

Energy Tidbits

Is China Pushing to Herd Immunity? If So, Vitol Sees “J” Shaped Recovery in China Transportation Fuels as Early as Q2/23

Produced by: Dan Tsubouchi

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Dan Tsubouchi
Chief Market Strategist
dtsubouchi@safgroup.ca

Ryan Dunfield
CEO
rdunfield@safgroup.ca

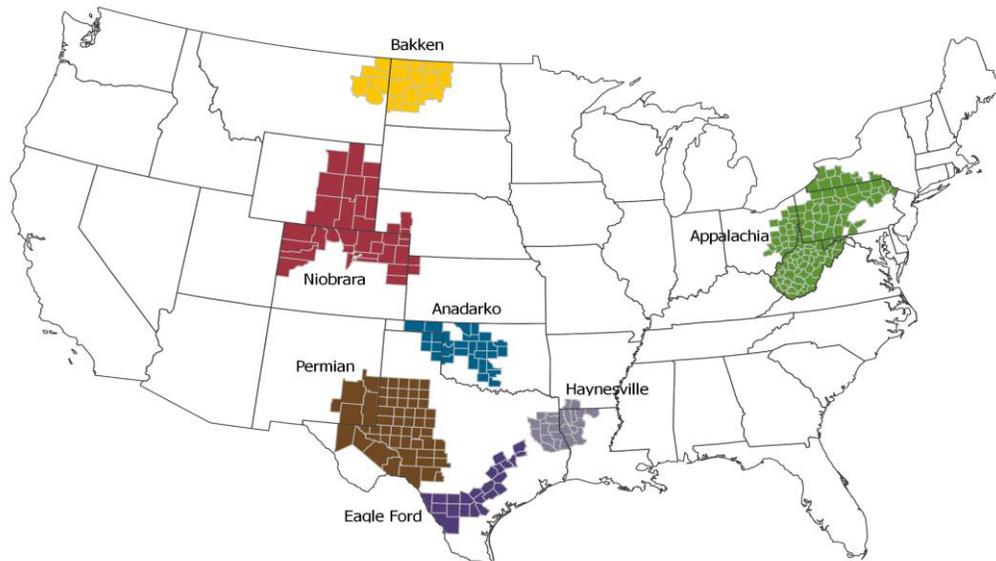
Aaron Bunting
COO, CFO
abunting@safgroup.ca

Ryan Haughn
Managing Director
rhaughn@safgroup.ca



Drilling Productivity Report

For key tight oil and shale gas regions



Note:

The DPR rig productivity metric *new-well oil/gas production per rig* can become unstable during periods of rapid decreases or increases in the number of active rigs and well completions. The metric uses a fixed ratio of estimated total production from new wells divided by the region's monthly rig count, lagged by two months. The metric does not represent new-well oil/natural gas production per newly completed well.

The DPR metric *legacy oil/gas production change* can become unstable during periods of rapid decreases or increases in the volume of well production curtailments or shut-ins. This effect has been observed during winter weather freeze-offs, extreme flooding events, and the 2020 global oil demand contraction. The DPR methodology involves applying smoothing techniques to most of the data series because of inherent noise in the data.

