, respectively, customs data showed on Tuesday. On-year, gasoline exports were lower, but diesel volumes were up."* And "*Other official figures from Beijing on Tuesday pointed to a rise in apparent oil demand and unprecedented daily throughput at refiners nationwide. Gasoline consumption, however, appears to be on a much stronger footing than diesel. For this month, fuel exports are expected to hold near March's level of about 2 million tons, according to industry consultant OilChem."* Our Supplemental Documents package includes the Bloomberg report.

Figure 44: China gasoline exports



Source: Bloomberg

Figure 45: China diesel exports



Source: Bloomberg

Oil – Schlumberger and Baker Hughes see stronger lasting long cycle oil investment

Stronger lasting long cycle oil investment

Q1 reporting started this week for two of the big oilfield service companies – Baker Hughes and SLB (new name of Schlumberger). Earlier in the memo, we noted Baker Hughes very bullish comments on LNG FIDs from 2023 thru 2026. Baker Hughes and Schlumberger don't forecast oil prices, but their Q1 call comments also seemed clear to indicate they saw stronger oil supply potential growth in the long term. They highlighted how long cycle oil investment is increasing around the world. And if there is much greater long cycle investment, it speaks to their expectation for great long term oil supply even if they don't specifically say so. But both also highlight the near term oil supply tightness. (i) Schlumberger on long-term. On Friday, we tweeted [LINK] "*Worth a read. $SLB Q1 call. They don't forecast #Oil prices, but seem to point to continued near term price upside potential BUT big broad long cycle capex from more than OPEC would point stronger oil supply in long term. Thx @business. #OOTT."* SLB held its Q1 call on Friday. In his prepared remarks and answers in the Q&A, CEO Le Peuch highlighted the increasing and expected lengthy duration of more spending in long cycle projects in more than OPEC ie. in offshore areas and around the world. Here are just a gre of the many Le Peuch quotes "*In the Middle East, the largest ever investment cycle has now commenced. This will support ongoing capacity expansion project over the next four years in both oil and gas."* And "*Offshore activity continues to surprise to the upside*

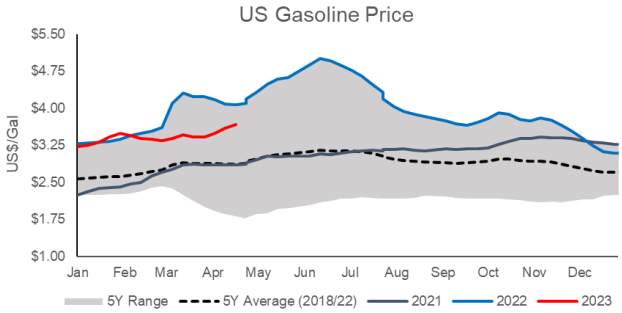
with breadth and a diversity of opportunities across all major basins. In addition, the latest FID projections and industry reports indicate that the offshore sector is set for its highest growth in a decade with more than $200 billion in new projects through the next two years." And "t*his will continue to strengthen in multiple geographies from this year onward. Second, ongoing large development projects in both oil and gas that are ramping up and starting to scale. This is evident in Latin America, such as in Guyana and Brazil, and in the Middle East, such as in Saudi Arabia, UAE and Qatar. And third, the resurgence of exploration and appraisal activity, which is starting to gather strong momentum in existing basins and new frontiers."* And "*First, the quality of the unfolding of cycling oil and gas is improving with unique attributes of resilience, breadth and duration. This is very much evidenced by the strengthening outlook in both Middle East and offshore markets and further reinforced by the tight supply balance as demand forecasts approach new highs at the year-end."* There are many more Le Peuch quotes on this much greater long cycle investment around the world. (ii) Baker Hughes on long term oil. Baker Hughes CEO Simonelli said "*We continue to believe that the current environment remains unique with the spending cycle that is more durable and less sensitive to commodity price swings relative to prior cycles. Factors driving this extended cycle include financially stronger operator balance sheets, disciplined capital spending focused on returns versus growth and IOCs and NOCs that are balancing modest production growth with longer-term investments in new energy".* (iii) SLB on short term oil. SLB CEO said ".. "*further reinforced by the tight supply balance as demand forecasts approach new highs at the year-end*." And highlighted that long cycle investment is not to take precedence over short cycle. Le Peuch said "*So I'm very, very positive about the mix, if you like, of short cycle on production enhancements to address the anticipated supply risk and the commitment, long commitment from Middle East from deepwater and offshore operator to complement the long cycle is not to offset and now take precedence over this short cycle."* (iv) Baker Hughes on short term oil. CEO Simonelli said "*Despite the elevated recession risks for major developed economies, we expect the supply-demand balance in the global oil markets to gradually tighten over the course of the year. Factors driving this include, China's economy recovering, non-OECD demand continuing to grow and OPEC+ remaining proactive in maintaining adequate and stable oil price levels."* Our Supplemental Documents package includes excerpts from the SLB Q1 release and Q1 call transcripts.

Oil – Expect Biden to attack oil companies if gasoline prices do normal seasonal ramp

US gasoline prices normally ramp up in Q2

We recognize that the US elections are still >18 months away, but we have to expect the Biden Administration to take aim again at the oil and gas companies for rising gasoline prices. Gasoline prices are still off the all time high over $5, but we are in the spring period that is typically the start of the normal seasonal increase in gasoline prices that tend to go higher in Q2 most years. Average US gasoline prices are above $3.60 and we expect to see the political rhetoric to step up as they start to approach $4. Below is a graph of the EIA's US gasoline prices.

Figure 46: US Gasoline Price



Source: EIA

Oil – Vortexa crude oil floating storage at Apr 21 was 93.47 mmb, -8.41 mmb WoW

Vortexa floating storage

We are referencing the Vortexa global crude oil floating storage data posted on the Bloomberg terminal as of 9am MT yesterday. Note that these estimates get revised over the course of the week and the revisions can go back months. We do not check daily for the revisions, so our comments on the new estimates are compared to the prior week's Vortexa estimates posted on Bloomberg on Apr 15 at 9am MT. (i) As of 9am MT yesterday, Bloomberg posted Vortexa crude oil floating storage estimate for Apr 21 at 93.47 mmb, which was -8.41 mmb WoW vs upwardly revised up big Apr 14 of 101.88 mmb. Note Apr 14 was revised +8.40 mmb vs the 93.48 mmb posted on Bloomberg as of 9am MT on Apr 15. (ii) There were large revisions to Apr 14 and Apr 7, but the remaining revision over the past seven weeks were small. The revisions from the estimates posted yesterday at 9am MT vs the estimates posted on Bloomberg at 9am on Apr 15 are as follows: Apr 14 revised +8.40 mmb. Apr 7 revised +5.03 mmb. Mar 31 revised +0.44 mmb. Mar 24 revised -1.13 mmb. Mar 17 revised +0.25 mmb. Mar 10 revised +0.56 mmb. Mar 3 revised +1.18 mmb. (iii) There is a wide range of floating storage estimates for the past seven weeks, but a simple average for the past seven weeks is 101.10 mmb, which is up vs last week's then seven-week average of 97.06. The increase is due to the upward revisions and dropping a low week and replacing it with a higher week in the current seven-week average. (iv) Also remember Vortexa revises these weekly storage estimates on a regular basis and we do not track the revisions through the week. (v) Apr 21 estimate of 93.47 mmb is -126.79 mmb vs the post-Covid peak on June 26, 2020 of 220.26 mmb. (vi) Note the below graph now goes back to Jan 1, 2020 and not just three years as floating storage in Apr 2020 had started to reflect the Covid impact. (vii) Apr 21 estimate of 93.47 mmb is +27.86 mmb vs pre-Covid Feb 28, 2020 of 65.61 mmb. (viii) Apr 21 of 93.47 mmb is +1.47 mmb YoY vs Apr 22, 2022 of 92.00 mmb. (ix) Below are the last several weeks of estimates posted on Bloomberg as of 9am MT Apr 22, 9am MT Apr 15, and 9am MT Apr 8.

