Energy Tidbits

May 15, 2022

Produced by: Dan Tsubouchi

IEA Birol's Blog Sounds Like a Recipe/Warning For an Energy Crisis for 2020s

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 and not just a specific company results. Our target is to write on 48 to 50 weekends per year and to post by noon mountain time on Sunday.

This week's memo highlights:

1. IEA's Birol: use near term oil & gas capacity to fill Russian void, don't invest in major future capacity yet still need massive policy/investment to get on Net Zero pathway – recipe for energy crisis thru 2020s [LINK]
2. 1st indicator in a month that maybe some hope for a JCPOA, EU says going back to negotiating table [LINK]
3. Sounds like EU is going to give in to Putin's natural gas payment process thru Gazprombank [LINK]
4. More buyers lock up long term LNG supply, now 7.57 bcf of long term LNG supply deals since July 1, 2021 [LINK]
5. Wells Fargo says the economics of the BEV "*really just doesn't work*" [LINK]
6. Please 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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Table of Contents

Natural Gas – Natural gas injection of +76 bcf, storage now -376 bcf YoY deficit

The YoY storage deficit started the winter at -282 bcf YoY at Oct 31 and is now -376 bcf YoY. The EIA reported a 76 bcf build (vs 78 bcf build expectations) for the May 6 week, which was slightly less than the 5-yr average build of 82 bcf, and above last year's injection of 70 bcf. Storage is 1.643 tcf as of May 6, decreasing the YoY deficit to -376 bcf, from -382 bcf last week and storage is 312 bcf below the 5-year average vs 306 bcf below last week. Below is the EIA's storage table from its Weekly Natural Gas Storage Report [LINK].

YoY storage at -376 bcf YoY deficit

Figure 1: US Natural Gas Storage

	Stocks billion cubic feet (Bcf)				Historical Comparisons: Year ago (05/06/21)		5-year average (2017-21)	
Region	05/06/22	04/29/22	net change	implied flow	Bcf	% change	Bcf	% change
East	274	253	21	21	345	-20.6	341	-19.6
Midwest	342	324	18	18	456	-25.0	419	-18.4
Mountain	96	92	4	4	130	-26.2	115	-16.5
Pacific	183	176	7	7	233	-21.5	215	-14.9
South Central	749	721	28	28	854	-12.3	865	-13.4
Salt	241	233	8	8	268	-10.1	276	-12.7
Nonsalt	507	489	18	18	586	-13.5	589	-13.9
Total	1,643	1,567	76	76	2,019	-18.6	1,955	-16.0

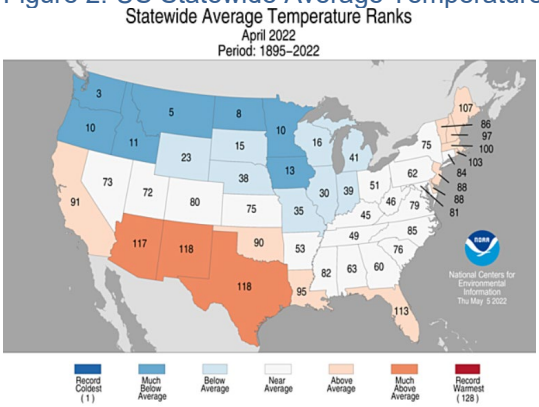
Source: EIA

Natural Gas – April was cold but it's not winter so no big natural gas demand win

April was colder than normal in the US, but April isn't winter and, in many parts of the US, it's the perfect weather to leave the windows open. So there wasn't any major draw on natural gas. But the colder April did help with natural gas demand in April. On Monday, NOAA posted its recap of US weather for April [LINK] that showed April 2022 was the 50th coldest April in the last 128 years. So there was a benefit to natural gas demand. However, the major pull on US natural gas continues to be increasing US LNG exports.

April weather recap

Figure 2: US Statewide Average Temperature Ranks April 2022



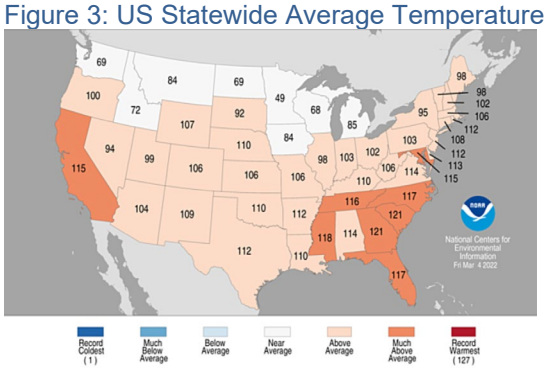
Source: NOAA

US was 18th warmest winter in last 128 years

Our April 17, 2022 highlighted NOAA's recap of winter 2021/22 tempertures. In that memo, we wrote "*It's a good thing US LNG exports have been increasing because, if*

not, this warm of a winter would have set HH prices close to $2 and not high $4's. February saw temperatures that were almost right on average for the month after a very warm January and December in the US. NOAA posted its recap of February 2022 weather [LINK], which was the 62nd warmest in the last 127 years. It has been a very warm winter in the US and in the pre-LNG days, this typically would have resulted in lower as prices moving into shoulder season with HH at ~$2/mcf and not the $4.60/mcf it currently is trading at. D/J/F was the 18th warmest winter on record in the last 128 years. Below is a graphic depicting the state average temperature ranks."

Figure 3: US Statewide Average Temperature Ranks D/J/F 2022



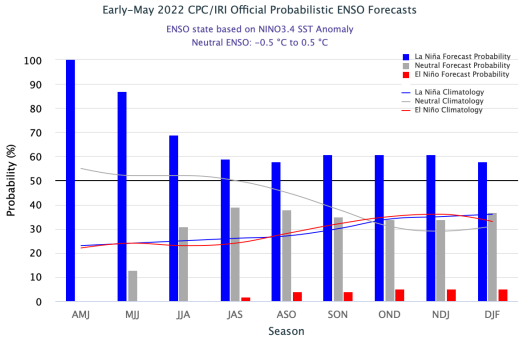
Source: NOAA

Natural Gas – 96% probability for La Nina/Normal conditions ie. a normal hurricane season

La Nina/El Nino conditions this summer

The CPC/IRI released its updated monthly El Nino/La Nina outlook is issued on the 2nd Thurs of every month [LINK]. The new May forecast for JAS is 59% (was 52%) La Nina, 39% (was 44%) Neutral and only 2% (was 4%) for El Nino conditions. The new ASO forecast is 58% (was 51%) La Nina, 38% (was 42%) Neutral and 4% (was 7%) El Nino conditions. ASO is the peak period for Atlantic hurricane season. Again, weather is never 100% the same, but El Nino summers are normally associated with low Atlantic hurricane seasons, whereas neutral/La Nina conditions are more likely normal hurricane seasons. Below is the CPC/IRI official ENSO forecast.

Figure 4: Early-March NOAA El Nino/La Nina Outlook



Source: CPC/IRI

Natural Gas – EIA forecasts US gas production growth in 2022 and 2023

U.S. gas production +3.16 bcf/d in 2022

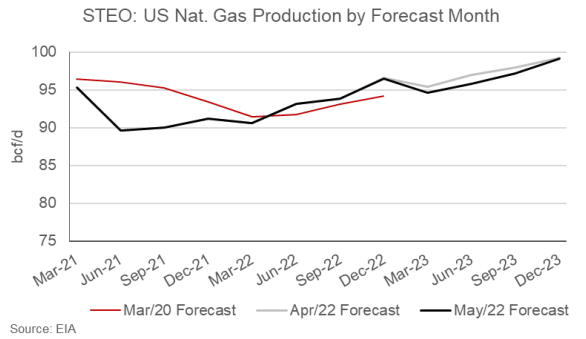
No surprise that, with continued stronger than expected oil and natural gas prices, the EIA increased its US natural gas production forecasts for 2022. However, what is different from prior years is that the increase isn't from associated natural gas from oil plays but from dry gas plays. The EIA released its monthly Short Term Energy Outlook May 2022 [LINK]. The EIA revised down its 2022 forecast and revised up its 2023 forecast for US natural gas production. (i) The EIA forecast shows US natural gas above the Q4/19 peak of 96.58 bcf/d, with Q4/22 US natural gas of 99.14 bcf/d (up 2.56 bcf/d from peak). (ii) For 2021, the EIA made slight downward revisions to Q4 keeping all other periods flat. 2021 US natural gas production is forecast to average 93.55 bcf/d (down from 93.57 bcf/d previously). (iv) US natural gas production is expected to average 96.71 bcf/d in 2022 (97.41 bcf/d previously) and 2022 is up 3.16 bcf/d YoY. 2023 production estimates were released and see Q1/23 production entering at 100.25 bcf/d (99.72 bcf/d previously) and exiting in Q4/23 at 102.42 bcf/d (101.72 bcf/d previously) for a 2023 average of 100.71 bcf/d. (v) The EIA wrote *"We estimate dry natural gas production averaged 95.5 Bcf/d in the United States in April, up 0.4 Bcf/d from March. Although production in April was lower than the recent peak in December 2021, it increased in each of the past two months. Periods of below normal temperatures and snow in some producing regions, along with seasonal maintenance on pipelines, limited the production increases in April compared with March. We forecast dry natural gas production to average 95.8 Bcf/d in May. For all of 2022, we expect that dry natural gas production will average 96.7 Bcf/d, which would be 3.2 Bcf/d more than in 2021. We expect dry natural gas production to average 101.7 Bcf/d in 2023."*

Figure 5: EIA STEO US Natural Gas Supply Forecasts by Forecast Month

May-2022	95.29	89.59	89.99	91.15	91.49	90.59	93.15	93.86	96.53	93.55	94.66	95.82	97.17	99.14	96.71	100.3	101.6	102.4	102.4	101.7
Apr-2022	95.29	89.59	89.99	91.15	91.49	90.59	93.15	93.86	96.63	93.57	95.41	97.01	97.94	99.23	97.41	99.72	100.6	101.4	101.7	100.9
Mar-2022	95.29	89.59	89.99	91.15	91.51	90.59	93.15	93.86	96.57	93.54	95.69	96.09	96.97	98.00	96.69	96.11	98.75	99.60	100.10	98.64
Feb-2022	95.29	89.59	89.99	91.15	91.51	90.59	93.15	93.86	96.69	93.57	95.43	95.54	96.26	97.12	96.09	97.11	97.57	98.34	98.84	97.97
Jan-2022	95.29	89.59	89.99	91.14	91.50	90.59	93.15	93.89	96.33	93.49	95.94	95.55	95.96	96.69	96.04	96.71	97.13	97.89	98.45	97.55
Dec 2021	95.29	89.59	89.99	91.14	91.50	90.48	93.20	94.01	95.59	93.32	95.22	95.35	96.1	97.21	95.97					
Nov 2021	95.29	89.59	89.99	91.14	91.50	90.48	93.20	94.52	94.94	93.29	95.41	96.00	97.12	98.18	96.68					
Oct 2021	95.29	89.57	89.99	91.14	91.50	90.30	92.89	93.32	93.65	92.54	94.38	95.41	97.12	98.69	96.40					
Sept 2021	94.80	89.68	89.83	91.15	91.36	90.30	93.05	92.64	92.70	92.18	93.17	94.54	96.25	97.59	95.40					
Aug 2021	94.79	89.68	89.83	91.15	91.35	90.29	92.49	92.67	93.11	92.15	93.34	94.15	95.51	96.47	94.88					
July 2021	94.79	89.68	89.83	91.15	91.35	90.31	92.88	93.17	93.80	92.55	93.65	94.10	95.16	95.82	94.69					
June 2021	94.79	89.68	89.83	91.15	91.35	90.53	92.26	92.63	93.26	92.18	93.13	93.48	94.31	94.81	93.93					
May 2021	94.79	89.68	89.83	91.15	91.35	90.09	90.75	91.34	92.03	91.06	91.97	92.54	93.60	94.36	93.12					
Apr 2021	94.79	89.68	89.83	91.18	91.36	90.82	90.90	91.59	92.31	91.41	92.23	92.75	93.76	94.39	93.29					

Source: EIA STEO

Figure 6: EIA STEO US Natural Gas Supply Forecasts By Forecast Month



Source: EIA STEO

Natural Gas – EIA STEO forecasts Nov 1 2022 storage to be down 308 bcf YoY

EIA STEO storage forecast

The EIA STEO also forecasts US gas storage. Its forecast is positive for natural gas. (i) Winter 2021/22. US gas storage started winter 2021/22 at 3.66 tcf, which was down -283 bcf YoY. But the EIA now forecasts end of winter (March 31, 2022) at 1.4 tcf, which is -395 bcf YoY and ~14% below the 5-yr average. (ii) Summer 2022. The EIA forecasts start of winter 2022/23 storage at 3.36 tcf, which is -308 bcf YoY. The start of 2022/23 winter forecast is -4% below the 5-yr average. (iii) The EIA wrote *"We estimate that natural gas inventories ended March at 1.4 trillion cubic feet (Tcf),which is 17% below the five-year (2017–2021) average. Inventory withdrawals in March were 203 billion cubic feet (Bcf), resulting from relatively flat production and rising natural gas exports. We expect natural gas inventories to increase by 245 Bcf in April, as the injection season begins, ending the month at about almost 1.7 Tcf, which would be 14% below the five-year average for this time of year. We forecast that natural gas inventories will end the 2022 injection season (end of October) at 3.5 Tcf, which is 4% below the five-year average."*

Figure 7: EIA STEO forecast US gas storage

	US Working Natural Gas in Storage (billion cubic feet)					
	Storage	2016-2023				
	Level	Low	High	Range	Average	Deviation
Mar 2016	2,486.3	1,184.9	2,486.3	1,301.4	1,835.6	35.4%
Oct 2016	4,012.7	3,236.3	4,012.7	776.4	3,624.5	10.7%
Mar 2017	2,062.5	1,184.9	2,486.3	1,301.4	1,835.6	12.4%
Oct 2017	3,816.5	3,236.3	4,012.7	776.4	3,624.5	5.3%
Mar 2018	1,390.3	1,184.9	2,486.3	1,301.4	1,835.6	-24.3%
Oct 2018	3,236.3	3,236.3	4,012.7	776.4	3,624.5	-10.7%
Mar 2019	1,184.9	1,184.9	2,486.3	1,301.4	1,835.6	-35.4%
Oct 2019	3,762.0	3,236.3	4,012.7	776.4	3,624.5	3.8%
Mar 2020	2,029.4	1,184.9	2,486.3	1,301.4	1,835.6	10.6%
Oct 2020	3,928.5	3,236.3	4,012.7	776.4	3,624.5	8.4%
Mar 2021	1,800.6	1,184.9	2,486.3	1,301.4	1,835.6	-1.9%
Oct 2021	3,664.6	3,664.6	4,012.7	348.1	3,838.6	-4.5%
Mar 2022	1,406.3	1,184.9	2,486.3	1,301.4	1,835.6	-23.4%
Oct 2022	3,357.0	3,236.3	4,012.7	776.4	3,624.5	-7.4%
Mar 2023	1,578.0	1,184.9	2,486.3	1,301.4	1,835.6	-14.0%
Oct 2023	3,800.0	3,236.3	4,012.7	776.4	3,624.5	4.8%

Source: EIA

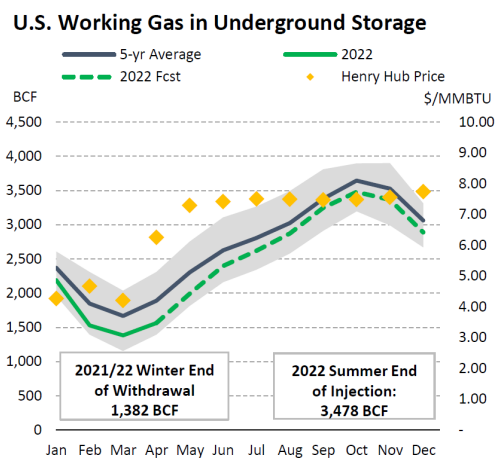
Natural Gas – NGSA summer outlook, storage to start winter 3.478 tcf, -156 bcf YoY

Stronger YoY summer gas outlook

On Thurs, the Natural Gas Supply Association released its 2022 Summer Outlook, which is one of our favorite must read annual reports. (i) The NGSA does not forecast gas prices, but rather goes thru the key demand and supply factors for natural gas, and then concludes that the direction for summer-to-summer pressure on natural gas prices is up. (ii) The one disappointment from the report vs pre 2020 is that the NGSA no longer posts the detailed backup analysis from Energy Ventures Analysis. Rather, the NGSA only posts a 10-pg executive summary of the EVA analysis. (iii) The key result of their forecast is lower YoY gas storage to start winter. They forecast Oct 31/2022 storage at 3.478 tcf, which is 156 bcf lower YoY vs 3.634 tcf at Oct 31, 2021. (iv) The big negative is NGSA forecasts summer US natural gas production +3.7 bcf/d YoY from 92.9 bcf/d to 96.6 bcf/d in summer 2022. (v) The big positive is increasing LNG exports. NGSA forecasts LNG exports this summer at 12.7 bcf/d, +2.1 bcf/d YoY vs 10.7 bcf/d last summer. Below is the EVA summary table showing the other supply/demand line items, and their storage forecast graph. Our Supplemental Documents package includes excerpts from the NGSA slide presentation and EVA Executive Summary.

Figure 8: NGSA/EVA Winter Natural Gas Supply And Demand Summary

Summer Natural Gas Supply and Demand Summary	2022 Summer	2021 Summer	Difference vs Last Summer	Difference vs Last Three Summers
Supply (BCFD)				
Dry Production	96.6	92.9	3.7	5.3
Net Canadian Imports	4.8	4.8	0.0	0.4
LNG Imports	0.1	0.0	0.1	0.0
Total Supply	101.5	97.7	3.8	5.7
Demand (BCFD)				
Power Burn	32.4	33.0	(0.6)	(1.0)
Industrial	22.0	21.3	0.7	0.7
Res/Comm	11.2	11.2	0.0	(0.2)
Net Mexico Exports	6.7	6.2	0.5	1.0
LNG Exports	12.7	10.7	2.1	5.4
Other	6.7	6.6	0.0	0.1
Total Demand	91.7	89.0	2.6	6.1
Average Injection (BCFD)	9.8	8.6	1.2	(0.4)
Total Injection (BCF)	2,096	1,857	239	(88.7)
CDDs	1,299	1,372	(73.0)	(90.0)



Henry Hub prices are NYMEX settlements as of 4/14.
Source: EIA, Energy Ventures Analysis

Source: NGSA, EVA

Natural Gas – Multi year squeeze on US natural gas from EU's shift from Russia

US natural gas supply squeeze

The huge pull on US LNG continues with US LNG export netbacks to Europe still well over $20 thru year-end. It's why we should be assuming that US LNG export facilities will be running at full capacity and drawing >12 bcf/d (other than during maintenance) of US natural gas supply out of the US and into export markets. That's over 4 tcf of US natural gas supply leaving US markets, and that is before pipeline exports to Mexico. So when we get questions on why HH and AECO prices have jumped up in the last couple months, we say it's because there is now a supply squeeze on US natural gas. There was an already strong global LNG market pre Russia/Ukraine, which became even stronger once Europe became committed to urgently cut out approx. 13 bcf/d of Russian natural gas and LNG as soon as possible. This has kept Europe gas prices (and US LNG export netbacks to Europe) way higher than Asian LNG prices (and US LNG export netbacks to Asia) thereby attracting any available LNG cargo to Europe so they can have a chance to refill gas storage before next winter. And this has been a huge pull on any potential US LNG cargo. And not likely to change for the next few years as Europe is just now starting on cutting out approx. 13 bcf/d of Russian natural gas and LNG. And Europe already started scrambling for any possible LNG cargos to refill storage. Last week's (May 8, 2022) Energy Tidbits highlighted Shell's Q1 call comments that Europe can't replace Russian gas with other pipeline gas or LNG. This just reinforces it's a multi year effort to replace Russia and one of the key supply sources will be US LNG, and therefore US natural gas prices, which also drags up Cdn gas prices. US LNG exports are now ~12 bcf/d, which means over 10% of US natural gas production is being pulled to much higher priced global LNG and natural gas markets in Europe and Asia. This is a multi year pull on US LNG, which is creating a multi-year supply squeeze on US gas supply ie a continued tighter US natural gas market. Below is Bloomberg's May 12 table of US LNG netbacks to Europe vs Asia.