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Year-over-year summary

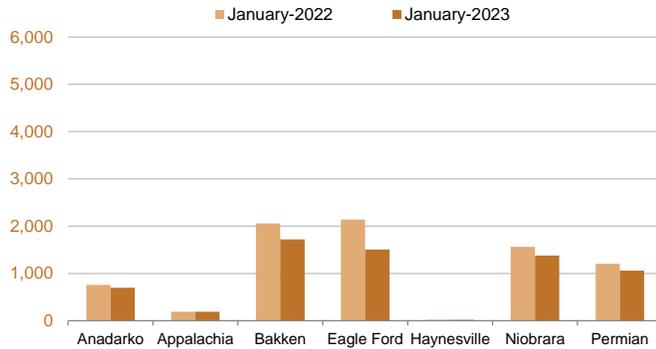
December 2022

Drilling Productivity Report

drilling data through November
projected production through January

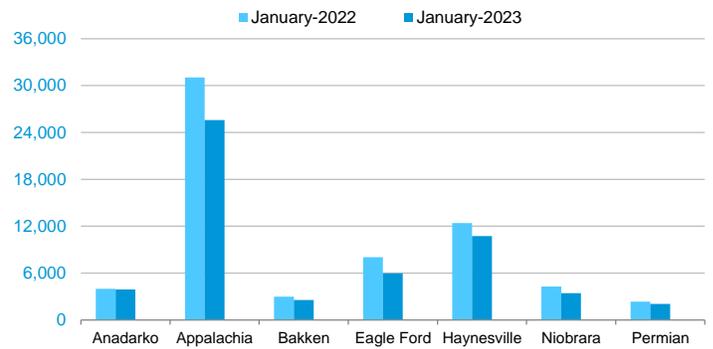
New-well oil production per rig

barrels/day



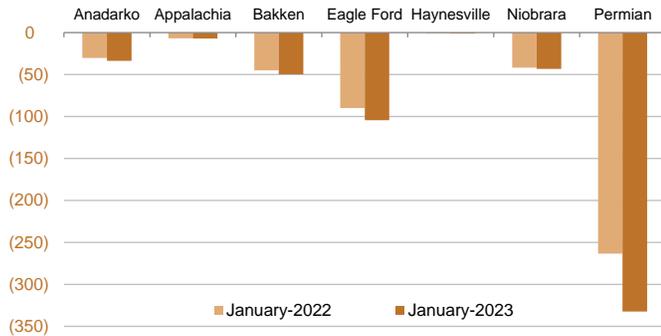
New-well gas production per rig

thousand cubic feet/day



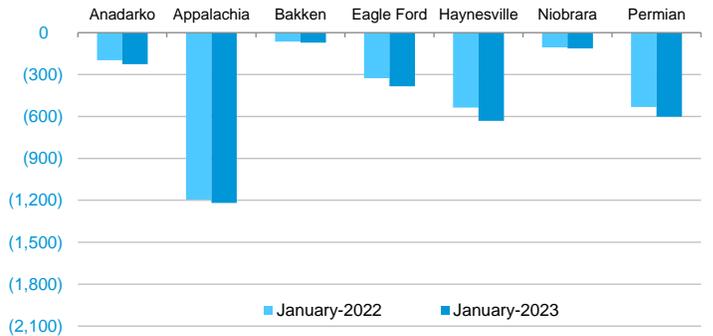
Legacy oil production change

thousand barrels/day



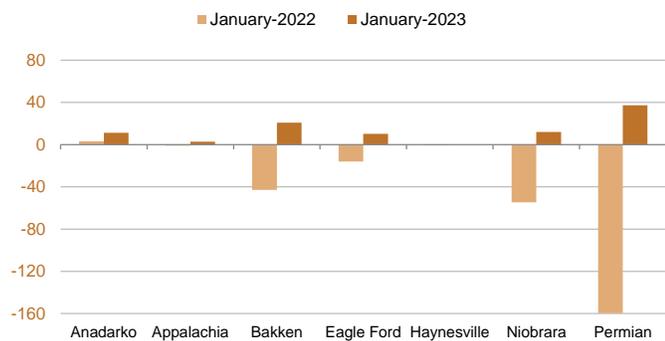
Legacy gas production change

million cubic feet/day



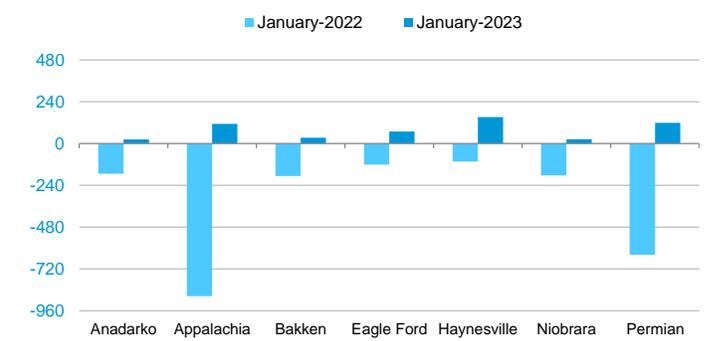
Indicated monthly change in oil production (Jan vs. Dec)

thousand barrels/day



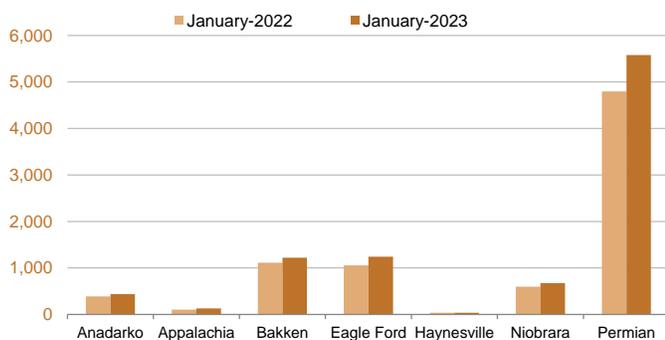
Indicated monthly change in gas production (Jan vs. Dec)

million cubic feet/day



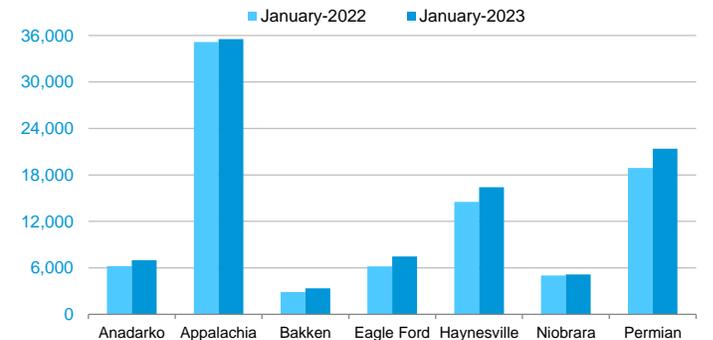
Oil production

thousand barrels/day



Natural gas production

million cubic feet/day



Oil
+1
barrels/day
month over month

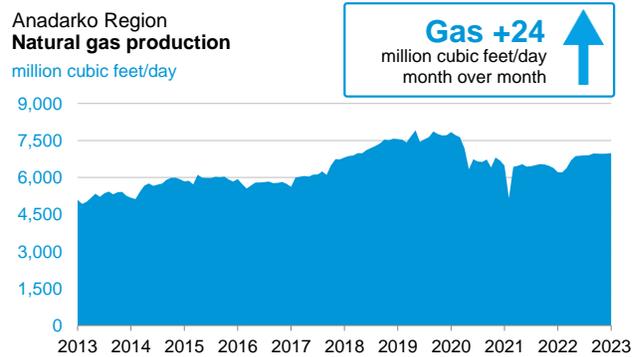
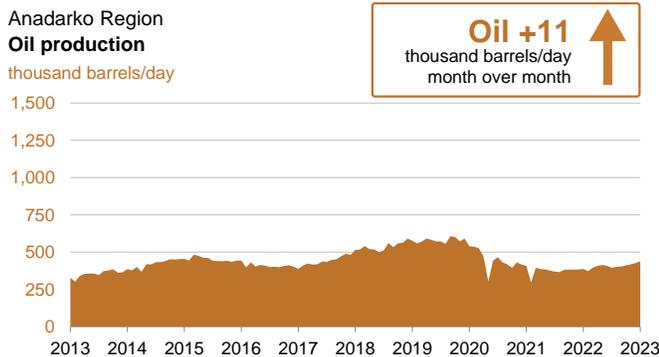
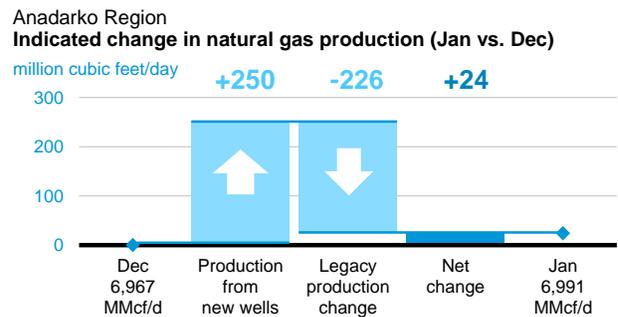
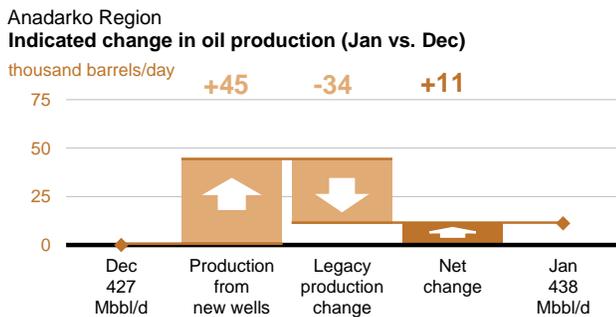
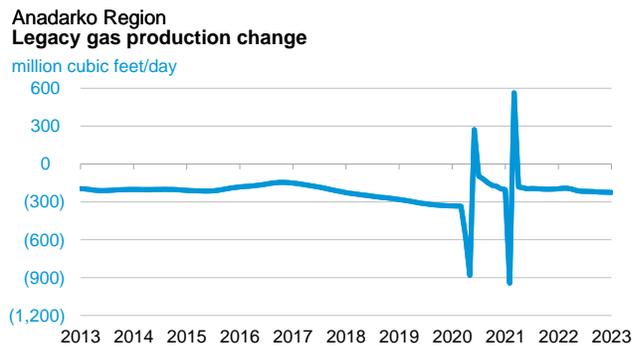
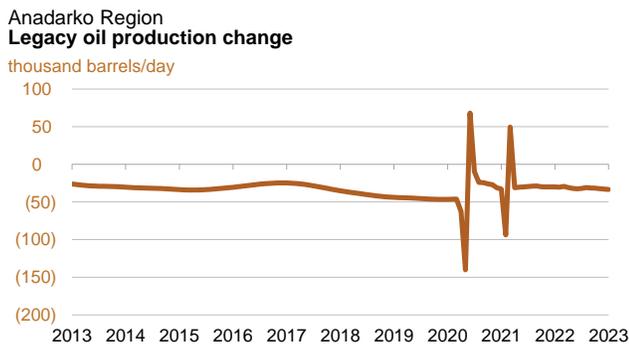
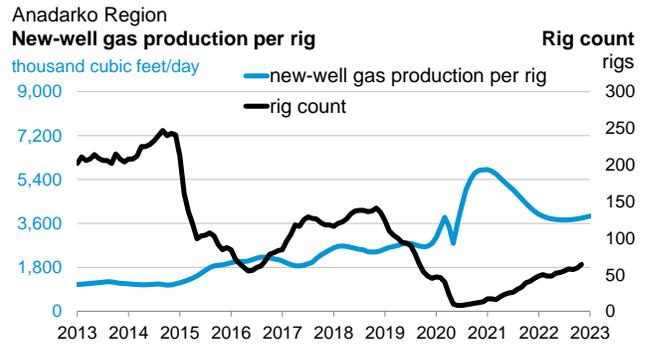
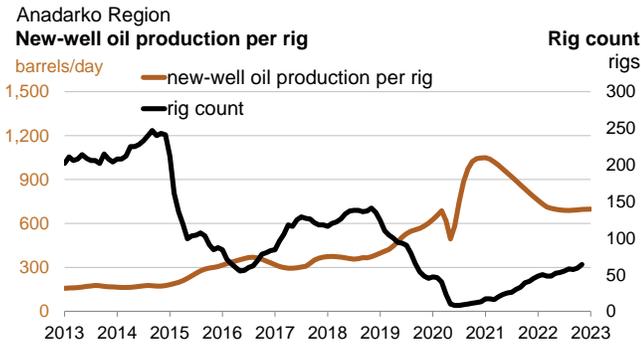