Figure 47: Vortexa Floating Storage posted on Bloomberg Apr 22 at 9am MT

Source: Bloomberg, Vortexa

Figure 48: Vortexa Estimates Posted Apr 22 9am MT, Apr 15 9am MT, Apr 8 9am MT

Posted Apr 22, 9am MT

Date	Last Px
Fr 04/21/2023	93468
Fr 04/14/2023	101.875k
Fr 04/07/2023	120.394k
Fr 03/31/2023	107.335k
Fr 03/24/2023	101.269k
Fr 03/17/2023	91152
Fr 03/10/2023	85234
Fr 03/03/2023	86891
Fr 02/24/2023	82811
Fr 02/17/2023	75854
Fr 02/10/2023	77442

Apr 15, 9am MT

Date	Last Px
Fr 04/14/2023	93477
Fr 04/07/2023	115.359k
Fr 03/31/2023	106.904k
Fr 03/24/2023	102.396k
Fr 03/17/2023	90897
Fr 03/10/2023	84666
Fr 03/03/2023	85714
Fr 02/24/2023	81712
Fr 02/17/2023	74957
Fr 02/10/2023	77699
Fr 02/03/2023	82290

Apr 8, 9am MT

Date	Last Px
Fr 04/07/2023	109.475k
Fr 03/31/2023	107.102k
Fr 03/24/2023	99773
Fr 03/17/2023	88863
Fr 03/10/2023	83975
Fr 03/03/2023	87025
Fr 02/24/2023	81255
Fr 02/17/2023	75236
Fr 02/10/2023	77570
Fr 02/03/2023	81992
Fr 01/27/2023	76501

Source: Bloomberg, Vortexa

Vortexa floating storage by region

Oil – Vortexa crude oil floating storage WoW changes by regions

We had some good feedback on our inclusion of Vortexa floating crude oil storage regional estimates and will, time permitting, try to include each week Bloomberg posts the Vortexa crude oil floating storage in the key regions, but not all regions of the world. The regions covered are Asia, Europe, Middle East, West Africa and US Gulf Coast. The largest WoW changes were in Asia -9.33 mmb WoW and the Middle East -3.22 mmb WoW, and then Other was +3.97 mmb WoW. Note the largest revision to the Apr 14 data was Asia, which saw an upward revision of +7.52 mmb to the Apr 14 data. Below is the table we created of the WoW changes by region posted on Bloomberg and we backed out to get “Other”.

Figure 49: Vortexa Floating Crude Oil Storage Weekly Changes by Region

Vortexa Crude Oil Floating Storage (mmb)				Original Posted
Region	Apr 21/23	Apr 14/23	WoW	Apr 14/23
Asia	42.80	52.13	-9.33	44.61
Europe	15.69	18.23	-2.54	18.96
Middle East	7.43	10.65	-3.22	10.87
West Africa	5.87	4.62	1.25	4.62
US Gulf Coast	1.46	0.00	1.46	0.33
Other	20.22	16.25	3.97	14.09
Global Total	93.47	101.88	-8.41	93.48
Vortexa crude oil floating storage posted on Bloomberg 9am MT on Apr 22				

Source: Bloomberg, Vortexa

Oil – Kpler "floating storage is not really on the rise", crude on water near record highs

Floating storage vs crude on water

Another good insight from the Gulf Intelligence Daily Energy Markets April 17 podcast wer ethe comments from Kpler's Matthew Wright (senior freight analyst) on crude oil floating storage vs crude on water. Wright highlighted crude oil in floating storage is not really on the rise, but crude on water is near record highs. He also highlighted that Russia is maxing out its oil to India and China. On Monday, we tweeted [LINK] " *floating [crude oil] storage is not really on the rise. But .... actual crude on water, it's near record highs & a lot of that has to do with Russia" "almost reached a peak" on RUS crude to India & China says @Kpler @mattwright8 to @sean_evers. #OOTT."*

SAF Group created transcript of Kpler's Matthew Wright comments

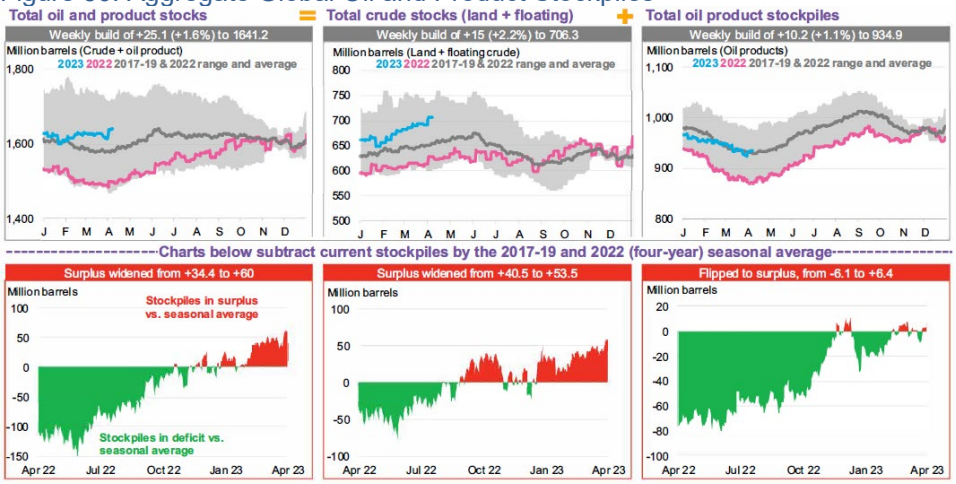
Our tweet included the transcript we created of comments by Matthew Wright (Senior Freight Analyst, Kpler) and Sean Evers (Managing Partner of Gulf Intelligence) on Gulf Intelligence's PODCAST: Daily Energy Markets April 17th. [LINK] Items in "*italics*" are SAF Group created transcript. Evers ".. *some calculations would suggest there is over a billion barrels of oil or some significant large number of oil in some element of floating storage?"* Wright "*I don't think it's floating storage. I think it's crude on water. And as a result, I don't think it's having an impact on price. These are cargoes that are all going places, they're just travelling further than they have ever had done before. So generally speaking, there's no distressed cargoes. There is not really any market structure incentive to store crude so it's all going somewhere. It's just, we're taking up a lot of ships to move a lot of oil at the moment.*" Evers " *and where is that being reflected? Is there a technical definition of where floating storage separates from taking a longer time to get somewhere. Ultimately, it's a lot of oil right that is moving slowly but ultimately, the supply is plentiful?*" Wright "*Yeah, absolutely. There's different definitions of floating storage. Some people say anything over 7 days, you know you have to a vessel that is essentially idled. At Kpler, we have an algorithm that will work that out for us. And floating storage is not really on the rise. But as we said actual crude on water, it's near record highs and a lot of that is to do with Russia. So the changes in terms of destinations of Russia's customers has changed massively in the last year. I think we have almost reached a peak with how much more we can see Russia ships to India and China. It's pretty much maxed out. There is almost nothing going into some of the shorter haul destinations so there is potentially a little bit of increase from Russia, but not a huge amount."*