Figure 9: Netbacks on US LNG to Europe vs Asia, May 12, 2022

$/MMBtu	U.S. LNG (115% Henry Hub)	Europe Gas Benchmark (TTF)	Europe netback	Asia spot LNG price (JKM)	Asia netback
June	8.84	31.98	22.74	23.32	13.74
July	8.95	32.69	23.33	21.07	11.38
August	8.93	32.78	23.44	20.81	11.14
September	8.88	32.83	23.55	22.65	13.03
October	8.87	32.46	23.19	24.34	14.74
November	8.95	32.15	22.80	26.69	17.00

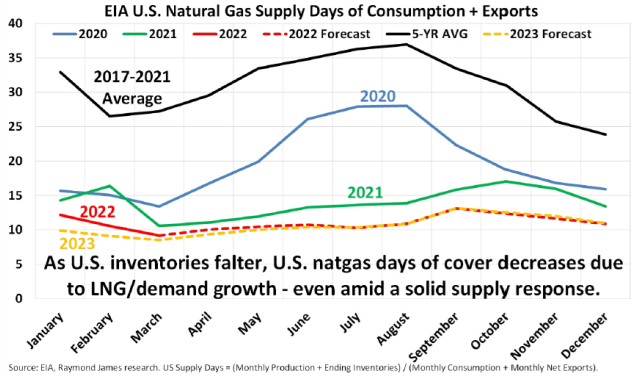
Source: Bloomberg

Natural Gas – Increased YoY LNG exports = days of supply down by ~6 days

US natural gas days of supply

Linked to the above item on US natural gas supply squeeze and how US LNG export facilities will be running at full capacity given the huge pull on US LNG by global LNG and natural gas prices. These global prices are going to pull over 4 tcf of US natural gas supply out of the US in 2022. And even on a YoY basis, the additional pull in 2022 will be over 0.5 tcf in 2022. On Monday, we tweeted [LINK] "*Here is why US #LNG exports being +1.5 bcf/d or +0.55 tcf YoY is so significant, it means US #NatGas supply days of consumption + exports are down 6 days YoY. This great @RJResearch graph* 👇 *tells the story. Thx John Freeman, JR Weston. #OOTT."* We included the below graph from the Raymond James comment "*Energy Stat: Dramatic U.S. Natural Gas Price Rally Isn't Done - Look Out for $9 Natgas*". RJ wrote "*Let's cut to the chase: a<er a historic price run, why should we be just as bullish on natural gas prices in 2023? We often get the question "why are you bullish on gas prices if you model inventories building next year?" For one thing, inventories don't build all that much in our model (which we will outline below). Additionally, the image to the right explains that even as inventories build back into the mid-3 Tcf range in 2023, overall supply availability is not getting looser. A core tenet of our outlook is that the U.S. market should try to drive closer to "full" ending storage levels each year to provide as much cushion as possible for growing U.S. LNG exports and other demand factors — in other words, to keep days of supply from getting too tight. In 2022 and 2023, this isn't happening."*

Figure 10: EIA US. Natural Gas Supply days of Consumption + Exports



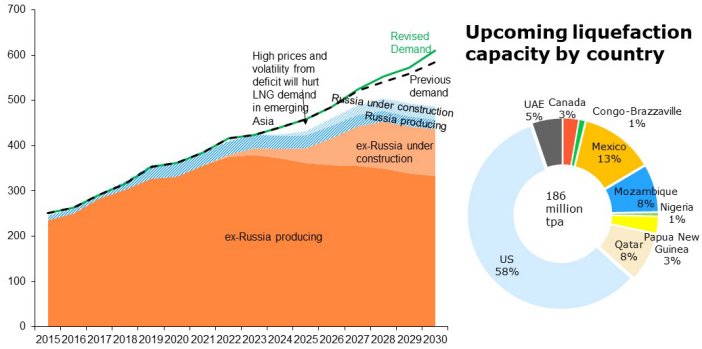
Source: Raymond James

Natural Gas – Rystad sees sustained LNG supply deficit

A sustained LNG supply deficit

We are fans of the Rystad Energy public blogs because they always include data and numbers that provide the basis for their views. On Monday, they posted a blog [LINK] that said *"Global LNG demand is expected to hit 436 million tonnes in 2022, outpacing the available supply of just 410 million tonnes. A perfect winter storm may be forming for Europe as the continent seeks to limit Russian gas flows. The supply imbalance and high prices will set the scene for the most bullish environment for LNG projects in more than a decade, although supply from these projects will only arrive and provide relief from after 2024."* Rystad went on to highlight that sharply reducing reliance on Russian gas and LNG from the current levels of 30-40% will be transformative for the global LNG market, causing a steep increase in energy-security based European LNG demand. The current and under-development projects will not be able to supply this demand. Rystad stated "*The stage is set for a sustained supply deficit, high prices, extreme volatility, bullish markets, and heightened LNG geopolitics*". Due to this supply shortage, Europe's gas production likely peaked in 2019 and will now decline steadily through to 2030. The problem is, there are not many options for the next few years, which will potentially lead to nuclear and coal playing a greater role in Europe as renewables catch up. Under the scenario that Russian flows stopped tomorrow, the gas currently in storage (35% full) would likely run out by year end. Under this scenario, Rystad states *"in the absence of joint buying arrangements and countries competing for limited molecules, the TTF gas price could climb to more than $100/MMBtu*". As we have already seen at play to some degree, Rystad also highlighted that "*higher prices will slow Asian LNG demand growth in the medium term, which means the continent will remain dependent on fuel oil and coal. In some scenarios, Asian LNG demand may be permanently dented, and deployment of renewables accelerated*". Below is a graphic of global LNG supply and demand outlook from the Rystad blog. Our Supplemental Documents package includes the Rystad blog.

Figure 11: Global LNG supply and demand outlook



Source: Rystad Energy

Natural Gas – Equinor's 0.63 bcf/d Melkoeya LNG restart is Tuesday May 17

Equinor Melkoeya LNG restart May 17/22

The restart of Equinor's Hammerfest LNG, including the Melkoeya LNG facility, looks to be on track for an official restart on Tuesday May 17. In its Q1/22 release on May 4, Equinor said "*Hammerfest LNG is on track for a safe start-up on 17 May*." Plus we saw numerous tweets

on how LNG tankers arrived this week to start loading LNG. The Melkoeya LNG facility has a capacity of 0.63 bcfx/d and has been offline since Sept 2020. In February, Equinor reported that the operational restrictions associated with the repairs and the uncertainty over the past months related to the pandemic are responsible for the delay in the restart to May 17 from the original date of March 31. The Equinor facility has been closed since September 2020 due to a build up of insects in the pre filters of the air intake-auto which caused an ignition.

Natural Gas – Mozambique LNG "containing the insurgency remains a struggle"?

Insurgent attack in Mozambique

It will be interesting (we don't think anyone knows) what level of security TotalEnergies needs to restart construction of its Mozambique LNG Phase 1. Surely, they can't be looking at the equivalent of a China zero Covid approach. The question will be what level of security imperfection will be required to make this restart decision. This thought came to mind when we read the Cabo Ligado Weekly: 25 April – 8 May 2022 that was posted on Tuesday. This is our primary go-to source for security updates in Mozambique. There were two key items in the Cabo Ligado update. (i) "*Palma district also saw an insurgent attack on the village of Olumbe on 6 May. According to one source, the insurgents told the villagers to leave and looted the area for supplies, mainly food. Joint forces consisting of the RDF and the Mozambican Defense and Security Forces (FDS) soon arrived and following a stand-off, all 20 insurgents were killed. Another source claims that before the insurgents were eliminated, three Mozambican soldiers were beheaded, suggesting there was already a military presence in the village when the insurgents arrived*." (ii) "*A further source confirmed the presence of a military base on the outskirts of Olumbe. The incident is highly significant as the insurgents were driven out of Palma district at the beginning of February, according to a statement from the Mozambican Ministry of Defense. Ever since, the majority of violent incidents have occurred in Nangade, Mueda, and Macomia districts. Their return to Palma indicates that containing the insurgency remains a struggle for the security forces*." Our Supplemental Documents package includes the Cabo Ligado update. [LINK]

Last week, we thought Galp was pointing to an earlier Mozambique LNG restart

The Cabo Ligado update caught our attention given what we wrote in last week's (May 8, 2022) Energy Tidbits on the Galp Q1 call comments, when we wrote "*we think Galp's general Mozambique LNG comments point to the potential for an earlier than expected restart of Mozambique LNG construction. Or at least, that would seem to be a logical interpretation*." And "*Galp held its Q1 call on Tuesday. We suspect that anyone listening to it will focus on mgmt's words that it's too early to go back on the ground to restart Rozuma Mozambique LNG, and not think about the meaning of what Galp mgmt said thereafter. We agree that is what mgmt said. However, if you just think about what mgmt said thereafter, it sounds like they are doing things that would not be done unless there was the expectation of an earlier restart. In the Q&A, mgmt noted that it was too early to tell when they would restart the project. However, it feels like there is the continued momentum for a restart sooner than later because the partners are now meeting to figure out how to optimize their onshore facilities, which sounds to us like planning to how to make up for some lost time. We don't think they would be focused on this type of what do we do differently meetings if they were still more than a year or more away from a restart because a lot could change. They must think that the worst is behind them and they can try to plan to make up for some lost time. Galp said "Secondly, we are continuously monitoring*

the security situation, as you are commenting the on the ground situation seems to be improving the security forces in place seems to be getting a better grip on situation. So what we are doing in Area Four is that we are working in the Partnership. Now, to see what are the ways to further optimize and the development of the onshore development of the field and actually as we speak in the next few days, we will have another so do know Partners meeting in order to discuss optimization options. But for now, it is too early to go back on the ground and and that's why we our focus is to optimize the product and making it even more robust that even more competitive. Thank you."

Natural Gas – Two more long-term LNG supply deals

More long term LNG deals

Our March 13, 2022 Energy Tidbits memo noted Europe's plan to move away from Russian pipeline natural gas and LNG is a global game changer for energy for at least the 2020s. We were already seeing clear signals of the bullish LNG for 2020s call since the end of June 2021 with the abrupt shift of Asian LNG buyers to long term contracts. Now, with Russia, the rush continues and from more than Asian LNG buyers. There continues to be more long-term LNG contracts signed as rampant price appreciation in gas markets continues to boost demand for American LNG. This trend is further demonstrated by two long term LNG sale and purchase agreements involving Venture Global announced this week: (i) On Tuesday, Venture Global LNG announced [LINK] the execution of two new long-term Sales and Purchase Agreements with ExxonMobil LNG Asia Pacific for the sale of 0.26 bcf/d of LNG. Under the agreements, the ExxonMobil affiliate will purchase half of the supply from the Plaquemines LNG facility and half from the CP2 LNG facility. There was no disclosure on the number of years this agreement will take place for. This marks the second supply agreement for CP2, which is expected to commence construction in 2023. The design of these facilities will be based upon the facility at Calcasieu Pass, where speed of execution and innovative design resulted in the production of LNG only 29 months after FID. (ii) Additionally, on Wednesday, Venture Global and Malaysian PETRONAS LNG, announced [LINK] the execution of a new 20-year Sales and Purchase Agreement for the purchase of 0.13 bcf/d of LNG from Venture Global's Plaquemines LNG facility. With this agreement, Venture Global has now announced 20-year sales for 80% nameplate capacity at Plaquemines LNG. Our Supplemental Documents package includes the Venture Global releases.

Europe has a long way to go to catch up to Asia

Our March 13, 2022 Energy Tidbits memo noted that Europe LNG buyers are 9 months behind Asian LNG buyers in locking up long term LNG supply. It was clear to many that there was a major change in LNG outlook. We turned very bullish on LNG outlook for the 2020s once TotalEnergies went force majeure on its Mozambique LNG in April 2021. We posted our April 28, 2021 blog *"Multiple Brownfield LNG FIDs Now Needed To Fill New LNG Supply Gap From Mozambique Chaos? How About LNG Canada Phase 2?"* as we thought the market had overlooked that this force majeure backed up 5.0 bcf/d of Mozambique LNG that was originally planned to start in phases in 2024. And that this would create an earlier and larger LNG supply gap in the mid 2020s. Then we started to see validation of this view when Asian LNG buyers in July made an abrupt change to their LNG contracting and pivoted to trying to lock in long term LNG supply. On July 14, 2021 we posted our 8-pg "*Asian LNG Buyers Abruptly Change and Lock in Long Term Supply – Validates Supply Gap,*

Provides Support For Brownfield LNG FIDs". Here is an excerpt from the blog "*The last 7 days has shown there is a sea change as Asian LNG buyers have made an abrupt change in their LNG contracting and are moving to lock in long term LNG supply. This is the complete opposite of what they were doing pre-Covid when they were trying to renegotiate Qatar LNG long term deals lower and moving away from long term deals to spot/short term sales. Why? We think they did the same math we did in our April 28 blog "Multiple Brownfield LNG FIDs Now Needed To Fill New LNG Supply Gap From Mozambique Chaos? How About LNG Canada Phase 2?" and saw a much bigger and sooner LNG supply gap driven by the delay of 5 bcf/d of Mozambique LNG that was built into most, if not all LNG supply forecasts. Asian LNG buyers are committing real dollars to long term LNG deals, which we believe is the best validation for the LNG supply gap. Another validation, Shell, Total and others are aggressively competing to invest long term capital to partner in Qatar Petroleum's massive 4.3 bcf/d LNG expansion despite plans to reduce fossil fuels production in the 2020s. And even more importantly to LNG suppliers, the return to long term LNG contracts provides the financing capacity to commit to brownfield LNG FIDs. The abrupt change by Asian LNG buyers to long term contracts is a game changer for LNG markets and sets the stage for brownfield LNG FIDs likely as soon as before year end 2021. It has to be brownfield LNG FIDs if the gap is coming bigger and sooner. And we return to our April 28 blog point, if brownfield LNG is needed, what about Shell looking at 1.8 bcf/d brownfield LNG Canada Phase 2? LNG Canada Phase 1 at 1.8 bcf/d capacity is already a material positive for Cdn natural gas producers. A FID on LNG Canada Phase 2 would be huge, meaning 3.6 bcf/d of Cdn natural gas will be tied to Asian LNG markets and not competing in the US against Henry Hub. And with a much shorter distance to Asian LNG markets. This is why we focus on global LNG markets for our views on the future value of Canadian natural gas."* Our Supplemental Documents package includes our April and July blogs.

There have been 7.57 bcf/d of long term LNG supply deals since July 1, 2021

We first highlighted this abrupt shift to long term LNG supply deals in our July 14, 2021 8-pg "*Asian LNG Buyers Abruptly Change and Lock in Long Term Supply – Validates Supply Gap, Provides Support For Brownfield LNG FIDs".* We included a table of the deals done in that short two week period. We continue to update that table, which now shows 7.57 bcf/d of long term LNG deals since July 1, 2021. 85% of the deals have been by Asian LNG buyers, but we are now seeing rest of world long term deals post Russia/Ukraine. Below is our updated table of Asian and Europe LNG buyers new long term supply deals since July 1, 2021

Figure 12: Long Term LNG Supply Deals since July 1, 2021

Long-Term LNG Buyer Deals Since July 1, 2021							
Date	Buyer	Seller	Country	Volume	Duration	Start	End
			Buyer / Seller	(bcf/d)	Years		
Asian LNG Deals							
Jul 7, 2021	CNOOC	Petronas	China / Canada	0.30	10.0	2022	2032
Jul 9, 2021	CPC	QatarEnergy	Taiwan / Qatar	0.16	15.0	2022	2037
Jul 9, 2021	Guangzhou Gas	BP	China / US	0.13	12.0	2022	2034
Jul 12, 2021	Korea Gas	QatarEnergy	Korea / Qatar	0.25	20.0	2025	2045
Sept 29, 2021	CNOOC	QatarEnergy	China / Qatar	0.50	15.0	2022	2037
Oct 7, 2021	Shenzhen	BP	China / US	0.04	10.0	2023	2032
Oct 11, 2021	ENN	Cheniere	China / US	0.12	13.0	2022	2035
Nov 4, 2021	Unipec	Venture Global LNG	China / US	0.46	20.0	2023	2043
Nov 4, 2021	Sinopec	Venture Global LNG	China / US	0.53	20.0	2023	2043
Nov 5, 2021	Sinochem	Cheniere	China / US	0.12	17.5	2022	2040
Nov 22, 2021	Foran	Cheniere	China / US	0.04	20.0	2023	2043
Dec 6, 2021	Guangdong Energy	QatarEnergy	China / Qatar	0.13	10.0	2024	2034
Dec 8, 2021	S&T International	QatarEnergy	China / Qatar	0.13	15.0	2022	2037
Dec 10, 2021	Suntien Green Energy	QatarEnergy	China / Qatar	0.13	15.0	2022	2037
Dec 15, 2021	SPIC Guangdong	BP	China / US	0.03	10.0	2023	2033
Dec 20, 2021	CNOOC Gas & Power	Venture Global LNG	China / US	0.26	20.0	2023	2043
Dec 29, 2021	Foran	BP	China / US	0.01	10.0	2023	2032
Jan 11, 2022	ENN	Novatek	China / Russia	0.08	11.0	2024	2035
Jan 11, 2022	Zhejiang Energy	Novatek	China / Russia	0.13	15.0	2024	2039
Feb 4, 2022	CNPC	Gazprom	China / Russia	0.98	30.0	2023	2053
Mar 24, 2022	Guangdong Energy	NextDecade	China / US	0.20	20.0	2026	2046
Mar 29, 2022	ENN	Energy Transfer	China / US	0.36	20.0	2026	2046
Apr 1, 2022	Guangzhou Gas	Mexico Pacific Ltd	China / Mexico	0.26	20.0	n.a.	n.a.
Apr 6, 2022	ENN	NextDecade	China / US	0.20	20.0	2026	2026
Apr 22, 2022	Kogas	BP	Korea / US	0.20	18.0	2025	2043
May 2, 2022	Gunvor Singapore Pte	Energy Transfer LNG	Singapore / US	0.26	20.0	2026	2046
May 3, 2022	SK Gas Trading LLC	Energy Transfer LNG	Korea / US	0.05	18.0	2026	2042
May 10, 2022	Exxon Asia Pacific	Venture Global LNG	Singapore / US	0.26	n.a.	n.a.	n.a.
May 11, 2022	Petronas LNG	Venture Global LNG	Malaysia / US	0.13	20.0	n.a.	n.a.
Total Asian LNG Buyers New Long Term Contracts Since Jul/21				**6.45**			
Non-Asian LNG Deals							
Jul 28, 2021	PGNiG	Venture Global LNG	Poland / US	0.26	20.0	2023	2043
Nov 12, 2021	Engie	Cheniere	France / US	0.11	20.0	2021	2041
March 7, 2022	Shell	Venture Global LNG	US / US	0.26	20.0	2024	2044
March 16, 2022	NFE	Venture Global LNG	US / US	0.13	20.0	2023	2043
March 16, 2022	NFE	Venture Global LNG	US / US	0.13	20.0	2023	2043
May 2, 2022	Engie	NextDecade	France / US	0.23	15.0	2026	2041
Total Non-Asian LNG Buyers New Long Term Contracts Since Jul/21				**1.12**			
Total New Long Term LNG Contracts since Jul/21				**7.57**			
*Excludes Asian short term/spot deals							
*on Dec 20, CNOOC also agreed to buy an additional 0.13 bcf/d from Venture Global for an undisclosed shorter period							

Source: Company reports, SAF Group

Natural Gas – India's Reliance Industries sees a tight LNG market ahead

Reliance sees tight LNG market ahead

Reliance Industries (India) held its year 2022 earnings call last Friday and highlighted a very bullish LNG view. Last Sunday, we tweeted [LINK] "*Elevated #LNG prices to continue. EUmove away from RUS #NatGas = "there's going to be tightness, particularly because there's no additional capacity coming on stream until at least 26 or so. So we expect tightness to continue, prices to be elevated" says #RelianceIndustries #OOTT*". Reliance mgmt said "*So just to give a perspective on the gas market and its outlook. As you can see, the tightness continues. Again, it's been exacerbated by the conflict. Now in Europe as more as they try to diversify their source from Russian supplies, there seems to be quite a bit of competition with the Asian consumption. Europe itself consumes about 85 million tonnes per annum, which is 1% of global supplies. So with them moving away from Russian supplies, there's going to be tightness, particularly because there's no additional capacity coming on stream until at least '26 or so. So we expect this tightness to continue, prices to be elevated."* Our Supplemental Documents package includes excerpts from Reliance transcript and slides.

