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Energy Tidbits

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Baker Hughes' Hugely Bullish LNG Forecast Calls For 24 Bcf/d of New LNG FIDS by 2025 to Meet 2030 Required Capacity

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. Baker Hughes LNG forecast is hugely bullish, need 24 bcf/d of new FIDs by 2025 to meet required 2030 capacity (Click Here)
2. Halliburton sees a "*perpetual threat of undersupply*" for oil from the pivot to short-cycle barrels. (Click Here)
3. Liberty Oilfield Available sees "*frac capacity is nearing full utilization*" (Click Here)
4. EIA's forecast of US shale/tight natural gas for May is less bcf/d than Feb/March (Click Here)
5. UK Treasury gives okay to open Gazprombank accounts to pay for Russian natural gas. (Click Here)
6. Please note we had an early news cut off of 9pm MT last night due to travel this morning.
7. 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.
8. For new readers to our Energy Tidbits and our blogs, you will need to sign up at our blog sign up to receive future Energy Tidbits memos. The sign up is available at [LINK].

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Natural Gas – Natural gas injection of +53 bcf, storage now -428 bcf YoY deficit

The natural gas winter withdraw season is over and it was a good winter for gas storge despite it being warmer than normal winter as there was a widening of the YoY storage deficit from -282 bcf YoY at Oct 31 to current -428 bcf YoY. The EIA reported a 53 bcf build (vs 38 bcf build expectations) for the Apr 15 week, which was more than the 5-yr average build of 42 bcf, and above last year's injection of 38 bcf. Storage is 1.450 tcf as of Apr 15, decreasing the YoY deficit to -428 bcf, from 399 bcf last week and storage is 303 bcf below the 5-year average vs 438 bcf below last week. Below is the EIA's storage table from its Weekly Natural Gas Storage Report [LINK].

YoY storage at -428 bcf YoY deficit

Figure 1: US Natural Gas Storage

	Stocks billion cubic feet (Bcf)				Historical Comparisons: Year ago (04/15/21)		Historical Comparisons: 5-year average (2017-21)	
Region	04/15/22	04/08/22	net change	implied flow	Bcf	% change	Bcf	% change
East	238	229	9	9	323	-26.3	290	-17.9
Midwest	304	293	11	11	420	-27.6	376	-19.1
Mountain	89	90	-1	-1	118	-24.6	102	-12.7
Pacific	169	169	0	0	209	-19.1	190	-11.1
South Central	650	617	33	33	808	-19.6	785	-17.2
Salt	201	186	15	15	255	-21.2	249	-19.3
Nonsalt	449	431	18	18	553	-18.8	536	-16.2
Total	**1,450**	**1,397**	**53**	**53**	**1,878**	**-22.8**	**1,742**	**-16.8**

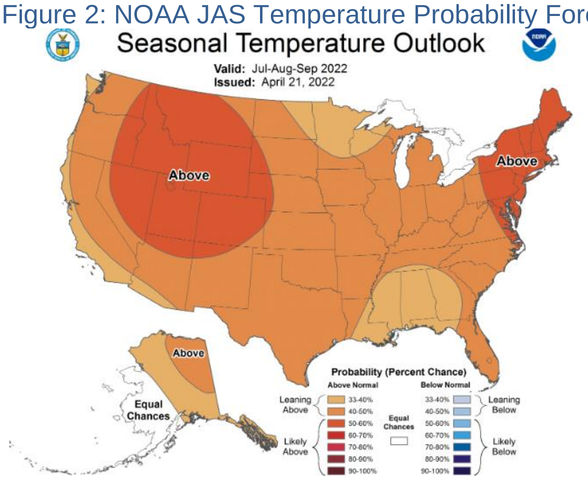
Source: EIA

Natural Gas – NOAA's early look to summer is for another hot summer

On Thursday, NOAA posted its monthly update to its seasonal temperature forecasts [LINK]. The forecast included small changes, but it's still calls for another hot summer with the JAS forecasted temperatures expected to be well above average temperatures ie. a supportive outlook for natural gas prices. Below are the temperature probability maps for and for JAS. We have added last years average temperature map across US states for the summer which ranked the 3rd hottest in the last 127 years.

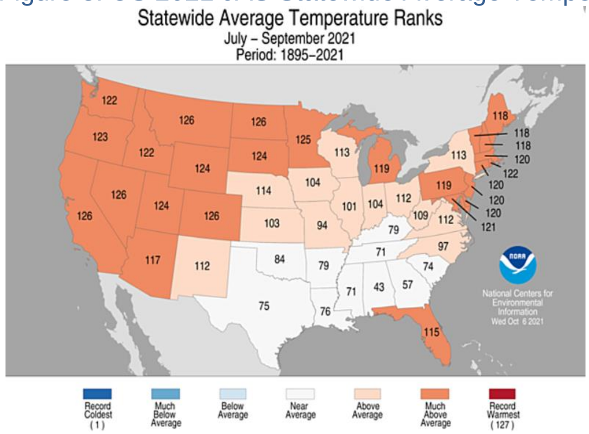
NOAA forecasts hot summer

Figure 2: NOAA JAS Temperature Probability Forecast



Source: NOAA

Figure 3: US 2021 JAS Statewide Average Temperature Map



Source: NOAA

Shale/tight gas seems stuck

Natural Gas – US shale/tight natural gas production is stuck/down a bit since Feb

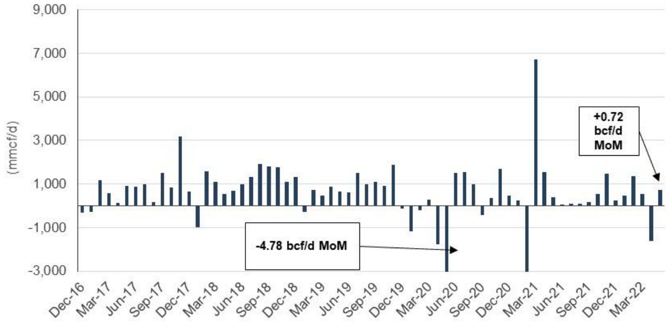
We recognize that the headlines on the EIA's updated Drilling Productivity Report April 2022 [LINK], was that shale/tight natural gas is forecast up MoM in May. That is true. But our concern is that shale/tight natural gas is stuck since Feb and actually down a little bit. The DPR is the EIA's forecast for oil and natural gas production from the major shale/tight oil and gas basins for the current month (in this case April) and the next month (in this case May). (i) The headline was that the EIA forecasts May at 90.826 bcf/d which is +0.154 bcf/d MoM (would have been +1.5 bcf/d MoM if not for the -2.221 bcf/d revision to April) and up +3.942bcf/d from the Nov/19 peak of 86.884 bcf/d. (ii) However, the other reason we do a table is so we can see the numbers. And May at 90.826 bf/d is actually slightly down from Feb at 91.187 bcf/d and March at 91.732 bcf/d. (iii) The below table shows that, when compared to Feb/March, of the three big gas plays, only the Haynesville is up a bit, Appalachia is flat, and Permian is down a little bit. (iv) Remember US shale/tight gas is ~90% of total US natural gas production. So, we will want to watch if total US natural gas production is stuck for April/May. Below is our running table showing the EIA DPR data for the shale/tight gas plays, and the MoM changes in major shale/tight natural gas production. Our Supplemental Documents package includes the EIA DPR.

Figure 4: MoM Change – Major Shale/Tight Natural Gas Production

mmcf/d	Apr	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	May YoY	May less Apr
Anadarko	6,082	5,992	5,919	6,129	6,192	6,139	6,107	6,203	6,321	6,278	6,341	6,286	6,118	6,103	111	-15
Appalachia	34,685	34,619	34,586	34,364	34,366	34,783	34,838	35,601	34,825	34,988	35,716	36,298	35,443	35,640	1,021	197
Bakken	2,851	2,787	2,732	2,798	3,005	3,003	3,004	3,012	3,071	3,150	3,137	3,079	2,932	2,959	172	27
Eagle Ford	5,660	5,610	5,589	5,842	5,971	5,990	5,994	5,950	6,012	6,118	6,176	6,288	6,298	6,408	798	110
Haynesville	12,699	12,826	12,942	13,337	13,413	13,415	13,514	13,778	13,874	14,019	14,291	14,425	14,527	14,772	1,946	245
Niobrara	4,967	4,922	4,882	4,960	5,032	5,090	5,183	5,308	5,329	5,339	5,293	5,196	5,254	5,257	335	3
Permian	17,499	17,543	17,602	18,030	17,947	18,700	19,027	19,298	19,573	19,936	20,233	20,160	19,533	19,687	2,144	154
Total	84,444	84,300	84,252	85,460	85,926	87,120	87,667	89,150	89,005	89,828	91,187	91,732	90,105	90,826	6,526	721

Source: EIA, SAF

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



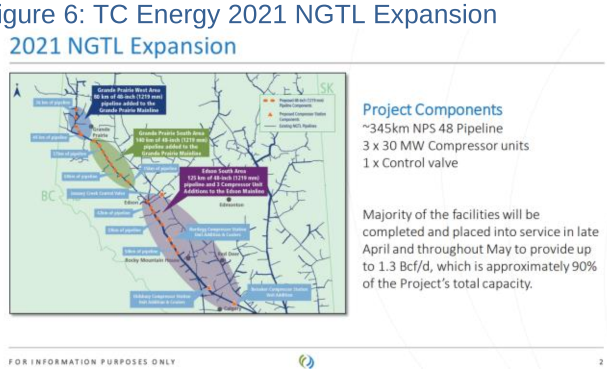
Source: EIA, SAF

Natural Gas –~0.9 bcf/d of new NGTL capacity adds delayed for ~5 months

Delays in new NGTL capacity addition

We were a little surprised that TC Energy's advising of delays for new NGTL gas capacity expansion in 2022 was going to be late didn't get any real attention. As soon as we saw the NGTL customer notice [LINK] on Tuesday night, we tweeted [LINK] "*Expect #AECO price hit as unexpected #NatGas will be forced into storage this summer. @TCEnergy likely case delays in USJR capacity addition in-service for ~0.9 bcf/d, most for ~5 mths, small % to early Q1/23. Thx @GregSheaWorkBee for flagging. #OOTT".* NGTL was supposed to put into service 1.3 bcf/d of new capacity in the Upstream James River Receipt area (USJR) in west-central and north-west part of Alberta ie. the primary growth area for Alberta natural gas. Producers were working on the assumption that 1.3 bcf/d was to be put into service in late April and throughout May. However, on Tuesday, NGLT advised to delays of most of this new capacity. Our tweet noted that ~0.9 bcf/d of this new capacity was being delayed, most of it for ~5 months and a small % delayed until early Q1/23. This delay did not impact current production takeaway, but it was being counted on by producers for the capacity to move the primary natural gas growth areas (ie. for the Montney) into the NGTL Alberta gas system and down to export markets. So even though it didn't impact current takeaway, we expected AECO to be hit and, as our SAF commodities partners suggested, the basis differential within Alberta would also be hit. On Wed, HH was down 1.6% to US$6.94, whereas AECO, reflecting these delays, was down 17.6% to $5.39. Our Supplemental Documents package includes the NGTL notice.

Figure 6: TC Energy 2021 NGTL Expansion



Source: TC Energy NGTL

Hugely bullish LNG view by Baker Hughes

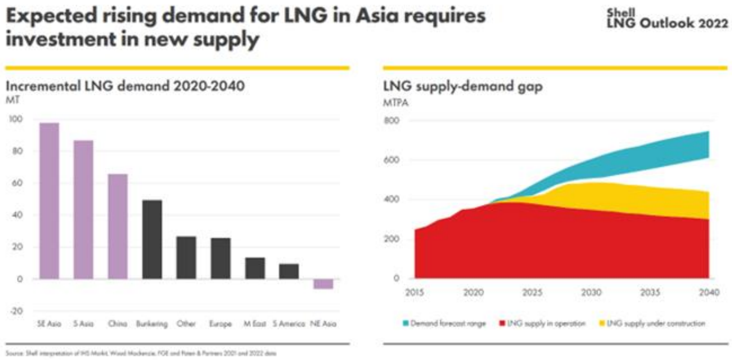
Natural Gas – Hugely bullish LNG capacity demand forecast by Baker Hughes

There is no other way to describe it but to say Baker Hughes has a hugely bullish view for LNG and the need for massive LNG export FIDs over the next 3 years. We were on the Bloomberg terminal and missed the first 10 minutes of the Baker Hughes Q1 call on Wednesday morning, but jumped on the call as soon as we saw the headlines coming across the terminal on CEO Simonelli's opening comments. We had to tweet [LINK] "*LNG growth is hugely more than expectations. On @business "Baker Hughes CEO Says Global LNG Capacity Will Exceed 800 MTPA By End Of This Decade". That's 105 bcf/d capacity. Recall Shell's LNG Outlook 2022 on 02/21 forecast #LNG demand of ~92 bcf/d in 2040. #LNGCanada #OOTT."* Fortunately, we had recorded the call so was able to make a quick transcript and attach it to our followup tweet [LINK] "*Must read transcript 👇. Huge #LNG growth fcast by #BakerHughes @simonelli_l. LNG capacity in 2030 >105 bcfd less current cap 61 bcfd less under construction 20 bcfd = FIDs needed by 2025 of 24 bcfd. Surely Shell will FID #LNGCanada Phase 2? Big plus to Cdn #NatGas. #OOTT".* Baker Hughes sees the need for 24 bcf/d of LNG export FIDs by 2025 to meet their forecast. Here is the transcript we created of Simonelli's comments/ *At 2:45 min mark. Simonelli "Recent geopolitical events have severely constrained what was already a tight global natural gas market and have refocused the world on the importance of energy security, diversity, and reliability. As the world reacts to the rapid changes in the global commodity market, governments are prioritizing natural gas and LNG as a key transition and destination fuel. We continue to see a focus on prioritizing LNG from stable, lower cost markets, and locations that can provide cleaner LNG. Given the current LNG price environment and the quickly changing dynamics, we believe that global LNG capacity will likely exceed 800 MTPA by the end of this decade to meet growing demand forecasts. This compares to the current global installed base of 460 MTPA and projects under construction totalling almost 150 MTPA. In order to be operational by 2030, this additional capacity will need to reach FID by around 2025*." Note Simonelli is referencing capacity and not LNG demand. A higher level of capacity is always needed to meet certain levels of demand. This is a hugely bullish LNG forecast from the company that is likely the most plugged into what is happening on LNG export project planning and discussions. Our tweet highlighted LNG Canada Phase 2, which as readers know we have been bullish on the potential for Phase 2 FID in 2022 and still expect to see it happen.

Baker Hughes LNG forecast for 2030 is about the same as Shell's for 2040

Our tweets tried to put in perspective the Baker Hughes LNG forecast. Baker Hughes forecasts LNG capacity needed of 105 bcf/d by 2030. That is capacity, so it probably links to a LNG demand forecast of 90 to 95 bcf/d assuming an average across the board throughput of 85-90%. Shell had its LNG Outlook 2022 on Feb 21, 2022 and forecast LNG demand of approx. 92 bcf/d but for 2040. So Baker Hughes has about the same LNG demand forecast, but 10 years earlier than Shell. Below is Shell's LNG forecast.

Figure 7: Shell LNG Outlook 2022 – Feb 21, 2022



Source: Shell

Natural Gas – More Asian long term LNG deals: Kogas 18 year LNG deal with BP

Another Asian long-term LNG deal

We continue to believe the best data point to show the sooner and larger LNG supply gap is the continued push by Asian LNG buyers to lock up long term LNG supply. We have been calling the LNG supply gap for a year now but we think it's even sooner and larger now with the western push to move away from Russian pipeline natural gas and pulling of capital from Russian LNG under construction LNG projects. On Friday, we saw another Asian LNG buyers lock up long term LNG supply from North American LNG projects. Platts reported BP inked a 18-year sale and purchase agreement (SPA) with Korea's Kogas on its 2nd LNG deal since we began highlighting them in Jul 2021. Platts reported that 70-80% of Kogas LNG purchases are based on long tern contracts, with the rest being spot purchases.The timing of the new deal comes as existing long term purchase agreements are set to expire with Malaysia's MLNG II, Yemen's YLNG, Brunels BLNG and Indonesia.. The deliveries will come from BP's Freeport LNG facility in Texas with 0.2 bcf/d of LNG indexed to the Henry Hub on a free board basis; deliveries are expected to begin in 2025. S&P Global Platts reported on the deal *""The supply deal based on LNG produced in the US including Freeport LNG would help Kogas reduce its reliance on the Middle East and diversify supply sources*. *"The deal also allows Kogas to reduce import volumes and change unloading ports, which will help the state utility cope with possible changes in demand and supply.*" Kogas's previous deal in 2021 was with Qatar gas and they expect to lose 0.92 bcf/d by 2026. A 20-year deal with Rasgas LNG will expire in 2032 driiving the need to secure more LNG agreements. Kogas currently has nine long-term contracts -- 9.02 million mt/ year in three contracts from Qatar, 4 million mt/year from Oman, 3.5 million mt/year from Australia, 2 million mt/year from Malaysia, 0.7 million mt/year from Indonesia, 1.5 million mt/year from Russia's Sakhalin, and 2.8 million mt/year from the US Sabin Pass. Our Supplemental Documents package includes the Platts reporting of the Kogas/BP deal. [LINK].

Asian LNG buyers abruptly switched to long term LNG deals last July

Our April 10, 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 July blog.