Oil – BNEF: global oil and product stocks surplus widened WoW to 60.0 mmb

BNEF's global oil inventories

One of the negatives for oil going into 2023 was that there was expected to be surplus oil in Q1 and a building of global oil inventories. That's happened. So, a key data point to watch will be does the building in Q1 and early Q2/23 start to turn into a draw as markets move thru Q2/23. And we remind that there are weekly changes that can flip flop but the key will be to watch the trend. Last week's (April 16, 2023) Energy Tidbits memo noted that the narrowing of the oil stock surplus. But this was reversed this week. For those with a Bloomberg terminal we recommend flipping through BloombergNEF's "Oil Price Indicators" weekly that came out on Monday as it provides good charts depicting near-term global oil demand and supply indicators. The global stockpile for crude oil and products surplus widened from 34.4 mmb to 60.0 mmb for the week ending Apr 7. Crude oil inventories increased by +7.1 mmb WoW to 591.3 mmb, narrowing the deficit to 14.1 mmb against the five-year average (2016-2019, 2022). Total crude inventories (incl. floating) increased by +2.2% WoW to 706.3 mmb, widening the surplus from 40.5 mmb to 53.5 mmb. Total product stocks were up by +1.1% WoW to 934.9 and the previous week's stockpile deficit against the 4-year average (2017-2019,2022) reversed to a 6.4mmb surplus for the Apr 7 week. The gas, oil, and middle distillate stocks were down -0.4% to 149.3 mmb/d, narrowing the deficit against the four-year average from 21.1 mmb to 19.0 mmb. Jet fuel consumption by international departures for the week of April 24 is set to increase by +7,000 b/d WoW, while consumption by domestic and passenger departures will also increase by 56,700 b/d WoW. Below is a snapshot of aggregate global stockpiles.

Figure 50: Aggregate Global Oil and Product Stockpiles



Source: BloombergNEF

Oil – Italy continues to be above pre-Covid oil consumption

Italy oil consumption

Italy's total oil consumption continues to be above pre-Covid levels. (i)We first highlighted this in our Dec 25, 2022 Energy Tidbits memo with our Dec 21 tweet [LINK] *"#PeakOilDemand is probably a reality if #Oil is $120. But likely not so if oil is <$100. Italy #Oil consumption in Nov 2022 above pre-Covid. YTD Nov 30/2022 is catching up, but still a little below pre-Covid*

given $120 oil prices earlier in 2022. Thx @GioSalzanoWire. #OOTT." Bloomberg had then reported Italy's consumption in Nov was back above pre-Covid levels. (ii) On Thursday, Bloomberg reported on Italy's May oil consumption. We tweeted [LINK] "*Italy March 2023 total oil consumption 4.877 mmt just went above pre-Covid March 2019 of 4.797 mmt. Global economy worries are the market story, but should still be a solid summer ramp up especially with all the tourists to hit Italy. Thx @business @GioSalzanoWire. #OOTT."* Bloomberg provided the splits by product. And we didn't do the conversions on each product from metric tons to b/d. But Italy's consumption is generally over 1.1 mmb/d. Below is Bloomberg's graph of Italy total oil consumption that was attached to our tweet. Our Supplemental Documents package includes the Bloomberg report.

Figure 51: Italy oil consumption

Source: Bloomberg

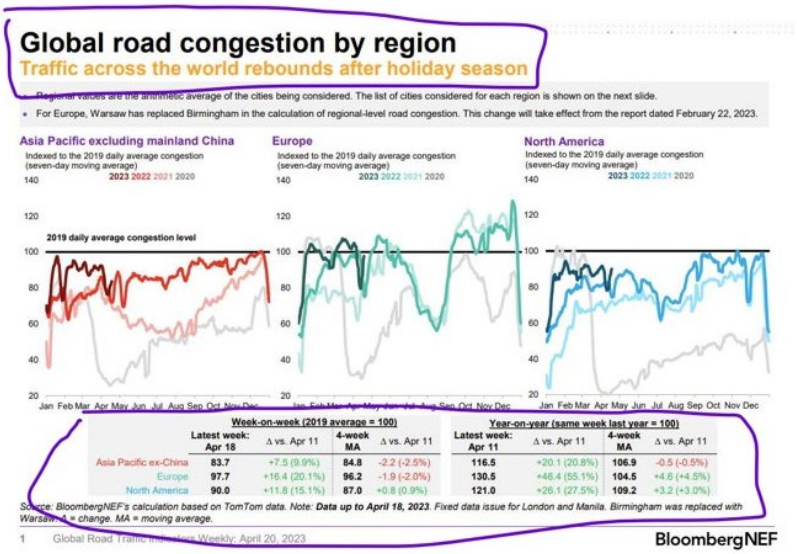
Oil – TomTom mobility indicators: big recovery in global traffic after the Easter holiday

Global road traffic indicators

In the BloombergNEF Global Road Traffic Indicators Weekly report we continue to see the same signals as the US gasoline consumption data from BloombergNEF US Oil Indicators Weekly. On Thursday, we tweeted [LINK], "*#Gasoline. #Diesel. @BloombergNEF road congestion - rebound as holiday season ends. China +1.4% WoW, well above Jan 2021. Asia Pacific excl China +9.9% WoW, well below 2019. EU +20.1% WoW, just below 2019. NA +15.1% WoW, well below 2019. #OOTT.*" Mobility indicators like TomTom data point to stable levels in global driving YoY, although road congestion has yet to recover to 2019 levels in Asia Pacific (ex-China), Europe, and North America. This week, traffic levels across all tracked regions were up significantly which is not surprising given that the Easter holiday last week led to a material decline in congestion across North America and Europe. For the week ending April 18, Asia Pacific (ex-China) road congestion was up +9.9% WoW, European congestion up +20.1% WoW, and North America congestion was up +15.1% WoW. On an annual basis, traffic levels in the Asia Pacific (ex-China) region were up +20.8% YoY and sat at 83.7% of average 2019 levels for the week ending Apr 18, European traffic levels were up +55.1% YoY to 97.7% of 2019 levels, and finally North American traffic was up +27.5% YoY and now sits at 90.0% of 2019 levels. Aside from the dip last week, traffic in the Asia-Pacific region has been exceptionally high since Feb but remains well below pre-Covid levels. The TomTom mobility data seems logical because despite the large WoW increase seen across all tracked regions; road congestion remains strong relative to 2020 and 2021 and is up slightly from 2022 levels. It its worth noting that TomTom data on congestion levels now

reflects daily average congestion compared to peak congestion previously. The change in methodology took effect from January 19.