698 January
697 December
barrels/day

Monthly additions from one average rig

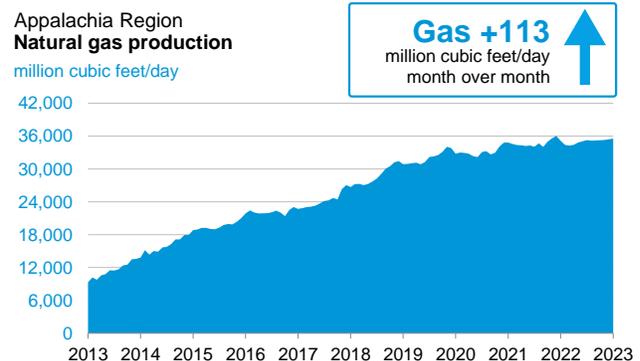
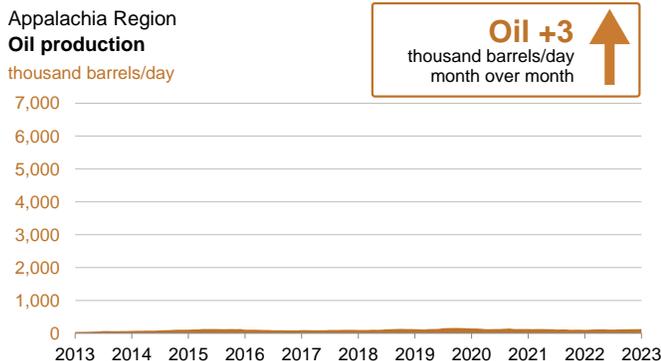
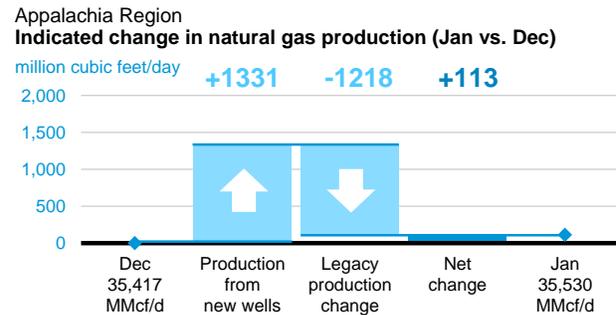
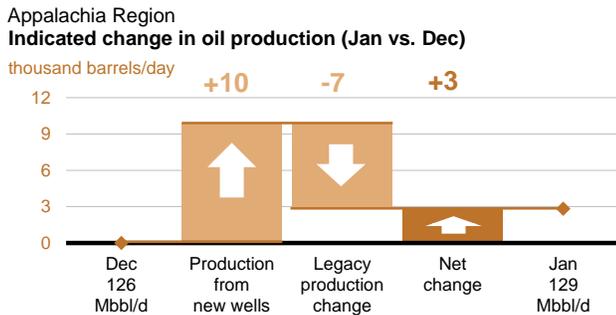
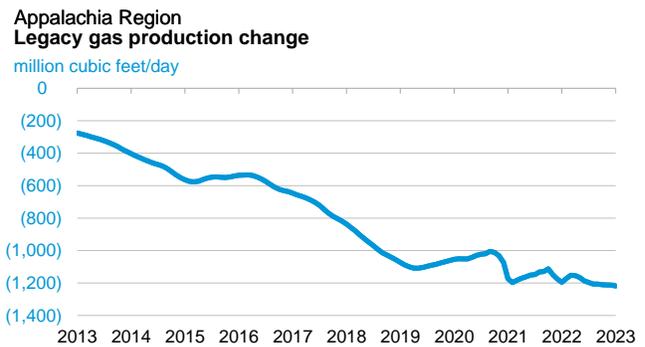
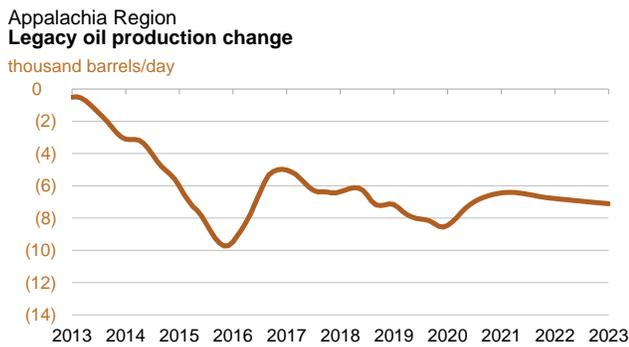
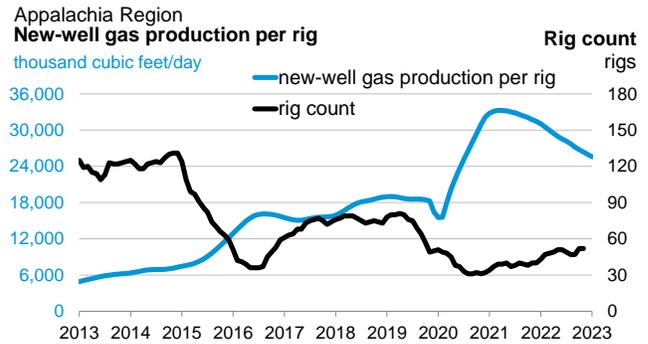
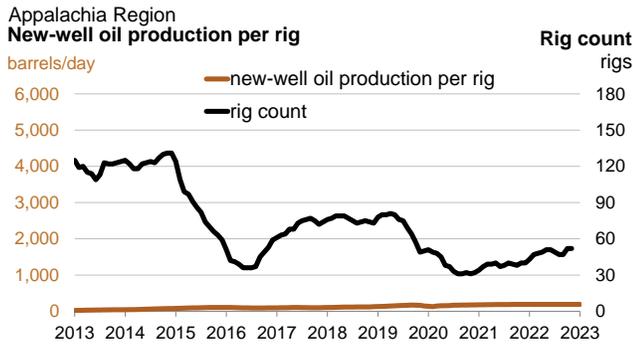
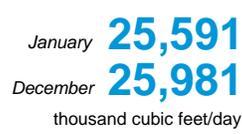
January **3,903**
December **3,857**
thousand cubic feet/day