Natural Gas – India to add +2.9 bcf/d of LNG regasification capacity by 2025

India adding 2.9 bcf/d of regas capacity

On Wednesday, we tweeted [LINK] "*Positive, India 👇adding 2.9 bcfd of #LNG regas capacity by 2025. But need a big step up in 2025-30 pace to hit #Petronet est +12 bcf/d LNG import growth to reach India's target for #NatGas to be 15% of its energy mix by 2030. #OOTT".* The good news is that India is moving quickly to expand its regasification capacity, but the bad news is that we don't see it moving at the pace needed to hit its ambitious goal for natural gas to 15% of its energy mix by 2030 or the pace forecast by Petronet in October that would see India increase LNG imports (not capacity) by +12.4 bcf/d to 2030. We retweeted the India Ministry of Petroleum and Natural Gas's tweet [LINK] "*India's capacity to regasify LNG to increase by 55% by 2025. LNG holds around 49% share in total natural gas consumption in FY 2021-22. LNG is bound to be the key driver for India's #PragatiKiGati #PMGatiShakti @Logistics_MoCI."* It's positive that India is ramping up its LNG regasification import capacity. It will increase regasification by +55% or +2.9 bcf/d to 8.2 bcf/d by 2025. But our concern is that these regasification plans were committed to 2 to 3 yeas ago, before the changing LNG market and current very high LNG prices. So we have to believe that they will not reach their ambitious goal of natural gas being 15% of the energy mix by 2030, especially with the huge stress and high prices of LNG with Europe moving off Russia oil supply. We still expect India's growth in LNG imports will be very big, but I think it will be more like +10 bcf/d to 2030 instead of +12.4 bcf/d. Our Supplemental Documents package includes the Ministry of Petroleum and Natural Gas tweet that also included some graphics.

Petronet Oct 22/21 forecast India LNG imports +12.4 bcf/d to 15.8 bcf/d in 2030

As noted above, it's positive for India's to add regasification capacity, but we believe they are behind the pace needed to reach Petronet's Oct 22, 2021 forecast for India's LNG imports to be +12.4 bcf/d by 2030. In our Oct 24, 2021 Energy Tidbits memo, we wrote "*We continue to believe India's moves to increase natural gas to 15% of its energy mix by 2030 is a game changer for LNG markets in the 2020s. Especially as we have seen clear signs of action toward that target. On Friday, there was very bullish for India's LNG import growth from Petronet CEO Singh at the India Energy Forum on Friday. As soon as we saw the reports, we tweeted [LINK] "Bullish for #LNG #NatGas in 2020s. #Petronet CEO fcasts India LNG imports +12.4 bcfd to reach 15.8 bcfd (120 MTPA) in 2030. In line with his June est, see below SAF Group June 20 Energy Tidbits #Petronet sees LNG imports +13 bcfd to 2030. Thx @JournoDebjit @rajeshsing13 #OOTT". Bloomberg's India energy team reported "India's import of natural gas is expected to hit 120 million tons/year by 2030 as the nation targets an energy mix goal, Akshay Kumar Singh, CEO of Petronet LNG, said at the India Energy Forum by CERAWeek. NOTE: India aims to boost use to natural gas to 15% of primary energy mix from about 6% now. * India's current annual LNG import is about 26 million tons". Singh is forecasting India's LNG imports to grow from current 26 MTPA (3.4 bcf/d) to 120 MTPA (15.8 bcf/d) in 2030. That is an increase of 12.4 bcf/d to 2030. This is very bullish for LNG and natural gas in the 2020s. Our Supplemental Documents package includes the Bloomberg report."*

India has been serious to expand natural gas infrastructure

India may be behind in the pace, but we have to give India credit as they have stepped up their efforts over the past 2 and ½ years to build out infrastructure so they can broaden the use of natural gas. Our September 19, 2021 Energy Tidbits wrote "*Natural Gas – India to expand natural gas distribution to cover 96% of population. LNG buyers better hope that the security picture in Mozambique get settled to an acceptable level for TotalEnergies, Exxon and others to get back to moving on 5 bcf/d of LNG capacity that has been held up now for several months. Because we continue to see support for the major LNG demand theme for the 2020s – India's target to double the share of natural gas in its energy mix to 15% by 2030. Yesterday, we retweeted [LINK] "Positive to #LNG. India to expand #NatGas distribution to cover 96% of population. Fits move to double #NatGas share of energy mix to 15% by 2030, which #Petronet CEO est adds 13 bcf/d #LNG demand. See [LINK]." Our retweet was of an India Ministry of Petroleum and Natural Gas tweet [LINK] on the new 11th round of bidding for city distribution of natural gas, and that "once completed, the CGD network in India shall cover 86% of the Country's area and 96% of the population". This will take years to roll out but covering 86% of India and 96% of its population is a good indicator for a strong ramp up in natural gas uses post 2025. And we expect that the industrial/commercial coverage ratio is much the same ie. call it 90% of India."*

Remember Modi's highlighted India "should be a gas-based economy"

Our August 15, 2021 Energy Tidbits highlighted Modi's 75th anniversary of India independence speech. Modi has been stressing the importance to increase natural gas share of India's energy mix from 6% to 15% by 2030. India posted the Modi speech transcript at [LINK]. This is a big picture speech about the future for India and Modi's tries to set a vision for the next 25 years to the 100th anniversary. It's a general speech but it is also good reminder to people in the west that India still has a long way to go to catch up. Modi notes how they *"have made authentic efforts to construct toilets in 100% households*". One of his major themes was that India should be a gas based economy but targets to be energy independent in 25 years. Modi didn't get into his policy to increase natural gas share of the energy mix from 6% to 15% by 2030 and only gave gas a glancing mention, but the mention is significant – India "should be a gas based economy". Our August 15, 2021 Energy Tidbits had more detailed on the other Modi speech themes.

Natural Gas – Tokyo won't be the last to focus on energy/natural gas conservation

Tokyo's energy saving push

It was interesting to see Tokyo make a big push on energy conservation, which is a focus we expect other countries/regions to follow. The Tokyo Metropolitan Government announced it "*will strengthen and accelerate its efforts not only from the perspective of the climate crisis, but also from the perspective of ensuring stable energy over the medium to long term. The point is to reduce power consumption, create it, and store it. The keyword is HTT. From these three perspectives, we need to work together with the citizens of Tokyo and businesses in a total war."* We tweeted [LINK] "*Tokyo's energy conservation push 👇 will be followed by EU. Also reminds of business trips to Japan post Arab Oil Embargo with office temps set to >80F except it was suits & ties, no suggestion of wearng cool (temp not fashion)*

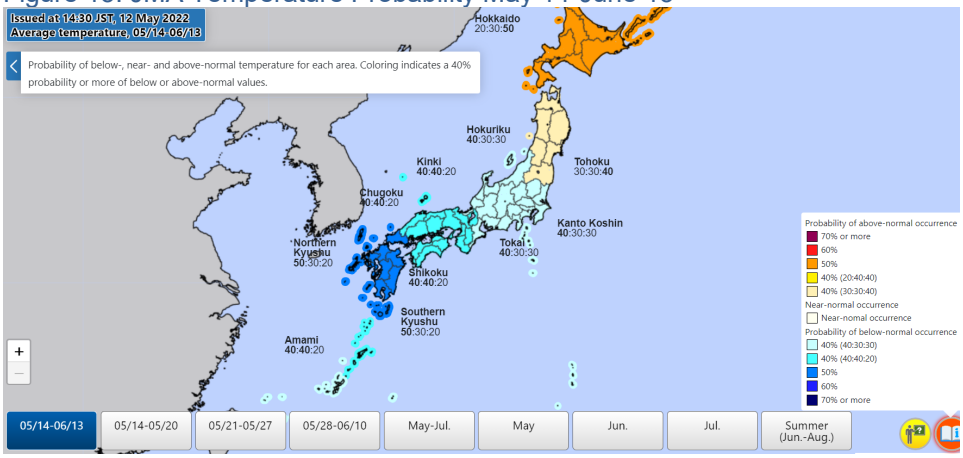
short sleeve shirts to work. Thx @shoko_oda #OOTT." A few of their energy saving guidelines were put air conditioning room temperature to 28℃ during cooling times, don't overload the refrigerator, set refrigerator setting to a warmer temp, and the one that got the most headlines was turn off toilet seat heating off. Tied to the warmer room setting, Tokyo also suggested "Cool Biz fashion" showing a picture of short sleeves shirts. There were many other energy saving ideas. Our tweet noted that the higher temperature under air conditioning is much what Japan did post the Arab Oil Embargo. Our Supplemental Documents package includes the Tokyo posting. [LINK]

Natural Gas – Cooler May weather will not help gas demand in Japan

Cooler May in Japan

Japan is forecasting cooler than normal temperatures in May, which means that there will be no real weather-related demand for natural gas. On Thursday, the Japan Meteorological Agency posted its May weather forecast [LINK] calling for a little cooler than normal temperatures for the next month. For Tokyo, this means daytime highs in the low 20sC, which is perfect spring weather for leaving the windows open and no need for air conditioning. This type of weather will not drive any significant weather related natural gas demand.

Figure 13: JMA Temperature Probability May 14-June 13



Source: Japan Meteorology Agency

Natural Gas – Japan's LNG stocks -9.3% YoY

Japan LNG stocks +9.3% YoY

LNG stockpiles held by Japanese utility companies have exceeded both last year's level and the 4-year average. Japan's METI weekly LNG stocks data was released on Wednesday morning local time [LINK]. LNG stocks at May 8 were ~97 bcf, +9.3% WoW from 87 bcf, up 8.9% YoY from 89 bcf and up small from the 5-yr average of 95 bcf. Below is the LNG stocks graph from the METI weekly report.

Figure 14: Japan's LNG Stocks

Source: METI

Natural Gas – Looks like EU giving into Putin's gas payment process via Gazprombank

Putin's gas payment process

No one should be surprised to see Bloomberg's report that the EU is giving in to Putin's natural gas payment process through Gazprombank. It's one thing to have very expensive natural gas but we have to believe some of the European countries were getting increasingly worried that they would have a natural gas shortage. As of our 7am MT news cut off, there hasn't been any confirmation or denial yet by the EU of yesterday's Bloomberg report "*EU Drafts Plan for Buying Russian Gas Without Breaking Sanctions*". But given the urgency for countries to avoid being cut off from natural gas supply, we would expect to hear some sort of official or unofficial confirmation of this position. Bloomberg wrote "*The European Union is set to offer its gas importers a solution to avoid a breach of sanctions when buying fuel from Russia and still effectively satisfy President Vladimir Putin's demands over payment in rubles. In new guidance on gas payments, the European Commission plans to say that companies should make a clear statement that they consider their obligations fulfilled once they pay in euros or dollars, in line with existing contracts, according to people familiar with the matter. The EU's executive arm told the governments that the guidance does not prevent companies from opening an account at Gazprombank and will allow them to purchase gas in accordance with EU sanctions following Russia's invasion of Ukraine, the people added. European companies have been scrambling for weeks to figure out how they can meet Moscow's demand and keep the crucial gas flowing without violating sanctions on Russia's central bank. Putin said on March 31 that if payments aren't made in rubles, gas exports would be halted. Europe depends heavily on the Russian fuel to heat homes and power industry. Initially, the EU had assessed that the payment mechanism demanded by Putin handed Moscow total control of the process, breached contracts and -- crucially -- violated the bloc's sanctions. On Friday, the commission told member states in a closed-door meeting that the updated guidance will clarify that companies can open an account in euros or dollars at Gazprombank as ordered by the Kremlin, according to the people, who asked not to be identified because the meeting was private. But the EU's executive arm stopped short of saying whether also having an account in rubles -- a step included in the Russian decree -- was in line with EU regulations. Previously, officials had indicated, though never in writing,*

that opening such an account would breach sanctions. The updated guidance, as presented to member states, fails to address this specific point, the people said." Our Supplemental Documents package includes the Bloomberg report.

Recall UK gave in to Putin's natural gas payment process via Gazprombank

Our April 24, 2022 Energy Tidbits noted UK had given in to Putin's gas payment process via Gazprombank. In that memo, we wrote "*Notwithstanding how European countries are publicly saying they won't give in to Putin's natural gas payment process to Gazprombank, on Friday, we tweeted [LINK] on how the UK Treasury approved a licence for an unnamed party for a period thru May 31, 2022 to make payments to Gazprombank ie. pay as Putin requested thru Gazprombank, a sanctioned entity. This is a temporary period approval but we expect to see month to month extensions. We tweeted "Putin's #NatGas payment process. UK approves payments to Gazprombank for prior contracts to supply #NatGas to EU incl "any activity reasonably necessary to effect this including the opening and closing of bank accounts. Thx @business @MaznevaElena #OOTT." Our tweet included the UK Treasury "General Licence: Gazprombank Energy Payments. INT/2022/1630477". [LINK] The UK approval was interesting as it allowed the opening of bank accounts with Gazprombank, who is the bank for Putin's natural gas payment plan ie. the UK is giving the okay to pay under Putin's plan. The key clause of the licence is "A Person may continue to make payments to Gazprombank or a Subsidiary under a contract entered into prior to the date of this licence for the purpose of making Gas available for use in the European Union and a Person, Relevant Institution, or Gazprombank, or a Subsidiary can carry out any activity reasonably necessary to effect this including the opening and closing of bank accounts."*

Natural Gas – Germany and Qatar haven't been able to agree to long term LNG deal

Germany/Qatar long term LNG negotiations

We suspect most weren't surprised to see the Bloomberg report that Germany and Qatar haven't been able to come to an agreement on a long term LNG supply deal. The Europeans have avoided committing to long term LNG supply deals, and Qatar does long term LNG deals. Bloomberg wrote "*Germany and Qatar are at odds about duration of any contract as they continue talks about liquefied natural gas supply deals, Reuters reports, citing three people familiar with the discussions. * Germany has expressed reluctance to accept Qatar's proposed deals of at least 20 years, due to its goal of cutting its carbon emissions 88% by 2040 * Qatar seeks a destination clause that would prevent any LNG from being rerouted to other countries in Europe, a condition the EU opposes * A deal isn't expected soon, one of the people said".* Our Supplemental Documents package includes the Bloomberg report.

In late March, Germany agreed to at least look at long term Qatar LNG deals

Last week' (May 8, 2022) Energy Tidbits noted the lack of news on the Germany and Qatar discussions on potential long term LNG deals. In that memo, we wrote "*We haven't seen any long term German deals with Qatar in the last 6 weeks, but, in late March, there were reports following Germany's meetings in Qatar that week on how Germany had locked up Qatar LNG. Our March 27, 2022 Energy Tidbits wrote "We don't think that is the case. It doesn't mean it won't happen, but, at least for now, its really a confirmation that the commercial parties within Germany and Qatar will re-engage on a potential contract. And note that Qatar Energy is clear that this would*

be on a long-term LNG supply deal, not a short term or spot deal. And Qatar Energy made a point of highlighting that they have been speaking to Germany for years but only recently has Germany prepared to engage on a long term deal. This is consistent with what they have said on Europe, they are always ready to engage on long-term contract discussions. Last Sunday, Qatar Energy released [LINK]
"QatarEnergy has been discussing the supply of Qatari LNG to Germany for a number of years with German companies. However, until recently, such discussions did not materialize into definitive agreements due to the lack of clarity on the long-term role of gas in Germany's energy mix and the requisite LNG import infrastructure. In a meeting held today between His Excellency Mr. Saad Sherida Al-Kaabi, the Minister of State for Energy Affairs, the President and CEO of QatarEnergy, and His Excellency Mr. Robert Habeck, the Vice Chancellor and the Minister for Economic Affairs and Climate Action in the Federal Republic of Germany, the German side confirmed that the German Government has taken swift and concrete actions to fast-track the development of two LNG receiving terminals in Germany as a matter of priority to allow for the long term import of LNG to Germany and that such scheme has the full support of the German government. Based on the foregoing, the two sides agreed that their respective commercial entities would re-engage and progress discussions on long term LNG supplies from Qatar to Germany.".

Qatar has always been focused on long term supply deals

The Qatar Energy comments on the Germany meetings in late March were in line with the prior public statements from Qatar that always remind Qatar does long term supply deals and not spot deals. Our Feb 27, 2022 Energy Tidbits wrote *"Qatar's energy minister Al Kaabi reminded this week that Qatar really can't help much if Russia natural gas supplied to Europe get interrupted. In fact, he noted that no one can replace Russia's dominant supply to Europe. There were three other key reminders in his comments at the GECF press conference. (i) He didn't hesitate to remind that Qatar is in the long term contract business. (ii) Only 10-15% of Qatar LNG that could be diverted to Europe. The Qatar Peninsula reported ""Russia provides I think 30-40 percent of the supply to Europe. There is no single country that can replace that kind of volume, there isn't the capacity to do that from LNG," he said. "Most of the LNG is tied to long-term contracts and destinations that are very clear. So, to replace that sum of volume that quickly is almost impossible," he said. Minister Al Kaabi said that for Qatar the amount of divertable contracts that can be shipped to Europe is only 10-15 percent. "It's not that something is not contracted, the question is, is it divertible or not? And the majority is tied up to long term contracts. The divertible volume is probably 10-15 percent," he said." (iii) He reminds the issue is the lack of investment, not Russia-Ukraine. The Qatar Peninsula wrote "The steep rise in the natural gas prices in the global markets are caused by the lack of investment and not due to Russian-Ukrainian crisis, said Minister of State for Energy Affairs H E Eng. Saad bin Sherida Al Kaabi. He said Qatar wants to meet European Union (EU) demands for additional LNG supplies, but most of its exports are already tied to long-term contracts. "Everything that is going on today on pricing is fundamentally because of lack investments and that will take time to catch up. Supply demand has a tendency to correct itself over time so hopefully this will be corrected, it will take time."*

Shell, Europe needs to do term deals to attract long term LNG supply

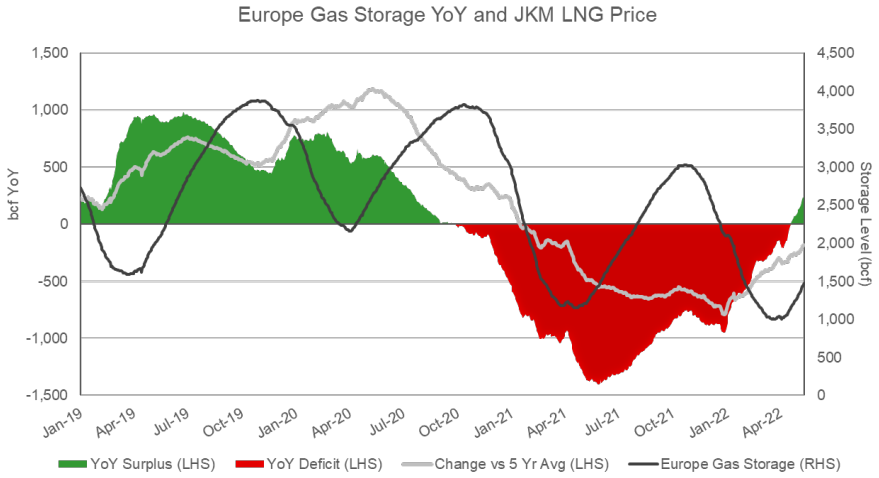
Last week's (May 8, 2022) Energy Tidbits noted Shell's comments from its Q1 call on May 5. We wrote "*The biggest challenge for Europe to compete against Asia for long term LNG supply is that, to the most part, Europe buyers, excluding traders/LNG portfolios, aren't prepared to commit to long term contracts. In Shell's Q1 call on Thursday, mgmt noted this is a shortfall and that Europeans will have to move to long term deals if they want to attract long term supply. In the Q&A, mgmt was asked "could we see a European corporate our European government really hand Shell of 15 to 20-year-long-term term LNG contracts. I just think that that's something that may not have been possible a few years ago but could actually be possible going forward?" Mgmt replied "it's difficult at the moment given the infrastructure of the importation into Europe to see anyone looking at term contracts here, but I do think it's going to be a critical part of the overall puzzle. If you are, they have truly the sort of energy security that you need in Europe. Who knows how it's going to go. So I'm not going to speculate as to whether from a government perspective or private entities step into that void. But I do think if you want to attract longer term volumes, you're going to have to see some of that.*"

Natural Gas – Europe storage surplus is now 5.98% ie. 38.06% full vs 32.08%

Europe storage now 38.06% full

The urgency to refill Europe storage has been working. As a result, the YoY Europe storage gap has changed to a YoY storage surplus. Europe gas storage started down 18.52% YoY and is now a YoY surplus of 5.98%. Inventories are rising all across Europe, as is normal during spring and early summer. Europe gas storage started last winter (Nov 1/20) at basically full levels at 94.66% and had dropped by 65.77% to be 28.89% at Apr 1/21. Europe storage levels bottomed in late Apr at 29%, which was the lowest level since Apr 2018. This winter began (Nov 1/21) with gas storage at 77.14% capacity, down 18.52% YoY. The YoY deficit has turned to surplus after months of the deficit tightening this week. Thanks to the warm weather and US LNG, storage as of May 11 is at 38.06%, which is +5.98% greater than last year levels of 32.08% and are -4.60% below the 5-year average of 42.66%. As spring injections continue, we expect to see a decline in demand for LNG as less is used to heat homes as we continue through the injection season. Below is our graph of Europe Gas Storage Level.