There have been 6.64 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 6.64 bcf/d of long-term LNG deals since July 1, 2021. 83% 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 8: 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
Total Asian LNG Buyers New Long Term Contracts Since Jul/21				**5.75**			
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
Total Non-Asian LNG Buyers New Long Term Contracts Since Jul/21				**0.89**			
Total New Long Term LNG Contracts since Jul/21				**6.64**			
*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: Bloomberg, Company Reports							
Prepared by SAF Group https://safgroup.ca/news-insights/							

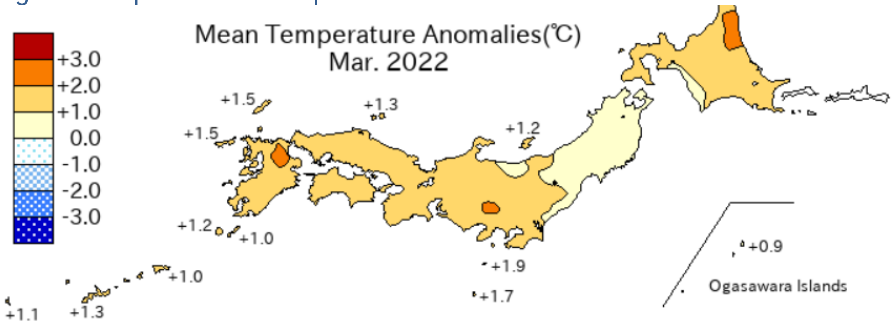
Source: Company reports, SAF Group

Natural Gas – Temperatures above average through March in Japan

Warm Mar in Japan

Japan experienced above normal average temperatures for March, which means there wasn't any significant weather related natural gas demand for the last real winter month. On Thursday, the Japan Meteorological Agency posted its recap of March weather [LINK] and their mean temperature anomalies map (below) shows it was below average temperatures month thru most of Japan. Their recap also noted how it got colder throughout the month of March, "*Monthly mean temperatures were significantly above normal in western Japan and Okinawa/Amami, and above normal in northern and eastern Japan, because cold-air advection was weaker than normal and warm-air inflow was stronger than normal.*"

Figure 9: Japan Mean Temperature Anomalies March 2022



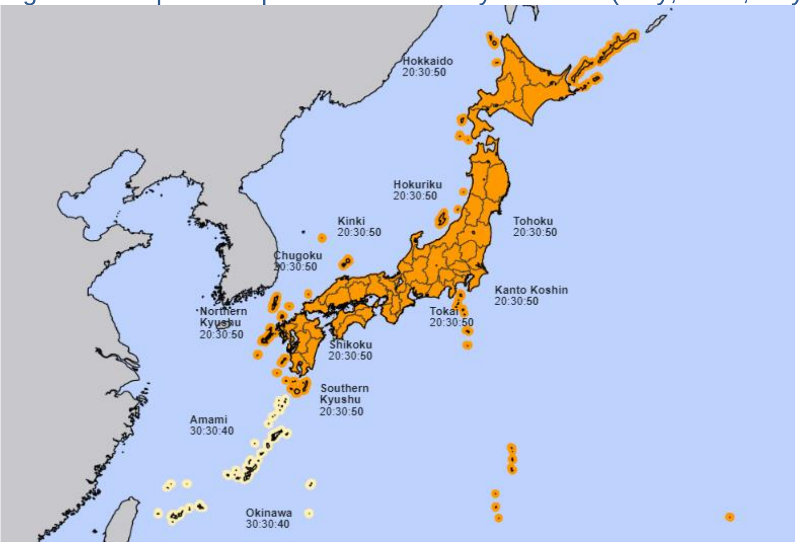
Source: Japan Meteorological Agency

Natural Gas – A warm start to summer being forecasted for Japan

The Japan Meteorological Agency posts its weekly temperature probability forecast for the next four weeks on Thursday mornings [LINK] and also included their outlook for May/June/July temperaures ie. the start to summer. JMA forecasts that Japan will start to experience warmer temperatures during the initial summer months, which should be supportive for Japan's LNG demand. Below is the JMA summer 2022 forecast for May-Jul which expects above normal temperatures fin the three-month period.

Japan forecasted warm start to summer

Figure 10: Japan Temperature Probability Forecast (May, June, July)



Source: Japan Meteorological Agency

Natural Gas – Japan LNG Imports in Mar -8.7% YoY to 10.07 bcf/d

Earlier, we noted that warmer March temperatures helped with builds to LNG stocks. It meant that there wasn't a weather demand urgency in March. At the same time, March had very high LNG prices that also led to Japan minimizing LNG imports in March. On Wednesday, Japan's Ministry of Finance posted its import data for Jan [LINK]. The MOF reported Japan's Mar LNG imports were 10.07 bcf/d, down 8.7% YoY and -17.84% MoM. Japan's Jan LNG

Japan Jan LNG imports -8.7% YoY

imports were the lowest Mar in a decade. The high LNG prices also showed up as Japan favored other cheaper fuel alternatives in Feb with a note that Japan is price sensitive as evidenced by thermal coal imports +15% YoY and Oil +5.4% YoY. Petroleum products imports were -43.2% YoY, so similarly impacted as LNG with high prices. Below is our table that tracks Japan LNG import data.

Figure 11: Japan Monthly LNG Imports

bcf/d	2015	2016	2017	2018	2019	2020	2021	21/20	2022	22/21
Jan	13.06	11.22	12.85	12.79	11.69	11.63	12.48	7.3%	10.51	-15.8%
Feb	13.26	12.30	13.36	14.23	12.61	10.99	13.84	25.9%	12.19	-11.9%
Mar	12.60	12.62	12.61	12.28	11.30	11.16	11.04	-1.1%	10.07	-8.7%
Apr	10.56	10.21	10.52	8.97	9.00	8.31	7.96	-4.3%		
May	8.91	8.55	9.66	9.92	8.62	7.09	7.67	8.1%		
June	10.61	10.02	9.90	8.88	8.32	8.42	9.13	8.5%		
July	10.77	10.19	10.19	10.55	10.56	9.35	9.58	2.5%		
Aug	10.93	11.96	11.24	11.73	9.45	9.04	9.75	7.8%		
Sept	11.06	10.67	9.31	10.04	10.30	10.41	8.66	-16.8%		
Oct	9.38	9.73	9.50	10.12	9.75	9.20	7.17	-22.1%		
Nov	10.71	12.07	10.26	10.15	10.03	9.63	9.38	-2.6%		
Dec	12.51	11.69	12.31	11.23	10.54	11.96	10.89	-8.9%		

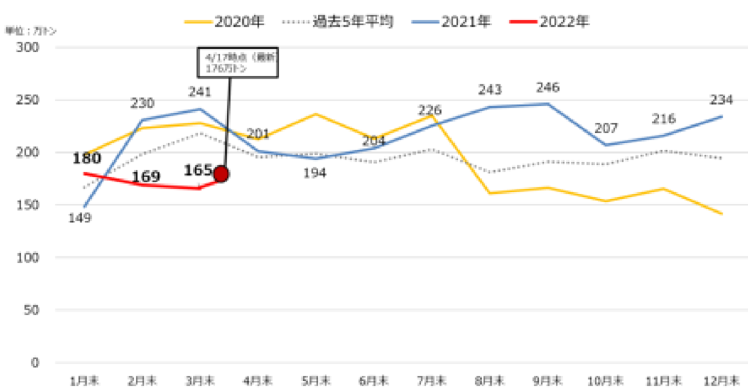
Source: Japan Ministry of Finance

Natural Gas – Japan's LNG stocks -13% YoY

Japan LNG stocks -13% YoY

The beginning of April has seen above average temperatures, which helped support a modest build in inventories despite the earthquake that knocked off coal fired plants. Japan's METI weekly LNG stocks data was released on Wednesday morning local time [LINK]. LNG stocks at April 17 were ~85 bcf, which is -13% YoY and -7% vs the 4-yr average. Below is the LNG stocks graph from the METI weekly report.

Figure 12: Japan's LNG Stocks



Source: METI

Natural Gas – China's natural gas imports down 13.9% MoM in Mar

China LNG and pipeline imports

We have been warning that China's LNG imports will be less in 2022 for two key reasons - higher pipeline imports via Gazprom's Power of Siberia and increasing domestic natural gas production and higher LNG prices. Plus, it was mild in March. China customs posted

China's March natural gas imports split by pipelines vs LNG. The customs data is at [LINK]. The customs data reports China Mar LNG imports of 7.17 bcf/d, -17.9% YoY and -13.95% MoM. And China natural gas pipeline imports of 5.2 bcf/d, +9.1% YoY and -18.2% MoM. Below are our running tables of China LNG and pipeline imports.

Figure 13: China LNG Imports

bcf/d	2016	2018	2019	19/18	2020	20/19	2021	21/20	2022	21/22
Jan	3.84	8.03	10.20	27.1%	10.31	1.1%	13.15	27.6%	12.10	-8.0%
Feb	3.10	6.84	7.46	9.1%	7.26	-2.7%	9.52	31.1%	8.34	-12.4%
Mar	2.60	5.04	6.28	24.8%	6.49	3.3%	8.74	34.6%	7.17	-17.9%
Apr	3.00	5.43	7.27	34.0%	8.16	12.3%	10.77	32.0%		
May	2.20	6.39	6.87	7.6%	8.10	18.0%	10.89	34.4%		
June	3.51	6.31	7.25	14.9%	9.27	27.8%	10.76	16.1%		
July	2.46	6.40	7.56	18.1%	7.79	3.1%	8.78	12.7%		
Aug	3.54	7.26	8.04	10.8%	9.23	14.8%	10.30	11.6%		
Sept	4.05	7.00	8.16	16.7%	9.17	12.4%	10.81	17.8%		
Oct	2.85	7.13	4.09	-42.6%	7.78	90.0%	9.56	22.9%		
Nov	4.26	9.59	10.42	8.7%	10.58	1.6%	11.05	4.4%		
Dec	5.80	9.75	10.01	2.7%	11.76	17.5%	11.82	0.5%		
Full Year Avg.	3.43	7.10	7.80	9.9%	8.83	13.1%	10.51	19.1%	9.20	-12.5%

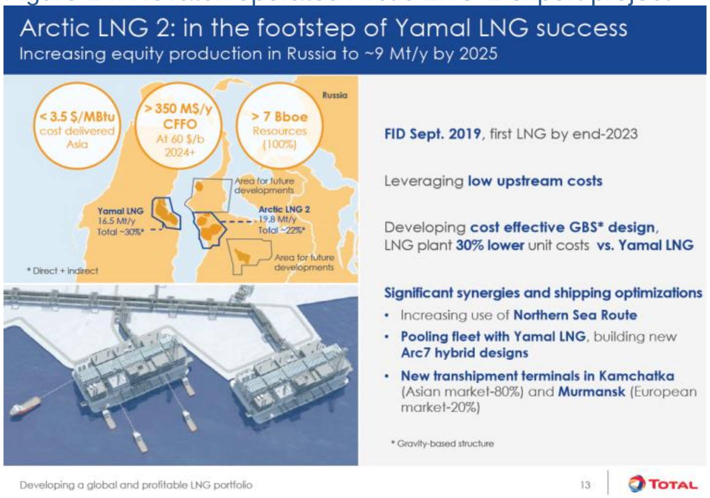
Source: Bloomberg, China Customs

Natural Gas – Have to believe Novatek's 2,6 bcf/d Arctic LNG-2 is in limbo

Novatek's 2.6 bcf/d Arctic LNG-2

No one knows what is the status of Novatek's 2.6 bcf/d Arctic LNG-2 export project, but it's got to be at big risk of some sort of indefinite delay. The question will be how long will of a delay will it be? The first of three phases had previously expected to have first LNG by end-2023. On Friday, Novatek announced [LINK] that it "*has decided not to publish its financial statements and not to hold a teleconference with investors on the first quarter 2022 financial results*." That can't be a good sign, especially for the status of its big Arctic LNG-2 export project. The question is Arctic LNG-2 is a 3 phase LNG export project for a total of 2.6 bcf/d capacity. Novatek's website posted "*At the end of 2021, the overall progress for Arctic LNG 2 is estimated at 59%, the first train is roughly 78% completed. As of December 31, 2021, about 57% of the total Project's planned capital expenditures had already been financed. At the end of 2021, we have drilled a total of 56 production wells. Essentially, we have drilled and completed enough wells to start production at GBS #1.*" The partners in Arctic LNG-2 are Novatek 60%, TotalEnergies 10%, CNPC 10%, CNOOC 10%, and Mitsui/Jogmec 10%. Below is the TotalEnergies Sept 2019 slide on Arctic LNG-2. Our Supplemental Documents package includes the Novatek Arctic LNG-2 info posted on their website as of Friday afternoon. [LINK]

Figure 14: Novatek operated Arctic LNG-2 export project



Source: TotalEnergies

Natural Gas – UK giving in to Putin's natural gas payment process via Gazprombank

UK okays Gazprombank payments

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*." Our Supplemental Documents package includes the UK Treasury licence.

Looks like Novak was telling the truth that buyers were going to pay this way

The UK Treasury licence looks like it validated the TASS Monday reporting that buyers already agreed to pay per this Gazprombank payment process. On Tuesday, we tweeted [LINK] "*Will Russia cut off #NatGas to European customers if May payments for April deliveries aren't in rubles? TASS "Novak said that several buyers of Russian gas had already agreed to convert payment into rubles and Moscow are waiting for a decision from other importers". #OOTT #LNG*." TASS had reported

[LINK] "*It has already been said that payment will follow sometime in May for those deliveries that began after the presidential decree [of the Russian Federation Vladimir Putin on a new gas payment scheme] came into force," Peskov recalled. Therefore, in his opinion, "now there is still some time." At the end of last week, Novak said that several buyers of Russian gas had already agreed to convert payments into rubles, and Moscow was waiting for a decision from other importers. He stressed that the transfer of payments for gas into the currency of the Russian Federation is caused by the desire to receive a 100% guarantee of payment, and for buyers the conditions remain as comfortable as possible."* Our Supplemental Documents package includes the TASS report.

Natural Gas – Italy puts limit on air conditioning temperature to reduce consumption

Italy caps AC temperature for the summer

The good news for Europe is that we are seeing some of the politicians trying to do things today to best protect them from a natural gas outage next winter. It's not just trying to get storage full earlier and look for alternative (and more expensive) natural gas supply than from Russia pipeline natural gas. It also includes trying to reduce natural gas consumption. On Wednesday, The Guardian reported [LINK] that the Italian government will prohibit schools and other public buildings from setting their air conditioning to any setting lower than 25C (77F) beginning next month as natural gas prices have been exacerbated by the war in Ukraine. The rationing initiative has been called "*operation thermostat*". The rules will come into effect on May 1 and be held in place until Mar 31, 2023. There has been no disclosure how this regulation will be enforced. The minister for public administration noted that this will incur big energy savings as 57% of a public building's energy costs is derived from temperature control.

Expect hotels to do something similar given the high natural gas prices

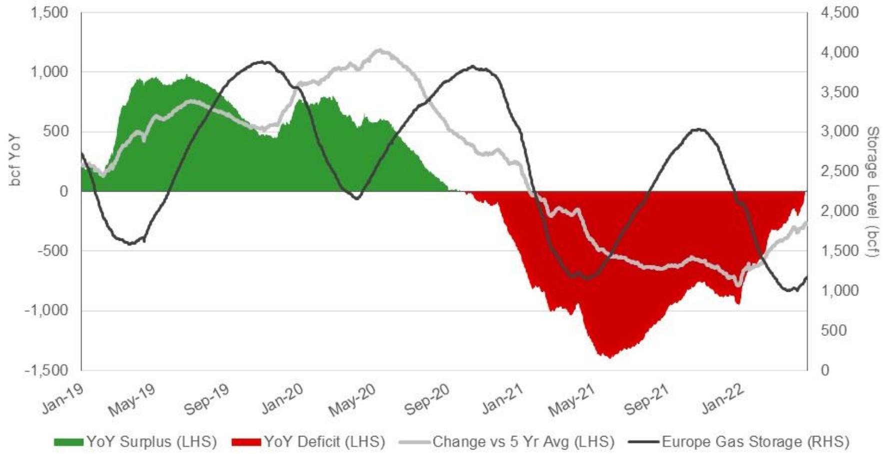
The rules aren't forcing private business, like hotels, to set their thermostats lower but, we will be surprised if hotels don't follow the lead given the extremely high natural gas prices. And they can link the practice to operation thermostat. And the reality is that Italian hotels, at least in Rome, have done this before. I was in Rome in June 2003, which was the start of the heat wave that summer. Staying at a well regarded hotel behind the Pantheon. It was 40c and we were relieved that our hotel had air conditioning, even if it was set a little higher. But the surprise came that night, when we discovered, the hotel turned off the air conditioning from midnight to 8am a a way to save on electricity. We expect hotels will follow the 25C limit, which means tourists better hope it's not a hot, humid summer.

Natural Gas – Europe storage YoY surplus is now only 0.91% ie. 30.1% full vs 29.19%

Europe storage now 26.84% full

Europe avoided natural gas shortages this winter with the combination of warmer weather, strong wind generation and a massive increase in US LNG imports. As a result, the YoY Europe storage gap continues to narrow since the start of the winter natural gas season. Europe gas storage started down 18.52% YoY and is now down to a YoY deficit of 0.91% ie basically flat YoY. Draws to European gas storage units ended this week with the second observed build. It was a small injection but signals the beginning of the injection season as Europe exits the heating season. The YoY deficit is narrowed but, even still, Europe inventories are at their lowest level at this time of the year in more than a decade. 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 Apr 20 is at 30.10%, which is +0.91% greater than last year levels of 29.19% and are -6.7% below the 5-year average of 36.8%. As winter draws come to an end we expect to see a decline in demand for LNG as less is used to heat homes as we enter the injection season. Below is our graph of Europe Gas Storage Level.