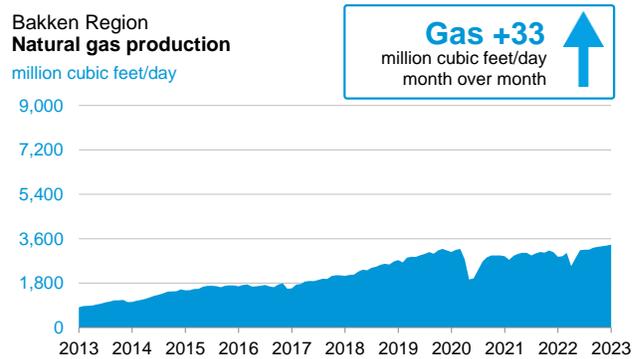
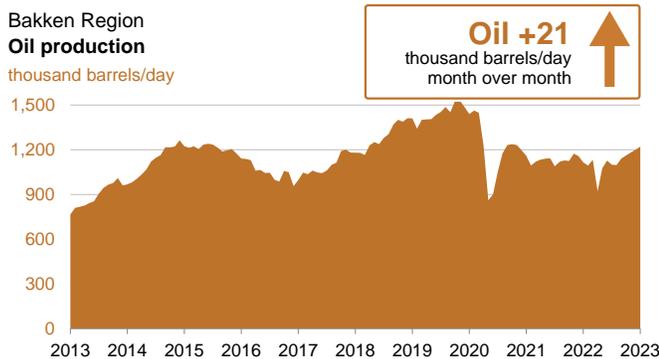
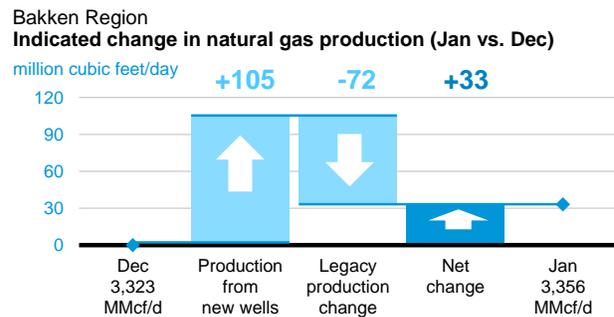
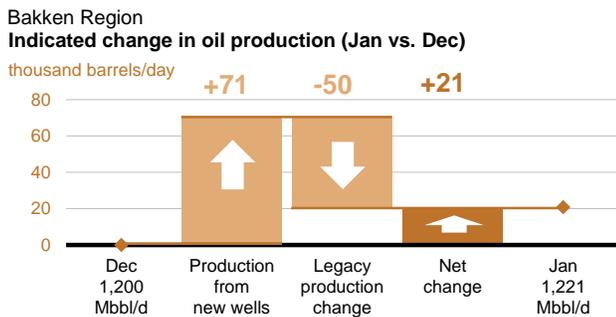
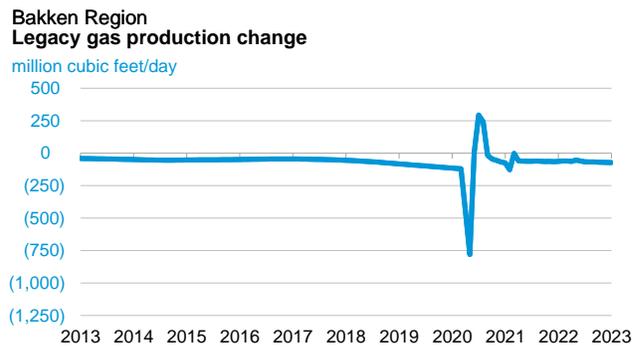
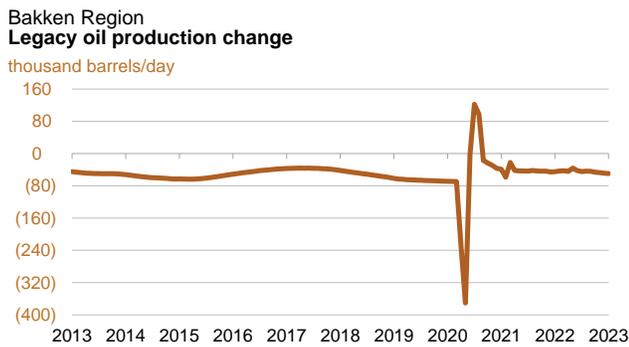
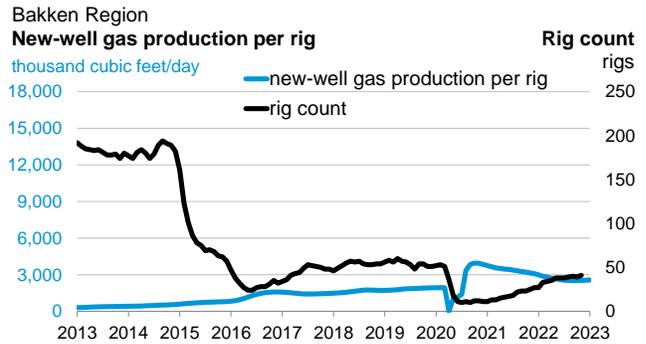
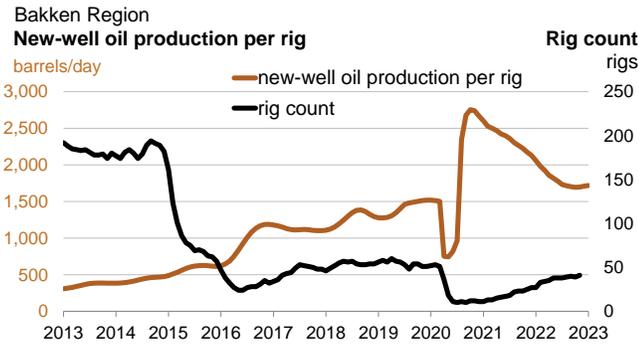
Gas
+46
thousand cubic feet/day
month over month