Figure 52: Mobility Indicators



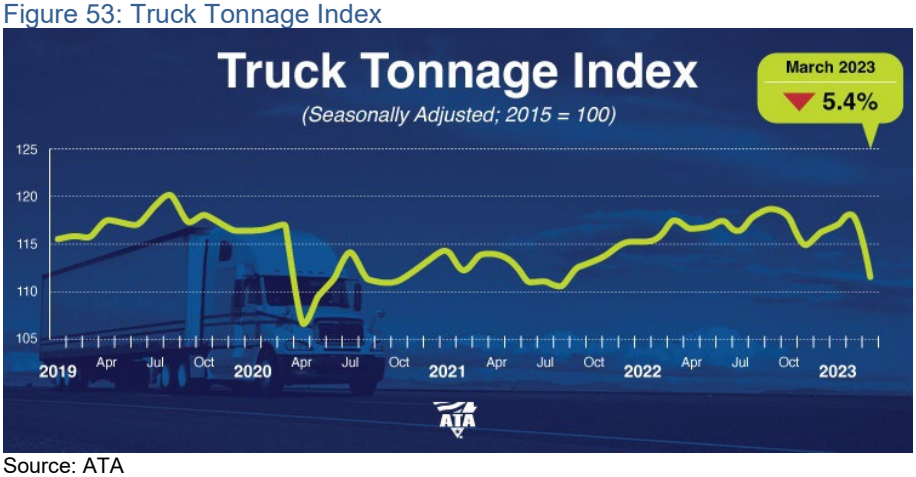
Source: BloombergNEF

Oil – Truck tonnage index fell -5.4% in March to 111.6

Truck tonnage index -5.4% MoM in March

We look to items like truck tonnage for indicators on the US economy and the March truck tonnage is in line with the expectations for a slowing US economy. Truck tonnage fell -5.4% MoM and -5.0% YoY in March, resulting in a total YTD decline of -3.13% since the start of 2023. This follows 2022's cumulative growth of 3.4% which was the largest single year increase observed since 2018. In addition, March's -5.4% YoY contraction marked the end of eighteen straight months of YoY gains and was the largest MoM decline since April 2020. The American Trucking Association released its seasonally adjusted Truck Tonnage Index for March on Thursday [LINK]. Chief Economist Bob Costello noted, *"After increasing a total of 2.6% during the three previous months, March's sequential decline was the largest monthly drop since April 2020 during the start of the pandemic… Falling home construction, decreasing factory output and soft retail sales all hurt contract freight tonnage – which dominates ATA's tonnage index – during the month. Despite the largest year-over-year drop since October 2020, contract freight remains more robust than the spot market, which continues to see prolonged weakness."* Trucking serves as a barometer of the U.S. economy, representing 72.2% of tonnage carried by all modes of domestic freight transportation, including manufactured and retail goods. Trucks hauled 10.93 billion tons of freight in 2021. Motor carriers collected $875.5 billion, or 80.8% of total revenue earned by all transport modes, equating to roughly 3.6% of total U.S. GDP in 2021. Our Supplemental Documents package includes the ATA release.

Figure 53: Truck Tonnage Index



Source: ATA

Oil & Natural Gas – TIPRO Texas oil natural and gas jobs up MoM in Jan

TIPRO March jobs update

Employment continues to increase in the Texas oil and gas sector. The Texas Independent Producers and Royalty Owners Association (TIPRO) updated their employment figures for the Texas upstream sector for March [LINK]. March saw an addition of ~1,500 jobs MoM, resulting in employment being up +11.2% YoY to 198,700 active jobs across direct oil and gas extraction and services. TIPRO wrote "*direct Texas upstream employment for March 2023 totaled 198,700, an increase of 1,500 jobs from revised February employment numbers. Texas upstream employment in March 2023 represented the addition of 20,000 positions compared to March 2022, including an increase of 1,100 jobs in oil and natural gas extraction and 18,900 jobs in the services sector… there were 14,491 active unique jobs postings for the Texas oil and natural gas industry in March, including 6,193 new job postings added in the month by companies. March active unique job postings reflect a 21 percent increase compared to February, and a 35 percent increase in new job postings for the month.* In addition, TIPRO president, Ed Longanecker commented, *"The Texas oil and natural gas industry continues to ramp up employment and production in-line with growing demand for our product here and abroad. With global oil and natural gas demand projected to increase by 34 percent by the year 2050, it's imperative that policy at the state and federal level reflect this reality and that our elected officials support continued investment in energy infrastructure and domestic production. By not doing so, energy prices will only increase for Americans and our country will become more reliant on other countries for oil and natural gas that do not adhere to the same environmental standards as the U.S. No other industry sector is more pervasive or important to our everyday lives and national security than oil and natural gas"*. Our Supplemental Documents package includes the TIPRO release.

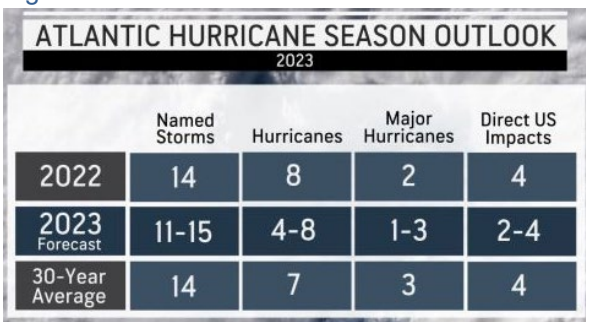
Oil & Natural Gas – AccuWeather forecasts below normal Atlantic hurricane season

Below normal hurricane season expected

Last week's (April 16, 2023) Energy Tidbits memo noted the Colorado State University (Phil Klotzbach) initial Atlantic hurricane season forecast calling for less than normal hurricane activity in 2023. The Atlantic hurricane season runs from Jun 1 to Nov 30. This week it was AccuWeather who is forecasting a less active hurricane season [LINK], which is in-line with

last year. On average, a normal hurricane season produces 14 named storms with roughly 50% of them reaching hurricane strength and storm seasons accompanied by El Nino characteristics are typically less intense. With that said, AccuWeather estimates that there will be 11-15 named storms with 35-50% of them potentially reaching hurricane strength, which implies slightly below normal activity levels relative to the historical 30-year average. Additionally, in our April 16, 2023, Energy Tidbits, we noted, *"The NOAA sees 62% probability for El Nino conditions during May/June/July"*, which foreshadows a less active first-half of the 2023 hurricane season. AccuWeather wrote, "*AccuWeather's team of tropical weather forecasters, led by veteran meteorologist and hurricane expert Dan Kottlowski, is once again predicting an above-normal season in terms of tropical activity in the Atlantic, as well as a higher-than-normal chance that a major hurricane could make landfall in the mainland United States, Puerto Rico and the U.S Virgin Islands. Specifically, the team is forecasting 16-20 named storms and six to eight hurricanes. Of those hurricanes, about three to five are forecast to reach major hurricane status, which occurs when a storm reaches Category 3 strength with winds exceeding 111 mph or higher. AccuWeather's forecast of 16-20 named storms is higher than the 30-year average of 14 per year, while the projection of six to eight hurricanes is about in line with the normal of seven. It's also nearly identical to how 2021 played out. Last year, the 21 named storms included seven hurricanes and four major hurricanes. Eight of those storms made a direct impact on the U.S. About four to six direct impacts are predicted for 2022."* Below is the AccuWeather forecast table. Our Supplemental Documents package includes AccuWeather's forecast.

Figure 54: AccuWeather Forecast for 2023 Atlantic Hurricane Activity



Source: AccuWeather

Atlantic hurricane/tropical storm names for 2023

Every year, there is a different list of names for the Atlantic hurricanes or tropical storms. The hurricanes/tropical storms naming follow the alphabet. But a hurricane name is retired if it causes major damage ie. Katrina is never to be used again. The AccuWeather Atlantic hurricane forecast also included the below list of Atlantic storm names for 2023.