Figure 15: Europe Gas Storage Level



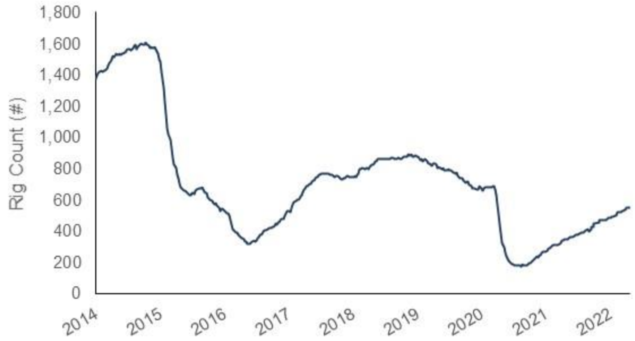
Source: Bloomberg
Prepared by SAF Group https://safgroup.ca/news-insights/

Oil – US oil rigs +1 WoW at 549 oil rigs at Apr 22

US oil rigs +1 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 +1 WoW at 549 oil rigs, with all major oil and gas basins up slightly. Oil rigs are +377 off the bottom of 172 in Aug14/2020 week. There were modest basin changes this week; Permian was flat at 333 rigs this week while Bakken was up +2 at 35 rigs after remaining flat last week. US oil rigs hit their 2020 peak at 683 on March 13 and have since fallen by 129 to 548 oil rigs (-12%). US gas rigs were +1 WoW though still higher than normal with increases in the Eagle Ford basin reflecting the heightened $4 HH. 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 +2 to 271 for the week ended April 22

Mark Rossano (C6 Capital Holdings) held his weekly US frac spread recap for the week ended April 22 on the Primary Vision network. YouTube video is at [LINK]. For the week ended April 22, US frac spreads at the high point in the week were +2 to 271. Appalachia came back up. Permian had a bit of a moving week, had a bit of small drop ie. repositioning and moving so will bounce back up. Overall, Rossano expects to see that steady move up to the 290 level. And then through May and into June should get to the 300 level, then some additional spreads in July

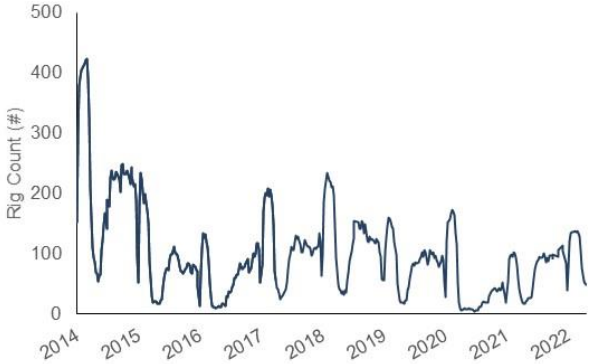
Frac spreads +2 to 271

Oil – Total Cdn rigs -2 to 101 total rigs, +46 rigs YoY

Total Cdn rigs were down -2 this week to 101 total rigs. Cdn oil rigs were -1 at 48 rigs. Cdn gas rigs were -1 at 53 gas rigs; attributed to the drilling season coming to an end; we expect declines will continue in the coming weeks but will not be as bad as in prior years. Total rigs are now +88 since the June 26, 2020 all-time low. Cdn drilling has recovered YoY, a year ago Cdn oil rigs were 17 and Cdn gas rigs were 38 for a total Cdn rigs of 55, meaning total Cdn rigs are +46 YoY and total rigs are +38 vs 2019.

Cdn rigs -2 WoW

Figure 17: Baker Hughes Total Canadian Oil Rigs



Source: Baker Hughes

Oil – US weekly oil production +0.100 mmb/d at 11.9 mmb/d

US oil production was up +0.100 this week at 11.9 mmb/d for the week ended Apr 15 after increasing for consecutive weeks. Lower 48 production drove total production and was up +0.100 mmb/d 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 +0.9 mmb/d from last year's production and is still down significantly at -1.2 mmb/d since the 2020 peak of 13.1 mmb/d on March 13. Absent weather impacts and 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.

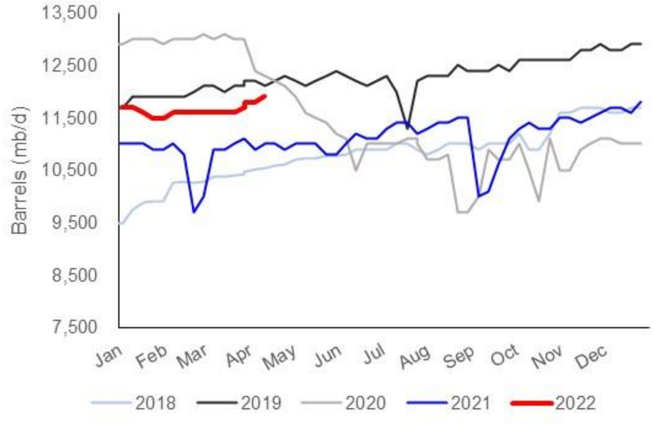
US oil production up WoW

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				

Source: EIA

Figure 19: US Weekly Oil Production



Source: EIA, SAF

Oil – North Dakota February oil production flat MoM

North Dakota oil production flat MoM

North Dakota oil production was basically flat from January to February. On Tuesday afternoon, the North Dakota Industrial Commission posted its Director's Cut, which includes February oil and natural gas production data [LINK]. The headline on the Feb numbers was that North Dakota Feb oil production was 1.089 mmb/d, which was basically flat from Jan 2022 production of 1.086 mmb/d. YoY production increased 0.5% from February 2022 production of 1.083 mmb/d. The NDIC reports that well completions were up significantly in February to 90, up from 75 in Jan and 65 in Dec. In theory, more wells completed should mean higher oil production in March. 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%	1,089,193	0.5%
Mar	1,025,690	1,162,134	1,391,760	1,430,107	1,108,906	-22.5%		
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 April oil production will be down MoM from blizzard last week

It looks like North Dakota April oil production will be down versus March oil production from the blizzard last week. This will mean that North Dakota natural gas production will also be impacted as almost all the natural gas is from associated gas from oil wells ie. if oil production is down, then natural gas production is down. We would also assume North Dakota crude by rail in April will also be impacted. . 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 "*Last week's blizzard caused North Dakota's daily oil output to drop by 25%, according to an estimate from state officials. The storm also resulted in at least one significant spill and fire in the oil fields. More winter weather expected this weekend could prolong the production slowdown, North Dakota Pipeline Authority Director Justin Kringstad said. The National Weather Service's Bismarck office forecasts rain and snow, with the most winter impacts in North Dakota's oil-producing regions, including the western third of the state and in the north central part.*" Our Supplemental Documents package includes the Bismarck Tribune report.

The EIA continues to show better Bakken growth versus NDIC

Our March 20, 2022 Energy Tidbits noted last month's North Dakota oil production data and how the EIA Drilling Productivity Report data shows better Bakken growth than the NDIC Director's Cut data. Last month, the EIA DPR estimated Bakken oil production was up MoM in Jan whereas the NDIC data had a 5% MoM decline. This month, there is a similar, but lesser variance, trend. The EIA DPR estimates Feb at 1.192 mmb/d, up from 1.184 mmb/d in Jan; while the NDIC reported Feb at 1.0892 mmb/d, up from 1.0886 in Jan We would expect North Dakota to have the more accurate data.

Oil – North Dakota crude by rail down MoM to 123,308 b/d in February

North Dakota CBR down in February

The average crude by rail exports from the Bakken were down significantly in February, for the consecutive month likely reflecting some impact of the frigid weather that had disrupted crude flows out of the Bakken. There is normally >100,000 b/d of Bakken crude by rail to the US West Coast including Washington state refineries. The North Dakota Pipeline Authority also posted its monthly update "*April 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 February was a low of 108,308 b/d and a high of 138,308 b/d for an average of ~123,308 b/d. This is down from January low of 114,707 b/d to high of 144,707 b/d for an average of ~129,707 b/d. Note that January's numbers were revised down 10,087 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 forecast US shale/tight oil for May is only up small since Feb

US shale/tight oil production

Earlier, we highlighted the EIA"s forecast for US shale/tight natural gas was basically a forecast of stuck or slight down shale/tight natural gas since Feb. The EIA Drilling Productivity Report Apr 2022 [LINK] forecast for US shale/tight oil is a little better than for natural gas but only slightly. The DPR is the EIA's forecast for production for the major shale/tight oil and gas basins for the current month (in this case Apr) and the next month (in this case May). (i) The headline from the report is that US shale/tight oil was +132,000 b/d

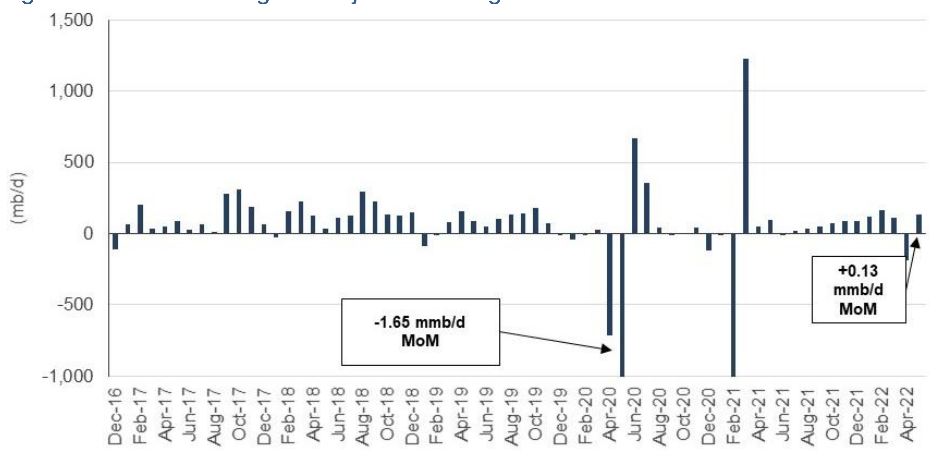
MoM to reach 8.649 mmb/d in May. That is true. (ii) However, as noted in the below table, the forecast for May of 8.649 mmb/d is only up slightly from 8.598 mmb/d in Feb. (iii) Compared to Feb/March, of the big oil shale/tight basins, the Permian is flat, the Bakken is flat, and only the Eagle Ford is up small. The Eagle Ford benefits from its higher natural gas ratio and the pull for natural gas for US LNG exports. (iv) Note that shale/tight oil is approx. ~70% of total US production, so whatever the trends are for shale/tight oil are normally the trends for US oil in total . Below is our table of running DPR estimates of shale/tight oil production and our graph of MoM changes in major shale/tight oil production. Our Supplemental Documents package includes the EIA DPR.

Figure 22: MoM Change – Major Shale/Tight Oil Production

Thousand b/d	Apr	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	May YoY	May less Apr
Anadarko	373	361	353	354	370	369	363	366	378	389	393	399	398	401	40	3
Appalachia	126	127	128	131	129	125	118	122	120	115	113	113	111	114	-13	3
Bakken	1,118	1,108	1,102	1,116	1,139	1,139	1,131	1,137	1,146	1,184	1,192	1,172	1,169	1,186	78	17
Eagle Ford	1,045	1,032	1,027	1,043	1,054	1,053	1,076	1,078	1,090	1,104	1,122	1,123	1,140	1,166	134	26
Haynesville	33	32	32	34	34	34	34	34	33	33	33	33	34	34	2	0
Niobrara	534	524	516	540	555	576	594	608	615	615	611	613	610	611	87	1
Permian	4,510	4,555	4,607	4,647	4,756	4,773	4,826	4,886	4,960	4,996	5,134	5,138	5,055	5,137	582	82
Total	7,739	7,738	7,765	7,865	8,037	8,069	8,142	8,231	8,342	8,436	8,598	8,591	8,517	8,649	911	132

Source: EIA Drilling Productivity Report

Figure 23: MoM Change – Major Shale/Tight Oil Production



Source: EIA Drilling Productivity Report

Oil – EIA DUC's worked down by 156 in February

DUCs continue to work down

The big risk to how much US oil production can grow in 2022 and 2023 is the need to increase rig counts to replenish the inventory of Drilled UnCompleted wells. The biggest problem in the past with the EIA's Drilling Productivity Report [LINK] estimate of Drilled UnCompleted wells was that the data had been constantly revised and sometimes significantly. However, the DUC estimates provide a clear picture of the trend since Aug 2020, which is that DUCs continue to be worked down. It's why there is the need for drilling rigs to pick up to replenish the DUC inventory if the US to have strong oil growth in 2022. (i) It is also important to remember that a portion of the DUCs will never be completed as there are drilled wells that don't look like they can justify the higher cost of completion. (ii) Drilled Uncompleted Wells are down another 111 MoM in March, meaning a total 4,601 DUCs were worked down since the Jun/20 peak of 8,874. The largest work downs are coming from the

Permian (-1,543 YoY) and Eagle Ford (-460 YoY). With DUCs being worked down so significantly we will need to see rig counts go up to replenish DUCs in the near future. (iii) Bakken DUCs. As per the NDPA presentation on April 22, 2021, they estimate there are only 395 economic DUCs at April 30. This is 268 DUCs or ~40% lower than the EIA estimate of 415 as of Mar. Bakken DUCs were worked down 240 since then and in 2021 DUCs have dropped ~23 per month. This means that at this rate, the Bakken has ~14 months of economic DUC inventory. Below is our running table of the EIA Drilling Productivity Report DUCs. Below is our running table of the EIA Drilling Productivity Report DUCs.

Figure 24: EIA - Estimated Drilled UnCompleted Wells

Drilled UnCompleted	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Mar YoY
Anadarko	932	921	901	880	863	856	838	824	812	799	787	773	758	753	740	-161
Appalachia	623	616	603	590	598	595	590	588	557	537	513	565	457	473	467	-136
Bakken	731	710	688	663	656	619	590	566	541	516	485	464	436	426	415	-273
Eagle Ford	1,152	1,135	1,102	1,071	1012	954	912	869	833	796	760	685	683	653	642	-460
Haynesville	375	389	387	385	392	399	402	406	396	392	386	372	369	371	383	-4
Niobrara	575	530	489	448	402	373	380	379	375	372	362	354	343	331	317	-172
Permian	2,988	2,955	2,852	2,731	2598	2,419	2,249	1,994	1,812	1,669	1,537	1,444	1,482	1,380	1,309	-1,543
Total	7,376	7,256	7,022	6,768	6,521	6,215	5,961	5,626	5,326	5,081	4,830	4,657	4,528	4,387	4,273	-2,749

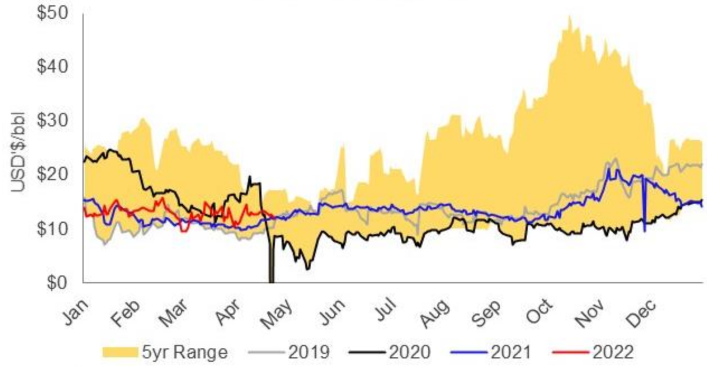
Source: EIA, SAF

Oil – Typical seasonal narrow WCS-WTI differentials continue in April

WCS-WTI differentials normally narrow in the spring

It continues to be another solid April for WCS prices with normal seasonally narrow WCS-WTI differentials. The setup continues to be strong for WCS (Western Canadian Select) heavy oil prices, which hit over $100 on Mar 2, peaking on Mar 8 at US $110.96, and this week closing at US $89.18 or a differential of $11.95. It just happens that a year ago, differentials were $11.90. In most years, WCS-WTI differentials narrow as US refineries tend to maximize production of asphalt ahead of the annual summer paving season. As is said in Canada, there are two seasons in Canada – winter and paving season. Below is graph showing WCS-WTI differentials that shows this normal seasonal trend of narrowing WCS-WTI differentials thru May.

Figure 25: WCS-WTI Differential



Source: Bloomberg

Expected to be a huge paving year in the US with infrastructure spending

It's less than 6 months to the mid-terms and the Democrats are expected to try to pull out all stops to avoid losing control of the House and Senate. And one area that is still looking to be a beneficiary is road repairs, especially with Pete Buttigieg as

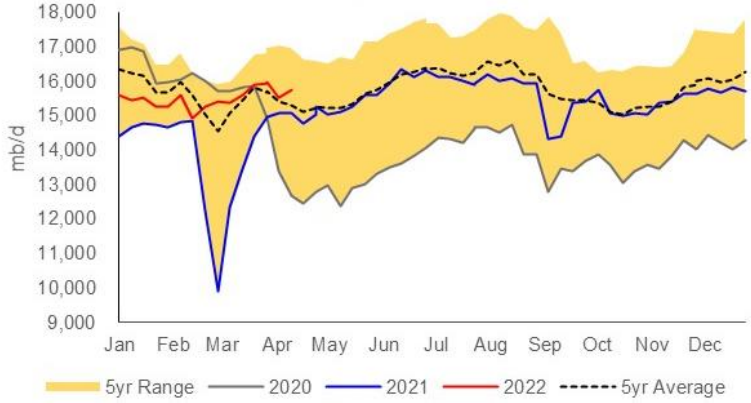
Transportation Secretary. We highlighted this theme two months ago as another support reason why WCS-WTI differentials would narrow into the spring. On Feb 20, we tweeted [LINK] "*Big increase in asphalt/paving should be positive to Cdn heavy oil. WCS-WTI diffs normally narrow as refiners move to maximize asphalt production ahead of paving season. note the normal seasonal narrowing below. Thx @katekelly* #OOTT." On Feb 19, the New York Times posted its story "*One of the Infrastructure Plan's Biggest Winners Is the Pavement You Drive On A range of special interests lobbied for infrastructure dollars. The asphalt industry may have been the most successful.*"[LINK]. The NYT wrote "*The strategy appears to have paid off. Within the $1 trillion of spending authorized by the infrastructure legislation that President Biden signed in November, the asphalt industry may ultimately receive the biggest share. And while roads were always likely to be a key focus of the legislation, the lobbying effort provided the industry a chance to promote what it cast as its environmental consciousness, making funding it more palatable to lawmakers who were concerned about road building fueling climate change. An outsize portion of the pavement spending under the infrastructure plan is expected to go to asphalt. An outsize portion of the pavement spending under the infrastructure plan is expected to go to asphalt. The infrastructure package allocates at least $350 billion over five years to highways and bridges, according to the Eno Center for Transportation, a nonprofit transportation think tank in Washington, compared with about $91 billion for mass transit. An additional $19 billion to the Transportation Department to fund major projects, like underwater vehicular tunnels or bridge replacements, could augment the pavement spending.*"

Oil – Refinery inputs +0.194 mmb/d WoW at 15.717 mmb/d

Refinery inputs up WoW

The EIA crude oil input to refinery data is for the week ended Apr 15. This week, the EIA reported crude oil inputs to refineries up 0.194 mmb/d this week to 15.717 mmb/d for the week ended Apr 15 and are +0.271 mmb/d YoY from last years February Freeze in the Permian. Refinery utilization was up at 91%, which is +6% YoY though is still below 5-year average utilization levels with some maintenance being tied to Cdn oil sands turnarounds. Total products supplied (i.e., demand) increased WoW, up 0.262 mmb/d to 19.033 mmb/d. Motor gasoline was up 0.131 mmb/d at 8.868 mmb/d from 8.736 mmb/d last week. Gasoline supplied, a proxy for demand, was up last week. Gasoline stockpiles are at their lowest levels with demand for gasoline at a 4-week high. The four-week average of production supplied decreased to 19.373 mmb/d, down from last year.