Figure 15: Europe Gas Storage Level



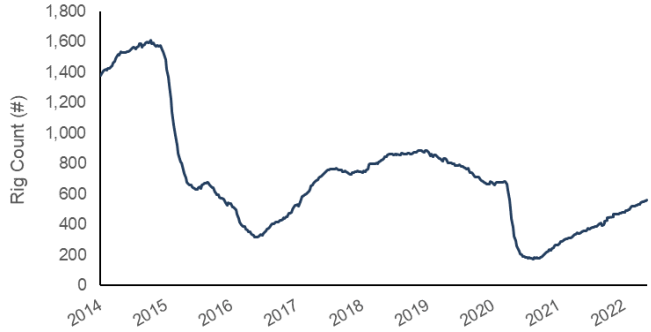
Source: Bloomberg

Oil – US oil rigs +6 WoW at 563 oil rigs at May 13

US oil rigs +6 WoW

Baker Hughes released its weekly North American drilling activity data on Friday. There are still extremely strong oil, NGLs and natural gas prices and industry has fresh (and many modestly increasing) 2022 capex budgets and the reality is that industry needs to crank up drilling to increase the depleted inventory of DUCs. This week US oil rigs were +6 WoW at 563 oil rigs, with the increase in oil rig counts fairly widespread among the basins outside the Permian. Oil rigs are +391 off the bottom of 172 in Aug14/2020 week. There were modest basin changes this week; Permian flat at 334 rigs this week while Bakken was +1 to 37 rigs after no change last week. US oil rigs hit their 2020 peak at 683 on March 13 and have since fallen by -120 to 563 oil rigs (-17%). US gas rigs were +3 WoW though still higher than normal. Below is our graph of US oil rigs since January 1, 2014.

Figure 16: Baker Hughes Total US Oil Rigs



Source: Baker Hughes

Oil – US frac spreads +6 to 284 for the week ended May 13

Mark Rossano (C6 Capital Holdings) held his weekly US frac spread recap for the week ended May 13 on the Primary Vision network. YouTube video is at [LINK]. For the week ended May 13, US frac spreads at the high point in the week were +6 to 284. This week's increase is in line with his view to get to 290 by the end of May and then another 8 to 10 increase in June. This would be in line with a normal seasonal increase. Some increase in the Permian, coming back to where fracs were after a little slowdown. The bigger shift is in the western gulf, the Eagle Ford and also Louisiana. in the Haynesville, have seen DUCs increase so will see spreads pick up there. Some of the other smaller basins also picked up some spreads. So still expect to get to 290 by the end of May.

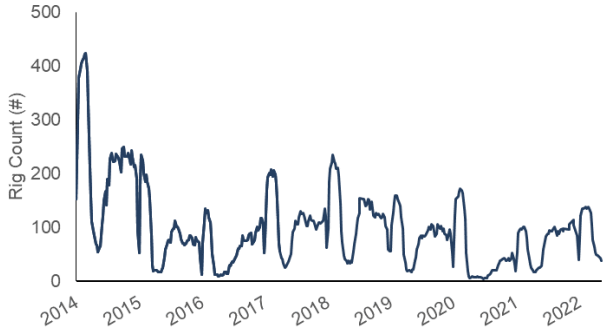
Frac spreads +6 to 284

Oil – Total Cdn rigs -3 to 88 total rigs, +29 rigs YoY

Total Cdn rigs were down -3 this week to 88 total rigs. Cdn oil rigs were -5 at 37 rigs. Cdn gas rigs were +2 at 51 gas rigs. These small declines in oil rigs during spring breakup are likely to continue, but the declines are much smaller than normal. The typical bottom for rig count is the first or second week of June. Total rigs are now +75 since the June 26, 2020 all-time low. Cdn drilling has recovered YoY, a year ago Cdn oil rigs were 25 and Cdn gas rigs were 34 for a total Cdn rigs of 59, meaning total Cdn oil rigs are +12 YoY and total rigs are +29 vs 2019. Below is our graph of US oil rigs since January 1, 2014.

Cdn rigs -3 WoW

Figure 17: Baker Hughes Total Canadian Oil Rigs



Source: Baker Hughes

Oil – US weekly oil production down -0.1 mmb/d to 11.8 mmb/d

US oil production was down -0.1mmb/d to 11.8 mmb/d for the week ended May 6 after staying stagnant last week. This was the first drop in weekly production since January. Lower 48 production drove total production and was up flat from last weeks level at 11.5 mmb/d this week, Alaska was also basically flat this week. US oil production is up YoY at +0.8 mmb/d from last year's production and is still down significantly at -1.3 mmb/d since the 2020 peak of 13.1 mmb/d on March 13. With the continued sanctions against Russian crude, we would expect US oil production to remain relatively flat if not inch up a little higher in Q2/22.

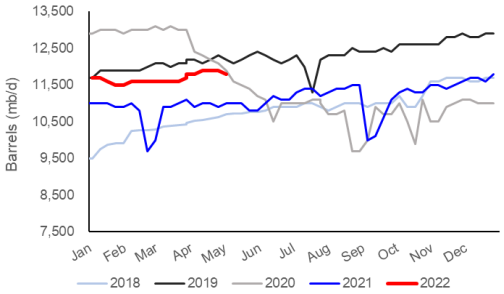
US oil production down WoW

Figure 18: 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
2020-Jan	01/03	12,900	01/10	13,000	01/17	13,000	01/24	13,000	01/31	12,900
2020-Feb	02/07	13,000	02/14	13,000	02/21	13,000	02/28	13,100		
2020-Mar	03/06	13,000	03/13	13,100	03/20	13,000	03/27	13,000		
2020-Apr	04/03	12,400	04/10	12,300	04/17	12,200	04/24	12,100		
2020-May	05/01	11,900	05/08	11,600	05/15	11,500	05/22	11,400	05/29	11,200
2020-Jun	06/05	11,100	06/12	10,500	06/19	11,000	06/26	11,000		
2020-Jul	07/03	11,000	07/10	11,000	07/17	11,100	07/24	11,100	07/31	11,000
2020-Aug	08/07	10,700	08/14	10,700	08/21	10,800	08/28	9,700		
2020-Sep	09/04	10,000	09/11	10,900	09/18	10,700	09/25	10,700		
2020-Oct	10/02	11,000	10/09	10,500	10/16	9,900	10/23	11,100	10/30	10,500
2020-Nov	11/06	10,500	11/13	10,900	11/20	11,000	11/27	11,100		
2020-Dec	12/04	11,100	12/11	11,000	12/18	11,000	12/25	11,000		
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								

Source: EIA

Figure 19: US Weekly Oil Production



Source: EIA, SAF

Oil – North Dakota March oil production 1.12 mmb/d, up MoM from 1.09 mmb/d in Feb

North Dakota oil production

On Friday Morning, the North Dakota Industrial Commission posted its Director's Cut, which includes March oil and natural gas production data [LINK]. The headline on the March numbers was that North Dakota March oil production was 1.120 mmb/d, which was up MoM from 1.089 mmb/d in Feb 2022, and up 1.0% YoY from 1.109 mmb/d in March 2021. We suspect the higher MoM March oil production was likely due to completions being late in the month of Feb with the high level of Feb completions (90). As a reminder, April oil production will be lower with the impact of the blizzard in April. Our Supplemental Documents package includes excerpts from the Director's Cut.

Figure 20: North Dakota Oil Production By Month

(b/d)	2017	2018	2019	2020	2021	2021/2020	2022	2022/2021
Jan	981,380	1,179,564	1,403,808	1,430,511	1,147,377	-19.8%	1,088,613	-5.1%
Feb	1,034,248	1,175,316	1,335,591	1,451,681	1,083,554	-25.4%	1,089,091	0.5%
Mar	1,025,690	1,162,134	1,391,760	1,430,107	1,108,906	-22.5%	1,120,022	1.0%
Apr	1,050,476	1,225,391	1,392,485	1,221,019	1,123,166	-8.0%		
May	1,040,995	1,246,355	1,394,648	859,362	1,128,042	31.3%		
June	1,032,873	1,227,320	1,425,230	893,591	1,133,498	26.8%		
July	1,048,099	1,269,290	1,445,934	1,042,081	1,076,594	3.3%		
Aug	1,089,318	1,292,505	1,480,475	1,165,371	1,107,359	-5.0%		
Sept	1,107,345	1,359,282	1,443,980	1,223,107	1,114,020	-8.9%		
Oct	1,183,810	1,392,369	1,517,936	1,231,048	1,111,910	-9.7%		
Nov	1,194,920	1,375,803	1,519,037	1,227,138	1,158,622	-5.6%		
Dec	1,182,836	1,402,741	1,476,777	1,191,429	1,144,999	-3.9%		

Source NDIC, NDPA

North Dakota's oil output almost back to normal after April blizzards

North Dakota's oil production is about 90% back online following back-to-back April blizzards that downed power lines and caused massive disruptions across the Bakken region. This meant that North Dakota natural gas production was down significantly. We always look to the local North Dakota oil media for extra insights from the monthly North Dakota Director of Mineral Resources Lynn Helms press conference on the monthly North Dakota production data. This week the Bismarck Tribune [LINK] reported *"State Mineral Resources Director Lynn Helms on Friday estimated that the state's oil production had rebounded to about 1 million barrels per day after falling as low as 300,000 barrels per day during the second blizzard in late April. He told reporters that "we're recovering" as oil patch crews work to bring the remaining 10% of idled wells back online. Prior to April, North Dakota's oil production had been slowly climbing. New data released Friday shows that the state's daily oil output was 1.12 million barrels in March, a 2.8% increase over February. The state's official oil figures lag two months as officials collect and analyze data from energy companies. High oil prices -- the result of the ongoing war in Ukraine -- have helped the state's oil industry as it continues to recover from the coronavirus pandemic, which sent oil demand and prices plummeting in 2020."* Our Supplemental Documents package includes the Bismarck Tribune report.

Oil – North Dakota crude by rail up MoM to 131,126 b/d in March

North Dakota CBR up in March

The North Dakota Pipeline Authority posted its monthly update "*May 2022 Production & Transportation*" [LINK]. Please note that we always go to the backup excel sheets from the 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 March was a low of 116,126 b/d and a high of 146,126 b/d for an average of ~131,126 b/d. This is up from February's low of 107,670 b/d to high of 137,670 b/d for an average of ~122,670 b/d. Note that February's numbers were revised down 638 b/d. Below is a chart from the NDPA monthly update showing the crude by rail volumes since 2013. Our Supplemental Documents package includes excerpts from the NDPA monthly update.

Figure 21: Estimated North Dakota Rail Export Volumes

Source: North Dakota Pipeline Authority

Oil – EIA lowers 2023 oil production forecast despite higher oil price assumptions

There were a few items that caught our eye in the EIA STEO on its oil outlook. It is not the norm for the EIA to increase oil price forecasts but reduce oil production forecasts. The EIA increased its 2023 WTI oil price forecast by almost $5/b, but lowered its 2023 oil proudciotn forecast to 12.85 mmb/d, down vs 12.95 mmb/d in the April STEO. That's a small decrease in oil production forecast, but, with an almost $5/b increase in WTI oil price, we would have expected some small increase in oil production forecast for 2023. The EIA uses a forecast model and price is normally the biggest indicator which way they move the production forecast. The EIA didn't provide any detailed explanation for this, but did not one of the energy supply uncertainties was "*the rate at which U.S. oil and natural gas producers increase drilling".* We have to wonder if the EIA is tweaking their model assumptions to reflect some sort of lesser service, labor and materials capacity for the US. The EIA did remind that 2023 will set a new record for average annual oil production "*We forecast that production will increase to more than 12.8 million b/d in 2023, surpassing the previous annual average record of 12.3 million b/d set in 2019.*"

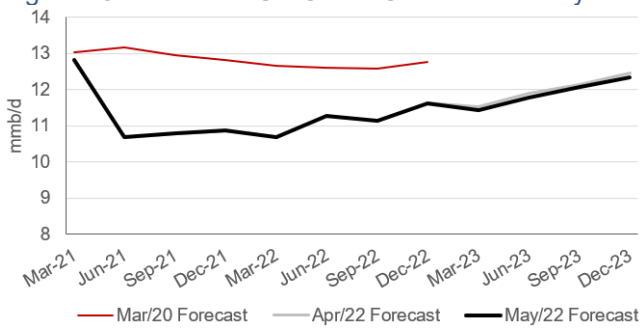
EIA forecasts US 2022 oil exit at 12.35 mmb/d

Figure 22: Estimated US Crude Oil Production By Forecast Month

(million b/d)	Q1/20	Q2/20	Q3/20	Q4/20	2020	Q1/21	Q2/21	Q3/21	Q4/21	2021	Q1/22	Q2/22	Q3/22	Q4/22	2022	Q1/23	Q2/23	Q3/23	Q4/23	2023
May-2021	12.81	10.68	10.79	10.87	11.28	10.69	11.28	11.13	11.63	11.19	11.42	11.78	12.07	12.35	11.91	12.56	12.71	12.94	13.18	12.85
Apr-2022	12.81	10.68	10.79	10.87	11.28	10.69	11.28	11.13	11.63	11.19	11.52	11.90	12.15	12.46	12.01	12.73	12.88	13.02	13.17	12.95
Mar-2022	12.81	10.68	10.79	10.87	11.28	10.69	11.28	11.13	11.62	11.18	11.59	11.89	12.15	12.48	12.03	12.75	12.91	13.06	13.24	12.99
Feb-2022	12.81	10.67	10.79	10.87	11.28	10.69	11.28	11.13	11.69	11.20	11.67	11.86	12.06	12.27	11.97	12.46	12.54	12.63	12.75	12.60
Jan-2022	12.81	10.67	10.79	10.87	11.28	10.69	11.28	11.12	11.54	11.16	11.58	11.7	11.88	12.05	11.8	12.26	12.33	12.46	12.58	12.41
Dec-2021	12.81	10.67	10.79	10.87	11.28	10.69	11.28	11.11	11.63	11.18	11.67	11.72	11.91	12.09	11.85					
Nov-2021	12.81	10.67	10.79	10.87	11.28	10.69	11.28	11.07	11.47	11.13	11.69	11.77	11.97	12.16	11.90					
Oct-2021	12.81	10.67	10.79	10.87	11.28	10.69	11.28	10.98	11.13	11.02	11.54	11.64	11.78	11.96	11.73					
Sept 2021	12.81	10.67	10.79	10.87	11.28	10.69	11.28	11.06	11.28	11.08	11.42	11.58	11.81	12.06	11.72					
Aug 2021	12.81	10.67	10.79	10.87	11.28	10.69	11.22	11.26	11.30	11.12	11.46	11.62	11.86	12.11	11.77					
July 2021	12.75	10.81	10.81	10.90	11.31	10.70	11.20	11.17	11.34	11.10	11.54	11.72	11.95	12.20	11.85					
June 2021	12.75	10.81	10.81	10.90	11.31	10.70	11.04	11.17	11.38	11.08	11.55	11.67	11.88	12.05	11.79					
May 2021	12.75	10.81	10.81	10.90	11.31	10.65	10.97	11.12	11.34	11.02	11.51	11.68	11.96	12.21	11.84					
Apr 2021	12.75	10.81	10.81	10.90	11.31	10.75	10.93	11.13	11.35	11.04	11.54	11.74	11.99	12.18	11.86					
Mar 2021	12.75	10.81	10.81	10.87	11.31	10.79	11.06	11.27	11.46	11.15	11.67	11.84	12.16	12.41	12.02					
Feb 2021	12.75	10.81	10.81	10.89	11.31	10.98	10.91	11.00	11.18	11.02	11.30	11.38	11.61	11.83	11.53					
Jan 2021	12.75	10.81	10.81	10.81	11.29	11.06	11.03	11.07	11.25	11.10	11.32	11.37	11.52	11.74	11.49					

Source: EIA STEO

Figure 23: Estimated US Crude Oil Production By Forecast Month



Source: EIA STEO

Oil – Trans Mountain expansion now >55% complete, on track for Q3/23 completion

Trans Mountain expansion 55% complete

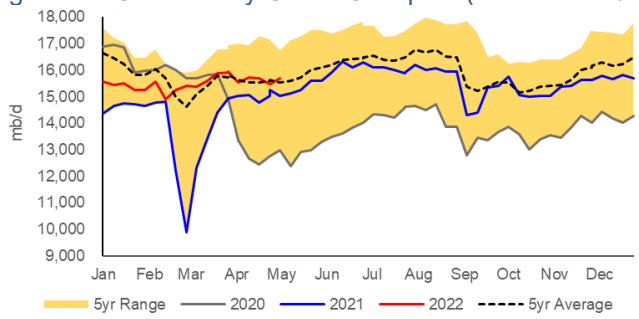
The Trans Mountain pipeline expansion (TMX) looks like it still on track for its target to complete construction in Q3/23 as construction has now passed the 55% completion mark. On Thursday, Trans Mountain posted [LINK] an update on its construction. We then tweeted [LINK] "*Trans Mountain Expansion ~55% construction complete as of May 5, 2022. Construction completion target is Q3/23. Expansion increases capacity from 300,000 b/d to 890,000 b/d & direct access to Asian markets*." The 55% mark of construction for the Expansion Project includes more than 350 kilometres of pipe in the ground, 490 kilometres of the pipeline right-of-way stripped and graded and 380 kilometres of pipe welded.