Figure 55: AccuWeather 2023 Atlantic Storm Names

Source: AccuWeather

Oil & Natural Gas– Tough Q1 reporting ahead for E&P with prices down QoQ & YoY

Tough Q1 reporting for Cdn E&P

We should start to see Q1 reporting for the Cdn oil and gas companies in the next week or so and one thing is clear, it will be a tough Q1 reporting when comparing to Q4/22 and Q1/22 with oil and gas prices down QoQ and YoY. On April 8, we tweeted [LINK] "*Tough Q1 reporting for E&P in a few weeks. See 👇#Oil #NatGas price table. Q1/23 prices down QoQ for all prices except WCS. Q1/23 prices down even more YoY for all prices. Looking further ahead, Q2/23 YoY price comparison will be even worse as Q2/22 was peak prices.* #OOTT." Our tweet included our quarterly oil and gas price table. Q1/23 Ed Par prices of US$73.80 were -7.5% QoQ and -21.0% YoY. Q1/23 WCS prices of US$56.52 were +3.4% QoQ and -31.3% YoY. Q1/23 AECO prices of $3.10 were -38.2% QoQ and -31.2% YoY. Our tweet reminded that the YoY comparisons for Q2/23 reporting this summer will be even worse as Q2/22 was the period of peak oil and natural gas prices. Below is our updated table of quarterly oil and natural gas prices.

Figure 56: Oil and Natural Gas Prices

Quarter	Brent US$	WTI US$	EdPar US$	WCS US$	HH US$	AECO C$
Q1/18	$67.00	$62.86	$57.19	$37.07	$3.11	$1.97
Q2/18	$74.41	$67.83	$60.78	$49.88	$2.83	$1.17
Q3/18	$75.27	$69.69	$59.81	$42.32	$2.92	$1.18
Q4/18	$68.18	$59.41	$36.53	$25.63	$3.79	$1.53
Q1/19	$62.91	$54.49	$50.28	$43.79	$2.93	$2.42
Q2/19	$68.58	$59.96	$54.41	$47.46	$2.57	$1.07
Q3/19	$61.95	$56.48	$52.43	$43.91	$2.38	$0.94
Q4/19	$62.51	$56.83	$50.61	$37.98	$2.40	$2.33
Q1/20	$51.28	$46.73	$39.75	$28.55	$1.92	$1.94
Q2/20	$31.14	$27.67	$21.84	$18.02	$1.70	$1.90
Q3/20	$42.70	$40.87	$36.83	$31.13	$1.96	$2.14
Q4/20	$44.47	$42.67	$37.92	$31.34	$2.46	$2.51
Q1/21	$60.51	$57.75	$54.17	$45.83	$3.39	$2.97
Q2/21	$68.44	$65.90	$61.94	$53.11	$2.89	$2.80
Q3/21	$72.95	$70.57	$66.90	$57.65	$4.28	$3.40
Q4/21	$79.45	$77.26	$73.78	$60.87	$4.74	$4.47
Q1/22	$99.08	$94.57	$93.40	$82.27	$4.60	$4.51
Q2/22	$112.72	$108.76	$107.10	$93.41	$7.46	$6.89
Q3/22	$99.67	$92.38	$90.52	$71.50	$7.98	$4.17
Q4/22	$88.35	$82.63	$79.74	$54.66	$5.59	$5.02
Q1/23	$81.44	$76.17	$73.80	$56.52	$2.69	$3.10
Q1/23 YoY	-17.8%	-19.5%	-21.0%	-31.3%	-41.6%	-31.2%
Q1/23 QoQ	-7.8%	-7.8%	-7.5%	3.4%	-52.0%	-38.2%

Source: Bloomberg

Energy Transition – G7 hide/deny need for more investment in LNG/natural gas supply

G7 hide/deny need for LNG & natural gas

Last week's (April 16. 2023) Energy Tidbits memo highlighted the just concluded G7 climate /energy meeting. It seems like our concern on how the G7 leaders were setting up a future energy crisis in the late 2020s were not shared. Regardless, here is what we wrote last week on our concern. "*Post this weekend's G7 climate/energy meeting, we are more concerned that the G7 leaders are setting up a future energy crisis in the later 2020s by their hiding/denial that LNG demand will continue to grow and more investment in natural gas and LNG is needed. We recognize the G7 leaders do not want to say more fossil fuels are needed. But the reality is simple - hiding the need for more investment in natural gas and LNG will only cause more supply shortfalls down the road. (i) We had trouble finding the actual communique issued today, but did rely on the Reuters reporting "Factbox: Key excerpts from G7 statement on energy and climate change" that provided excerpts from the communique. [LINK] (ii) The G7 didn't disappoint, they do what they can to NOT say more investment in natural gas and LNG supply is needed to meet growing LNG demand. Earlier this morning, we tweeted [LINK] "Why can't #G7 simply say #LNG demand is growing & need investment in #NatGas #LNG supply? Rather G7 political speak ""investment in the gas sector can be appropriate to help address potential market shortfalls". Thx @Reuters Katya Golubkova. #OOTT". Here is what Reuters quoted from the G7 communique "GAS INVESTMENTS. "Recognising the primary need to accelerate the clean energy transition through energy savings and gas demand reduction, investment in the gas sector can be appropriate to help address potential market shortfalls provoked by the crisis, subject to clearly defined national circumstances, and if implemented in a manner consistent with our climate objectives and without creating lock-in effects, for example by ensuring that projects are integrated into national strategies for the development of low-carbon and renewable hydrogen." (iii) This denial/hiding was our concern and confirms the Reuters report from Tuesday "G7 climate ministers drop language on growing LNG demand". [LINK] Reuters reported "A previous draft communique for this week's meeting of G7 climate change and energy ministers had called for "necessary upstream investments in LNG and natural gas" amid the energy fallout from Russia's invasion of Ukraine and said "demand for LNG will continue to grow". But, as negotiations over the communique resumed on Tuesday ahead of the ministerial meeting on April 15-16 in Sapporo, Japan, the wording was changed, the latest draft reviewed by Reuters showed." (iv) On Tuesday, we tweeted [LINK] "Recipe for #EnergyCrisis & stronger for longer #LNG #NatGas prices in late 2020s. Hide/Deny more LNG & capex is needed! See 👇 @KateAbnett @maki_yamaz report. #G7 drop text "demand for LNG will continue to grow", need "necessary upstream investments in LNG & NatGas" #OOTT." (iv) As the week progressed, the reporting on the G7 didn't mention the dropping of the LNG demand growing and the need for more investment in LNG and natural gas. So on Thursday, we tweeted a reminder [LINK] "Cover up is always worse than the crime. See 👇04/11 tweet. G7 climate communique tomorrow not expected to acknowledge demand for #LNG will continue to grow. Hide/deny more LNG & Capex is needed can only add to higher global LNG #NatGas prices in late 2020s. #OOTT." Our Supplemental Documents package includes the two Reuters reports."*

Japan's Mitsui wastes no time, makes an "appropriate" Eagle Ford gas buy

Japan was reportedly the G7 country that wanted a more definite need for increasing natural gas and LNG supply only to get shot down by other G7 countries who wanted the more watered down statement on natural gas and LNG as noted above. Instead

of saying there is a need for increasing natural gas and LNG supply, the G7 went with the watered down and unclear statement "*investment in the gas sector can be appropriate to help address potential market shortfalls provoked by the crisis*." It looks like Japan's Mitsui wasted no time in making an "*appropriate"* natural gas supply acquisition. On Thursday, Mitsui announced [LINK] they have completed an undisclosed price acquisition of Eagle Ford natural as assert. Mitsui did not disclose the price but said it was buying Eagle Ford assets that have access to US LNG export terminals. Interestingly, Mitsui will operate the assets. Mitsui said it "w*ill develop and operate the asset, aiming for stable gas production of over 200 million cubic feet per day from the field, while maintaining a focus on the safety of employees, the community, and the environment."* Mitsui also wrote "*Mitsui believes that natural gas and LNG will play an important role as a "pragmatic solution" for energy transition, and we will continue to contribute to stable energy supply, enhanced quality of life, and sustainable development of society by further promoting our global natural gas and LNG businesses."* Our Supplemental Documents package includes the Mitsui release.