Figure 26: US Refinery Crude Oil Inputs (thousands b/d)



Source: EIA

Oil – US "net" oil imports down -2.249 mmb/d WoW at 1.567 mmb/d

US "NET" imports were down -2.249 mmb/d to 1.567 mmb/d for the Apr 15 week. US imports were down -0.158 mmb/d to 5.837 mmb/d. US exports were up +2.080 mmb/d to 4.270 mmb/d. The WoW increase in US oil imports was driven by US's Top 10 imports by country were down up by 0.526 mmb/d from Top 10. Some items to note on the by country data. (i) Canada was up this week by +0.312 mmb/d to 3.465 mmb/d, which is now ~0.1 mmb/d above the average levels in Jan/Feb of 2020. (ii) Saudi Arabia was down 73,000 b/d to 0.255 mmb/d this week. (iii) Colombia was up 0.283 mmb/d to 0.332 mmb/d. (iv) Ecuador was up +0.066 at 0.211 mmb/d. (v) Iraq was up 111,000 b/d to 266,000 b/d. (v) Venezuela remained at 0 due to US sanctions. (vi) Mexico was down by 275,000 b/d to 0.488 mmb/d.

US "net" oil imports down WoW

Figure 27: US Weekly Preliminary Oil Imports by Major Countries

(thousand b/d)	Feb 4/22	Feb 11/22	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	WoW
Canada	3,631	3,342	3,869	3,630	3,731	3,398	3,806	3,612	3,923	3,153	3,465	312
Saudi Arabia	383	250	358	520	701	562	534	333	573	328	255	-73
Venezuela	0	0	0	0	0	0	0	0	0	0	0	0
Mexico	958	510	768	497	412	645	641	731	619	763	488	-275
Colombia	258	234	332	144	71	279	72	284	216	49	332	283
Iraq	226	225	285	295	188	161	489	82	71	155	266	111
Ecuador	101	98	98	0	160	205	103	96	76	145	211	66
Nigeria	144	182	25	43	96	0	2	148	148	89	191	102
Kuwait	0	0	0	0	0	0	0	0	0	0	0	0
Angola	0	0	0	0	0	0	0	0	0	0	0	0
Top 10	5,701	4,841	5,735	5,129	5,359	5,250	5,647	5,286	5,626	4,682	5,208	526
Others	688	949	1,093	638	960	1,145	839	973	674	1,313	629	-684
Total US	6,389	5,790	6,828	5,767	6,319	6,395	6,486	6,259	6,300	5,995	5,837	-158

Source: EIA, SAF

Oil – Norway March oil production of 1.744 mmb/d, down +2.1% MoM

The Norwegian Petroleum Directorate released its March production figures [LINK] of 1.744 mmb/d of oil, which is -1.8% YoY and -2.1% MoM from February of 1.782 mmb/d. March production was down slightly (-0.108 mmb/d) with the forecast amount of 1.852 mmb/d. The NPD does not provide any explanations for the MoM changes. The theme for Norway over the past 5 years has been that Norway oil production returned to growth in the last 3 years because of the Johan Sverdrup oil field, and tax breaks from the government allowing increased capex in the energy sector.

Norway oil production

Figure 28: Norway February 2022 production

		Oil	Sum liquid	Gas	Total
		mill bbl/d	mill bbl/d	MSm³/d	MSm³ o.e/d
Production	March 2022	1.744	1.960	336.7	0.648
Forecast for	March 2022	1.852	2.141	316.7	0.657
Deviation from forecast	March 2022	-0.108	-0.181	20.0	-0.009
Deviation from forecast in %	March 2022	-5.8 %	-8.5 %	6.3 %	-1.4 %
Production	March 2021	1.776	2.093	318.1	0.651
	March 2021	-0.032	-0.133	18.6	-0.003
	March 2021	-1.8 %	-6.4 %	5.8 %	-0.5 %
Production	February 2022	1.782	1.998	348.3	0.666
Deviation from	February 2022	-0.038	-0.038	-11.6	-0.018
Deviation in % from	February 2022	-2.1 %	-1.9 %	-3.3 %	-2.7 %

Source: Norwegian Petroleum Directorate

Oil – India's Reliance reportedly buys another 15 mmb of Russia oil for Q2

India buying Russia oil

No surprise, we continue to see reports that India is buying more oil from Russia. On Friday, Reuters reported [LINK] "*Reliance Industries Ltd (RELI.NS), operator of the world's biggest oil refining complex, has ordered at least 15 million barrels of Russian oil since Russia invaded Ukraine in February, trade sources said. Reliance has bought an average 5 million barrels a month for the June quarter, the sources said'*." Last week's (April 17, 2022) Energy Tidbits highlighted the Biden/Modi call. When we saw the White House readout of the call, we tweeted [LINK] "*#Biden says will India pls stop buying RUS crude oil? #Modi replies no, unless you get #Oil to us at the same big discount. How else can you interpret the #WhiteHouse readout of their call?*" Last week, we concluded our Biden/Modi comments writing "*our end takeaway is that the US is trying to get India to not buy more India oil, but we don't think Modi made any promise to try to do so ie. look for India to continue to buy cheap Russia oil and we suspect, likely more*." The Reliance buy seems to support that view. Our Supplemental Documents package includes the Reuters Reliance report.

Oil – Energy Aspects sees Russia oil production -1.7 mmb/d vs Feb, and going lower

Russia oil -1.7 mmb/d & going lower

One of the big unknowns is how much Russia oil production is being shut in from lack of buyers. There was some excellent insight from Energy Aspects Amrita Sen on Bloomberg Surveillance on Friday morning. We tweeted [LINK] "*positive for #Oil. usual good insights from @ea_amrita to @tomkeene based on flaring, see Russia #Oil production could be down almost 1.7 mmpd vs feb and obviously going lower as storage is full. #OOTT*". There were two key elements – her commentary on how flaring supports her view that Russia oil production is down almost 1.7 mmb/d vs Feb and, more importantly, it is obviously going lower because Russian storage is full. Our tweet included a video clip of her answer and we created the below transcript of her answer. "*In terms of flaring, we are collecting g that date from Russia as well just to try and understand where the production is going down and by* *how much. When oil fields are producing, a lot of countries like Russia, and even in the US, the gas that comes out of that oil tends to get flared up into the atmosphere because there isn't capturing facilities so that the gas will not go up. This gives an indication of how much production is going on. The flaring data we are collecting suggests that production could be down 1.7 mmb/d vs February levels and obviously it is going to be headed lower in Russia given that storage is full."*

Oil – Can't make this up, Yellen says EU should be careful on banning Russia oil

US warns EU on banning RUS oil imports

On Thursday, we couldn't help tweeting [LINK] "*Can't make this stuff up. US been trying to get EU to stop importing RUS #Oil, now @SecYellen "we need to be careful when we think about a complete European ban on, say oil imports"from RUS "would clearly raise global oil prices". Thx @TheAmaraReport @aduehren #OOTT".* The Biden administration has been leading the push to stop Russian energy imports. But then on Thursday comes Treasury Secretary Yellen warning Europe to be careful about doing so and that it "*would clearly raise global oil prices".* Surely, the Biden administration knew that higher oil prices would be the result of their push to ban Russian oil imports. How could they not? if so, is this just a case of the Biden administration wanting to be on the record warning about higher prices are coming after pushing countries to cut Russian imports. The WSJ reported ""*We need to be careful when we think about a complete European ban on, say, oil imports," Ms. Yellen said, speaking at a news conference. "That would clearly raise global oil prices, it would have a damaging impact on Europe and other parts of the world, and counterintuitively it could actually have very little negative impact on Russia because although Russia might export less, its price for its exports would go up*." Our Supplemental Documents package includes the WSJ report. [LINK]

Oil – Russia's 2nd phase is to control southern Ukraine, make what's left land locked

Russia's southern strategy

We aren't getting into the day to day Russia/Ukraine war updates, but the one item that we have noted was the risk for Russia to control southern Ukraine. We noted this because it has major implications for commodities and food markets if Russia were to make Ukraine a land locked smaller country. Last week's (April 17, 2022) Energy Tidbits highlighted a good map that reminded us of this risk and the reason for our April 17 tweet [LINK] "*Great maps paint a clear picture and tell a story. Ukraine would be landlocked if RUS can take control of Odessa region. Thx @TheStudyofWar for great maps. #OOTT,"* The map shows Russia controlling all of southern Ukraine Black Sea coast other than around Odesa. On Friday, Russia made it clear that its plan is to take control of southern Ukraine. We tweeted [LINK] "*Make Ukraine landlocked. #TASS reports "one of the tasks of the Russian army is to establish full control over the Donbass and southern Ukraine" says RUS ministry of defense. Area around Odesa is critical for west to make sure doesn't fall*." Our tweet attached the TASS report [LINK] that reported "*Deputy Commander of the Central Military District (CVO), Major General Rustam Minnekayev, at the annual meeting of the Union of Defense Industries of the Sverdlovsk Region. "Since the beginning of the second phase of the special operation, it has already begun, literally two days ago, one of the tasks of the Russian army is to establish full control over the Donbass and southern Ukraine," he said."* Our Supplemental Documents package includes the TASS report.

Figure 29: Control of Terrain in Ukraine as of April 22, 2022, 3:00 PM ET

* Assessed Russian advances are areas where ISW assesses Russian forces have operated in or launched attacks against but do not control.

Source: Institute for the Study of War

Oil – IEA's table of sustainable spare capacity by country

IEA's sustainable spare capacity table

We still worry that the market is underestimating the impact of Russia oil supply losses especially as demand is expected to increase this summer. Our concern is that there isn't a lot of sustainable spare capacity in the world. The IEA included some new data in their publicly disclosed information on their Oil Market Report April 2022 – their estimate of sustainable spare oil capacity of all OPEC+ countries. On April 13, we tweeted [LINK] "*Here's why @MoEnergy_Saudi Abdulaziz ("The Man") & #OPEC+ are in control of #Oil prices for next few years - New @IEA OMR table est only 1.16 mmb/d of global spare sustainable capacity outside of Saudi 1.95, Iran 1.22, UAE 1.10 & Kuwait 0.53. #OOTT.*" The IEA table is excellent as it shows that the only significant sustainable spare capacity is with Saudi Arabia, Iran, UAE and, then to a lesser degree, Kuwait. Below is the IEA's new table.

Figure 30: IEA Estimate of Sustainable Spare Capacity

OPEC+ crude oil production[1]
million barrels per day

	Feb 2022 supply	Mar 2022 supply	March compliance	Mar 2022 target	Sustainable capacity[2]	Spare cap vs. Mar
Algeria	0.98	1.00	0.88	0.99	0.99	0.00
Angola	1.16	1.14	4.17	1.44	1.19	0.05
Congo	0.26	0.26	3.42	0.31	0.29	0.03
Equatorial Guinea	0.09	0.09	5.29	0.12	0.11	0.02
Gabon	0.19	0.20	-1.08	0.18	0.21	0.00
Iraq	4.27	4.29	1.28	4.37	4.82	0.53
Kuwait	2.61	2.64	0.99	2.64	2.79	0.15
Nigeria	1.27	1.25	5.22	1.72	1.54	0.29
Saudi Arabia	10.23	10.28	1.08	10.33	12.23	1.95
UAE	2.96	2.99	0.93	2.98	4.09	1.10
Total OPEC-10	**24.02**	**24.14**	**1.57**	**25.06**	**28.26**	**4.13**
Iran[3]	2.58	2.58	0.00	0.00	3.80	1.22
Libya[3]	1.16	1.10	0.00	0.00	1.20	0.10
Venezuela[3]	0.72	0.72	0.00	0.00	0.75	0.03
Total OPEC	**28.48**	**28.54**	**0.00**	**0.00**	**34.02**	**5.48**
Azerbaijan	0.57	0.58	3.21	0.68	0.60	0.02
Kazakhstan	1.65	1.60	1.06	1.61	1.69	0.09
Mexico[4]	1.63	1.64	0.00	1.75	1.69	0.05
Oman	0.82	0.83	1.02	0.83	0.87	0.04
Russia	10.05	10.00	1.49	10.33	10.23	0.23
Others[5]	0.90	0.90	3.18	1.04	0.93	0.04
Total Non-OPEC	**15.62**	**15.55**	**1.62**	**16.23**	**16.01**	**0.47**
OPEC+-19 in cut deal[4]	**38.00**	**38.05**	**1.59**	**39.54**	**42.58**	**4.55**
Total OPEC+	**44.10**	**44.09**	**0.00**	**0.00**	**50.03**	**5.96**

1. Excludes condensates. 2. Capacity levels can be reached with 90 days and sustained for extended period. 3. Iran, Libya, Venezuela exempt from cuts. 4. Mexico excluded from OPEC+ compliance. Only cut in May, June 2020. 5. Bahrain, Brunei, Malaysia, Sudan and South Sudan.

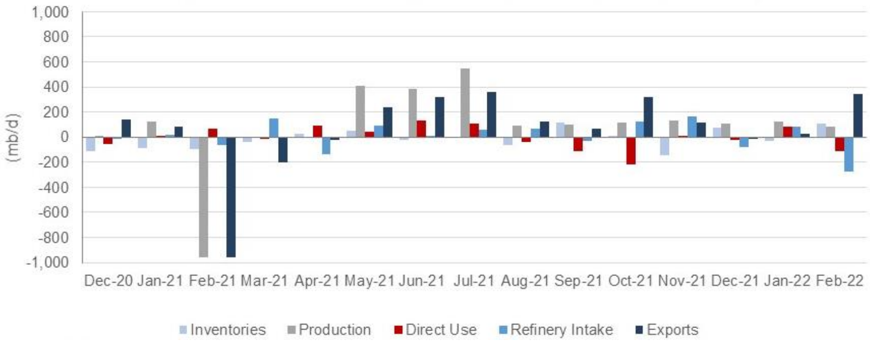
Source: IEA,

Oil – Why did Saudi refinery crude input decline in Feb?

JODI data for Saudi oil in February

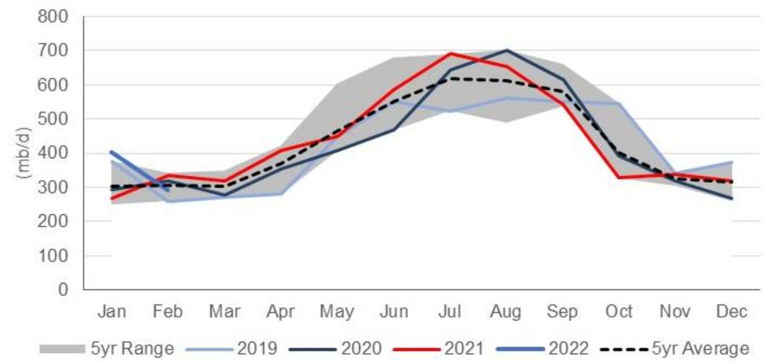
The JODI data for Saudi Arabia oil supply and demand for February was updated on Monday [LINK]. (i) Normally, we do not have any questions on the JODI data for Saudi Arabia's oil production and usage. But this month, we were left with a question on why did Saudi refinery crude oil input decline MoM? Apart from that, the increase in MoM production and build to inventory were above the increase in exports and decrease in direct use and refinery intakes. There was a large decrease to direct use of crude oil for electricity. Exports are at the highest level observed since April 2020. (ii) Saudi used significantly less oil for electricity in Feb vs Jan which is a reversion back to normal after an unusual increase in Jan. As is normal, use declined as temperatures were milder over the course of the month. The peak summer use was July at 691,000 b/d, that declined to 339,000 b/d in Nov and now reported -111,000 b/d MoM to 291,000 b/d for Feb. Feb 2022 is up -43,000 b/d YoY from Feb 2021 of 335,000 b/d. Feb was also below the 5-yr average of 309,000 b/d. (iii) The normal seasonal decline in Saudi use of oil for electricity would see a peak to trough decline of >400,000 b/d to under 300,000 b/d. (iv) The data that isn't clear is oil used in refineries was -271,000 b/d MoM to 2.506 mmb/d. If this was March, it would make sense because it would signal a confirmation that maybe the Houthi missile hit on the Riyadh refinery did damage operations. But this is Feb, and there were no reported Houthi drone strikes on refineries so the reduction remains unclear. One explanation could be that it was a result of the US pressing them to increase exports. If not, then we wonder if one of the regular drone attacks on the new 400,000 b/d Jizan refinery in southern Saudi Arabia had an impact. (v) On the overall JODI data for Feb, there was 11,000 b/d of unaccounted for supply though there was 0 b/d of unaccounted demand. There was decreased supply of 30,000 b/d MoM from production +80,000 b/d MoM and a large inventory build of +110,000 b/d MoM. vs increased demand -41,000 b/d from refinery intakes -271,000 b/d MoM, exports +341,000 b/d MoM, and direct use for electricity -111,000 b/d. ie. leaving 0 mmb/d unaccounted for. (vi) Inventories increased up 3.407 mmb MoM from 133.742 mmb to 137.149 mmb. Inventories remain at historically low levels, sitting below 150 mmb. (vii) Below are the AccuWeather Temp maps for Riyadh for Feb, Mar and Apr MTD. Careful they are different scales but look for oil for electricity to decrease as we continue to move away from peak season. Below are our updated graphs for the Saudi JODI data for January.