Oil – Refinery inputs +0.230 mmb/d WoW at 15.969 mmb/d

Refinery inputs up WoW

The EIA crude oil input to refinery data is for the week ended May 6. This week, the EIA reported crude oil inputs to refineries up 0.230 mmb/d this week to 15.696 mmb/d for the week ended May 6 and are +0.676 mmb/d YoY from last year that was still recovering from the big February Freeze in the Permian. Refinery utilization was down slightly at 90%, which is +1.6% YoY though is still below 5-year average utilization levels; refineries are exiting the planned maintenance season as the summer demand is soon to ramp up. Note that hurricane season in the US is around the corner with the official start of the season on June 1. Total products supplied (i.e., demand) decreased WoW, down -0.236 mmb/d to 19.231 mmb/d. Motor gasoline was down -0.154 mmb/d at 8.702 mmb/d from 8.856 mmb/d last week. The four-week average for Finished Motor Gasoline was down this week at 8.791 mmb/d.

Figure 24: US Refinery Crude Oil Inputs (thousands b/d)



Source: EIA

Oil – US "net" oil imports up +0.647 mmb/d WoW at 2.213 mmb/d

US "net" oil imports up WoW

US "NET" imports were up +0.647 mmb/d to 2.213 mmb/d for the May 6 week. US imports were down -0.063 mmb/d to 6.269 mmb/d. US exports were down -0.695 mmb/d to 2.879 mmb/d. The WoW increase in US oil imports was driven by US's Top 10 imports by country were up by 0.441 mmb/d from Top 10. Some items to note on the by country data. (i) Canada was down this week by -0.208 mmb/d to 3.284 mmb/d. (ii) Saudi Arabia was up 0.139 mmb/d to 0.693 mmb/d this week. (iii) Colombia was up 0.013 mmb/d to 0.326 mmb/d. (iv) Ecuador was up 0.08 mmb/d at 0.143 mmb/d. (v) Iraq was up 0.170 mmb/d to 0.351 mmb/d. (vi) Venezuela was relieved of some US sanctions and was up 0.306 mmb/d from zero (vii) Mexico fell by -0.277 mmb/d to 0.276 mmb/d. (viii) Kuwait and Angolia restarted their imports, with 0.136 mmb/d and 0.128 mmb/d of imports respectively.

Figure 25: US Weekly Preliminary Oil Imports by Major Countries

(thousand b/d)	Feb 18/22	Feb 25/22	Mar 4/22	Mar 11/22	Mar 18/22	Mar 25/22	Apr 1/22	Apr 8/22	Apr 15/22	Apr 22/22	Apr 29/22	May 11/22	WoW
Canada	3,869	3,630	3,731	3,398	3,806	3,612	3,923	3,153	3,465	3,510	3,492	3,284	-208
Saudi Arabia	358	520	701	562	534	333	573	328	255	438	554	693	139
Venezuela	0	0	0	0	0	0	0	0	0	0	0	306	306
Mexico	768	497	412	645	641	731	619	763	488	391	553	276	-277
Colombia	332	144	71	279	72	284	216	49	332	364	313	326	13
Iraq	285	295	188	161	489	82	71	155	266	242	181	351	170
Ecuador	98	0	160	205	103	96	76	145	211	108	66	143	77
Nigeria	25	43	96	0	2	148	148	89	191	0	43	0	-43
Kuwait	0	0	0	0	0	0	0	0	0	0	0	136	136
Angola	0	0	0	0	0	0	0	0	0	0	0	128	128
Top 10	5,735	5,129	5,359	5,250	5,647	5,286	5,626	4,682	5,208	5,053	5,202	5,643	441
Others	1,093	638	960	1,145	839	973	674	1,313	629	881	1,130	626	-504
Total US	6,828	5,767	6,319	6,395	6,486	6,259	6,300	5,995	5,837	5,934	6,332	6,269	-63

Source: EIA, SAF

Oil – Azerbaijan April oil production 579,100 b/d vs quota of 681,000 b/d

Azerbaijan is ~100,000 b/d below quota

We recognize that many call for spare capacity in many of the OPEC+ countries, but we suspect most of these calls assume capacity that could be available with significant capex in 12 to 18 months. Because the reality is that with $100 oil, OPEC+ countries would be producing to quota if they had the productive capacity today. Yesterday, we tweeted [LINK] "*Another of the many #OPEC+ underperformers who are well below quota. @business Zulfugar Agayev reports Azerbaijan April crude oil production of 579,000 b/d vs OPEC+ quota of 681,000 b/d in April. Note Azerbaijan also produced 114,000 b/d condensate. #OOTT.*" Bloomberg terminal had a short report yesterday morning "*Azerbaijan pumped 693.1k b/d of crude and condensate in April, down from 696.4k b/d in March, according to an emailed statement from the country's Energy Ministry. * Production in April comprised 579.1k*

b/d of crude and 114k b/d of condensate." Note Azerbaijan's quota for May is 688,000 b/d and June is 696,000 b/d.

Oil – Russia's Novak expects oil production up MoM in May

Novak expects Russia's oil production up

One of the big wildcards for oil is at what level will Russia oil production and exports settle out, but that isn't likely to be clearer until there is some definite indications of what specifically will happen in Japan and Europe, in particular Germany, Hungary, Czech Republic and Slovakia. Vitol's Head Asia Mike Muller believes Russia oil production is down about 1 mmb/d. On Monday, we tweeted [LINK] "*#Novak expects RUS production up MoM in May. "If you look at the indicators of early May, they are better than April. The situation is stable. Production increased compared to April. We expect that the indicators in May will be partially restored and will be better". #OOTT".* Novak also noted that they are getting different buyers for Russian crude. On Monday, TASS reported [LINK] "*If you look at the indicators of early May, they are better than April. The situation is stable. Production increased compared to April. We expect that the indicators in May will be partially restored and will be better*," and "*Of course, they (Russian oil companies - TASS note) are looking for new directions in the new situation, building new supply chains. We see, of course, that there are new buyers, including an increase in [oil exports] to suppliers in other directions, including the Asia-Pacific region.*," Our Supplemental Documents package includes the TASS report.

Oil – G7 leaders commit to phase out Russia oil, no comment on Russian natural gas

G7 Leaders statement

Last Sunday, the G7 leaders (Canada, France, Germany, Italy, Japan, UK and US) released a statement post their video meeting. It was on Russia's attack on the US and included the G7's latest work to stop importing Russia energy. The headlines that came out of the statement were positive on their agreement to ban Russian oil. We were less enthusiastic on the statement and tweeted [LINK] "*Reality restricts #G7 Leaders ability to cut off RUS energy. Don't even mention RUS #NatGas. "phase out" of RUS #Oil in orderly fashion that provide time for "the world" not just G7 to "secure alternative supplies". #OOTT."* There is a reality on what the G7 countries can do and that is why they made zero mention of even committing to eliminate imports of Russian natural gas or LNG. And reality also hit their hopes on Russian oil. The statement said "*First, we commit to phase out our dependency on Russian energy, including by phasing out or banning the import of Russian oil. We will ensure that we do so in a timely and orderly fashion, and in ways that provide time for the world to secure alternative supplies. As we do so, we will work together and with our partners to ensure stable and sustainable global energy supplies and affordable prices for consumers, including by accelerating reduction of our overall reliance on fossil fuels and our transition to clean energy in accordance with our climate objectives."* On the phase out of Russian oil imports, there is no indication on over what time period. But the G7 says it will be done in ways *to "provide time for the world*" to secure alternative supplies ie. not just the G7 but the world. We assume that is to try to reassure countries like Hungary, the Czech Republic and Slovakia that are landlocked and will have an extremely difficult job to replace oil imports via the Druzhba pipeline. It was also interesting that they say they want to provide stable, sustainable & affordable prices to consumers, yet don't mention that they could work to increase oil and natural gas production. Then they want to accelerate reduction of "our" overall reliance on fossil fuels. The reality is that the only way this is possible in the near term is to reduce oil and natural gas consumption ie. energy conservation and efficiency actions such as reducing highway speeds, higher temperatures settings for air conditioning,

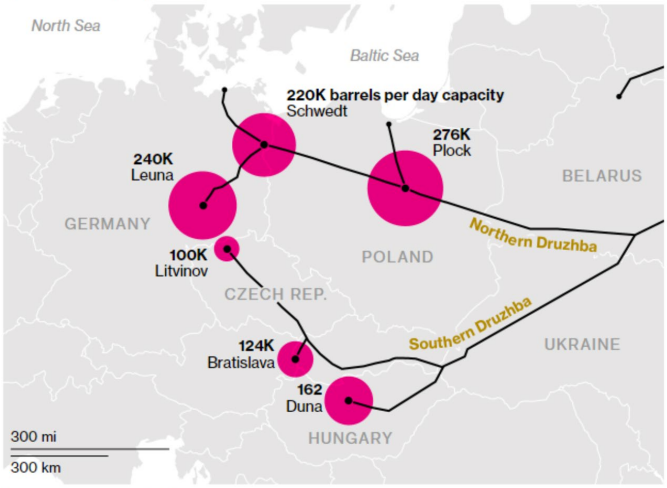
lower temperatures during heating season, public transportation and not driving, etc. We expect to see western governments be pushing these behavioral changes either by regulations or shaming. Our Supplemental Documents package includes the G7 Leaders statement.

Oil – No surprise Hungary continues to hold out against EU ban on Russian oil

Russia's Druzhba oil pipeline

No surprise, the EU has not been able to move Hungary off its position that it can't ban Russian oil imports. Hungary is supplied by Russia's Druzhba oil pipeline and is landlocked so its alternative supply would be to have oil imported to some European port, and then transported by a combination of rail, truck and barge. No wonder they say it can't be done. Last week's (May 8, 2022) Energy Tidbits noted the May 6 headlines on how Friday was how Hungarian Prime Minister Orban rejected the then latest EU proposal on banning imports of Russian oil saying it was as bad as dropping a "nuclear bomb" on the Hungary economy. But within the same radio interview, Bloomberg reported Orban "*also said weaning Hungary off of Russian crude requires billions of dollars in investments*". It was a good reminder of the huge logistical challenge to replace pipeline oil with some combination of anything possible to get oil to landlocked refineries. Germany has ports, but Czech Republic, Hungary and Slovakia are landlocked. Druzhba pipeline capacity to Hungary refineries is ~162,000 b/d. That is just for Hungarian refineries and excludes landlocked refineries in Slovakia (124,000 b/d) and Czech Republic (100,000 b/d). There has to be an increase in port unloading, tankage capacity to handle more oil coming from tankers. And then the entire problem of how to get the oil from a port inland to refineries. And let's not forget, it's Europe and so it would basically within the existing infrastructure of rail, roads and rivers. And then there will be the issue of rail tankcars, truck tankers or river barges to move the oil. Its why, on May 6, we tweeted [LINK] "*A huge logistical above ground transportation challenge 👇is coming to move #CrudeOil to refineries supplied by Druzhba pipeline in CZ, DE, HU & SK. Plus added unloading,tankage capacity at ports to receive more #Oil barrels to move inland. No wonder HU wants $ billions. #OOTT*".

Figure 26: Europe refineries dependent on Druzhba oil pipeline



Sources: Bloomberg; AW Consulting
Source: Bloomberg

Oil – OPEC MOMR sees near term economic downside risk

OPEC MOMR

On Thursday, OPEC released its Monthly Oil Market Report at 6am MT. (i) We thought it was slightly negative as there was a small narrowing of the oil stocks deficit and world economy assumptions with more downside than upside potential. (ii) There was an immaterial change to 2020 demand from 91.13 mmb/d in April to 91.19 this month. For 2021, full year average demand was revised up to 96.92 mmb/d from 96.82 mmb/d last month. 2021 is now +5.73 mmb/d YoY. YoY demand growth is unchanged at +5.70 mmb/d YoY. 2021 remains down -3.28 mmb/d vs pre-covid 2019 of 100.10 mmb/d. (iii) As expected, oil demand growth in 2022 declined to +3.36 mmb/d YoY from 3.67 mmb/d last month. 2022 demand average was revised down at 100.29 mmb/d from 100.50 mmb/d, up 0.09 mmb/d from pre-covid 2019 of 100.20 mmb/d. OPEC wrote "*In 2022, oil demand growth was revised down by 0.3 mb/d to average 3.4 mb/d y-o-y, accounting for potential declines in global GDP and the resurgence of the Omicron variant of COVID-19 in China and its impact on global oil demand.*" And "*Downward revisions in 2Q22, 3Q22 and 4Q22 oil demand growth mainly took into account current economic forecasts and other developments that could potentially impact world oil requirements*." (iii) OPEC Mar production per "secondary sources" was down -0.62 mmb/d to 28.495 mmb/d. As a reminder, for the participating countries within OPEC, the OPEC+ agreed increase was +400,000 b/d MoM in Apr and OPEC's share was +255,000 b/d MoM to 25.315 mmb/d. Mar was revised -62,000 b/d to a revised Mar of 28.495 mmb/d, vs Apr MOMR of 28.557 mmb/d. There were only small revisions to Mar. The only notable revision was Saudi was revised -43,000 b/d to 10.219 mmb/d, vs Apr MOMR of 10.262 mmb/d. For the OPEC quota countries, the largest MoM changes were Saudi Arabia +127,000 b/d, Iraq +103,000 b/d, and UAE +36,000 b/d. For the OPEC countries not subject to quota, Iran was +16,000 b/d to 2.564 mmb/d, Libya was -161,000 b/d to 0.913 mmb/d, and Venezuela was +14,000 b/d to 0.707 mmb/d. (iv) There were no revisions to non-OPEC supply growth for

2021 at 63.56 mmb/d, and 2022 growth was revised down -0.29 mmb/d to +2.41 mmb/d YoY. Canada was revised up +0.30 mmb/d MoM to 63.56 mmb/d. Key non-OPEC supply growth areas for 2021 are Canada +0.30 mmb/d (unchanged), Russia +0.21 mmb/d (unchanged), US +0.15 mmb/d (unchanged) and China +0.15 mmb/d (unchanged). The UK remained unchanged at -0.16 mmb/d. Key YoY growth areas for 2022 are US +1.29 mmb/d (unchanged), Canada +0.17 mmb/d (was +0.16), Brazil +0.14 mmb/d (was +0.16), Kazakhstan +0.14 mmb/d (was +0.13), Guyana +0.11 mmb/d (unchanged). We noted that the May MOMR revised Russia down 0.35 mmb/ for 2022 to average 10.74 mmb/d, vs Apr MOMR of 11.23 mmb/d. (vi) There was an immaterial revision to Mar OECD commercial oil stocks, which was revised +12 mb. The May MOMR has Mar at 2,611 mb vs Apr MOMR at 2,599 mb. Our Supplemental Documents package includes the OPEC MOMR.

Oil – IEA OMR: Fairly neutral with few changes to forecasts

IEA Oil Market Report

On Thursday, the IEA released its monthly Oil Market Report for May at 2am MT. They only release very limited public info, but Bloomberg provided tables and added color from the report. So big thanks, as usual, to the Bloomberg team. (i) The outlook of this IEA OMR is fairly neutral. There are very few changes to their forecasts vs last month. Perhaps a small positive takeaway from the OMR was the IEA specifically saying they don't expect an *"acute supply deficit in the near term"*. (ii) There was an immaterial reduction in 2022 demand forecast, still at 99.4 mmb/d but below pre-covid levels of 100.4 mmb/d. Global oil demand is also unrevised at 97.5 mmb/d for 2021. (iii) Non-OPEC supply growth saw no changes to 2021 and 2022 at +2.1 mmb/d. Non-OPEC supply remained forecasted at 63.7 mmb/d in 2021 and 64.5 mmb/d in 2022 with no revision. (iv) The IEA reminds that the only sustainable surplus capacity is in the Persian Gulf. Outside of the Persian Gulf, there is a revised sustainable surplus with Russia at 1.13 mmb/d, Libya 0.30 mmb/d, Nigeria 0.29 mmb/d and Kazakhstan 0.28 mmb/d. (v) The IEA does not see an "acute" supply deficit from an increasing Russia oil ban. We found this interesting as there were only immaterial changes to their forecast. IEA writes "*Russia's isolation following its invasion of Ukraine is deepening as the EU and G7 contemplate tougher sanctions that include a full phase out of oil imports from the country. If agreed, the new embargoes would accelerate the reorientation of trade flows that is already underway and will force Russian oil companies to shut in more wells. Even so, steadily rising output elsewhere, coupled with slower demand growth, especially in China, is expected to fend off an acute supply deficit in the near term*." Russia shut in 1 mmb/d of production April, vs April OMR that estimated 1.5 mmb/d hit in April. But the IEA expects the 3.0 mmb/d hit to be in the second half of the year as major trading houses are winding down deals ahead of a 15 May deadline to halt all transactions with state-controlled Rosneft, Gazprom Neft and Transneft. (vi) There were no significant revisions to OPEC April production in any country, with total OPEC production up +0.50 mmb/d MoM to 28.67 mmb/d in April. The biggest MoM changes were Libya -0.20 mmb/d to 0.90 mmb/d in April, Saudi Arabia +0.12 mmb/d to 10.40 mmb/d in April, and Iraq +0.09 mmb/d to 4.42 mmb/d in April. Iran was -0.03 mmb/d to 2.55 mmb/d in April. The IEA revised April production to 28.67. There was no major difference between countries in OMR at 28.67 vs OPEC MOMR at 28.55. (vii) On refinery runs, the IEA wrote *"Global refinery margins have surged to extraordinarily high levels due to depleted product inventories and constrained refinery activity. Throughputs in April fell 1.4 mb/d to 78 mb/d, the lowest since May 2021, largely driven by China. Between now and August, runs are forecast to ramp up by 4.7 mb/d, but the tightness in product markets is expected to continue based on our current oil demand*

outlook." They went on to say "*Limited spare capacity in the global refining system, together with reduced exports of Russian fuel oil, diesel and naphtha have aggravated the tightness in product markets, which have now seen seven consecutive quarters of stock draws. While a first tranche of SPR releases halted the precipitous decline in OECD industry stocks in March, crude made up the majority of it and product stocks have continued to fall. Notably, middle distillate reserves reached their lowest levels since April 2008*" (viii) The IEA continues to be positive on OECD stocks, although there was a slight narrowing of the deficit in oil stocks relative to the 5 year average in March to 299 mmb vs 320 mmb deficit for Feb. The IEA wrote, "*Global observed oil inventories declined by a further 45 mb during March and are now a total 1.2 billion barrels lower since June 2020. In the OECD, the release of 24.7 mb of government stocks during March halted the precipitous decline in industry inventories. OECD industry stocks rose by 3 mb to 2 626 mb, but remained 299 mb below the five-year average. Preliminary data for April show OECD industry inventories increased by 5.3 mb*." We noted that the EIA did not specifically mention SPR releases as they did last month. Our Supplemental documents package includes the IEA release and the Bloomberg report.