Energy Transition – Germany to phase out oil/gas heating systems at a cost of $10b/yr

Germany phasing out oil and gas heating

No one should be surprised to see the reports that the German cabinet has approved a bill to phase out oil and gas heating systems. We have continued to believe that no one should be surprised to find out the energy transition will cost citizens and lead to higher energy and cost of living. It's been obvious. But it sounds like some are surprised to see that this will cost Germans $10 billion a year. We suspect the surprise comes from western leaders selling the energy transition as something that will lead to lower energy prices, not higher. At least they needed that to sell the vision to people and get people committed to the view that the energy transition would lead to both a reduction in emissions and energy costs cheaper than fossil fuels. On Wednesday, we tweeted [LINK] "*This was known yrs ago. but leaders chose not to warn #EnergyTransition will increase cost of living. German cabinet approves bill to phase out #Oil #NatGas heating systems. Est cost $10b annually but some subsidies to partially offset. Thx @RihamKousa @MarkusWacket #OOTT."* Reuters reported "*The German cabinet on Wednesday approved a bill that bans most new oil and gas heating systems from 2024, the economy minister said, a policy designed to cut greenhouse gas emissions but that critics warned could be costly for poorer households. Berlin's ruling coalition last month agreed that almost all newly installed heating systems in Germany should run on 65% renewable energy from 2024, both in new and old buildings."* And "*Such a shift could cost Germans around 9.16 billion euros ($10 billion) annually until 2028, the draft bill showed. The costs would fall to 5 billion from 2029 as Berlin expects renewable energy expansion and a ramp up of heating pumps production to make the switch cheaper. The government will offer a subsidy of 30% for residential properties occupied by owners and 10% extra if the owners opt for an earlier climate-friendly heating switch than required by law, regardless of the household income.Homeowners who receive income-related welfare benefits could get 20% extra subsidy for the switch*." Our Supplemental Documents package includes the Reuters report.

Energy Transition – "Chilenization" [nationalization] of Lithium industry

Chilenization of the Lithium industry

We have been highlighting the expected critical metals supply shortage ahead for the past two years. And we believe controlling/capturing of critical metals supply will be an accelerating push by countries, companies and consumers. Chile just stepped into this competition. On Thursday night, Chile President Gabriel Boric announced is National Lithium Strategy, which includes their plan to nationalize the lithium industry. His YouTube video is only in Spanish. [LINK]. But the Chile website posted a transcript of Boric's announcement. [LINK] (i) On Friday morning, we tweeted [LINK] "*Chilenization (Nationalization) of #LIthium, like #Copper 56 yrs ago. Will respect current contracts BUT "anticipated participation of the State in the Salar de Atacama will be the result of an agreement with those who currently have the rights to exploit lithium. And much more!"* (ii) Boric wants "*Our challenge is for our country to become the main producer of lithium in the world*". (iii) Chllenization. There shouldn't be any doubt what Boric wants. He said "*Compatriots: When in this same place 56 years ago President Eduardo Frei Montalva promoted the Chilenization of Copper, he did so with the firm conviction that this mineral would be "the master beam" of the Chilean economy. In 1971, a few years later, this idea also accompanied and inspired President Salvador Allende who at the time of nationalizing the Great Copper Mining, with unanimous support of Congress, called it the "Salary of Chile". I hope that today, with that high vision, we will also be able to count on that transversality. In order for the State to be actively involved in the entire lithium cycle, in the second half of this year, after the dialogue we will hold with the different communities that coexist with the salt flats, we will send to the Congress of the Republic the bill that creates the National Lithium Company*." *"In the first place, the State will participate in the entire production cycle of this mineral, creating a National Lithium Company*." (iv) Respect "current" contracts. Note Boric using "current". "*And in that sense here in Chile and the world, we know that we are a serious and reliable country, we have respected and will continue to respect the current contracts and we know that only in 2030 the lease to private of an important part of the Salar de Atacama ends. If we decided to do nothing, this would simply continue. For this reason, I have instructed Corfo, the institution that manages our lithium reserves, to send Codelco the search for the best ways to achieve, from now on, the participation of the Chilean State in the extraction of lithium in the Salar de Atacama. Thus, Codelco will be our representative before the companies that are currently in the Salar to have a participation of the State before the expiration of the current contracts."* (v) Chile will be negotiating an agreement to participate with those that currently have the rights. Boric said "*Secondly, the State of Chile shall fully respect the provisions of the contracts in force. That is, an anticipated participation of the State in the Salar de Atacama will be the result of an agreement with those who currently have the rights to exploit lithium."* (vi) There is much more in the Boric speech on the Chilenization of Lithium. Our Supplemental Documents package includes the Google Translate of the Boric speech. [LINK]

Looks like Germany wants to help Chile in its nationalization

Did German Chancellor Scholz know about Chile's announcement or just expected such an announcement sometime following his late Jan meeting with Chile President Boric. Regardless, it looks like Germany wants to help Chile in its nationalization. (i) Last Sunday, Reuters reported [LINK] "*Germany to support critical minerals-rich countries build processing capacity. German Chancellor Olaf Scholz delivers a speech during the opening ceremony of the annual industry trade fair Hannover*

Messe in Hanover, Germany April 16, 2023. - Germany wants to help countries that are rich in critical minerals such as Chile, Indonesia and Namibia to build their own processing infrastructure to cut dependency on China, Chancellor Olaf Scholz said on Sunday. Berlin is trying to rebalance its relationship with China and reduce reliance on Asia's powerhouse for key inputs, such as nickel and other critical minerals."If we succeed in locating more processing steps where the raw materials are in the ground, then that will not only create greater local prosperity ... we will ensure that we have more than just one supplier in the future," Scholz said in a speech at Germany's industrial trade fair Hannover Messe." (ii) Scholz met with Boric in late Jan to discuss critical minerals. On Jan 29, Reuters reported [LINK] "*Scholz Seeks to Secure More Critical Minerals on South America Tour. German Chancellor Olaf Scholz lobbied this week for South America to prioritize cooperating with Germany in its commodities sector as Berlin joins the race for critical minerals, with lithium key for its auto industry. Europe's largest economy has fallen behind in the race for critical minerals, in part due to a distaste for the dirty business of mining as well as faith in the open market, German government officials say. That has led to a reliance on China, which has invested widely in the mining sector in resource-rich South America and in processing commodities. Now though, soaring demand for critical minerals and geopolitical concerns are sparking a push to better secure and diversify supply - for example through offtake agreements, stakes in mines, or possibly the establishment of Germany's own processing capacity."* Our Supplemental Documents package includes the two Reuters reports.