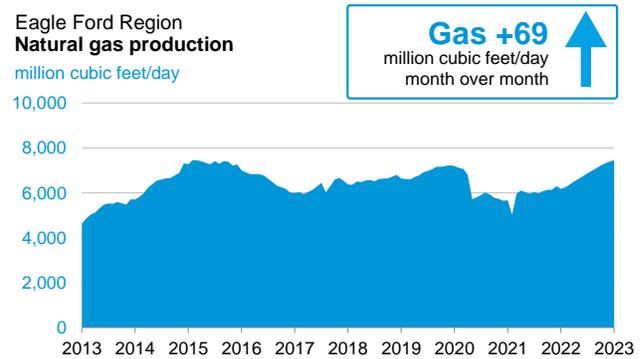
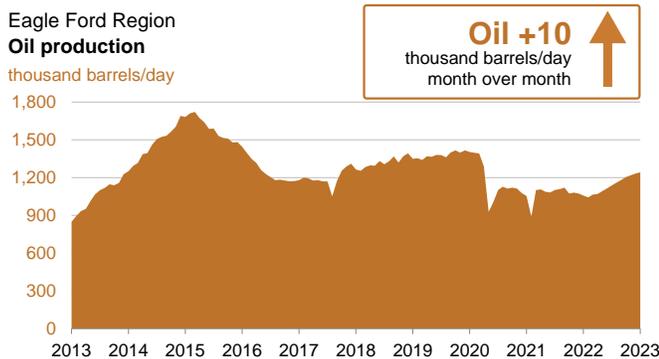
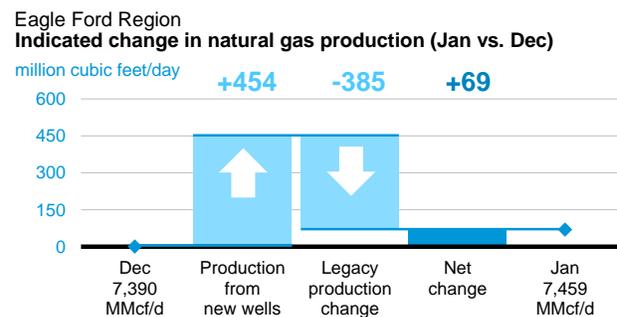
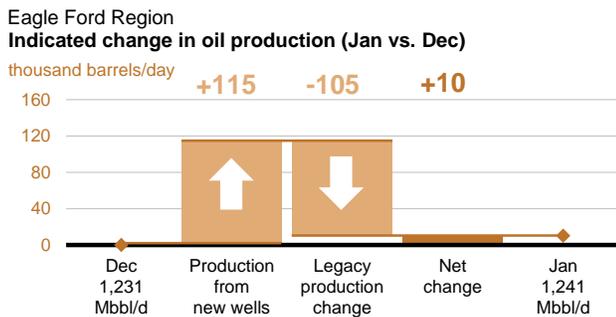
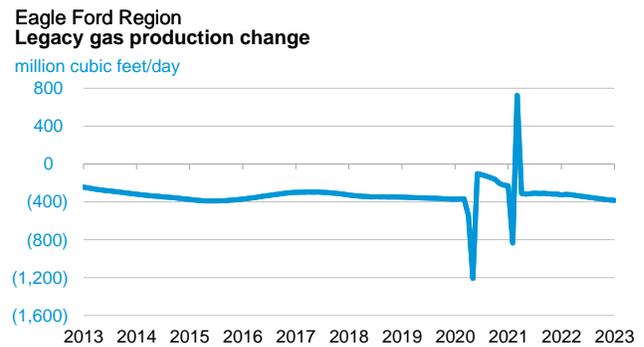
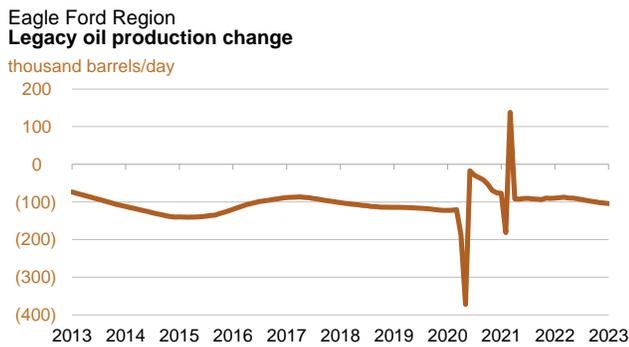
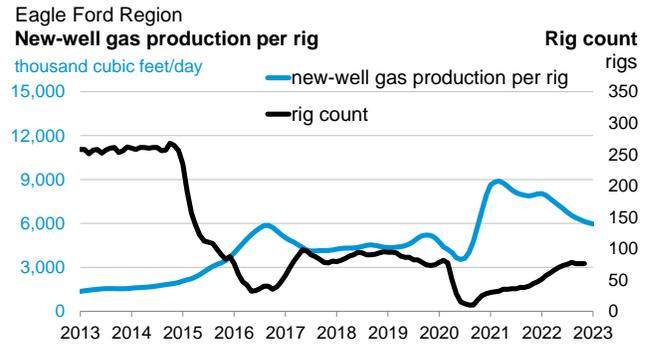
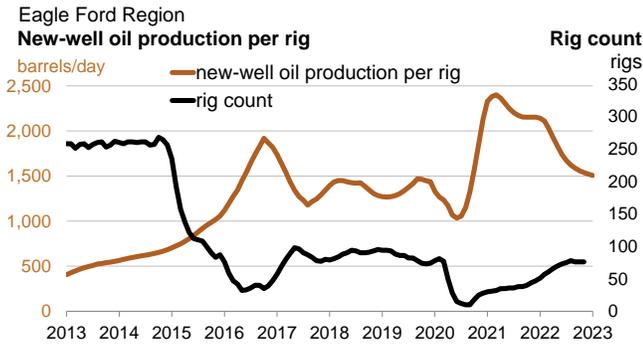