Figure 31: MoM Saudi Inventories, Production, Direct Use, Refinery Intake & Exports



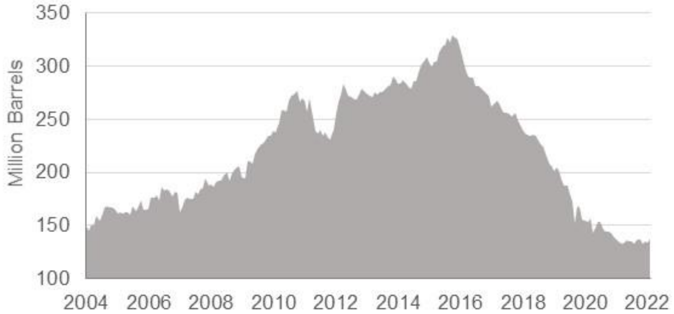
Source: JODI, Bloomberg

Figure 32: Saudi Arabia Direct Use of Crude Oil For Electric Generation



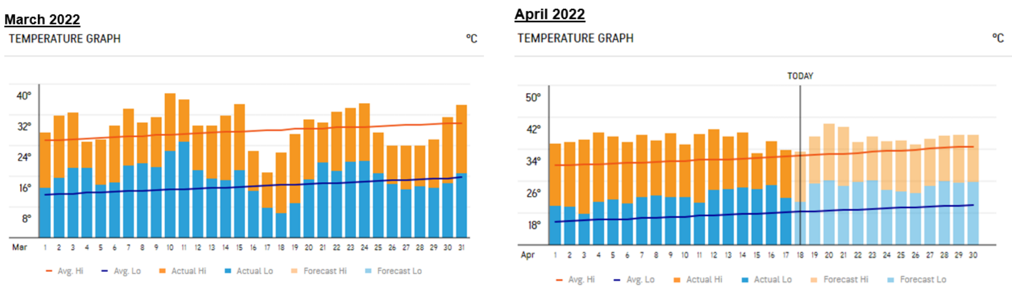
Source: JODI

Figure 33: Saudi Arabia Crude Oil Inventories (million barrels)

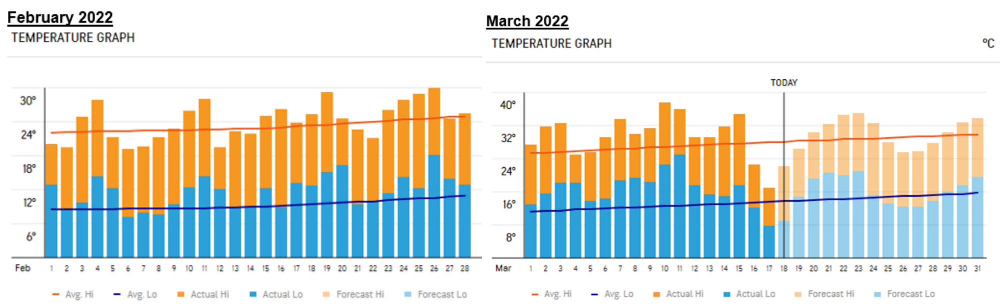


Source: JODI

Figure 34: Riyadh Temperature Recaps for Feb, Mar and Apr



Source: AccuWeather



Source: AccuWeather

Oil – Did anyone really expect Saudi to help the US on oil?

Low state of US/Saudi relations

No surprise, the US and Saudi Arabia both went thru the obligatory denials, but, given how events have played out, it's hard for anyone not to believe the basic premise of the WSJ report "*How U.S.-Saudi Relations Reached the Breaking Point. The decades long alliance is at risk over disagreements regarding oil production levels, security concerns and the invasion of Ukraine". *[LINK]. The sensational part of the report was "T*he 36-year-old crown prince ended up shouting at Mr. Sullivan after he raised the 2018 killing of Saudi journalist Jamal Khashoggi. The prince told Mr. Sullivan he never wanted to discuss the matter again, said* *people familiar with the exchange. And the U.S. could forget about its request to boost oil production, he told Mr. Sullivan."* The key to the report is the history of Biden painting, right or wrong, MBS as the villain may have played well with the base, but not with MBS. And how he just expected MBS to give in when he was asked. The report is worth a read as it gives perspective why the Saudis will be reluctant to give help to the US unless absolutely necessary. Our Supplemental Documents package includes the WSJ report.

Oil – Will mid-terms put JCPOA on ice? Or is this last minute dancing?

More don't see a JCPOA

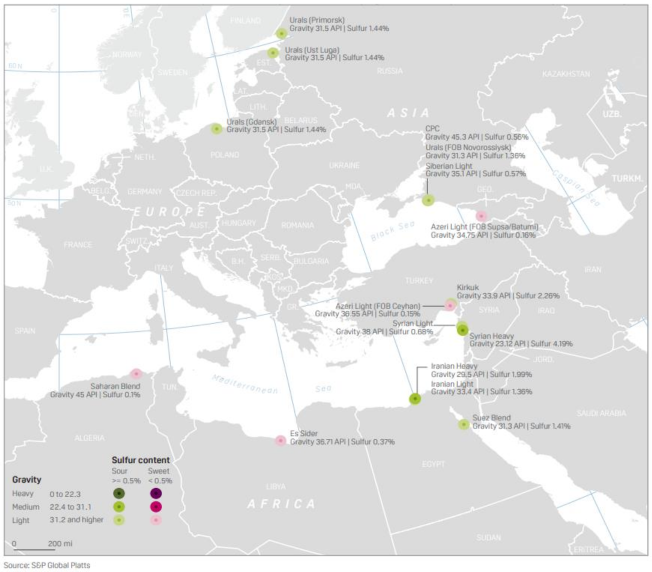
The view of most Iran observers has now moved to not expecting a return to the JCPOA. We have been big believers a deal would get done, but it just hasn't happened. A key reason for our view is that all of the supposed time deadlines get passed and neither Iran or the US walks away. They just don't want to walk away. Rather they continue to say it's in the other side's court. The other growing factor is that it's now less than 6 months to the mid-terms. Biden wanted this done in 2021. What isn't clear is if he sees this as a positive or negative to push or walk away from any JCPOA for the mid-terms. But what we think is clear is that the mid-terms have to add a dynamic to Biden's decision making.

Oil – Iran's oil would be a good crude quality replacement for Urals crude to Europe

Iran oil similar to Russia Urals

There is no question that the general view on the potential for a JCPOA has shifted in the last week with most now not expecting a JCPOA deal. It's clearly a who know situation. But one key item to remember is that Iran oil is needed to replace Russian crude oil in Europe markets. On March 9, we tweeted [LINK] on a good reminder from the Gulf Intelligence daily Podcast [LINK] that Iran's crude oil quality would be a good replacement for Russian Urals crude oil to Europe. We tweeted *"#JCPOA. Good reminder from @gulf_intel podcast. Matt Stanley @starfuels reminds Iran light matches API and H2S very well and is a good substitute RUS Urals. See below @SPGlobalPlatts crude specs map. #OOTT".* Our tweet included the below Platts map that noted crude qualities for Russia were Urals (Primorsk) 31.5 API 1.44% H2S, Urals (Ust Luga) 31.5 API 1.44% H2S, and Urals Gdansk 31.5 API 1.44% H2S, which compares to Iranian Light 33.4 API 1.36% H2S.

Figure 35: Platts Specifications Guide Europe and Africa Crude Oil



Source: Platts

Oil – Libya Oil Minister says shut-ins are now over 400,000 b/d

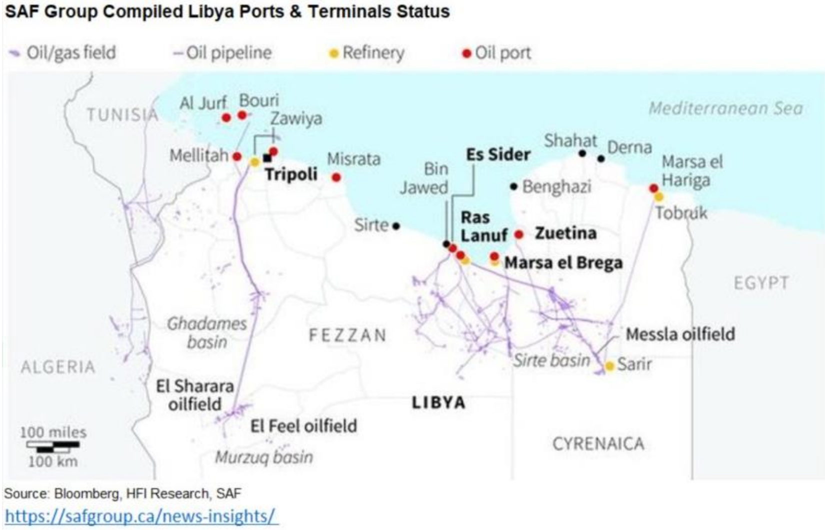
Libya shut-ins now >400,000 b/d

Last night, we tweeted [LINK] "*LIbya #Oil shut-ins now >400,000 b/d due to closures imposed on major export fields and ports says Oil Minister Aoun. #OOTT*". We were surprised the shut-in wasn't over 0.5 mmb/d. We linked toa Libya Observer report [LINK] that wrote "*The Minister of Oil and Gas, Mohamed Aoun, has revealed that Libya is currently losing about 50 to 70 million dollars and more than 400,000 barrels of oil production per day due to the closures imposed on major export fields and ports, after it reached nearly 1.2 million per day. Aoun said that they had formed a committee to prepare a detailed report on the effects of closing the oil fields, explaining that the Government of National Unity had developed a plan to achieve production of up to 1.4 million barrels per day by the end of the year*. "

Eastern Libya military leaders urged Haftar to shut down Libya oil exports

As a reminder, there was the big warning on April 9 that Libya oil shut-ins were about to happen. Our April 10, 2022 Energy Tidbits memo said "*It looks like one of the oil news stories for Monday will be Libya. Last night, we tweeted [LINK] "Positive for #Oil prices with risk to Libya oil exports. Libya unity looking like a fantasy. @Lyobserver says eastern military leaders leaving 5+5 & urge Haftar to stop oil exports, close key road, etc. Libya loaded ~1 mmbd in March. #OOTT ". We have to wonder if we are about to go back to a split in Libya and oil supply interruptions. Yesterday, Tripoli based and pro Western Libya, Libya Observer, reported [LINK] "Haftar's representatives in JMC 5 + 5 call for closing oil, coastal road and cutting cooperation with GNU Representatives of warlord Khalifa Haftar in the Joint Military Commission 5+5 (JMC) have advised him to stop oil exports, close the coastal road* *linking the eastern region with the western region, suspend flights between both regions, and stop all aspects of cooperation with the Government of National Unity (GNU). The representatives have also suspended their participation in UN-brokered JMC talks. In a statement issued on Saturday, they claimed that "the Prime Minister of the GNU, Abdel Hamid Dbeibah, had practised behaviours that are contrary to the political agreement and a flagrant violation of human rights in accordance with international and national standards". Our tweet referenced Libya loadings at ~1 mmb/d in March, which was from Bloomberg's tanker tracking."*

Figure 36: Libya Ports, Major oilfields and Terminals map



Source: SAF Group

Oil – China's oil imports down 14% MoM to 10.1 mmb/d in March

China preliminary oil imports

It wasn't a big surprise to see China's oil imports in March were down MoM and YoY. This extends the 2-month slide as independent refiners curbed purchases under narrowing margins and large state-owned refineries underwent maintenance. China imported the equivalent of 10.06 mmb/d in March which was down 14% from March 2021 of 11.69 mmb/d and down from the Jan/Feb average of 10.53 mmb/d. Total first quarter imports averages 10.4 mmb/d which is down 8% from Q1/21. Analysts estimated that China's independent refiners lowered their operations to approx. 50% of their capacity in response to Brent >$130/bbl due to the Ukraine crisis. We usually get our monthly commentary from Bloomberg, but this week Reuters summarized the decline in imports. Reuters reported on Apr 12 [LINK] *"Analysts estimated China's independent refiners lowered their operations to just above 50% of capacity in March, compared with operating at more than 70% of capacity a year earlier, as global oil prices soared above $130 a barrel last month because of the Ukraine crisis, squeezing refining margins. Domestic gasoline demand also took a hit in March as China's "dynamic clearance" COVID-19 control policy restricted mobility with lockdowns and led to the first decline in three months in Chinese vehicle sales. Planned maintenance outages at several plants under refining giant Sinopec Corp, including refineries* *at Yangzi, Hainan and Tahe, shut combined processing capacity of 460,000 bpd, further curbing crude oil demand in March."*

China increased crude imports from Russia in March

It's not just India that has stepped up its buying of Russia oil. It's also China. On Thursday, Bloomberg reported [LINK] China increased its imports of Russin oil over the course of the month. Russian imports were up 7% MoM at 1.51 mmb/d from 1.42 mmb/d in Feb. China skipped out on imports from Iran for the second month this year. Saudi Arabia led China oil imports, slightly above Russia at 1.62 mmb/d, down 7% from 1.74 mmb/d in Feb. Imports from Iraq were up 37% at 1.12 mmb/d from 0.81 mmb/d. Oman, Angola and Kuwait were all down MoM 26%, 22% and 28% at 0.67 mmb/d, 0.59 mmb/d, and 0.59 mmb/d respectively. Malaysia imports were up 99% at 40.45 mmb/d from Feb and Brazil was up 16% from 0.42 mmb/d to 0.48 mmb/d in Mar. The US delivered just 0.15 mmb/d of crude to China. Our Supplemental Documents package includes the Bloomberg report.

Oil – Halliburton's oil view "A perpetual threat of undersupply"

Perpetual threat to undersupply of oil

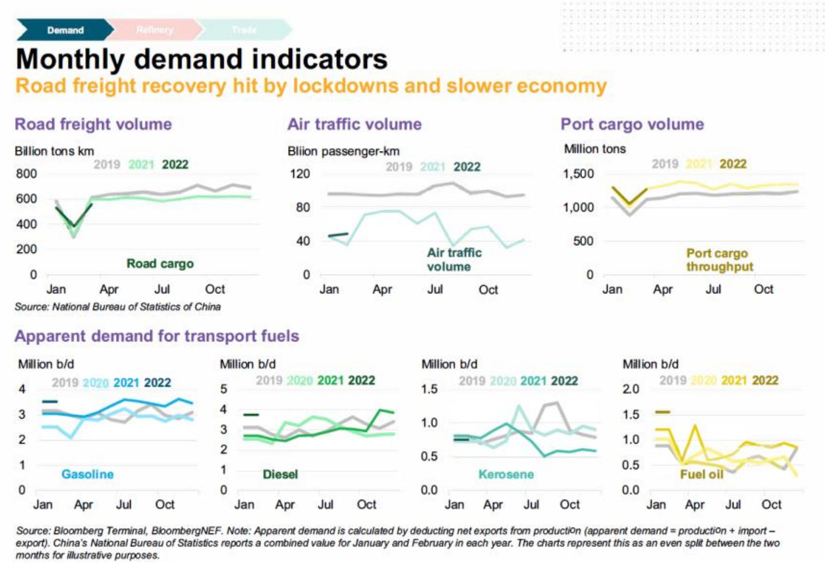
There was an excellent perspective on oil markets from Halliburton Chairman Jeff Little in his introduction reports on Tuesday's Q1 call. Fortunately, we recorded the call so we could create a transcript of his oil view. And we tweeted [LINK] ""*pivot to short-cycle barrels creates the opposite effect - a perpetual threat of undersupply that is supportive to commodity price" says @Halliburton. Just in time #Oil supply in a world of supply interruptions/delays & demand > expectations. Oil looks great for 2020s. #OOTT*." Little had a lengthy explanation of his oil view, but the gist of it was that the sector has moved to a focus on short-cycle barrels. Not just shale, but also offshore focus on tie-backs. There are exceptions but, to the most part, there has been less of a capital focus on long cycle projects. Little didn't use the phrase "just in time oil supply", rather that is how we describe the new world of oil supply. Part of Little's explanation was "*With short cycle barrels, companies make investment decisions annually and can respond more quickly to commodity price signals. As a result, when investment stops, production, at a minimum, doesn't grow. And, in the case with unconventionals, it quickly declines. For example, when the pandemic drove the collapse of oil demand two years ago, US shale companies swiftly reduced activity and production declined 2 million barrels in 9 months. In contrast, long cycle projects have two key elements: a long time horizon and large up-front capital investment. Once these projects begin, investment continues and production cannot quickly respond to price signals. This tends to result in market oversupply. The pivot to short-cycle barrels creates the opposite effect - a perpetual threat of undersupply that is supportive to commodity price."* Note that later in the memo, we note other items from the Q1 call such as Halliburton sees the NOCs start to increase investment but that doesn't have a big impact in the next few years. Our Supplemental Documents package includes the transcript we made of the Halliburton Chairman's oil outlook.

Oil – BloombergNEF believes China oil demand bottomed in March

BNEF's China Oil Markets Monthly

It may be too soon to get excited, but China may be near the bottom of their oil demand. BloombergNEF released their "China Oil Markets Monthly" report for April that highlights some positive indicators for oil demand moving forward. The report was subtitled titled *"Oil* *demand bottoms out"* and we tweeted [LINK] *"China #OilDemand "seems to have bottomed out" "the recovery could be slow as jet fuel and gasoline consumption remain subdued" says @BloombergNEF 's China Oil Markets Monthly. Thx stang237@bloomberg.net for recap of China oil demand indicators. #OOTT."* While China continues to stick to their zero covid policy, the government has encouraged factoriess to resume operations after weeks of lockdown. Diesel demand is expected to be the main beneficiary. Recovery is still expected to be slow as jet fuel and gasoline consumption remain subdued. Flight cancellations remain at 69% across 20 of China's major airports for the week ended Apr 19, indicating no sign of improvement over the last month. Refinery throughput dropped 2% YoY in March due to the reduced demand with run rates stalled 52% in mid April. Bloomberg expects refinery runs to remain sluggish in the coming weeks on high inventory levels and low margins. State refiners have pushed to lift export quotas to provide additional outletys for fuel surplus. Crude oil imports dropped 9% year-on-year in the first quarter of 2022, in line with the decline in refinery runs. Below is a chart indicating China's oil demand indicators. Our Supplemental Documents package includes the Bloomberg report.