Figure 27: IEA Global Demand Forecast By OMR Report Month

mmb/d	2019	2020	20-19	Q1/21	Q2/21	Q3/21	Q4/21	2021	21-20	Q1/22	Q2/22	Q3/22	Q4/22	2022	22-21
May-22	99.7	91.0	-8.7	94.3	96.3	98.8	100.7	97.5	6.5	98.8	98.2	100	100.4	99.4	1.9
Apr-22	99.7	91.0	-8.7	94.3	96.3	98.8	100.5	97.5	6.5	98.5	98.3	100.1	100.5	99.4	1.9
Mar-22	99.7	91.0	-8.7	94.3	96.3	98.8	100.5	97.5	6.5	99	98.8	100.2	100.6	99.6	2.1
Feb-22	99.7	91.0	-8.7	94.1	96.2	98.7	100.2	97.4	6.4	98.9	100.1	101.7	101.6	100.6	3.2
Jan-22	99.7	91.0	-8.7	93.3	95.4	97.8	99.0	96.4	5.4	97.8	99.3	100.9	100.8	99.7	3.3
Dec-21	99.7	91.0	-8.7	93.3	95.2	97.6	98.6	96.2	5.2	97.9	99.1	100.8	100.3	99.5	3.3
Nov-21	99.7	91.0	-8.7	93.3	95.2	97.7	98.9	96.3	5.3	98.5	99.2	100.6	100.3	99.7	3.4
Oct 21	99.7	91.0	-8.7	93.4	95.2	97.8	98.9	96.3	5.3	98.6	99.1	100.5	100.2	99.6	3.3
Sep 21	99.7	91.0	-8.7	93.4	95.1	97.2	98.8	96.2	5.2	98.2	98.9	100.3	100.7	99.5	3.3
Aug 21	99.7	91.0	-8.7	93.4	94.9	97.4	98.9	96.2	5.2	98.0	98.8	100.1	100.2	99.3	3.1
July 21	99.7	91.0	-8.7	93.6	94.7	98.1	99.4	96.4	5.4	98.2	98.7	100.3	100.6	99.5	3.1
June 21	99.7	91.0	-8.7	93.3	94.9	98.0	99.3	96.4	5.4	98.3	98.6	100.3	100.6	99.5	3.1
May 21	99.7	91.0	-8.7	93.1	94.6	98.3	99.6	96.4	5.4	-	-	-	-	-	-

Source: IEA, SAF

Oil – IEA's Birol blog makes us worry the 2020s will be a decade of energy crisis

IEA Birol's LinkedIn post

The reality of the world is that IEA's Executive Director Birol works for the western developed countries, who went "all-in" on a speedy Energy Transition. As politicians know, "never let a good crisis go to waste" and that is the case in Birol's Friday night LinkedIn posting. [LINK]. There is a lot in this 2-pg posting. It is an extremely well crafted/drafted post. It is positive for oil and gas, but our concern is that the strategy is one that will put the world teetering every year on an energy crisis and that isn't good for anyone, including the oil and gas sector. There has to be a balance or a steady market between producer and consumer and we worry that we will have what Europe was seeing before Russia/Ukraine. No one can disagree with the aspirations for having clear air, clean water and a healthy, safe environment. The problem is that western governments have assumed a perfectly timed and coordinated and very fast energy transition. And, as we saw pre Russia/Ukraine, that wasn't happening. The Birol post is what his bosses are doing/saying – get short cycle oil and gas on production but do not build long term capacity ie. use all the bullets now. It's why earlier this morning, we tweeted [LINK] "*1/3 Need to use up near term #Oil #NatGas capacity to replace RUS, but don't build up future #Oil #NatGas capacity ICYMI, @IEA @fbirol says need available short cycle #Oil #NatGas ie. US shale, existing field extensions, etc to fill RUS shortfalls, Makes sense BUT ...#OOTT", [LINK] "2/3. .. then says "Nobody should imagine that Russia's*

invasion can justify a wave of new large-scale fossil fuel infrastructure in a world that wants to limit global warming to 1.5 C". YET clearly warns ... #OOTT." and [LINK] "*3/3.. "we are not yet seeing the massive level of policy and investment efforts worldwide that would be needed to move us onto a net zero pathway ". Looks like a recipe for 2020s to be a decade of teetering on #EnergyCrisis. Positive for #Oil #NatGas for 2020s. #OOTT*." There is much more in the post, but this is our major concern. If the western governments continue to discourage adding future capacity while encouraging using up short term capacity at the same time as they are nowhere near on course for their assumed rapid energy transition, it is a recipe for disaster for everyone. Producers also want some sort of balance/stable market.

Oil – Will US and Iran do more than dance this round of JCPOA talks?

Still no JCPOA deal or no deal

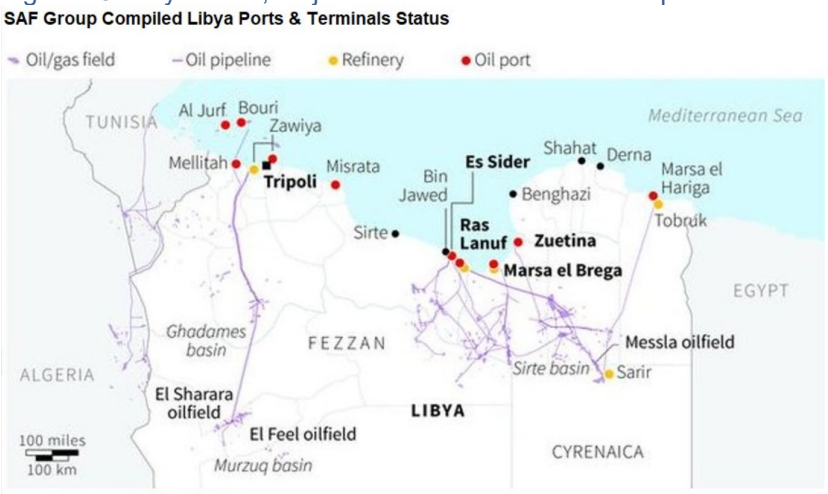
We have been highlighting how the US and Iran have been dancing around for 2-3 months on whether there will be a JCPOA deal or no deal with no signs of either side giving in to get to a deal. There has been a stalemate for a month with no JCPOA negotiations. But, at least there looks to be a resumption of negotiations about to happen. Our one timing issue is that we doubt there will be a quick deal ahead of Biden's reported trip to meet PM Bennett in Israel in June. Rather we think Biden's style is more to at least go thru the motions of consulting in a Bennett one-on-one ahead of any potential deal, rather than show up after a deal. On Friday, we tweeted [LINK] "*#JCPOA. "It has gone better than expected - the negotiations were stalled, and now they have been reopened" says EU @JosepBorrellF. But hard to see a quick deal, don't think Biden would sign off on deal ahead of his Israel visit in June? #OOTT".* Reuters reported on comments from EU foreign policy chief Josep Borrell who, following his meeting with Iran in Tehran, "*Speaking as Enrique Mora, the EU diplomat who coordinates the talks, returned to Europe from Tehran, Josep Borrell said Iran's response had been "positive enough" after Mora had delivered a message that things could not continue as they were. "These things cannot be resolved overnight," Borrell told reporters at a G7 foreign ministers' meeting in Germany. "Let's say the negotiations were blocked and they have been de-blocked", with the prospect of "reaching a final agreement".* And "*"It has gone better than expected - the negotiations were stalled, and now they have been reopened," Borrell said."* Our Supplemental Documents package includes the Reuters report.

Oil – Libya oil production reportedly down to ~600,000 b/d

Libya oil down to ~600,000 b/d

It looks like Libya Oil Minister Oun's comments a couple weeks about Libya oil production being restored right away turned out to be optimistic. So instead of increasing oil production back to 1.1 or 1.2 mmb/d, production has gone the other way. On Tuesday, Bloomberg reported on Oil Minister Oun's email on Libya current oil production, writing "*Libya oil output at about 600,000 barrels/day: Minister Oun*. There was no color on what fields are down. On Thursday, OPEC's Monthly Oil Market Report reported on Secondary Sources estimate for Libya oil production in April was 913,000 b/d.

Figure 28: Libya Ports, Major oilfields and Terminals map



Source: SAF Group

Potential oil price crash?

Oil –Euronav thinks oil prices could be dramatically lower by Q4/22

One of the keys to our Energy Tidbits memos over the past 20 plus years has been to make sure we highlight contrary views that come from reputable firms/people. Most of the views seem to be on continued bullish view for oil and products prices over the balance of 2022. But, on Wednesday, we saw a contrary view and tweeted [LINK] *"Is massive #Oil demand destruction & price drop coming? @EuronavNV Rustin Edwards says yes. Poor countries already hit. Can western govts keep subsidizing to minimize the impact & avoid Edwards scenario? Always worth reading different views. Thx @gulf_intel @DyalaSabbagh_GI .#OOTT."* One of our favorite podcasts is the Gulf Intelligence Daily Energy Markets podcasts. Its Wednesday podcast included Rustin Edwards (Head, Fuel Oil Procurement, Euronav NV) [LINK]. Edwards "*wouldn't be surprised that by Q4 we have a much dramatically lower crude oil price a big drop in oil prices by Q4*". He believes the developing countries energy/economic crisis will inevitably roll into Europe and then the US. And he said "*The way I have it in my mind its going to hit the European Union first and then it's going to roll in the United States. European Union will probably slow down Q3, Q4. Then the US will probably be Q4, Q1. It will be a domino effect. It's all predicated on the fact we've had inflationary pressures since the beginning of 2021 when freight rates went thru the roof on containerized goods supply chains got dislocated with the Covid outbreaks. And now it just keeps on rolling forward. I don't see any relief here in the near future".* Our Supplemental Documents package include the transcript we made of Edwards key comments.

Oil –Can Saudi Energy Minister Abdulaziz keep strong oil prices?

There is no question that oil has historically been directly tied to global economic strength or weakness. To us, the key question will be if Saudi Energy Minister Abdulaziz can continue to manage oil markets as he has done since he initial oil price crash in Q2/20 from the world shutting down from Covid. Our second tweet on

the Edwards comment was [LINK] "*Hard to disagree food, energy, commodities prices won't hit economies. But even harder to disagree Saudi's Abdulaziz won't keep attending to #Oil markets as he has successfully done to avoid oil price crash. He is The Man and why oil is $100. #OOTT."*

Real time data has been key tool for Saudi to manage oil markets

The key reason why we believe Saudi's Abdulaziz has the ability to manage oil markets better than seen in prior cycles is the emergence of real time supply and demand data over the past few years. Plus Abdulaziz was smart in arranging the monthly OPEC+ meetings so OPEC+ can deal with changing supply/demand factors on a current basis. A year ago, we highlighted this theme in our May 9, 2021 Energy Tidbits. We then wrote "*One of our favorite early morning oil market checks is to put on the Gulf Intelligence New Silk Road Podcast. They have a wide range of speakers and, inevitably, we come away with one thing to consider. Their May 5 podcast [LINK] led to our tweet [LINK] that the more you think about it, the more you have to give Abdulaziz credit for what he set up – monthly meetings, agree to pay back over produced barrels. Good reminder why OPEC+ can manage oil prices assuming they still want to keep working together in particular on the agreement to pay back over produced barrels. There is now real time data on demand and on supply. Saudi Arabia can see who is cheating from Kpler data. This Kpler data is the big difference from a decade ago, it gives real time data on loadings, destinations, changes in destinations, etc. And this real time supply data is the missing link for Abdulaziz. And monthly meetings, he can rail in someone quickly. They also get real time data on demand from many sources ie. air flights, traffic, etc. And more importantly, they have eliminated the supply side variables they don't control. US oil production is under control and they can see weekly data. Other non-OPEC+ producers like Brazil, Canada, China, etc all can give regular indicators for OPEC. The key is that Abdulaziz has pretty good real time data and his monthly meeting set up and getting cheaters to commit to pay back over produced barrels allows him to effectively manage markets. Its why we tweeted "Kudos @MoEnergy_Saudi #Abdulaziz for set up #OPEC+ monthly meet & pay back overproduced bbl. Real time supply data let them adjust monthly & its working. Thx @gulf_intel @MatrixGlobalNRG CEO reminder on @Kpler tanker is key data. @ericnuttall been hammering Kpler value add #OOTT". Our tweet noted Eric Nuttall because he has been hammering home the big value add he gets from the paid Kpler real time data."*

Oil – Vortexa crude oil floating storage 110.86 mmb as of May 13, +9.87 mmb WoW

Vortexa crude oil floating storage

We are referencing the Vortexa global crude oil floating storage data posted on the Bloomberg terminal as of Noon MT yesterday. And we 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 today are compared to the prior weeks Vortexa estimates posted on Bloomberg on May 7 at noon MT. (i) As of noon MT yesterday, Bloomberg posted Vortexa crude oil floating storage estimate as of May 13 was 110.86 mmb, which is +9.87 mmb vs upwardly revised May 6 of 100.99 mmb. Note May 6 was revised +5.60 mmb from the 95.39 mmb posted on Bloomberg as of noon MT on May 7. (ii) Please note it's another week of revisions to the several weeks of data. All weeks were revised up, similar to last

week which saw upward revisions. What this means is that instead of crude oil floating storage being in the 90 to 100 mmb range, its in the +/- 105 mmb range. Ie. crude oil floating storage looks to be increasing. Again, we would think it isn't that surprising to see revisions given this coincides with the post Russian/Ukraine war period. (iii) The revisions to the last several weeks were all revised up. Revisions in today's estimates at noon MT vs the Vortexa estimates on Bloomberg as of noon MT on May 7 for May 6 data. May 6 data, revised +5.60 mmb to 100.99 mmb. April 29 data, revised +2.64 mmb to 104.11 mmb. April 22 data, revised +3.70 mmb to 105.00 mmb. April 15 data, +1.54 mmb to 107.13 mmb. April 8 data, +0.19 mmb to 103.08 mmb. (iv) May 13 estimate of 110.86 mmb is -119.95 mmb vs June 21, 2020 peak of 221.81 mmb. (v) Note that the below graph goes back 3 years and not just 2 years as floating oil storage was in the big ramp up period in late March/April/May 2020 as Covid started to have a huge impact. May 13 estimate of 110.86 mmb is +62.39 mmb vs pre-Covid of 48.47 mmb on May 13, 2019. Note May 13 estimate of 110.86 mmb is -83.77 mmb lower vs March 15, 2020 of 194.63 mmb.

Figure 29: Vortexa Floating Storage as of May 13 Posted on Bloomberg Noon MT Sat

Source: Bloomberg, Vortexa

Figure 30: Vortexa Estimates May 14 noon MT, May 7 noon MT, and Apr 30 2pm MT

Est as of May 14, noon MT

Date	FZWWFST VT... Mid Px
Fr 05/13/2022	110.855k
Fr 05/06/2022	100.987k
Fr 04/29/2022	104.107k
Fr 04/22/2022	105.002k
Fr 04/15/2022	107.129k
Fr 04/08/2022	103.082k
Fr 04/01/2022	92019
Fr 03/25/2022	94393
Fr 03/18/2022	96587
Fr 03/11/2022	96533
Fr 03/04/2022	93377

Est as of May 7, noon MT

Date	FZWWFST VT... Mid Px
Fr 05/06/2022	95392
Fr 04/29/2022	101.474k
Fr 04/22/2022	101.304k
Fr 04/15/2022	105.59k
Fr 04/08/2022	102.886k
Fr 04/01/2022	89972
Fr 03/25/2022	93433
Fr 03/18/2022	95012
Fr 03/11/2022	97174
Fr 03/04/2022	93921
Fr 02/25/2022	90235

Est as of Apr 30, 2pm MT

Date	FZWWFST VT... Mid Px
Fr 04/29/2022	88983
Fr 04/22/2022	99590
Fr 04/15/2022	103.672k
Fr 04/08/2022	100.027k
Fr 04/01/2022	88907
Fr 03/25/2022	92321
Fr 03/18/2022	93582
Fr 03/11/2022	97056
Fr 03/04/2022	94408
Fr 02/25/2022	91897
Fr 02/18/2022	85737

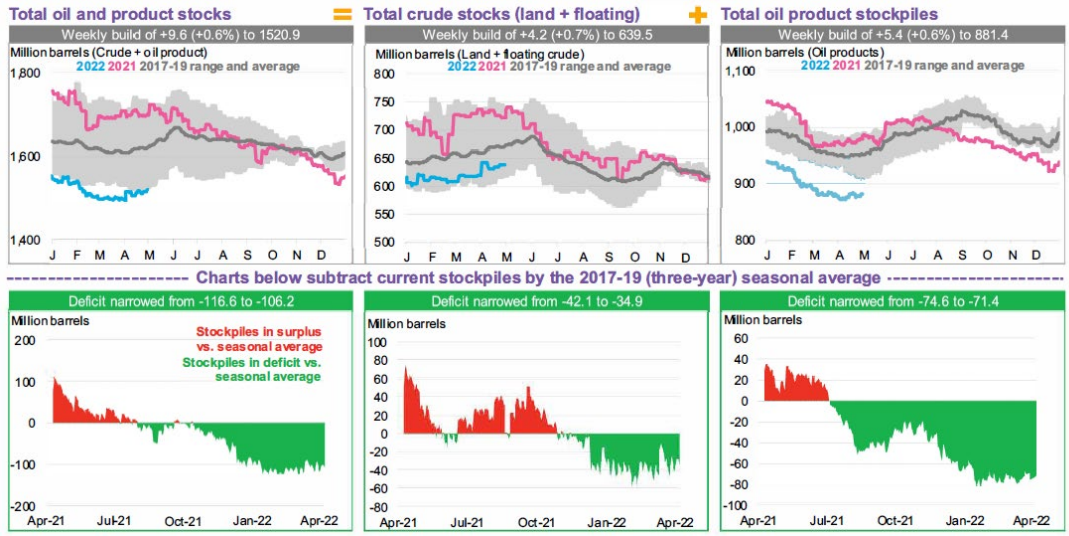
Source: Bloomberg, Vortexa

Oil – BloombergNEF: Global oil inventories YoY deficit narrows

BNEF's global oil inventories

For those with a Bloomberg terminal we recommend flipping thru BloombergNEF's "Oil Price Indicators" weekly that comes out on Mondays as it provides good charts depicting near-term global oil demand and supply indicators. There is no question that there are increasing risks on the demand indicators with lockdowns in China, inflation, etc, but the key global oil and products stocks data point continues to be positive with a large deficit relative to the 2017-2019 average. However, we do want to watch as the YoY deficit is narrowing for crude and products from 116.6 mmb to 106.2 mmb compared to the 2017-2019 average. For the week ended Apr 29, land crude oil storage in tracked regions rose WoW at 534.9 mmb. The stockpile deficit against the 5 yr average (2015-2019) narrowed from 42.1 mmb to 34.9 mmb. Total crude inventories increased by 0.7% to 639.5 mmb, including global floating inventories. Product stocks were down 1% WoW with the stockpile deficit against the 3-year average narrowing from 74.6 mmb to 71.4 mmb. Gas oil and middle distillate stocks have widened against their three-year average deficit (2017-2019) of 38.7 mmb to 40.8 mmb. Jet fuel consumption by international departures decreased by 50,900 b/d WoW while consumption by domestic passenger departures increased by 68,500 b/d. Global mobility indices grew slightly in the past week despite there being several holidays in Asia. The high frequency oil and product stockpile deficit against the three-year seasonal average (2017-2019) suggests the stockpile deficit has narrowed from the post pandemic record set last month. Below is a snapshot of aggregate global stockpiles. Our Supplemental Documents package includes excerpts from the BloombergNEF report.

Figure 31: Aggregate Global Oil and Product Stockpiles



Source: Bloomberg

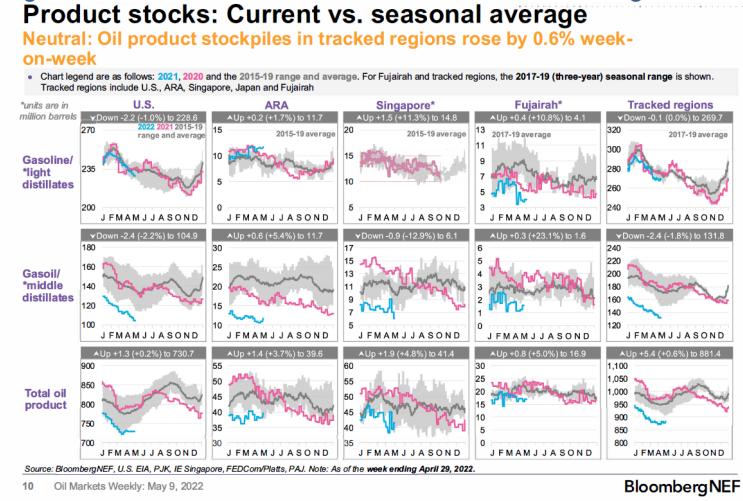
Oil – Global diesel stocks well below the 2017-19 average

Diesel prices surge with tight supply

The big products issue around the world, especially in Europe, is diesel, which is part of the middle distillates group along with jet fuel/kerosene. On Monday, BloombergNEF's "Oil Price Indicators" weekly clearly showed the low diesel stockpiles. We tweeted [LINK] *"Very high #Diesel prices supported by diesel stocks well below 2017-19 avg in all global regions. Diesel*

aka gasoil is in middle distillates along with #JetFuel/#Kerosene. #Gasoline prices have to go way higher to get more refinery space. Thx @BloombergNEF @WayneTanMing. #OOTT."
CNBC released an article on May 7 [LINK] highlighting factors contributing to the elevated prices and the tight supply. On Friday the national average for a gallon hit a record of $5.51, according to AAA, after hitting a new high every single day over the last week. Diesel stocks were down 2.4 mmb or 2.2% from the seasonal average stockpile levels. Jet fuel and Kerosene also show a stockpile deficit, with crude oil the only product stock that shows a surplus across April and into May. Diesel plays a vital role in the American and global economy. Tankers, trains and trucks all run on diesel. The fuel is also used across industries including farming, manufacturing, metals and mining.