On Apr 16, the G7 warned a critical minerals shortfall is coming

Here is what we wrote in our Apr 16, 2023 Energy Tidbits memo on the G7 meeting last weekend. "*The most important excerpt we saw from the Reuters G7 excerpts was on critical minerals and raw materials. The G7 is warning there will be a supply shortfall ahead, but they will do their best to maintain products as long as possible. This would include wind, solar, EVs, etc. We wish the G7 had used the same language on the need for LNG and natural gas supply to provide electricity that they did for warning on a critical minerals supply shortfall. We were surprised by this warning and, earlier this morning, we tweeted [LINK] "#NatGas is needed for longer, #EnergyTransition will take longer. G7 warns critical minerals shortfall is coming. "We are fully committed to maintain products containing critical minerals and raw materials in the economy as long as possible" Thx @Reuters Katya Golubkova #OOTT." Critical minerals and raw materials are essential to the energy transition. Maybe people will look at the G7 using "products" and only think about mobile phones or electric toothbrushes. But it's the entire gambit of energy transition from power to mobility. And natural gas and LNG will be a big winner if the lack of critical minerals and raw materials impacts wind and solar generation. The G7 is saying they will maintain these products long as possible. Why not just say, we have a problem. Our Energy Transition plan depends on critical minerals and raw materials and there isn't enough supply. Here is the full G7 quote "We reaffirm the growing importance of critical minerals for the clean energy transition and the need to prevent economic and security risks caused by vulnerable supply chains, monopolisation, lack of diversification of existing suppliers of critical minerals; "We are fully committed to maintain products containing critical minerals and raw materials in the economy as*

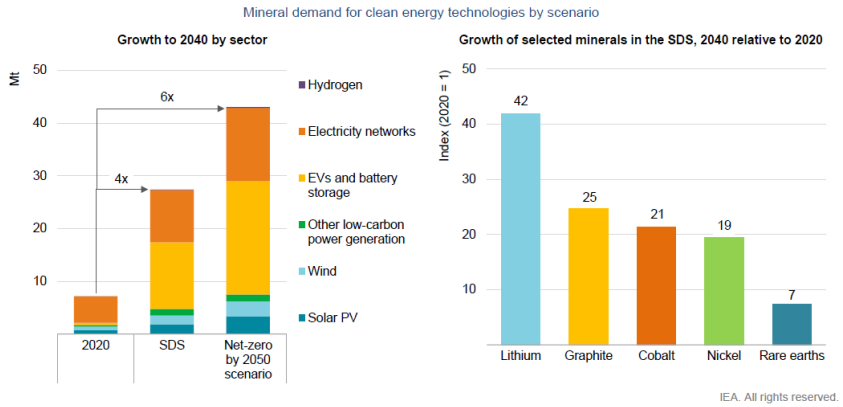
long as possible; "We emphasise the importance of countering geopolitical risks, including with respect to critical minerals, for the clean energy transition. "We boost up developing new mines and supply chains for critical minerals in a responsible manner that promotes transparency and traceability to meet the rising demand."

Two years ago, IEA warned on critical minerals risk for the energy transition

We have been surprised that G7 leaders haven't jumped on the issue of critical metals supply. It is not a surprise. It was a huge risk prior to Russia and the increasing anti-China views. And those have both made a bad problem worse. Here is what we wrote in our May 9, 2021 Energy Tidbits memo. "*Energy Transition – IEA warns critical minerals risk for energy transition. We have been warning that the big IEA theme will be that the world is behind in where it needs to be to meet its Net Zero and Energy Transition aspirations. This is not a new IEA theme, rather they have been hammering this home for a year. Its one of the reasons why we continue to say the Energy Transition is happening, it will just take longer, be a bumpy road and cost more than the aspirations. On Wednesday, the IEA released a major report "The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions" [LINK] that reinforced these concerns. The IEA release starts off "Supplies of critical minerals essential for key clean energy technologies like electric vehicles and wind turbines need to pick up sharply over the coming decades to meet the world's climate goals, creating potential energy security hazards that governments must act now to address, according to a new report by the International Energy Agency." The messaging isn't in any doubt here and why we tweeted [LINK] "Path to #EnergyTransition is clear, but demise of #Oil #NatGas won't be as quick as aspirations. Another @fbirol warning not on track to meet #NetZero aspirations. this time critical minerals raising risk of delayed or more expensive #EnergyTransition. Great report @IEA . #OOTT". This is a good report to read and for reference libraries. There are a huge amount of good insights and perspective report. One perspective example is that coal revenues will still be almost double energy transition minerals revenues in 2030. Its not just a potential shortage of critical minerals, it's the concentration of minerals sources that will cause increased security risks ie. China in the below chart. Its why the IEA recommendations include "as well as voluntary strategic stockpiles in some instances".*

Figure 57: Critical Minerals demand

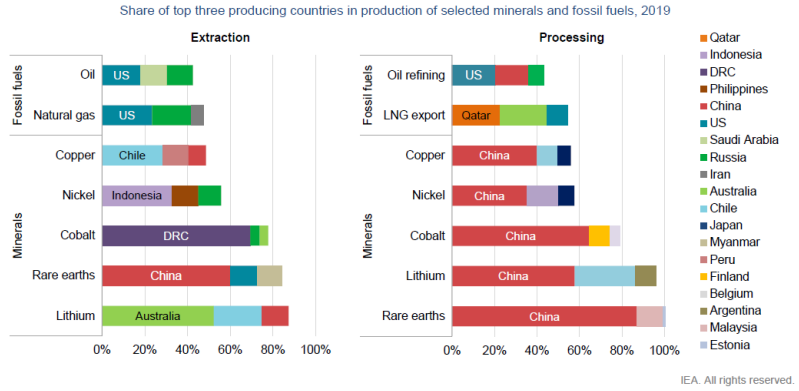
Mineral demand for clean energy technologies would rise by at least four times by 2040 to meet climate goals, with particularly high growth for EV-related minerals



Source: IEA May 2021

Figure 58: Extraction and Processing of Fossil Fuels and Critical Minerals

Production of many energy transition minerals today is more geographically concentrated than that of oil or natural gas



Source: IEA May 2021

Two years ago, IEA suggested strategic critical metals reserves

Here is another item from our May 9, 2021 Energy Tidbits memo. "*The IEA's report also brings a reminder as to why it was formed. The IEA warns on the risk of security of supply. The critical minerals report has 6 recommendations and one includes "4. Enhance supply chain resilience and market transparency. Policy makers need to explore a range of measures to improve the resilience of supply chains for different minerals, develop response capabilities to potential supply disruptions and enhance market transparency. Measures can include regular market assessments and stress-tests, as well as strategic stockpiles in some instances." Strategic stockpiles caught our attention. Its why we tweeted [LINK] "Hmm! @IEA 's recommendations incl "as well as voluntary strategic stockpiles in some instances". IEA was formed from*

#ArabOilEmbargo 73/74, members committed to 90 day strategic oil reserves. IEA doesn't see same no gas for cars, but more expensive, delayed #EnergyTransition #OOTT" As we have noted before, the IEA was created following the Arab Oil Embargo after the Arab producers shut out the west. And one of the key requirements for membership was that memos committed to have 90 day strategic oil reserves. Its also why the US created the Strategic Oil Reserves. Every year we remind on the Arab Oil Embargo and include the below picture that reminds of the block long line ups to get gasoline when the embargo hit. It was the game changer for energy for decades to come."