Monthly additions from one average rig

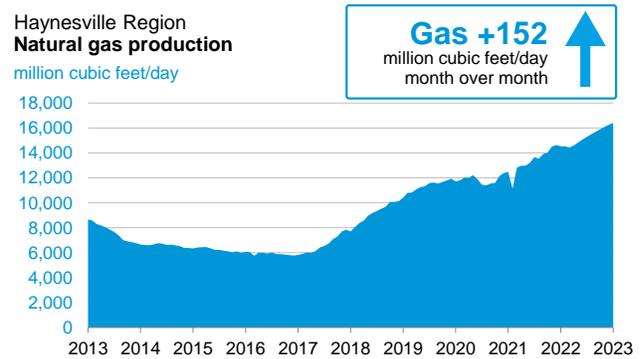
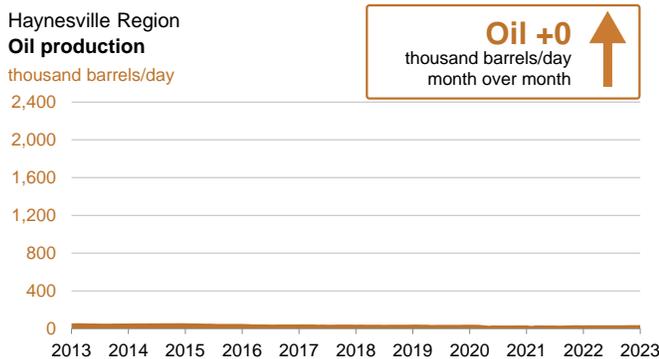
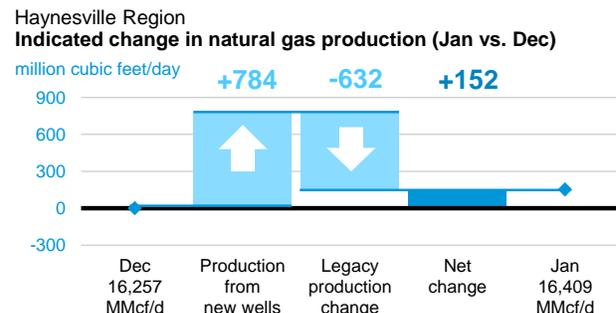
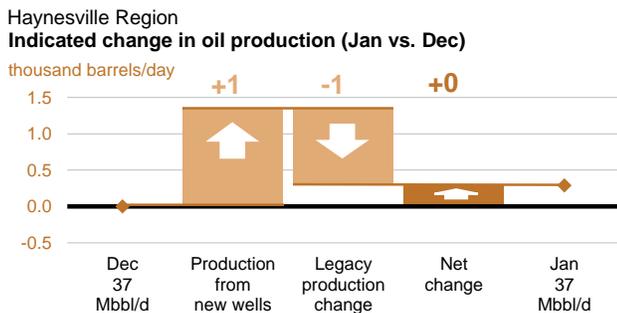
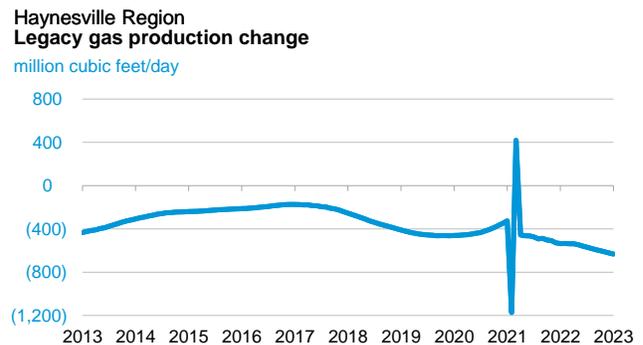
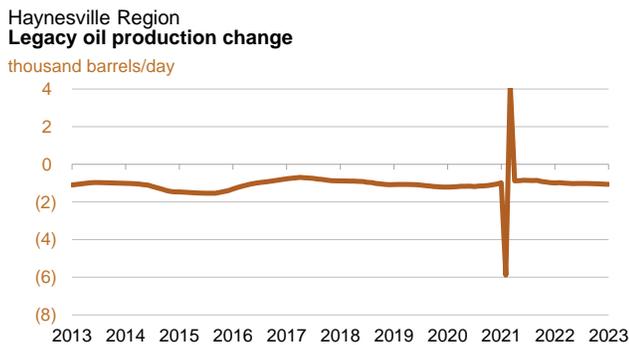
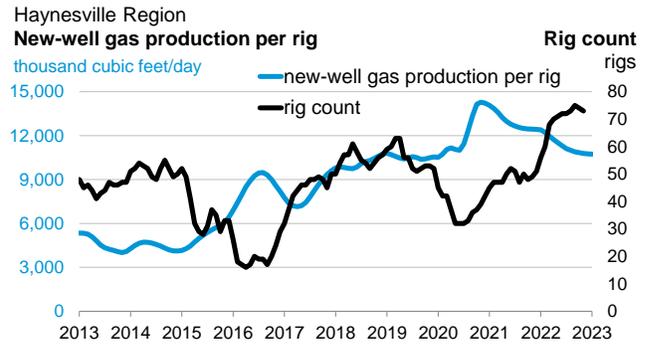
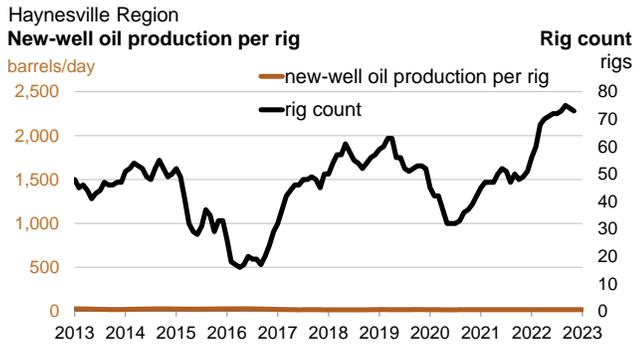