Figure 32: Product stocks: Current vs seasonal average



Source: BloombergNEF

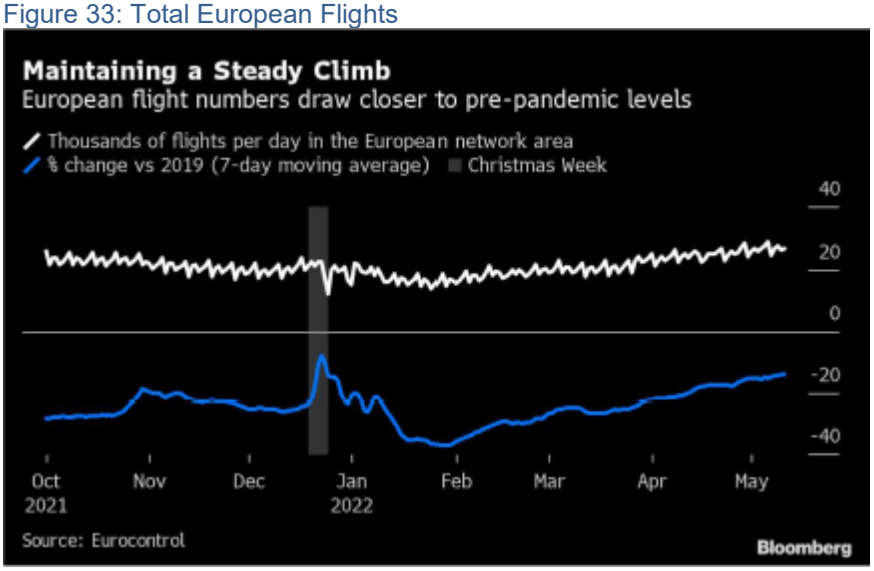
Oil – Bloomberg Oil Demand Monitor: Air travel slowly recovering in Europe

Bloomberg's Oil Demand Monitor

We recommend reading the weekly Bloomberg terminal Oil Demand Monitor for a good recap of key oil demand indicators around the world. Airline traffic continues to pick up, especially in Europe as coronavirus restrictions continue to be eased back. China international air travel remains low as restrictions continue with elevated covid-19 cases. International flights at London's Heathrow airport surpassed 5 million passengers in April, the first time since the pandemic began. The number of European flights steadily rises higher, with total flights now 14% below 2019 levels compared to the deficit of 37% in late January when cases peaked across the continent. The global number of seats offered by airlines on scheduled planes was at 90.7 million seats for the week ended May 9, 17% below the equivalent week in 2019. There was a 2% increase in global flights offered with small improvements in China's domestic market. The collapse in Russian commercial flying, plus the ongoing drop in air traffic in China, is slowing the recovery in global demand for jet fuel. Indian demand for all oil products, diesel and gasoline in April was slightly above the equivalent month in 2019 according to government data. Higher pump prices are preventing further gains in demand for now as Jet fuel remains down 19% from 2 years ago. Estimated gasoline demand in the U.S. was about 12% below the 2019 level for the week ended May 6, the UK continues to

see demand below 2019 as has been the trend for many months with the exception of two spurts of panic buying. European cities showed the strongest level of congestion in a long while according to the data collected from TomTom. London, Berlin and Rome all showed higher congestion than the average for that time of the week back in 2019, by 14%, 9% and 2%, respectively. The volume of traffic using toll roads in Spain last month was down only about 3% from the equivalent period of 2019, while the March reading was down 11%. Road congestion in Chinese cities dropped last week, during the Labor Day holiday. The decline was much more pronounced in Beijing where the drop resembled the dip when lockdown measures were implemented. Industry consultant 0ilChem expects gasoline consumption in China to rise ~7% in May as lockdown measures are likely to ease, encouraging drivers to make more short trips. Refinery Utilization at US refineries was up 3.9% YoY with US GoM and US East refineries up 5.6% and 12% YoY, respectively. Our Supplemental Documents package includes the Bloomberg Oil Demand Monitor.

Figure 33: Total European Flights



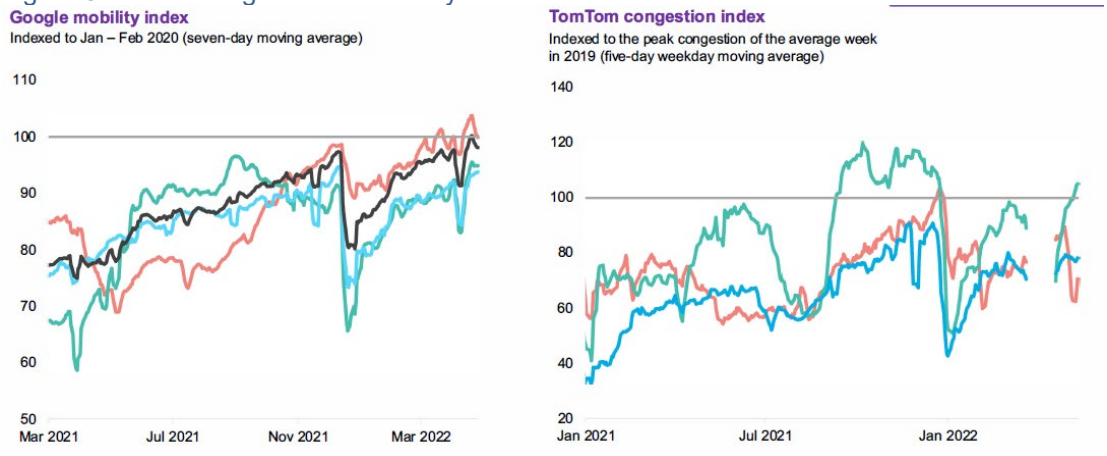
Source: Bloomberg

Oil – BNEF, China driving activity returning to normal outside Beijing and Shanghai

BNEF Road Traffic Indicators

It looks like most cities in China are seeing increasing mobility indicators except for Beigjing and Shanghai. No surprise given Shanghai still has lockdowns and, as noted below, Beijing may not have lockdowns but authorities are suggesting people stay at home. As a results, China congestion levels in all cities, excluding Beijing and Shanghai inched upwards after the Labor Day holidays last week, implying a return to normal outside of the highly concentrated cities where Covid cases were the worst.Our Supplemental Documents package includes excerpts from the BloombergNEF Global Road Traffic Indicators report.

Figure 34: Bloomberg Tracked Mobility Indexe's



Source: BloombergNEF

Shanghai and Beijing on Covid

Oil – Reduced Shanghai restrictions, but tougher Beijing restrictions for Covid

The last day has seen both good news (Shanghai) and bad news (Beijing) on China's Covid restrictions. (i) Earlier this morning, we tweeted [LINK] on the relaxation of Shanghai restrictions. Global Times reported [LINK] "*Shanghai planned to restart business and services activities in phases from Monday, with shopping centers, supermarkets, pharmacies, wet markets, catering and hairdressing services to resume offline operation in an orderly manner, Shanghai city officials said on Sunday, while vowing to stabilize the development expectation of foreign companies in Shanghai."* It's hard to believe, it's been almost two months for Shanghai. (ii) Earlier today, we also tweeted [LINK] on last night's Global Times report [LINK] "*Beijing's Fangshan district, home to 1.3 million people, will strictly implement work-from-home measures for all local residents, suspending all bus, subway and car hailing services, after health officials uncovered at least eight cluster infections related to a bank, a railway construction company, a bus station and restaurants in the city that has added to the uncertainty of the already complex epidemic situation. Beijing reported 40 new infections in the past 24 hours, including three detected during mass community level nucleic acid testing. Since April 22, a total of 1,015 COVID-19 patients have been received by designated hospitals in the capital, Xu Hejian, spokesperson for the Beijing Municipal Government, said at Saturday's press conference*." (iii) Beijing's Thursday suggestion. On Thursday, we tweeted [LINK] "*Beijing says no lockdown, but "suggests" people stay in their home for next 3 days. Will keep mobility low in Beijing. Beijing "suggests" is like when western politicians "ask" higher income people to pay a little more in taxes. #OOTT*." On Thursday, Global Times reported "*Beijing refutes rumors of lockdown, reassures of adequate food supplies amid hoarding"* [LINK] and "*Amid claims circulating that Beijing would be locked down, which led to local residents flooding supermarkets to hoard food, Beijing officials on Thursday clarified that these are just rumors, but local residents are suggested to stay at home and take nucleic acid testing in the following three days as a bid to curb transmission in communities as early as possible."* How can you not chuckle at what Beijing "suggested" to their citizens as if it's only a suggestion.

Oil – India only 5% below pre-Covid domestic air travel

India air traffic - 5% vs pre-Covid

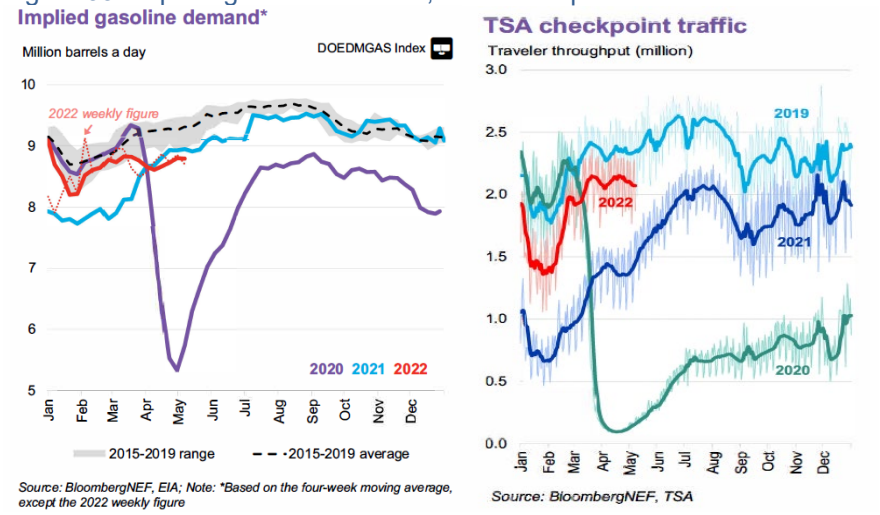
We will have to watch how high jet fuel prices impact the return of air travel. But so far, India continues to see a recovery in air travel and is just below pre-Covid levels. On Wednesday, BW Business World reported [LINK] that domestic air carriers in India have logged an 83% growth YoY in April at 10.5 million passengers. This comes as Covid-19 cases decline around the world and leaves the gap from 2019 levels at just 5% when Indian air crafts carried approximately 11 million passengers. Domestic operators also noted that the rising aviation turbine fuel would be an ongoing issue stemming from the Russia/Ukraine conflict which continues to evolve as a major threat to the global recovery process. For April 2022, the average daily departures were at around 2,726, notably higher than the average daily departures of around 2,000 in the same month a year earlier and higher compared to around 2,588 in March 2022, the average number of passengers per flight during the previous month of April was at 128, against that of 133 passengers per flight in March 2022 and lower than the average of 135 passengers per flight in April 2019. A resurgence of Covid-19 cases still poses a risk as the sector head of the ICRA stated *"Though recovery in passenger traffic is expected to be relatively fast-paced in FY2023, given the near normalcy situation seen in domestic airline operations, overhang of any further Covid wave looms on the sector."*

Oil – Is US showing signs of demand response from high petroleum products prices?

US oil demand indicators

One of our favorite BloombergNEF reports is the U.S. Oil Indicators Weekly and this week's report showed a reversal of their prior weekly views on the resilience of US driving and air travel to higher prices. On Friday, we tweeted [LINK] *"Looks like #PetroleumProducts price response in US. "#Gasoline demand has reversed course with 4-week moving average falling for the 1st time in 3 weeks" "jet fuel demand is beginning to look a bit shaky". Thx @BloombergNEF Danny Adkins. #OOTT".* BNEF had a couple of key messages. "*Gasoline demand has reversed course, with the four-week moving average falling for the first time in three weeks; inventories continued to fall, now dipping below the five-year average."* And "*Jet fuel demand is beginning to look a bit shaky. Airport activity is showing signs of faltering and demand figures are stalling amid typical seasonal growth*." Our Supplemental Documents package includes excerpts from the BloombergNEF report.

Figure 35: Implied gasoline demand, TSA checkpoint traffic



Source: BloombergNEF

Oil – Gasoline prices are headed substantially higher in July, says Goldman's Jeff Curie

Gasoline prices headed way up

It doesn't look like Biden will get his wish for lower gasoline prices ahead of the mid-terms if Goldman Sachs call is right. On Monday, Goldman's Global Head of Commodities Jeff Currie was on CNBC Squawk Box [LINK] and warns that he sees US gasoline prices going "*substantially higher*". When we saw the interview, we tweeted [LINK] "*Buckle up! Where will US #Gasoline prices be in July asks @JoeSquawk? "substantially higher from here" & "let's not forget the macro backdrop for paying for these higher prices is much stronger than what we have seen historically" says #GoldmanSach Jeff Currie. #OOTT".* Our tweet included a transcript we made of Currie's key comments. It was interesting as Squawk Box's Joe Kernen also asked "*do you think we'll see 6, $7 gas, will we have European style prices this summer?"* Currie starts his response "Yeah, yeah" then concludes his comment ""*And that's, as you probably talked about in your discussion around diesel fuel, you know the capacity to produce these fuels is also significantly curtailed. And think about this, if you have those really high margins for refined products right now, the refineries are shut down for maintenance. As they come out of this maintenance period again, in that July time period, their pull on crude supplies is going to be significant. And then it goes back to that whole underinvestment theme that you brought up earlier. The revenge of the old economy. We haven't, you know, invested enough in oil production capacity, refining capacity. All of the system used to deliver these fuels at a time demand is probably going to be off the charts as you point out."* Our Supplemental Documents package includes the transcript we made of Currie's comments.

Oil & Natural Gas – CAOEC raises wells drilled forecast 6,902, +6.9% Nov 2021 forecast

CAOEC 2022 forecast

The CAOC updated its drilling activity forecast for 2022 on May 10 [LINK] and increased their wells drilled forecast from their original forecast from Nov 2021. The revised forecast projects wells drilled at 6,902 on the year- an increase of 445 from the original forecast (6,457). Rigs are expected to average 170 in 2022, up from 159 and total jobs are expected to increase

2,484 from the original forecast of 34,925. The number of wells drilled was expected to be higher through the year but was hampered in Q1 due to permit issues in BC due to the Blueberry First Nations treaty rights challenge, but CAOEC expects that to wind down through the remainder of the year. The CAOEC warns on risks – "*Unfortunately, labour shortages will be a drag on industry activity through the remainder of 2022. . The industry is also monitoring supply chain challenges in China and around the world that could impact the availability of steel casing. The forecast fully accounts for these headwinds."* We recognize industry associations don't like to be confrontational to the federal government but we still wish they would be more direct. Rather the CAOEC writes "*War, supply chain challenges, and surging inflation are waking up millions of people in Canada and around the world to the importance of stable, affordable, and responsibly-produced energy. Canada can meet those needs with our best-in-class energy," says CAOEC President and CEO, Mark A. Scholz. "Now is the time for Canada to rise up to the challenge and produce more oil and natural gas. Infrastructure projects are crucial to help us increase export capacity and meet demands now and for decades ahead."* Our Supplemental Documents package includes the CAOEC announcement.

Oil & Natural Gas – Updated EIA Libya country brief

EIA's country brief on Libya

We continue to recommend adding the EIA's country analysis briefs to reference libraries as good quick references, in this case its new EIA country executive summary [LINK] on Libya. Unfortunately for Libya, the inability to carry out the planned Dec 2021 elections have led to oil supply interruptions. Regardless, the EIA brief is an excellent recap of Libya. Libya was the seventh-largest crude oil producer in OPEC and the third-largest total petroleum liquids producer in Africa in 2021. However, despite holding 39% of Africa's proved oil reserves, political conflicts and militia attacks on hydrocarbon infrastructure have limited investments in the country's oil and natural gas sectors since 2011. In 2021, oil revenues accounted for an estimated 98% of Libya's total government revenues. Net oil export revenues totaled $23 billion in 2019, slightly higher than 2018 totals, as a result of the country's rise in oil export volumes since 2016. 93% of Libya's 40 mbb proved oil reserves are located in the onshore Sirte Basin in the northeast and Murzuq Basin in the southwest, which also make up most of the country's oil production capacity. Libya produces mostly high-quality light, sweet crude oil grades, with a maximum crude oil capacity of 1.3 mmb/d which is 0.4mmb less than the country's pre-conflict capacity. Severe disruptions in 2020 forced Libya's crude oil production to fall significantly from 1.1 million b/d in 2019 to a record-low 365,000 b/d in 2020. In October 2020, a ceasefire agreement was reached, and Libya's national oil company lifted its force majeure on the coastal ports. Libya's national oil company (NOC) plans to bolster oil production to 2.1 million b/d by 2025, with plans to develop new projects, rehabilitate damaged fields, and increase power supply to the fields. Despite the numerous challenges to maintaining oil production, the NOC did bring online a few small fields since 2020, including the Sinawin field (0.01 mmb/d oil) and the Tahara field (2.2 bcf/y natural gas). Libya's petroleum and other liquids consumption remained slightly above 200,000 b/d each year after 2015 and was 220,000 b/d in 2021. Libya has five refineries with a combined nameplate crude oil distillation capacity of 0.380 mmb/d, however, damage from the conflicts has caused a significant drop in utilization. The NOC is constructing a 30,000 b/d refinery in southwestern Libya near the Sharara oil field, and will be the first refinery to serve southern Libya. Libya exported nearly 350,000 b/d of crude oil and condensates in 2020, down from about 1.1 million b/d from 2019, but recovered back to 0.35 mmb/d in 2021. Libya mostly exports their

crude to European countries, though they have diversified their oil over the past few years with Asia and the Middle East receiving greater shares of total shipments. Libya is a net importer of petroleum products as a result of its low operational refining capacity. At the end of 2021, Libya had proved natural gas reserves of 53 tcf, the fifth-largest in Africa. Libya's dry natural gas production fell in 2020 to 438 Bcf from 500 Bcf in 2019, though they plan to increase natural gas production by reducing natural gas flaring and developing new fields to help meet Europe's growing natural gas demand. Additional NOC plans include increasing natural gas production onshore fields with Eni, expecting to produce a maximum of 277 Bcf/y and 42,000 b/d of condensates. Libya's natural gas consumption totaled 271 Bcf in 2019, or about half of domestic production. Libya vented or flared approximately 180 Bcf in 2019, ranking seventh highest in the world. Our Supplemental Documents package includes the EIA country brief.