Figure 37: China Monthly Oil Demand Indicators



Source: Bloomberg

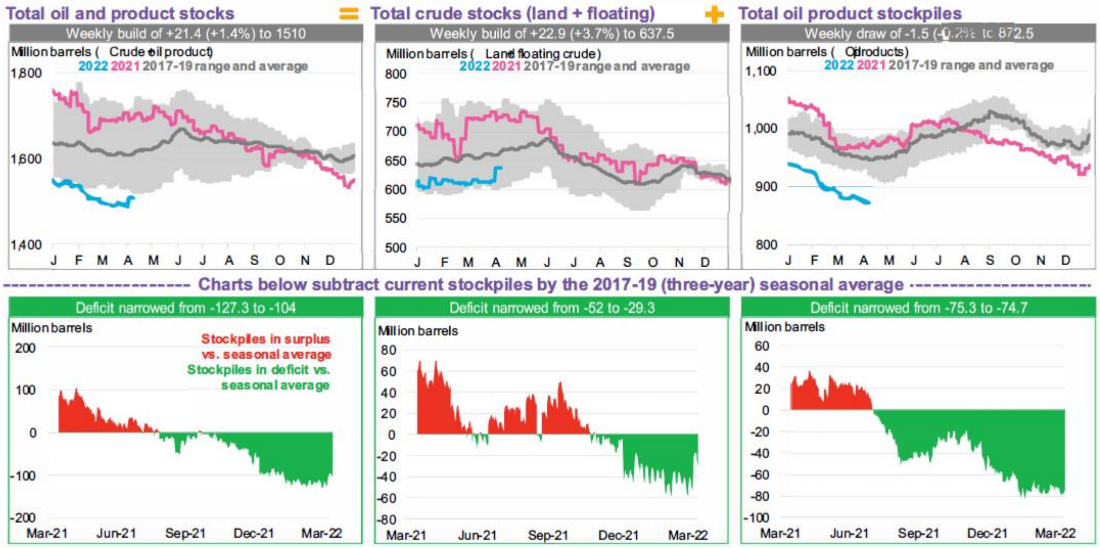
Oil – BloombergNEF: Global oil inventories continue to show big deficit

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. The key data this week is the outlook for global oil and products stocks which delivers a bullish outlook at the widening of the deficit relative to the 2017-2019 average. It is also important to note that most indicators outside of Asia are positive. The deficit for crude and product narrowing from 127.3 mmb to 104.0 mmb compared to the 2017-2019 average. For the week ended Apr 8, land crude oil storage in tracked regions grew WoW at 540.6 mmb. The stockpile deficit against the 5 yr average (2015-2019) narrowed from 81.5 mmb to 76.1 mmb. Total crude inventories increased by

BNEF's global oil inventories

3.7% to 637.5 mmb, including global floating inventories. Product stocks were down 0.2% WoW with the stockpile deficit against the 3-year average narrowing from 75.3 mmb to 74.7 mmb. Gas oil and middle distillate stocks have widened against their three-year average deficit (2017-2019) of 38.4 mmb to 39.0 mmb. Jet fuel consumption by international departures decreased by 49,900 b/d WoW while consumption by domestic passenger departures declined by 30,500 b/d, a consecutive week of declines. Global mobility indices were weaker over the week after a decline last week with declines in Europe and Asia Pacific-specifically for China. The high frequency oil and product stockpile deficit against the three-year seasonal average (2017-2019) suggests the stockpile deficit has widened to near the post pandemic record set three weeks ago. Below is a snapshot of aggregate global stockpiles. Our Supplemental Documents package includes excerpts from the Bloomberg report.

Figure 38: Aggregate Global Oil and Product Stockpiles



Source: Bloomberg

Oil – Vortexa crude oil floating storage 101.96 mmb as of Apr 22, -5.14 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, as noted below, the revisions can go back for 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 April 16 at Noon MT. (i) As of Noon MT yesterday, Bloomberg posted Vortexa crude oil floating storage estimate as of April 22 was 101.96 mmb, which is -5.14 mmb WoW vs revised up April 15 of 107.1 mmb. Note April 15 was revised up big, +15.22 mmb from the Bloomberg estimated 91.88 mmb posted as of noon MT on April 16. (ii) Vortexa estimates were revised for the past several weeks. So instead of floating storage being around 90 mmb, the more typical level is around 100 mmb. It's probably not too surprising as it coincides with the post Russia invasion of Ukraine period. Regardless, it is something to watch to see if it holds around 100 mmb or moves higher. (iii)

There were revisions to the prior several weeks of estimates. Based on the revisions being about the same every week, it feels like they may have 4 or 5 big tankers that were missed in the floating storage data. Revisions in today's estimates vs the Vortexa estimates posted as of noon MT on April 16. April 15 data revised +15.22 mmb to 107.1 mmb. April 8 data revised +9.37 mmb to 103.32 mmb. April 1 data revised +8.17 mmb to 92.62 mmb. March 25 data revised +8.48 mmb to 97.78 mmb. March 18 data revised +7.24 mmb to 98.01 mmb. March 11 data revised +8.99 mmb to 102.98 mmb. March 4 data revised +6.30 mmb to 99.42 mmb. (iv) April 22 estimate of 101.96 mmb is -119.51 mmb vs June 26, 2020 peak of 221.47 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/early April as Covid started to have a huge impact. April 22 estimate of 101.96 mmb is +46.53 mmb vs pre-Covid of 55.43 mmb as of April 22, 2019. Note April 24, 2020 was 162.31 mmb, which was up almost 100 mmb vs March 27, 202 of 65.33 mmb.

Figure 39: Vortexa Floating Storage as of April 22 Posted on Bloomberg Noon MT Sat

Source: Bloomberg, Vortexa

Figure 40: Vortexa Estimates Apr 23 noon MT, Apr 16 noon MT, and Apr 9 noon MT

Est as of Apr 23, noon MT

FZWWFST VTXA Inde — 04/21/2019 - 04/22/2022

	Date	FZWWFST VT... Mid Px
Fr	04/22/2022	101.958k
Fr	04/15/2022	107.1k
Fr	04/08/2022	103.317k
Fr	04/01/2022	92621
Fr	03/25/2022	97776
Fr	03/18/2022	98006
Fr	03/11/2022	102.976k
Fr	03/04/2022	99424
Fr	02/25/2022	97694
Fr	02/18/2022	91072
Fr	02/11/2022	102.693k

Est as of Apr 16, noon MT

FZWWFST VTXA Inde — 04/14/2019 - 04/15/2022

	Date	FZWWFST VT... Mid Px
Fr	04/15/2022	91882
Fr	04/08/2022	93949
Fr	04/01/2022	84450
Fr	03/25/2022	89304
Fr	03/18/2022	90780
Fr	03/11/2022	93993
Fr	03/04/2022	93116
Fr	02/25/2022	92805
Fr	02/18/2022	86368
Fr	02/11/2022	97959
Fr	02/04/2022	99663

Est as of Apr 9, noon MT

FZWWFST VTXA Inde — 04/06/2019 - 04/08/2022

	Date	FZWWFST V... Mid Px
Fr	04/08/2022	87295
Fr	04/01/2022	85965
Fr	03/25/2022	89581
Fr	03/18/2022	91542
Fr	03/11/2022	93402
Fr	03/04/2022	92397
Fr	02/25/2022	92181
Fr	02/18/2022	84472
Fr	02/11/2022	97403
Fr	02/04/2022	98271
Fr	01/28/2022	93433

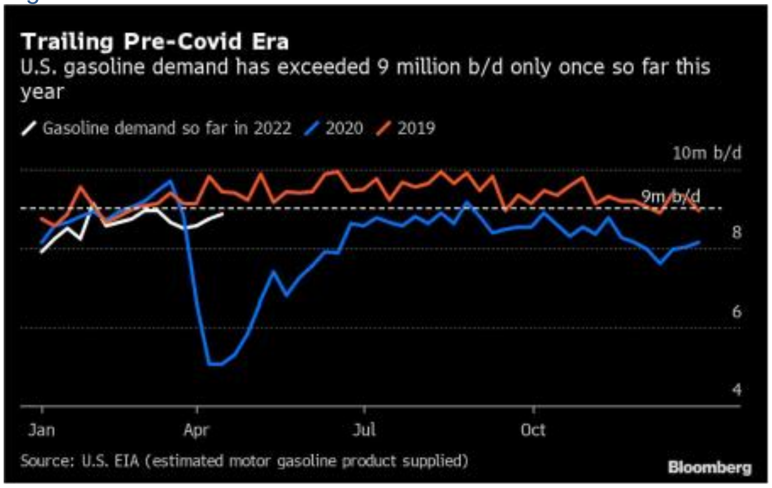
Source: Bloomberg, Vortexa

Oil – Bloomberg Oil Demand Monitor: US gas demand up while China air travel suffers

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. US gasoline demand was up for a third consecutive week yet remained below pre-pandemic levels ad high retail prices continue to erode consumer demand. US gas consumption hovers around 9 mmb/d which it has remained above for every week of 2019 from March through November. Food and fuel inflation is beginning to show consumers are cutting back in their spending though it is important to note that this effect typically shows earlier in devolving nations. Diesel sales in India declined by 16% in the first half of April from the previous period. As sharp increases at retail stores ended stockpile hoarding. Congestion data in the 13 Bloomberg tracked cities were mixed over the past week due to the Easter holiday. Of the 13 tracked cities around the world, just Jakarta exceeded the 2019 average for the equivalent week in 2019. European cities and negligible or zero congestion on Easter Monday. Service station sales data show motorists continue to buy about 7% less fuel than they did before the pandemic. Air travel numbers continue to improve slowly. European flight numbers have continued to increase for consecutive weeks with the region now 17% below the equivalent 2019 levels, compared with 37% in late January when infection levels peaked. The number of passengers at London's Heathrow airport jumped almost 50% MoM and exceeded 4 million passengers for the first time since Feb 2020. The latest seven-day average of all commercial flights is about 21% below the equivalent level for 2019. China air travel continues to struggle as lockdown measures have decimated international travel and hurt domestic routes. This is in stark contrast to last year when China was the only major market with more passenger seats than pre covid levels. Refinery utilization was up across the US at 91% which is 3.3% higher than in 2019 and 6% above last years utilization level. The increase vs 2019 was primarily attributed to GoM and eastern refineries. Our Supplemental Documents package includes the Bloomberg Oil Demand Monitor.

Figure 41: US Gasoline Demand



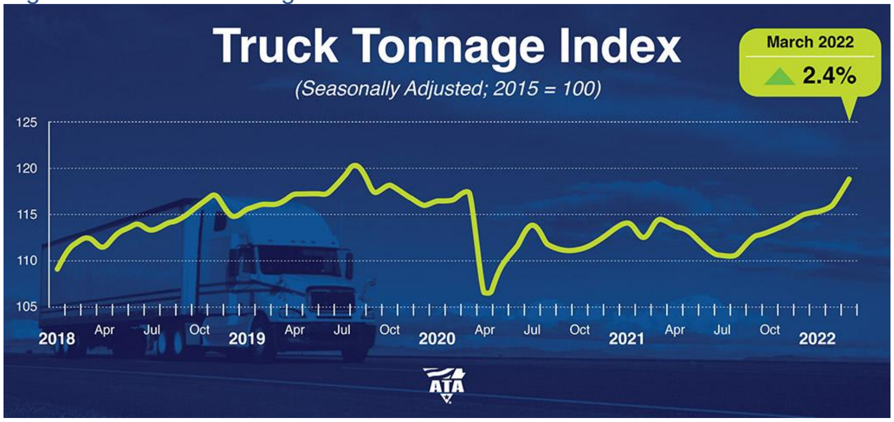
Source: Bloomberg

Oil – March truck tonnage flat MoM, up 2.4% YoY

Demand for truck haulage continues to grow, but supply shortages are still an obstacle for the industry. Truck tonnage was up during March after a February revision, but it is worth noting that the index fell by 4.6% from April to July 2021 so not quite back to the levels observed in 2020. The American Trucking Association released its seasonally adjusted Truck Tonnage Index for March on Tuesday [LINK]. March observed a 2.4% increase MoM from February, after increasing 0.7% last month. It was a consecutive months of gains after a revision to the Feb data. MoM gain and Chief Economist Bob Costello noted, "*"It is important to note that ATA's for-hire tonnage data is dominated by contract freight with minimal amounts of spot market loads. And clearly contract freight was solid in March, witnessing the largest sequential gain since May 2020. March was also the eighth straight month-to-month improvement, with a total increase of 7.4% over that period."* The index is up 2.6% YoY from March 2021, with a consecutive YoY gain. Trucking serves as a barometer of the U.S. economy, representing 72.5% of tonnage carried by all modes of domestic freight transportation, including manufactured and retail goods. Trucks hauled 11.84 billion tons of freight in 2019. Motor carriers collected $791.7 billion, or 80.4% of total revenue earned by all transport modes. Our Supplemental Documents package includes the ATA release.

Truck tonnage index +2.4% YoY in February

Figure 42: Truck Tonnage Index



Source: ATA

Oil & Natural Gas – Schlumberger, a significant change to energy landscape

No matter how you describe it, the reality is that the west's actions against Russia are reshaping energy markets for the 2020s or longer. And one that will lead to much higher than previously expected energy prices. How can there be any other outcome when you have the west trying to get as much of the world as possible to shun exports from the world's largest exporter of natural gas and 2nd largest exporter of crude oil? We were reminded of this simple concept from the Schlumberger Q1 call on Friday, when they joined the other service companies with their bullish view for oil and natural as for the 2020s in their Q1 call on Friday. We tweeted [LINK] "*Positive #Oil #NatGas for 2020s. "energy security & supply diversification have also emerged as pre-eminent global drivers that will shape the future or our industry" "This new dimension will have long lasting, positive implications for energy investments" #Schlumberger CEO #OOTT*." Schlumberger highlights how the energy security and supply diversification have emerged as "*pre-eminent global drivers that will shape the future of our*

Significant change to energy landscape

industry". Schlumberger's comments are worth a read. Our tweet included the transcript we made "*The energy landscape has evolved significantly over the past few months. Recent events on one hand resulted into a change in the pace of demand recovery while energy security and supply diversification have also emerged as pre-eminent global drivers that will shape the future or our industry, in addition to decarbonization, capital discipline and digital transformation. This new dimension will have long lasting, positive implications for energy investments over the next few years. I would like to share how we see these dynamics developing over the short and long term horizons. And more importantly, how this condition will play to Schlumberger's differentiated strength. First, in the short term, commodity prices are elevated as supply conditions continue to tighten due to the impact of capital discipline, consistent OPEC+ policy implementation, and the potential impact of supply dislocation from Russia. The industry is responding to this new, to these high commodity price environment with accelerated short-cycle investments in North America led by the private producers and a gradual increase in investment by the public operators albeit [xx?] by capital discipline and bottlenecks in capacity and supply chain. Internationally, short-cycle investments are set to accelerate thru the seasonal rebound in the second quarter, and more strongly in the second half of the year led by the Middle East and key international offshore basin. Second, the elevation of energy security as a priority will drive further capacity expansion and optionality to deliver more diverse oil and gas supply. This with [xx?] additional long cycle development projects, exploration activity and brownfield third generation {xx?]*"

Oil & Natural Gas – Glencore on the need for energy supply

Glencore's view on energy supply

On Thursday, Glencore posted its Sustainability Report 2021. Most of it is focused on how they are doing on their sustainability progress. However, there were energy outlook comments that caught our attention. On Thursday, we tweeted [LINK] "1/2. *#CriticalMinerals, #Oil, #NatGas needed just to get to "low-carbon" economy. #Glencore "the challenge of meeting the increasing energy needs of a growing global population, while drastically reducing the world's carbon footprint, will require the ..." #OOTT #LNG."* And [LINK] "*2/2. ".. continued production of primary metals for the products and energy supply needed to respond to changes in population and growth of developing economies, as well as deliver the energy transition needed to achieve a low-carbon economy." #Glencore #OOTT #NatGas #Oil."* Surely no one believes Glencore is talking about renewable energy supply to power these items. Our Supplemental Documents package includes excerpts from the Glencore report.

Oil & Natural Gas – sector/play/market insights from Q1 calls

Sector insights from Q1 calls

We are just starting to get into Q1 calls and we expect to see a ramp up this week. As usual, the oil and gas services companies are first to report and we typically get some of the best macro insights from the services, pipelines, refineries and utilities. This is our favorite time each time of each quarter as it is quarterly reporting and this is when we get the best insights into a range of oil and gas themes/trends, sectors and plays. As a reminder, our Energy Tidbits memo does not get into the quarterly results, forecasts, or valuation. Rather the purpose of highlighting a company is to note themes/trends and plays that will help shape a reader's investment thesis to the energy sector. In the conference calls, we also tend to find the best insights from the Q&A portion as opposed to the prepared remarks. Plus, we tend to get the best E&P sector insights from services, pipelines, refineries, and utilities

Baker Hughes – Middle East NOCs to add capacity on long term gradual basis
Baker Hughes held its Q1 call on Wedneday. (i) Earlier in the memo, we highlighted Baker Hughes hugely bullish view on the need for way more LNG export capacity than any other forecast. (ii) Baker Hughes also sees the OPEC countries getting back to increasing investment. This is consistent with the other large service companies and is really for two reasons – to support their current oil capacity, but also to start to build for future capacity. In the Q&A, mgmt said "*Yeah, Yes, we are seeing customers talk about increasing they're increasing their spend planned, I'd say particularly we've seen that in the Middle East, and have started to see awards increase and I think you'll start to see some of that flow through here in the second half of the year and into 23".* And later in the Q&A, mgmt said "*we believe, Middle East, could be one of the strongest markets in 2022 and it's likely in the early stages of a growth cycle as the NOCs in the region, look to add production capacity on a gradual long-term basis."* (iii) See a combination of small, mid and large scale LNG export projects. In the Q&A, mgmt said "*Yeah, Dave and I think you have to go back to the tenure we've had in the LNG cycle and we've always said that there's going to be small scale, mid scale, large scale and we are going to be participating in all of those and also looking at modular as well as stick-built and depending on the customers' needs. We are going to be providing them clearly the modular is a fast with the market. It is a plug and play model. So we are seeing increased interest from some of the independent players. And I'd say also within North America globally with some of the larger projects, they still continue on that the stick-built. We don't have a challenge on capacity again we've had big flows of LNG projects in the past and we feel good about being able to manage it and our facilities that are set up in Florence and mass and events in Italy a well prepared for the LNG project wave."* (iv) Remind of one growing constraint to LNG growth is EPC limits. EPC is Engineering, Procurement and Construction. But is also reminds that the advantage to LNG projects like Cheniere that do modular growth, or for the brownfield phases of LNG projects like LNG Canada for its Phase 2. In the Q&A, mgmt replied "*I think the area that time people are looking at and also reacting to is on the EPC side and that's one of the areas that I think it's a focus right now I'd say also the modular approach reduces some of the dependence on the full aspect of EPCs and so it's a faster approach from that respective, but labor continues to be constrained and so that's something that's being looked at."* (v) Reminds that LNG projects impacted by critical metals price escalation. And there is a key reminder that the prices are moving quickly so price quotes from their suppliers are only open for a short time period ie. a limited time offer. In the Q&A, mgmt replied "*Hey, Roger. I'll go ahead you cut off there a little bit, but on supply chain, it tends to be challenging and obviously with everything going on in the global geopolitical space. It's been, a little more challenging. But look, I'd say from how it, how it impacts us and how we're dealing with we are managing the price increases and various metals like copper and steel and nickel there is no supply issue is just managing through those pricing and you can imagine that's going into our quotes and to deal with all of this, we have taken down the timing and validity of our quotes, to be able to deal with this. So customers know what's going on and they can have good visibility into what the cost of these projects are going to be look from a castings and forgings standpoint still able to get supply we're dealing with some scarcity in Europe and higher pricing*

there. So we are seeing what we are doing with our customers, our suppliers are doing as well with quotes are only valid for a shorter period of time given the raw material pricing and a unique energy challenges in Europe." Our Supplemental Documents package includes excerpts from the Baker Hughes Q1 call transcript.