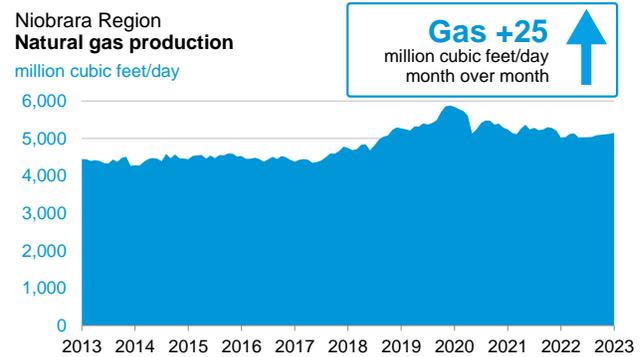
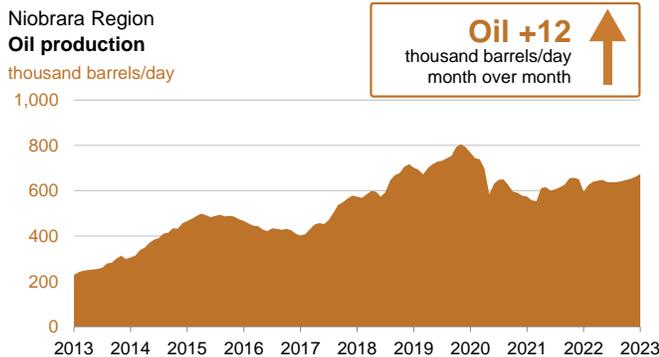
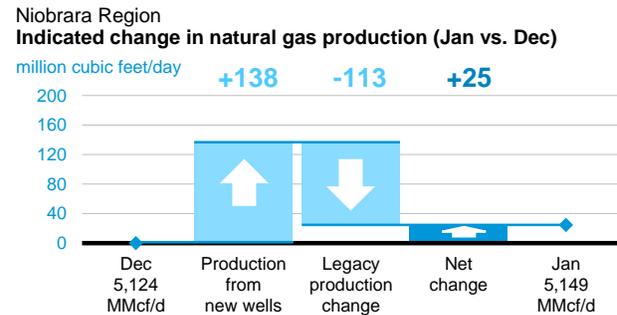
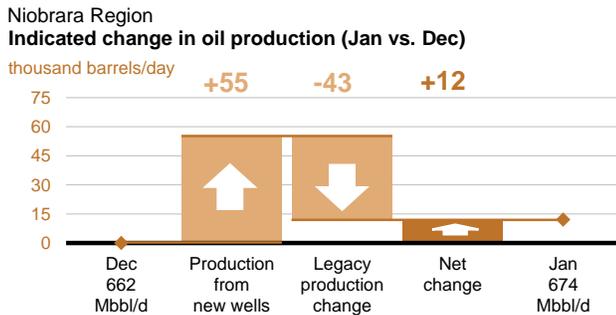
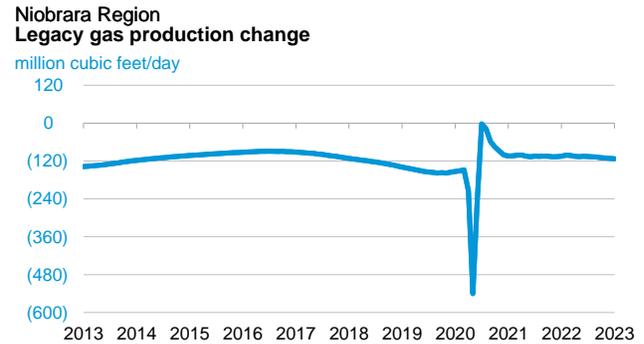
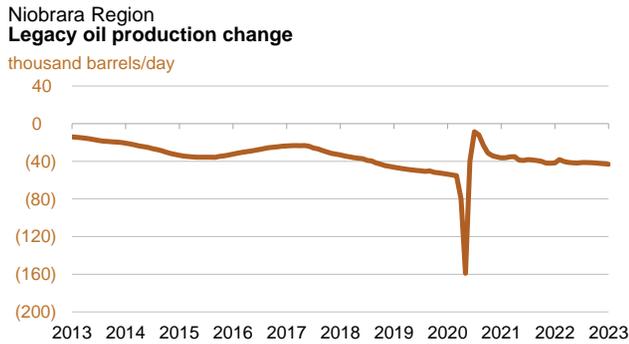
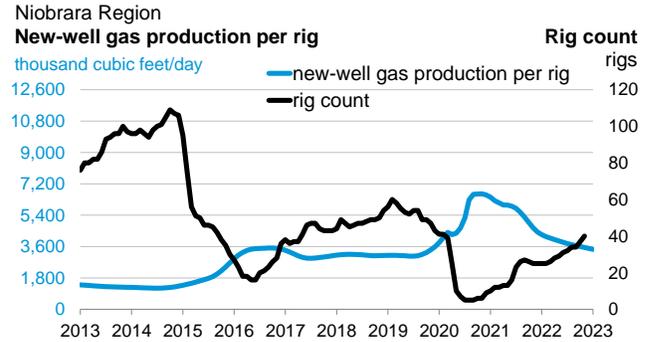
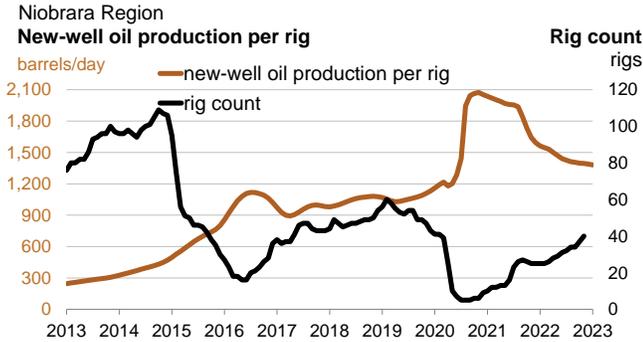