Oil & Natural Gas – Updated EIA UK country brief

EIA's country brief on the UK

The new EIA country executive summary [LINK] on the UK highlighted the state of the country's imports and exports. Petroleum and other liquids production was at 934,000 b/d in 2021, down from the peak of 3.0 mmb/d in 1999. They became a net importer of crude in 2005 and have continued to be through 2022. The economic slowdown in 2020 significantly affected the transportation sector, which accounts for about 80% of total domestic petroleum product supplied in the UK, which dropped 25%. In 2021, UK crude oil imports grew by 2% after declining by 21% in 2020. Similarly, imports of petroleum products increased by 5% in 2021 after falling by 25% in 2020. However, the UK exported 17% less crude oil and 2% less petroleum products than in 2020. In terms of sector organization, The UK government regulates the oil, natural gas, and carbon storage industries through the Oil and Gas Authority (OGA). The UK has 2,000 mbb of proved crude oil reserves, 20% lower than at the end of 2020. In 2021, UK crude oil production decreased by 15% to 0.793 mmb/d. The UK's extensive network of pipelines carries oil extracted from North Sea fields to coastal terminals in Scotland and northern England, and The UK had 1.2 mmb/d of refining capacity at the end of 2020. The UK exports 0.6 mmb/d, 73% of which goes to the Netherlands and other EU countries. UK refiners imported 0.723 mmb/d in 2021, mostly from Norway, the US and Libya. The UK is a net exporter of motor gasoline and fuel oil, but significant volumes of diesel and jet fuels are imported. Diesel imports from Russia represented 34% of total imports, and 20% from the Netherlands. Following a 23% decline in 2020, UK consumption of refined petroleum products increased by 5% to 1.3 mmb/d in 2021. In 2021, demand for jet fuel, which dropped by 60% to 0.107 mmb/d in 2020 because of tight air travel restrictions during the pandemic, remained well below pre-COVID levels at 0.101 mmb/d. The UK has been a net importer of natural gas since 2004 and has three large-scale operational LNG terminals with total import capacity of 1.8 tcf per year, and plans to increase its import capacity by 0.183 tcf with the expansion of the Isle of Grain Terminal. In 2020, demand for natural gas in the residential sector, which accounted for 41% of UK consumption of natural gas, increased by 2% and demand for natural gas in the industrial sector in 2020, which accounted for 12% of total consumption, decreased by 8%. UK held an estimated 4.6 Tcf of proved natural gas reserves as of January 2022, a 27% decrease from January 2021. Domestic natural gas production accounted for 48% of total natural gas supply in 2020, with 987 bcf from offshore fields and 394 bcf from dry fields. Our Supplemental Documents package includes the EIA country brief.

Energy Transition – Wells Fargo "*Economics of the BEV … really just don't work*"

BEV economics "*really just don't work*"

On Thursday, Wells Fargo analyst Colin Langan was on CNBC's Power Lunch to discuss his negative call on EVs. His call was simple – the costs of key raw materials for EVs has spiked (up about 50% YoY), sees no way for EVs to get anywhere near cost parity to ICE for at least another 10 years, and the economics "*really just don't work*". We tweeted [LINK] ""*cost parity between a BEV & an ICE at least another 10 years out" "economics of the BEV, which are, particularly that nickel based chemistry that everyone is moving towards, really just doesn't work" #WellsFargo's Colin Langan to @KellyCNBC. #Oil is needed for longer. #OOTT".* Our tweet included a transcript we made of his key comments on CNBC [LINK]. At 0:29 min mark, Langan says "… *the most shocking thing, I mean Tesla is a pretty well known car, but the raw material costs have actually spiked much more than we were expecting. So if you go back to 2021, you're talking about a $112 per kilowatt hour battery that is now about $168 according to those experts. That really puts cost parity between a BEV and an ICE at least another 10 years out*". And at 1:25 min mark, Langan says "… *so what we did is we dug into the raw material supply chain to really understand whether that is going to stay sustainably high. if its' just a temporary blip. And what I thought was very concerning, if you go out to 2030, six of the seven key raw materials – copper, nickel, lithium. All will be very tight on supply at that point. And so it's really hard to see an opportunity for these to sustainably correct downward. And that really is the big challenge because the economics of the BEV, which are particularly, that nickel based chemistry that everyone is moving towards, really just doesn't work. We've talked about the $100 per kilowatt hour target, sort of the point that people think is parity. You know the raw materials of that battery went from 62 to 119. So it's just impossible unless costs come down. and the problem is that it doesn't look like they're going to*."

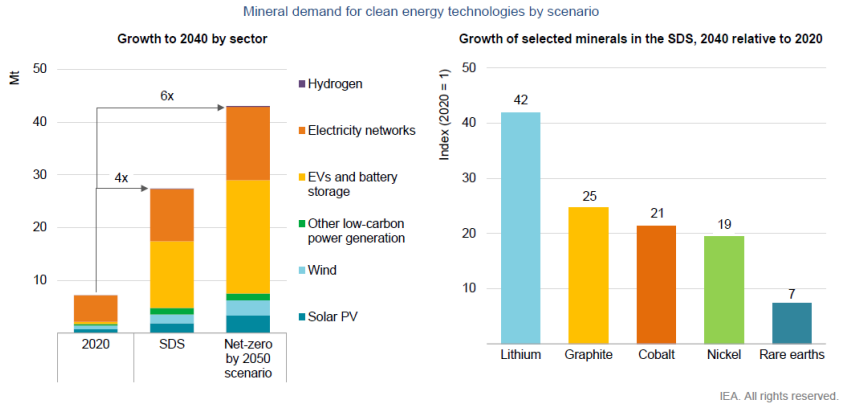
A year ago, IEA warned on the critical minerals risk for the energy transition

No one should be surprised by the Wells Fargo call. We did not see the Wells Fargo research report, rather relied on the analyst's public CNBC comments. On CNBC, Wells Fargo called them "*key raw materials*" but he is speaking about what others have put in the basket called "*critical minerals*". Critical minerals risk a huge risk to EVs and the energy transition in total. Our May 9, 2021 Energy Tidbits highlighted the IEA"s May 5 major report "*The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions*" [LINK] that warned the world is behind on where it needs to be on critical minerals for the energy transition. 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*". Our Supplemental Documents package includes excerpts from the IEA Executive Summary from the report.

Figure 36: Critical Minerals demand

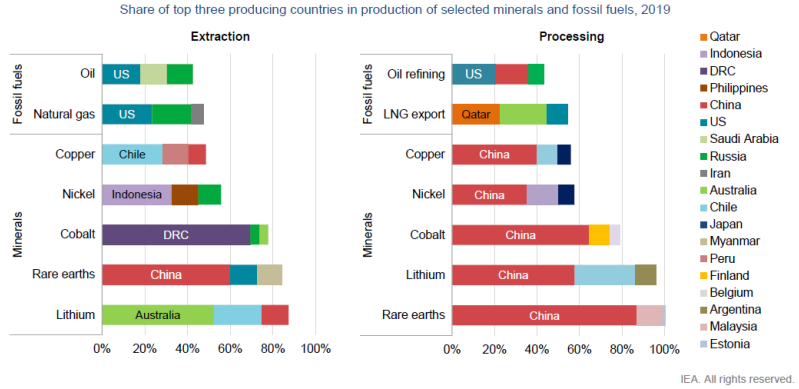
Mineral demand for clean energy technologies would rise by at least four times by 2040 to meet climate goals, with particularly high growth for EV-related minerals



Source: IEA

Figure 37: 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

A year ago, IEA suggested strategic stockpiles of critical minerals

Our May 9, 2021 Energy Tidbits highlighting of the IEA's May 5, 2021 report "*The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions*" [LINK] also reminded us of the reason why the IEA was initially formed. At that time, we wrote that 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 38: Gas station line up during Arab Oil Embargo 1973-74

Source: Time

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

Some countries are already moving to set up strategic stockpiles of critical minerals. In our Aug 8, 2021 Energy Tidbits, we wrote "*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."

Energy Transition – Wonder what the full cycle math is on high speed rail vs car

China high speed rail at 350 km/hr

Yesterday, we spent an hour or so (unsuccessfully) looking for some sort of full cycle math for energy cost/benefit analysis of high speed rail vs cars in developed countries. It is something we will look at France and other European countries to see if there is math. Yesterday, we saw the Global Times (China) report [LINK] on how the high speed rail of the Beijing to Wuhan section will be increased to >350 km per hour, which will reduce the minimum rail time for the ~1,330 km to 3 hrs 48 min. This is the longest section for high speed rail travel in China. The Beijing-Wuhan section opened in 2012 and had been operating at 300 to 310 km/hr. The reason why we remember travelling Montreal to Toronto on rail when flights weren't available, it was good for work but it was still longer even accounting for car trips downtown and wait times at the airport. However, even today, the Via Rail time for the ~500 km trip is ~5 hrs so call it 100 km/hr travel time.

Water – Non-functional grass in Las Vegas to be pulled out by 2027

Where lawns are outlawed

We have to believe the cable news stories on the Colorado River must have been the reason for the reports over the last two weeks on legislation passed in 2021 by Nevada that will require "non-functional" turf in non-single family residences to be removed by 2027. One example was the New York Times May 3 report "*Where Lawns Are Outlawed (and Dug Up, and Carted Away*" [LINK]. We downloaded the Southern Nevada Water Authority's "*2021 Water Resource Plan*" [LINK], which explained "*AB356 (Non-Functional Turf Removal). The Nevada Legislature passed AB356 in 2021, restricting the use of Colorado River water to irrigate non-functional turf in non-single family residential applications by the end of 2026. The new law targets turf found in streetscapes, medians, parking lots, traffic circles and other areas not used for recreation and play. There are approximately 5,000 acres of non-functional turf in the SNWA member agency service area. The legislation targets approximately 3,900 acres for removal. Conversion of non-functional turf associated with AB356 implementation will reduce consumptive water demands by an estimated 10 percent, saving about 9.5 billion gallons of water annually (or 29,000 AFY).*" The report is a good resource for background on the Colorado River water situation and outlook affecting Nevada.

Capital Markets – India bans wheat exports

India bans wheat exports

There may have been a small pause in global food prices in April off the all-time record high in March, but it's hard to see an pause being anything but temporary. Last week's (May 8, 2022) Energy Tidbits highlighted the UN's FAO Food Price Index [LINK] titled "*FAO Food Price Index retreated slightly in April from the all-time high registered in March.*" Yesterday morning, we tweeted [LINK] "*#Inflation #FoodCrisis. India bans #Wheat exports unless*

existing irrevocable LC or India approves foreign govt request due to food security. With RUS/UKR exports already hit, any further hit to wheat exports should hit global wheat price. Thx @TopExports". Our tweet included the link [LINK] to India's May 13 Amendment to the Export Policy of Wheat that announced the wheat export ban. The amendment noted that the export shall be allowed if there is a Irrevocable Letter of Credit prior to May 13 for a shipment or India government approves another government's request to meet their food security. Our tweet also included the top 20 world wheat exporters. India is only #18 and is only a small fraction 3% of #1 Russia and 7% of #Ukraine wheat exports. But the reality is that with Russia and Ukraine exports being hit, every bit off the wheat export market will impact global prices. Below is the World's Top Exports ranking of top wheat exporting countries.

Figure 39: Wheat Exports by Country

RANK	EXPORTER	EXPORTED WHEAT (US$)	2019-20
1.	Russia	$7,918,294,000	+23.7%
2.	United States	$6,322,649,000	+0.7%
3.	Canada	$6,301,250,000	+17%
4.	France	$4,540,749,000	+4.3%
5.	Ukraine	$3,595,472,000	-1.7%
6.	Australia	$2,712,736,000	+7.9%
7.	Argentina	$2,117,434,000	-13.6%
8.	Germany	$2,103,668,000	+67.7%
9.	Kazakhstan	$1,137,140,000	+13.4%
10.	Poland	$1,045,944,000	+142.4%
11.	Romania	$948,815,000	-25.4%
12.	Lithuania	$910,697,000	+34.9%
13.	Bulgaria	$699,212,000	-26.2%
14.	Latvia	$649,231,000	+35.2%
15.	Hungary	$630,557,000	+20.3%
16.	Czech Republic	$522,919,000	+37%
17.	Slovakia	$281,852,000	+46%
18.	India	$243,067,000	+350%
19.	Sweden	$238,720,000	+90.8%
20.	Austria	$191,300,000	-3.1%

Source: World's Top Exports

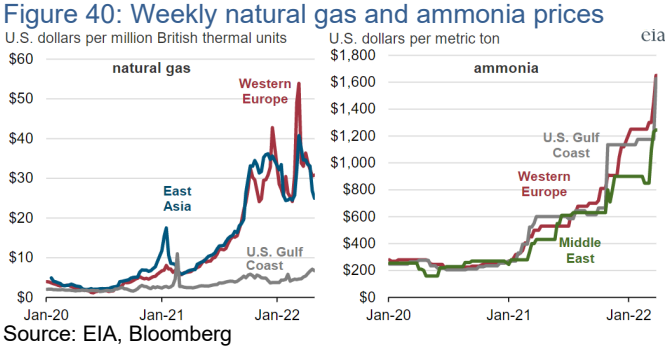
Capital Markets – US fertilizer prices up huge, linked more to Europe gas prices

We remain concerned on how the impact of fertilizer prices and availability will still be a big hurt to food prices in 2022 and 2023. On Tuesday, the EIA posted its blog [LINK] noting that the US price of ammonia, which is the primary source of nitrogen fertilizer, has risen by a factor of six in the past two years. Ammonia prices generally follow natural gas prices because ammonia is produced primarily from natural gas. The global ammonia market is highly interconnected, so the U.S. price of ammonia closely follows international ammonia prices rather than only U.S. natural gas prices. Therefore, the sharp rise in international gas

Fertilizer prices up huge

prices in the past 12 months has pulled ammonia prices up. In 2021, the United States produced 816 bcf of ammonia, behind China (2,257 bcf) and Russia (913 bcf). Despite efforts to increase domestic production, they are still net importers of ammonia. This price discrepancy is important because nearly 90% of the ammonia consumed in the United States in 2021 was for fertilizer production in 2022, and this fertilizer is essential for producing major crops such as corn and wheat. In the US, nitrogen-based fertilizer is used in increase yields for nearly all corn acreage. Our Supplemental Documents package includes the EIA blog.

Figure 40: Weekly natural gas and ammonia prices



Source: EIA, Bloomberg

Capital Markets – Will Trudeau put in a wealth tax now? or maybe wait for an election?

A Canada wealth tax?

No one would put it past him, but we are still in the camp that doesn't expect Trudeau to put in a wealth tax, or certainly not at this time. If anything, we think his timing would be ahead of an election. However, the National Post reported [LINK] "*Jay Goldberg: Ottawa looking at a wealth tax to pay for soaring spending A wealth tax would inflict economic pain on rich Canadians, poor Canadians and everyone in between."* "*Prime Minister Justin Trudeau has been eyeing a wealth tax to pay for his government's spending spree. Heavily redacted documents obtained by the Canadian Taxpayers Federation under an access to information request show the prime minister asked for analysis of a $60-billion wealth tax. With deficits looming to the far horizon, it must be a tempting cash grab."* And "*According to the report, which was written at the request of a Liberal member of parliament, a one-time three per cent tax on people with more than $10 million in assets, coupled with a one-time five per cent tax on people with more than $20 million in assets, would rake in $60 billion."* It would be interesting as $10 million would seem to be a low level for this "wealth" tax. And it would probably include a lot of oil executives that would have loaded up on options in 2020 and seem stocks prices up multiples. The National Post report notes how France quickly backtracked on a wealth tax. Our Supplemental Documents package includes the National Post report.

Capital Markets – Americans relocating to Sun Belt states with low tax rates

Top 10 moving destinations 2021

There is no doubt weather is a huge factor, but we also lower taxes are another key factor driving Americans moves within the US. Last Monday, Penske Truck Rental released their Top 10 Moving Destinations list [LINK], and it couldn't have been a busier year for people on the move. 20% more Americans moved in 2021 compared to 2020, and the new remote work opportunities enabled an estimated 14-23 million Americans to relocate, according to the U.S. Census Bureau. Most of the moves were into the Sun Belt region, including four major metro areas of Texas: Austin, Dallas, San Antonio, and Houston, which topped the list.

Below is a table displaying the top 10 states and their associated state income tax rate and combined state and local sales tax rate. There is a clear correlation between low tax rates and high inbound migration in these states, especially for income tax rates. Below is a graphic depicting income taxation in the US.

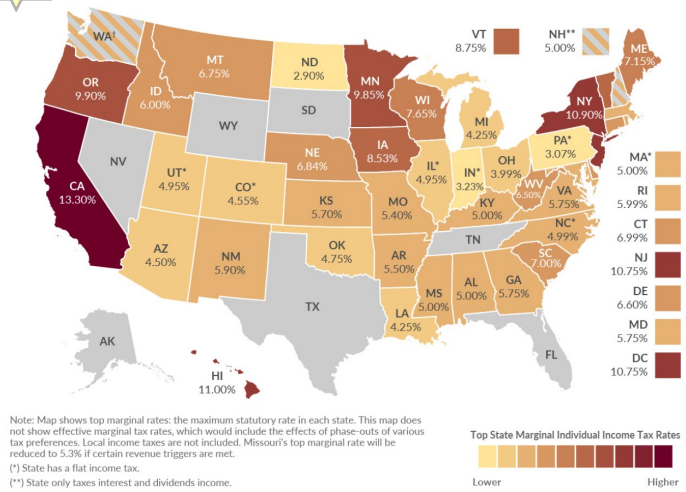
Figure 41: US Top 10 moving destinations in 2021

Rank	Location	State Income Tax	Sales Tax
#1	Houston, TX	0.00%	8.20%
#2	Las Vegas, NV	0.00%	8.23%
#3	Phoenix, AZ	4.50%	8.40%
#4	Charlotte, NC	4.99%	6.98%
#5	Denver, CO	4.55%	7.77%
#6	San Antonio, TX	0.00%	8.20%
#7	Dallas, TX	0.00%	8.20%
#8	Orlando, FL	0.00%	7.01%
#9	Austin, TX	0.00%	8.20%
#10	Chicago, IL	4.95%	8.81%
Avg		**1.90%**	**8.00%**

*Sales tax includes State and Local

Source: Penske, SAF Group

Figure 42: State Individual Income Tax Rates and Brackets 2022



Source: Tax Foundation

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.

It's down to the Oilers & hopefully the Flames for Canada's Stanley Cup hopes

It looked like we would have three Canadian teams get thru the first round of the playoffs, but unfortunately, the Toronto Maple Leafs lost game 7 to the Tampa Bay Lightning. But the good news is that Edmonton Oilers beat the LA Kings in game 7 last night so they are now through. And tonight, the Calgary Flames are at home in game 7 vs the Dallas Stars. It's been almost 30 years since a Canadian team has won the Stanley Cup, when the Montreal Canadiens beat the Wayne Gretzky led LA Kings in 1993.

Another candidate for UK worst football club fan food

We look at UK press most days, in great part to read about their Premier League "football" coverage. In their football coverage, The Sun will often post football stories about the rip-offs in snack food at Premier League games. On Monday, The Sun posted "*SKY-HIGH FRIES 'You have to sell a kidney to pay' – Fuming Arsenal fans 'embarrassed' by price of chips at The Emirates*". [LINK]. Note in the picture below, you can get a sense of the portion size by the left thumb on the side of the picture. The cost is approx. US$15.50 or Cdn $20. One of The Sun's comments was "*While a fourth summed up the dish as: "Potatoes, fake cheese, some spring onion and and some burnt onion pieces with a 0.001p dash of chilli sauce*."

Figure 43: Chilli Cheese Chips at Arsenal costs US$15.50, Cdn $20

Source: The Sun

Calgary's official bird is the Black Capped Chickadee

We didn't realize that Calgary was going to name an official bird, but all the local media reported this week that Calgary's official bird is now the Black Capped Chickadee. There apparently was a choice of five birds with 36,677 Calgarians voting with the results being Black-capped chickadee #1 with 16,114 votes (44%); Black-billed magpie #2 with 8,933 (24%); Northern flicker #3 with 6,076 (17%); Blue jay with 2,938 (8%) and Red-breasted nuthatch with 2,616 (7%). Calgary was named a bird-friendly city by Nature Canada and a requirement to maintain such honor is to have an official bird.

Figure 44: Black Capped Chickadee

Source: e-bird