Halliburton – Bullish on O&G through the 2020s, increased NA capital spend

Halliburton held its Q1 call on Tuesday. (i) Earlier in the memo, we highlighted Halliburton's oil view and how they see oil at a perpetual threat of undersupply. (ii) Mgmt remains very bullish on oil through the 2020s. International spending is expected to increase in the mid teens YoY with the operator stating *"have a strong pipeline of new projects scheduled to start in the second half of this year, particularly in the Middle East. We expect international activity to gain momentum in the second quarter led by the Middle East and Latin America and further accelerate in the second half of the year"* (iii) They highlighted the limitations to US oil growth with one item being capacity shortage in frac spreads; Halliburton's hydraulic fracturing fleet remains sold out and along with the overall market appearing sold out for the second half of the year. There isn't the pricing yet to support growth in fleet capacity. In the Q&A mgmt. stated *"Finally, I see greater differentiation in hydraulic fracturing equipment types. In prior cycles, fleets were relatively the same. Today, all equipment is not created equal."* They also expect to see tightness in the supply chain throughout the whole oil and gas value chain. (iv) Expects North America capital spend to be 35% YoY versus prior forecast of 25% YoY – they noted how some of this is inflation driven. Mgmt stated "*think it is a bit of a stickier shock because you're seeing inflation across the entire sector. So we've got inputs that are going up meaningfully, our own costs are going up meaningfully, and we're outpacing those costs in terms of net pricing. And so I would describe it, I think you're accurate. It's more around sticker shock."* (v) Halliburton expects NOC build activity in 2022. When asked what kind of story the NOC build up was going top be, Mgmt replied ""*Look, I think we're going to see building activity sooner than that. I think it builds throughout the balance of 2022 and then probably continues to get legs in '23, likely beyond. I think the key is that a $100 oil, everything is busy. And people want to be busy, but the question is, can they be busy? And what we've seen is really seven years of underinvestment around the entire world, spending about half of what we used to spend. And that's not something that's overcome in a day or a year or -- that just takes time to get momentum."* Our Supplemental Documents package includes the Halliburton Q1 call transcript.

Liberty Oilfield – "*Available frac capacity is nearing full utilization*"

There was a clear message from Liberty Oilfield Services Q1 call on Thursday that US shale growth will be limited by sand, labor, equipment and supply chain issues. Liberty sees available frac capacity is nearing full utilization. Here are a few of their quotes. "*Sand supply tightness in southern oil and gas basins, including the Permian, Eagle Ford and Haynesville, impacted industry-wide operations." "Sand supply challenges were exacerbated by truck driver shortages." "Drilled but uncompleted well inventory has stabilized after a steep continuous declined from pandemic elevated levels. Available frac capacity is nearing full utilization as demand has increased and supply is limited due to continued equipment attrition,* *improvement." "It's both, the single biggest challenge right now is labor. But and everyone knows this, right. This is country wide, but certainly in our industry after a big downturn that pushed a lot of people out of our industry. There's high-paying jobs in more pleasant conditions. So we've unfortunately lost some people out of our industry. We are actively today recruiting people back into our industry, but that's harder today. So labor particularly competent, qualified trained labor is in tight supply, but it's not just labor. There's just not that many frac fleets or frac pumps sitting around. The extra capacity today again is the very old stuff or mostly very old stuff that some of -- a lot of which got scrapped and some of which is still parked or is going through auction houses. So there -- it's tightened in both areas. And as you know that the logistics are tight, if you - - theoretically you wanted to stand up 10 more fleets in the Permian Basin, well where you going to get to sand from? Where you going to get the truck drivers? How you are going to staff those fleets? And what are those fleets going to be? So the challenges are pretty broad-based."*

Oil & Natural Gas– Expect record cash flows in Q1 for Cdn E&P, higher again in Q2

Expect record Q1 cash flows

We are about to start Q1 reporting for the Cdn oil and gas companies and one thing is clear, there should be record cash flows. And that means the conference calls will all the analysts starting off with the "great quarter guys". The conference calls will be peppered with analysts. On April 1, we tweeted [LINK] that Cdn E&P should report record Q1/22 cash flows. Cash flows will be up huge YoY and also big QoQ. Edmonton par oil prices in Q1/22 were If we use Ed Par oil prices, WCS oil prices and AECO natural gas prices, Q1/22 Ed Par prices of US$93.66/b were +72.9% YoY and +26.8% QoQ. Q1/22 WCS prices of US$82.51/b were +80.0% YoY and +35.3% QoQ. Q1/22 AECO prices of $4.51 were +43.9% YoY and +0.6% QoQ. And based on April 22 closing prices, it looks like Q2 will be even higher cash flows. On Friday, WTI closed at $102.07, Ed Par at $106.68, WCS at $89.18 and AECO at $5.02. Below is our updated table of quarterly oil and natural gas prices.

Figure 43: Oil and Natural Gas Prices

Quarter	Brent US$	WTI US$	EdPar US$	WCS US$	HH US$	AECO C$
Q1/18	$67.00	$62.86	$57.19	$37.11	$3.09	$2.06
Q2/18	$74.41	$67.83	$60.78	$49.88	$2.84	$1.23
Q3/18	$75.27	$69.69	$59.81	$42.32	$2.92	$1.25
Q4/18	$68.18	$59.41	$36.53	$25.63	$3.78	$1.62
Q1/19	$62.91	$54.49	$50.28	$43.79	$2.92	$2.55
Q2/19	$68.58	$59.96	$54.41	$47.46	$2.55	$1.13
Q3/19	$61.95	$56.48	$52.43	$43.91	$2.37	$1.00
Q4/19	$62.51	$56.83	$50.61	$37.98	$2.36	$2.46
Q1/20	$51.28	$46.73	$39.75	$28.55	$1.91	$2.04
Q2/20	$31.14	$27.67	$21.84	$18.02	$1.70	$2.00
Q3/20	$42.70	$40.87	$36.83	$31.13	$1.98	$2.26
Q4/20	$44.47	$42.67	$37.92	$31.34	$2.47	$2.65
Q1/21	$60.51	$57.75	$54.17	$45.83	$3.39	$3.13
Q2/21	$68.44	$65.90	$61.94	$53.11	$2.89	$2.95
Q3/21	$72.95	$70.57	$66.90	$57.65	$4.28	$3.41
Q4/21	$79.43	$77.31	$73.84	$60.96	$4.74	$4.49
Q1/22	$99.08	$94.79	$93.66	$82.51	$4.61	$4.51

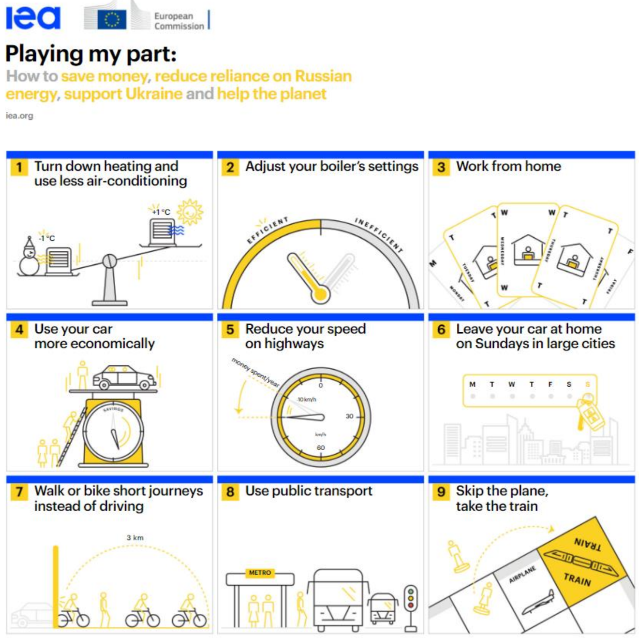
Source: Bloomberg

Energy Transition – Back to the Future, IEA's suggestion to reduce energy demand

IEA's way to reduce energy demand

We couldn't help think back to the 70s and how the US responded in response to the Arab Oil Embargo in 1973/74. Recall, it was very different back then as the Arab oil producers cut off supply and the US and other western countries has a real oil supply shortage. And don't forget this is before any strategic oil reserves. Strategic oil reserves and the IEA came about in response to the Arab Oil Embargo. The IEA posted its "*Playing my part: how to save money, reduce reliance on Russian energy, support Ukraine and help the planet*". [LINK]. This is right out of Jimmy Carter's 1976 election campaign playbook. Other than people couldn't' work remotely from home in the 70s as we didn't have computers and plane travel was still mostly for the rich. Rather it was the response to the real worry that the Arab oil producing countries would once again cut off oil exports to the West forcing immediate cut off of oil and gasoline. The IEA"s tips are right out of the post Arab Oil Embargo playbook like turning down heating, adjusting boiler setting, reducing your speed on highways, etc. Don't forget the US lowered its interstate highway speed to 55 mph after the Arab Oil Embargo for this very reason – to reduce gasoline consumption. Below is the IEA's graphic.

Figure 44: IEA's Playing my part



Source: IEA

Energy Transition – Macron looks to win easily, a huge relief to wind power

Big Macron lead in the polls

It looks like wind generation in France will get a break today as the polls show a big widenng in Macron's lead over Le Pen in today's Presidential election. Most of the polls are showing a widening double digit lead in the polls. If so, the big winners in the election will be wind generation. Our April 10, 2022 Energy Tidbits highlighted how a Le Pen victory would have led to a huge shift in wind (negative) and in nuclear (positive). And because of this, on April 8, we tweeted [LINK] ""*Stop #Wind projects & gradually dismantle existing farms", "return to* *households the 5b in subsidies in particular to wind turbines" "get out of EU electricity market to find decent prices" "relaunch the #Nuclear & hydroelectric sectors" Le Pen is closing gap on Macron. #OOTT".* Our tweet included Marine Le Pen's "22 Measures for 2022" [LINK], which is her priority list if she wins. It will be a big hit to wind power and a big plus to nuclear. Here are the key bullet points on energy from Le Pen's 22 Measure. "*12 Ensure our energy independence to lower the French bill. Return to households the 5 billion in subsidies paid in particular to wind turbines. Stop wind projects and gradually dismantle existing farms. Relaunch the nuclear and hydroelectric sectors and invest in the hydrogen sector. Get out of the European electricity market to find decent prices*."

Energy Transition – Good thing Norway's wealth fund kept oil and gas stocks

A bad Q1 for Norway's wealth fund

On Thursday, we tweeted [LINK] "*Tough Q1 for Norway wealth fund, equities -5.2%. Good thing Norway wealth fund decided to keep #Oil #NatGas stocks. Their biggest energy holding at 12/31 was #Shell, which is +30% YTD. See 👇 SAF Group Dec 26/21 Energy Tidbits. #OOTT.*" It's a good think Norway announced in Dec that it was going to keep investing in oil and gas stocks. Norway's wealth fund had released its summary Q1/22 performance titled "*Negative return in the first quarter*" [LINK] They do not provide detail by sector performance, but said "*In the first quarter of 2022, the Government Pension Fund Global returned -4.9 percent, equivalent to -653 billion kroner. The return on the fund's equity investments was -5.2 percent. The return on the investments in fixed income was -4.8 percent, whereas the investments in unlisted real estate returned 4.1 percent."* Norway did not disclose its new portfolio, but its top energy holding at Dec 31, 2021 was Shell, which is +30% YTD. The fund's return was 0.66 percentage points, or 82 billion kroner, stronger than the return on the benchmark index. "The first quarter has been characterised by geopolitical turbulence, which has also affected the markets. The return was negative for both equities and fixed income, but positive for unlisted real state", says Deputy CEO at Norges Bank Investment Management Trond Grande.

In Dec, Norway said it was going to keep investing in oil and gas stocks

Our tweet this week referenced our Dec 26, 2021 Energy Tidbits memo. Here is what we wrote that week on Norway's announcement to keep investing in oil and gas stocks. In that memo, we wrote "*We believe there is the case for multiple expansion for oil and gas stocks in 2022 as investors realize more significant institutional investors, especially pension funds, won't be selling down oil and gas stocks. The predictable is happening – more long term investors realize that the demise of oil and gas is many years further away than the Net Zero aspirations and that they will need oil and gas stocks for their returns. We expect to see more of these types of announcements/news over the next couple weeks. History has shown that the Xmas period is the time for announcements to be made to get the minimum attention. On Tuesday, we tweeted [LINK] "Multiple expansion for #Oil #NatGas stocks? Norway wealth fund has #MacronMoment & follows @cppib to slow play #EnergyTransition, won't sell, rather be a driving force for their equity investments to "adjust to #NetZero emissions over time". Less sellers is always good. #OOTT." Norway's sovereign wealth fund may be saying it a little differently but has come to a similar conclusion as CPPIB last week – they aren't selling oil and gas. They don't say it specifically but we also believe they won't be hesitating to buy . On Tuesday, Norway outlined its view on capital allocation [LINK] that had a number of key items. (i) High emissions* *sectors including oil and gas make up 14% of Norway's equity portfolio. These are companies that Norway believes must be restructured significantly to manage transition risk. (ii) "But that is not our approach, nor is it the expert group's proposal. Instead of selling ourselves out, we will through active ownership be a driving force for the companies to adapt. In order to influence, we must actually be owners." (iii) They want to be invested in all sectors. "If we are to achieve the best balance between expected return and risk, we must spread the investments widely and own a little of everything in the market. There is a solid professional basis for this approach." (iv) Priority to those that have the largest emissions ie. where they can effect change. "Going forward, we will increase ownership activity on climate, both in scope and depth. We will give particular priority to ownership activity towards the companies that have the largest emissions, towards those that have not published their own climate plans or have inadequate climate reporting." Our Supplemental Documents package includes the speech.*

Energy Transition –World's largest direct air capture of carbon plant freezes over

Design issues at direct air capture carbon plant

We were surprised to see the reported reasons for the Carbon Herald headline "*World's Largest Carbon Removal Plant 'Orca' Freezes Over In Iceland"* [LINK] that reported"*The world's largest carbon removal plant located to the east of Reykjavik, Iceland, has frozen, putting its operations behind schedule."* We would have just attributed the issues to not uncommon issues that often hit new start up plants. This is the Orca direct air capture plant in Iceland, which started up in Sept. However, we were surprised to see the reason. Carbon Herald wrote "*However, as it became apparent, the plant was not equipped to handle the harsh weather conditions in Iceland and some of the machinery froze. Climeworks was thus forced to urgently make modifications, which will inevitably be a bump in the road towards the company's carbon removal goals in Iceland."* We would have thought a plant designed for Iceland would have been designed for cold winters. Our Supplemental Documents package includes the Carbon Herald report.

Biggest direct air capture of carbon plant offsets <900 cars

Here is what we wrote in our Sept 26, 2021 Energy Tidbits, when we first reported on Orca. "*We are well aware that governments and capital providers are going to make sure the world is put on a push to get to Net Zero, we just don't want to see that ambition result in an massive energy crisis for multiple years in the 2020s. But it gets increasingly harder to not believe a massive energy crisis is coming because we continue to see capital allocation go to energy transition technologies that are Not Ready for Prime Time. Yet, capital continues to pour into them. A good example is the push into direct capture of carbon from the air. On Tuesday, NowThis news tweeted a video [LINK] from Climeworks CEO (Jan Wurzbacher) on how they just turned into operation their Orca plant in Iceland, "which is the largest direct air capture plant currently operational in the world with a capacity of 4,000 tonnes of CO2 that are captured from the air every year. So that's phenomenal capacity." We hadn't realized that the capacity of the direct air capture plants was that low, which is why we tweeted [LINK] "World needs massive cuts to #CO2 emissions & need demonstration projects like this to show it can be done. But world's biggest project can remove 4,000 tonnes CO2/yr only offsets <900 cars, EPA est typcial car emits ~4.6 tonnes CO2/yr. #EnergyTransition will be hugely expensive." Our tweet* *included the main page from the EPA's Greenhouse Gas Emissions from a Typical Passenger Vehicle* [LINK] *"a typical passenger vehicle emits about 4.6 metric tons of carbon dioxide per year" . The math perspective is that the world's largest operating direct air capture of carbon plant will only offset the CO2 emissions of <900 cars. Climeworks did not disclose the capital or operating costs of the Orca plant. But this must be hugely expensive to take the equivalent of <900 cars off the road. Yet direct air capture of carbon is still able to attract massive capital. To illustrate the challenge, the number of cars in the US is approx. 290 million, or the equivalent of ~325,000 Orca direct air capture of carbon plants.*

Figure 45: Climeworks Direct Air Capture Plant

Source: Climeworks, NowThis

Energy Transition – Kitty Hawk eVTOL aircraft marks milestone in aviation history

Electric powered aircrafts further development

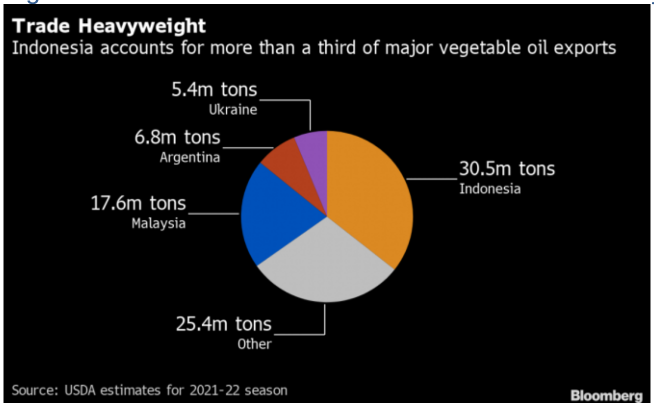
Debate on full cycle economics aside, there is no question that governments and society are pushing the world to electric transportation. This is not just EVs, but also air. Dubbed the "flying battery" the Alia eVTOL, owned by Kitty Hawk, marks a long held aviation goal of developing a craft with no need for jet fuel and one that has no carbon emissions. The Alia was developed by Beta Technologies, a five-year start-up, that's main focus is on cargo transport rather than passenger. DNYUZ reported on Apr 16 [LINK] that an e-plane was long thought beyond reach since batteries were too heavy and would impact the aerodynamics of the plane; technological innovation since the 1990s allowed for further development of green aviation tech. The report noted *"Despite the excitement about e-planes, the Federal Aviation Administration has never certified electric propulsion as safe for commercial use. Companies expect that to change in the coming years, but only gradually, as safety concerns are worked out. As that process occurs, new forms of aviation are likely to appear, planes never seen before outside of testing grounds. Those planes will have limitations as to how far and fast they can fly, but they will do things other planes can't, like hover and take off from "runways in the sky."* Beta is alone in focusing on cargo and seeks F.A.A approval in 2024, it has a limit of 250 nautical miles per battery charge and would be reliant on soar paneled charging stations. The US Air Force has recently begun evaluating the use of its heavy side craft for medevac missions [LINK]. Kitty Hawk is the latest eVTOl developer to join the Air force's agility prime program to explore the dual uses of the electric aircrafts. Upon testing the heavy side eVTOL craft, Col. Don Haley commented *"the exercise "revealed common attributes that serve both urban air mobility and search-and-rescue operations: high reliability, responsive launch and recovery, minimal logistical footprint, accessibility for mobility-challenged, low acoustic signature, and high levels of autonomy."*

Capital Markets – Indonesia halts palm oil exports

Palm oil market hit

The inflation stress to global food markets should be going up in the near term. Our April 10, 2022 Energy Tidbits highlighted the USN FAO Food Price Index in March that was +33.6% YoY. That should be going up and there will be increased risk for shortages, at least for the already very expensive vegetable oils. Yesterday, we tweeted [LINK] "*a big hit to global markets, moreso to key importers of Indonesia palm oil like India/China that were also the big imports of Ukraine sunflower oil. UN FAO Food Price Index already had vegetable oils seeing highest cost inflation of any food group."* Bloomberg had reported on Indonesia's Friday decision to ban exports of palm oil (within the vegetable oil class) to ensure there won't be any shortages at home. Bloomberg included the below graph and noted that Indonesia "*accounts for more than a third of global vegetable-oil exports, with China and India, the two most populous countries, among its top buyers."* And "*While limited supply and soaring prices are set to worsen inflation of food items like salad dressing and mayonnaise in wealthy economies like the U.S., developing nations like India are set to feel the worst impacts. Such countries depend on imports of palm oil as a cheaper alternative to more costly soybean, sunflower and canola oil."* Note that sunflower oil exports have already been hammered because of the Russia/Ukraine war.