Figure 59: Gas station line up during Arab Oil Embargo 1973-74

Source: Time

Countries are setting up SPR equivalent for critical minerals/rare earths

Here is an excerpt from our Aug 8, 2021 Energy Tidbits memo. "*There was a good food for thought Argus report on Thursday "South Korea to increase stockpiles of rare metals" [LINK] as to why there is likely an additional leg of demand for critical metals (copper, zinc, cobalt, etc) and rare earths over and above an already strong decades long demand outlook. Argus reported "South Korea has announced plans to raise its stockpiles of critical metals such as cobalt, nickel and rare earths that are used in key emerging industries including electric vehicle (EV) batteries and renewable energy. The government has set a target to increase its stockpiles to cover 100 days of consumption, up from 56.8 days currently, the country's ministry of trade, industry and energy (Motie) said today. It did not give a target date. South Korea will build new facilities and expand existing ones to achieve this goal. State-run firm Korea Resources (Kores) will manage the stockpiles, Motie said." We thought the title could have calls it "critical metals" and "rare earths" because copper and nickel are included. It also would have been linked more to the IEA's recent report (see the following item). Critical metals and rare earths are the oil of the 70s. The arab oil embargo led to creation of the IEA and the IEA member countries committing to have 90 days of strategic petroleum reserves. But because that was a supply cut off, it forced governments to look to reduce oil consumption ie. small cars like the Honda Civic started to take off, increased fuel efficiency standards, etc. This is a little different in that it is a predictable demand driven cycle as the govts are putting the world, not just one region, on a path of decades acceleration in items like EVs that rely on critical metals and rare earths. At the same time, western countries*

are making it tougher for mining. We have to believe that there will be other manufacturing countries that will take a similar approach."

Twitter – Look for our first comments on energy items on Twitter every day

@Energy_Tidbits on Twitter

For new followers to our Twitter, we are trying to tweet on breaking news or early views on energy items, most of which are followed up in detail in the Energy Tidbits memo or in separate blogs. Our Twitter handle is @Energy_Tidbits and can be followed at [LINK]. We wanted to use Energy Tidbits in our name since I have been writing Energy Tidbits memos for over 20 consecutive years. Please take a look thru our tweets and you can see we aren't just retweeting other tweets. Rather we are trying to use Twitter for early views on energy items. Our Supplemental Documents package includes our tweets this week.

LinkedIn – Look for quick energy items from me on LinkedIn

Look for energy items on LinkedIn

I can also be reached on Linkedin and plan to use it as another forum to pass on energy items in addition to our weekly Energy Tidbits memo and our blogs that are posted on the SAF Energy website [LINK].

Misc Facts and Figures

During our weekly review of items for Energy Tidbits, we come across a number of miscellaneous facts and figures that are more general in nature and often comment on sports and Calgary items.

Japan's Karage (best fried chicken) Grand Prix

Anyone who been to Japan knows a favorite comfort food is Japan fried chicken or Karage. Most Japanese restaurants in Canada will serve Karage, almost as many who will serve Yakitori. What we didn't know was that there was an annual competition, the Karage Grand Prix. We checked again yesterday and still haven't been able to find if there has been a winner declared for 2023. Japan Today wrote [LINK] "*Munching their way through hundreds of golden-brown morsels, a team of judges has searched relentlessly to find the ultimate karaage -- the fried chicken known as "Japan's comfort food". While a global buzz has grown around Korean fried chicken in recent years, in Japan, karaage reigns supreme. Its name refers to a technique where pieces of chicken, other meat or vegetables are marinated and coated in flour and starch before being fried. The dish is a national obsession: winners of the Karaage Grand Prix, an annual competition to find Japan's choicest chunks, can see their sales as much as triple if their chicken wins an award." "This year, judges were appointed to replace a public vote after allegations of fowl play by some of the competing pubs, restaurants and chicken shops. The judges met for several tasting sessions around the country -- each putting away around a kilogram of chicken a day. The contest, now in its 14th year, hands out prizes in categories such as soy sauce or salt-based flavors -- and splits the awards between east and west Japan. An overall winner is crowned in each category, with several lesser "gold" awards also handed out."*

Do only non-golfers buy homes on fairways?

Golf season is about to start for many, which will, for people who live along a fairway, bring the normal seasonal flow of errant drives into the backyards and hopefully not

hitting their house or their family. We were reminded of a recent Feb 21, 2023 WSJ report "*Golf Course Living Is Paradise—Except for the 651 Balls Pelting Your House and Yard. In a Massachusetts country club battle, teed-off neighbors are suing, saying errant balls have made life a living hell. How many is 'reasonable'?"* [LINK] The WSJ wrote "*Erik and Athina Tenczar in 2017 bought what they thought was their forever home in Kingston, Mass., a four-bedroom colonial that sits near a left-hand dogleg on the 15th hole of the Indian Pond Country Club. To their dismay, the Tenczars soon learned that ambitious golfers regularly attempted to cut the corner, putting their house in the line of fire*." Surely a golfer would have looked at where the home was situated relative to tee shots. The WSJ wrote *"The jury awarded the Tenczars $3.5 million in damages, but the highest court of Massachusetts issued a mulligan of sorts in December 2022, throwing out the verdict and ordering a retrial, scheduled for August. A new jury will need to consider whether the number of balls hitting the home is reasonable, the court said."*

Figure 60: Crcled spots show spots where errant balls hit the Tenczar family home on a golf course in Kingston, Mass

Source: WSJ

NFL draft starts Thursday

The NFL draft is Thursday, Friday and Saturday this week. So no surprise, the NFL Network had many shows about prior drafts in their Path to the Draft show. There were many great individual stories about how the young men had personal life challenges on their way to having their name called out as being drafted. IT was great to see these amazing personal life stories and realize how many of these young men have been able to use football to change their life and the lives of their families. While we will never know what it feels like, we can't help feel the joy (and relief) of the player and his family at hearing his name called. Can't wait to hear some of the personal stories of these young men drafted this week in the NFL Draft.

The best in any business are like Tom Brady – they earn it every singe day

I have often said how fortunate I was to have worked with some of the very best in the financial services and see them in action every day on what makes them the best in their profession. And I have always thought a key to their being the best is that they seemed to bring their "A" game every day. They were consistently great and could be counted on to be consistently great. I was reminded of this when watching the 2011 "Brady 6" on Tom Brady. The Brady 6 refers to the six quarterbacks picked ahead o fhis being the 199th pick in 2000 NFL Draft – Chad Pennington (18, Jets) ... Giovanni Carmazzi (65, 49ers) ... Chris Redman (75, Ravens) ... Tee Martin (163, Steelers) ... Marc Bulger (168, Saints) ... Spergon Wynn (183, Browns). A couple Brady quotes were "*I always want to feel I am the best quarterback for this team. I want to earn it every single day.*" ""*in all the lessons I learned here on State Street and in the Big House, that's still what I bring to practice today. And after 14 years, I love the game more than I have ever loved it. Where did I llelearn the love for the game. Where did I learn to practice. Where did I learn to compete. It was sitting in the same chairs you guys are sitting in today*"