Figure 46: Indonesia accounts for more than 1/3 of major vegetable oil exports



Source: Bloomberg

Capital Markets – Alberta is cheap to live vs Ont & BC

Most affordable and expensive cities

Our March 20, 2022 Energy Tidbits highlighted the Demographia report on relative housing but the data seemed to make the rounds this week so we decided to include it in today's memo. Housing around the world have been subject to rapid appreciation in recent months. Demographia released their ranking of the most affordable metropolitan areas around the world [LINK]. We were interested to see that Canadian cities were amongst the most affordable and the most expensive cities to live in as of March 7, 2022 data. We tweeted

[LINK] *"Great for our friends/relatives in #Vancouver #Toronto to have made huge home value appreciation. Hopefully #Calgary #Edmonton will start to catch up as 2020s bring continued high #Oil #NatGas prices. thx @urbanreforminst @FrontierCentre"* Edmonton Alberta was ranked the 4th most affordable city in the list when comparing median income to median home prices in the city. Calgary was the next highest ranking Canadian city at the 10th most affordable major metropolitan centre with a median multiple of 4.0. Vancouver is the most expensive city in Canada to live in and the 3rd most expensive in the world with a median multiple of 13.3x. Toronto was the 10th most expensive city to live in the world and the second most expensive in Canada with a median multiple of 10.5. Ottawa ranked 50th on the list with a median multiple of 5.6. Pittsburgh was the most affordable city to live in around the world with a median multiple of 2.7 and Hong Kong was the most expensive city in the world with a median multiple of 23.7. Below is our chart highlighting the top 10 most affordable and expensive major metropolitan areas around the world.

Figure 47 Metropolitan Housing Markets Ranked by Affordability

Metropolitan Housing Markets Ranked by Affordability							
Rank	**Nation**	**Top 10 Most Affordable**	**Multiple**	**Rank**	**Nation**	**Top 10 Least affordable**	**Multiple**
#1	U.S.	Pittsburgh, PA	2.7x	#1	CHN	Hong Kong	23.2x
#2	U.S.	Oklahoma City, OK	3.3x	#2	AUS	Sydney, NSW	15.3x
#3	U.S.	Rochester, NY	3.3x	#3	CAN	Vancouver, BC	13.3x
#4	CAN	Edmonton, AB	3.6x	#4	U.S.	San Jose, CA	12.6x
#4	U.S.	St Louis, MO	3.6x	#5	AUS	Melbourne, VIC	12.1x
#6	U.S.	Cleveland, OH	3.7x	#6	U.S.	Honolulu, HI	12.0x
#7	U.K.	Glasgow	3.8x	#7	U.S.	San Francisco, CA	11.8x
#7	U.S.	Cincinnati, OH	3.8x	#8	N.Z.	Auckland	11.2x
#9	U.S.	Buffalo, NY	3.9x	#9	U.S.	Los Angeles, CA	10.7x
#10	CAN	Calgary, AB	4.0x	#10	CAN	Toronto, ON	10.5x
Avg			**3.6x**				**13.3x**

*Multiple (Median House Price/Household Income)

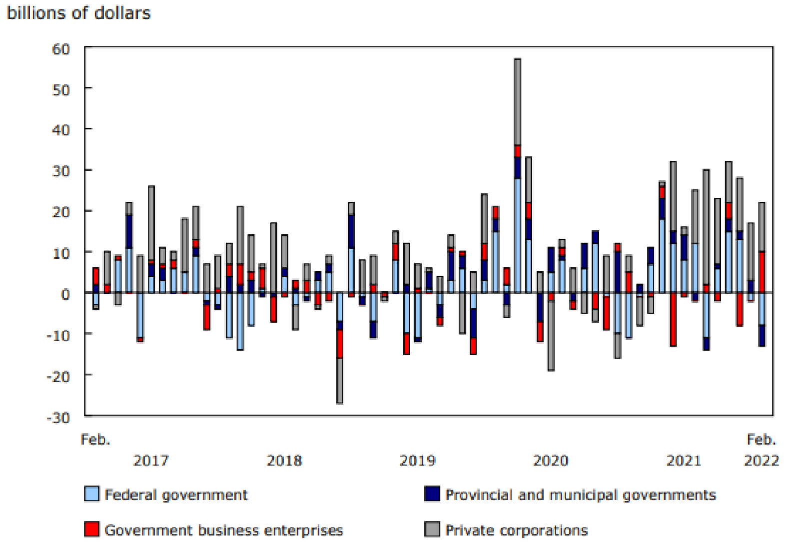
Source: Urban Reform Institute

Capital Markets – Canadian investors divest by $9.7 bn in foreign securities

International transactions in Cdn securities

Statistics Canada released Canada's international transactions in securities for February 2022 on Apr 19 [LINK]. Foreign investors acquired $7.4 bn of Canadian securities in February with the largest target in purchases being private corporate bonds and smaller provincial government bonds. This marks the lowest investment since March 2021; the overall foreign investment activity was moderated by a divestment in Canadian government debt securities. Non-residents added $18.2 bn of Canadian debt securities to their portfolios in February. Non-resident investors divested $9.1 bn of money market instruments from their portfolios mainly made up of private corporate instruments. Long term interest rates continued their upward trend this month. Canadian investors reduced their investment by $9.7 bn of foreign debt securities in February which was a consecutive month of divestment in debt instruments after 11 months of investments. Investment activity was led by acquisitions of non–US foreign bonds and a divestment in non-US foreign shares. The report stated, *"Canadian investors reduced their holdings of foreign securities by $9.7 billion in February for a second consecutive month of large divestment. The reduction was mainly because of sales of US shares and was moderated by acquisitions of US corporate debt securities. Canadian investors continued to reduce their exposure to foreign equity securities, disposing of $11.5 billion in February, following a divestment of $16.7 billion in January. Investors sold $9.4 billion worth of US shares, largely investment fund shares tracking broad stock market indexes. US stock prices, as measured by the Standard and Poor's 500* *composite index, were down by 3.1% in February, following a decrease of 5.3% in the previous month."* Below is a graph illustrating foreign investment in Canadian debt securities.

Figure 48: Foreign Investment in Canadian debt securities



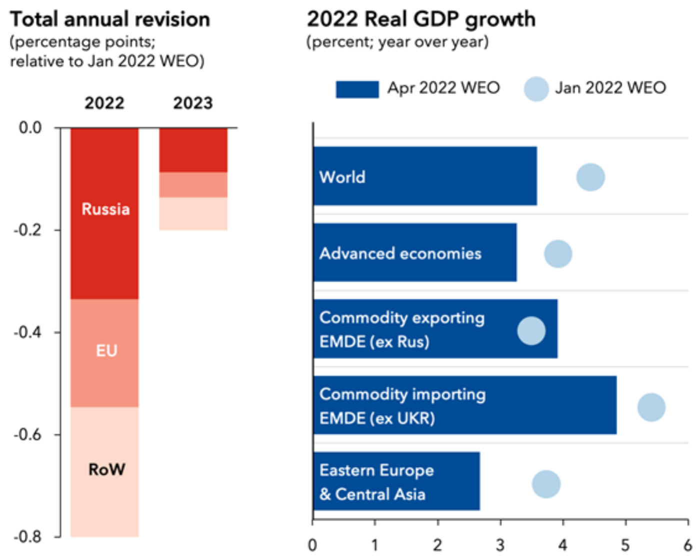
Source: Statistics Canada

Capital Markets – IMF "*war dims global economic outlook as inflation accelerates*"

Russia/Ukraine conflict slows global recovery

The IMF released their world economic outlook for April 2022 [LINK] and it was titled "*War Sets Back the Global Recovery"* and the headlines were on the IMF lowering its global growth rate for 2022 to 3.6% vs 4.4% in its January forecast. Everyone has their own view but our concern is that, as seen so far, the impact of the war and the west's move to economically punish Russia for the long term is yet to be understood. We are concerned the impact on the global economy will be even worse. For example, earlier in the memo, we noted Indonesia halting exports of palm oil. Who knows how long it will last, but it is another item that will impact the global economy. The Jan 2022 GDP forecast was 4.4% and has ow been revised to 3.6% in the April forecast. Similarly, growth was pegged at 3.8% in 2023 and is now forecasted in the April report. Beyond 2023 the report noted "*global growth is forecast to decline to about 3.3 percent over the medium term. War-induced commodity price increases and broadening price pressures have led to 2022 inflation projections of 5.7 percent in advanced economies and 8.7 percent in emerging market and developing economies—1.8 and 2.8 percentage points higher than projected last January. Multilateral efforts to respond to the humanitarian crisis, prevent further economic fragmentation, maintain global liquidity, manage debt distress, tackle climate change, and end the pandemic are essential."* The war adds to the series of supply shocks that have struck the global economy in recent years. Russia is a major oil, gas and metals exporter and Ukraine is a leading exporter of wheat and corn. Commodity importers in Europe, the Caucasus and Central Asia, the Middle East and North Africa, and sub-Saharan Africa are most affected. But the surge in food and fuel prices will hurt lower-income households globally, including in the Americas and the rest of Asia. Inflation has become a clear and present danger in many countries with the key risk is the rising inflation expectations drift away from central bank targets, prompting an aggressive tightening response from policy makers. Increases in the cost of food is also likely to increase civil unrest in poorer countries. The IMF reported in their blog [LINK] "*So far, this repricing has been mostly orderly. Yet, several financial fragility risks remain, raising the prospect of a sharp tightening of global financial conditions as well as capital outflows. The war also increases the risk of a more permanent fragmentation of the world economy into geopolitical blocks…such a tectonic shift would cause long-run efficiency losses, increase volatility and represent a major challenge to the rules-based framework that has governed international and economic relations for the last 75 years."* The IMF emphasizes that particular attention should be paid to the global economic order to make sure the multilateral framework responsible for lifting millions out of poverty is not dismantled. Below is a graphic depicting the updated economic growth outlook. Our Supplemental Documents package includes excerpts from the IMF update.

Figure 49: Global Growth as Impacted by the War in Ukraine



Source: IMF

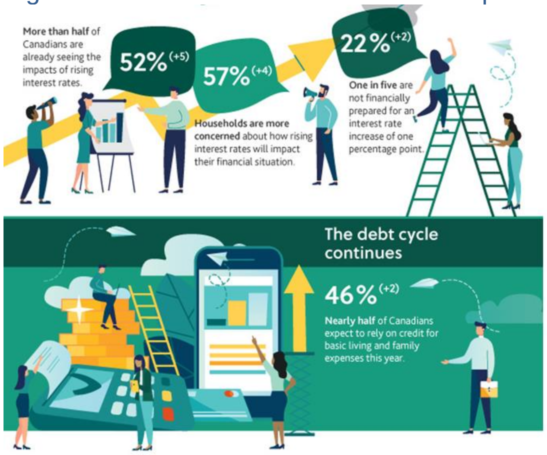
MNP Consumer Debt Index

Demographics – Canadians worry about rising interest rates

The interest rate debate late this week has now moved to will the Fed's next rate hike be 50 or possibly even 75 bps. And then how much more after that that. The expectation is for continued rate hikes in the US and also in Canada. Couple that with the fact the Bank of Canada raised its rates by 50 bps on April 13, it's why we found the MNP Consumer Debt Index [LINK] a little scarier than some have taken it. People may have missed the fine print that said the survey was taken March 9-14. Keep that in mind when you note the survey results such as "*and two in 10 (22%, +2pts) say they're not financially prepared to deal with a rate increase of one percentage point*." Also "*More than half of Canadians say they're already feeling the effects of interest rate increases (52%, +5pts). Looking ahead, six in 10*

(57%, +4pts) say they're concerned about the impact of rising interest rates on their financial situation'". Our Supplemental Documents package includes the MNP release.

Figure 50: MNP Consumer Debt Index April 2022



Source: MNP

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.

Sasaki pulled after the 8th inning, analytics going too far in Japan's baseball?

We understand the concept that young pitchers are on a pitch count to try to make sure they don't do any longer term damage to their arms, but it's still hard to believe what happened on Sunday to Chiba Lotte pitcher, 20 year old Roki Sasaki. Sasaki had thrown the first perfect game, including 19 strikeouts, on 105 pitches the prior Sunday, April 10, against the Orix Buffaloes, which was the first perfect game in

Japan's Nippon Professional Baseball League since 1994. Then in his next start last Sunday April 17, he throws eight perfect innings, but then gets pulled after the 8th inning as his pitch count had hit 102 pitches. Due to our early news cut off of 9pm MT last night, we do not have Sasaki's box score for his start today (local time). Chiba was playing Orix again and the first pitch was to be at 10pm MT last night.

Washington Nationals pre-game parachutist causes capital evacuation

There was a brief commotion on Wednesday around dinner when the U.S. Capitol Police ordered an evacuation of the Capitol buildings around 6:30pm ET based on a "probable threat". It turns out the threat was a plane carrying members of the U.S. Army Golden Knights who were in the air to parachute into the Washington Nationals baseball stadium for a pre-game event. Apparently the plane circling over the stadium sent the police and other federal agencies scrambling. The warning didn't last too long. And then the politicians got into the blame game, such as House Speaker Nancy Pelosi's statement "*an apparent failure to notify Capitol Police o the pre-planned flyover Nationals Stadium is outrageous and inexcusable*".

Figure 51: U.S. Army Golden Knights Parachutist

Source: ESPN

Dylan Frittelli's 2-stroke penalty at the RBC Heritage

Everyone who plays golf inevitably shakes their head at playing with people who cheat on the rules. The classic is when they hit a ball out of the fairway, say they find it, and then someone else finds their ball. Busted, but they won't admit it. But then there are certain applications of rules that make you shake your head. In the final round of the RBC Heritage last Sunday, on the 6th hole just off the fairway. Dylan Frittelli found his ball had come to rest about 7 feet above the ground in Spanish moss hanging from a tree. He identified the ball, and then gripped way up on his driver, raised it over his head to hit the ball out of the tree and back on the fairway. Then made an up and down to save his par, or so he thought. He was later assessed a two-shot penalty and ended up with a double bogey 6 on the par 4. The PGA tweeted "*Dylan Frittelli was assessed a two-stroke penalty on No. 6 under Rule 10.1c (making stroke while standing across or on line of play).*" Frittelli was facing straight and therefore the driver was being held right in the middle of body aligned with the direction his body was facing. Frittelli later tweeted [LINK] "*I thought this would be the greatest Par of my life 😲 I was assessed a 2-stroke penalty for "standing astride" my intended line of play during this shot. The rules of golf remain undefeated ✌️ 🙄*

@SportsCenter top 10 play maybe?"

Figure 52: Dylan Frittelli on 6th hole of RBC Heritage

Source: The Sun

Frittelli reminds of how Sam Snead changed golf's putting rules in 1968

You have to be a lover of golf history or old enough to remember how Slammin Sam Snead forced a change to golf's putting rules in 1968. He won more PGA events than anyone in in the 40s' and 50's, and his final PGA tour win came in 1964 at the age of 52. But he was also known in his 50s as the poster child for a golfer with putting yips. Midway thru the 1966 PGA Championship at the famous Firestone club in Akron, he double hit a 2 foot putt. On the next hole he changed his putting style to put croque style. He ended up tied for 6th, and then kept the croquet style putting. He then went on to win a number of PGA seniors events, and also tied for 1967 Masters with his croquet style But in 1967, the USGA and R&A met and put in a rule change for 1968 banning the croquet style putting. Basically the same concept as hit Frittelli last weekend. The Rule 16-1e was "*on the putting green a player shall not make a stroke from astride, or with either foot touching the line of the putt, or an extension of that line behind the ball.*" It forced Snead to move to a modified version.

Figure 53: Sam Snead putting before and after Rule 16-1e

Source: Society of Golf Historians, Aussie Golfer