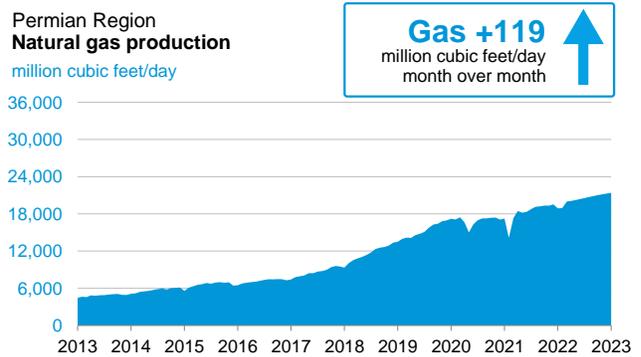
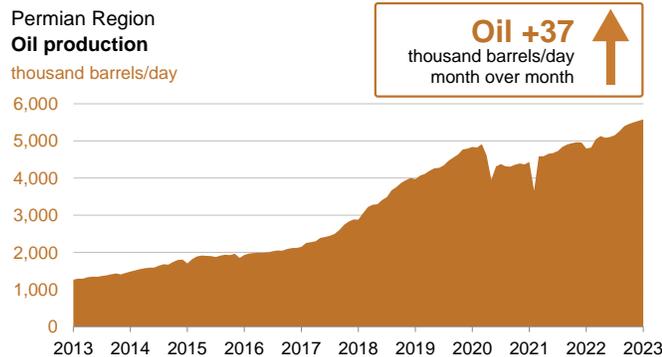
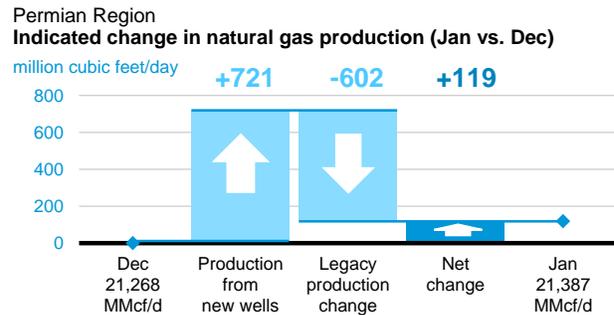
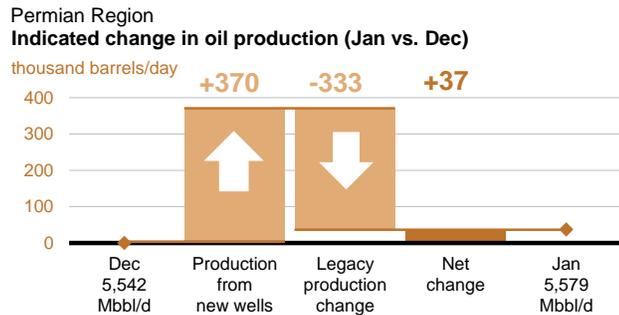
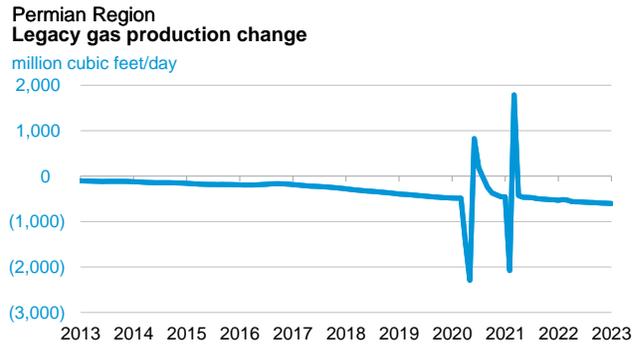
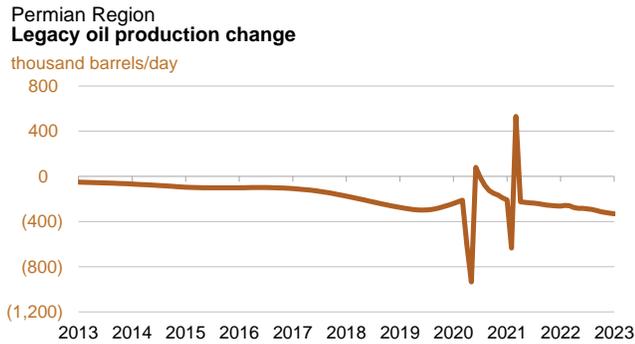
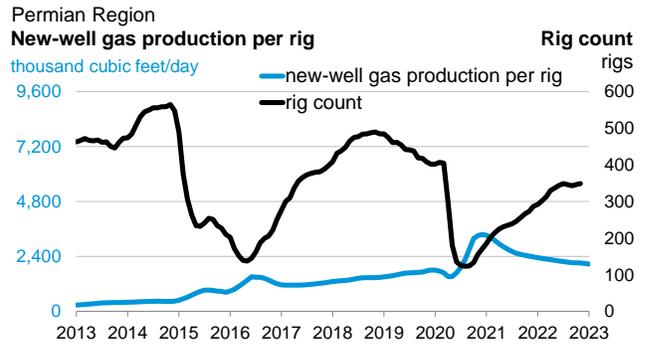
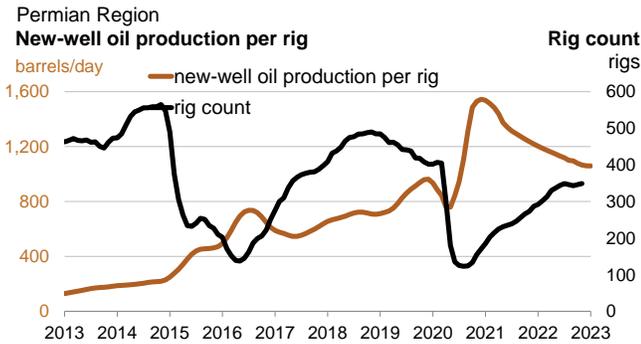




Monthly additions from one average rig







The Drilling Productivity Report uses recent data on the total number of drilling rigs in operation along with estimates of drilling productivity and estimated changes in production from existing oil and natural gas wells to provide estimated changes in oil¹ and natural gas² production for seven key regions. EIA's approach does not distinguish between oil-directed rigs and gas-directed rigs because once a well is completed it may produce both oil and gas; more than half of the wells do that.

Monthly additions from one average rig

Monthly additions from one average rig represent EIA's estimate of an average rig's³ contribution to production of oil and natural gas from new wells.⁴ The estimation of new-well production per rig uses several months of recent historical data on total production from new wells for each field divided by the region's monthly rig count, lagged by two months.⁵ Current- and next-month values are listed on the top header. The month-over-month change is listed alongside, with +/- signs and color-coded arrows to highlight the growth or decline in oil (brown) or natural gas (blue).

New-well oil/gas production per rig

Charts present historical estimated monthly additions from one average rig coupled with the number of total drilling rigs as reported by Baker Hughes.

Legacy oil and natural gas production change

Charts present EIA's estimates of total oil and gas production changes from all the wells other than the new wells. The trend is dominated by the well depletion rates, but other circumstances can influence the direction of the change. For example, well freeze-offs or hurricanes can cause production to significantly decline in any given month, resulting in a production increase the next month when production simply returns to normal levels.

Projected change in monthly oil/gas production

Charts present the combined effects of new-well production and changes to legacy production. Total new-well production is offset by the anticipated change in legacy production to derive the net change in production. The estimated change in production does not reflect external circumstances that can affect the actual rates, such as infrastructure constraints, bad weather, or shut-ins based on environmental or economic issues.

Oil/gas production

Charts present all oil and natural gas production from both new and legacy wells since 2007. This production is based on all wells reported to the state oil and gas agencies. Where state data are not immediately available, EIA estimates the production based on estimated changes in new-well oil/gas production and the corresponding legacy change.

Footnotes:

1. Oil production represents both crude and condensate production from all formations in the region. Production is not limited to tight formations. The regions are defined by all selected counties, which include areas outside of tight oil formations.
2. Gas production represents gross (before processing) gas production from all formations in the region. Production is not limited to shale formations. The regions are defined by all selected counties, which include areas outside of shale formations.
3. The monthly average rig count used in this report is calculated from weekly data on total oil and gas rigs reported by Baker Hughes.
4. A new well is defined as one that began producing for the first time in the previous month. Each well belongs to the new-well category for only one month. Reworked and recompleted wells are excluded from the calculation.
5. Rig count data lag production data because EIA has observed that the best predictor of the number of new wells beginning production in a given month is the count of rigs in operation two months earlier.

The data used in the preparation of this report come from the following sources. EIA is solely responsible for the analysis, calculations, and conclusions.

Drilling Info (<http://www.drillinginfo.com>) Source of production, permit, and spud data for counties associated with this report. Source of real-time rig location to estimate new wells spudded and completed throughout the United States.

Baker Hughes (<http://www.bakerhughes.com>) Source of rig and well counts by county, state, and basin.

North Dakota Oil and Gas Division (<https://www.dmr.nd.gov/oilgas>) Source of well production, permit, and completion data in the counties associated with this report in North Dakota

Railroad Commission of Texas (<http://www.rrc.state.tx.us>) Source of well production, permit, and completion data in the counties associated with this report in Texas

Pennsylvania Department of Environmental Protection

(<https://www.paoilandgasreporting.state.pa.us/publicreports/Modules/Welcome/Welcome.aspx>) Source of well production, permit, and completion data in the counties associated with this report in Pennsylvania

West Virginia Department of Environmental Protection (<http://www.dep.wv.gov/oil-and-gas/Pages/default.aspx>) Source of well production, permit, and completion data in the counties associated with this report in West Virginia

Colorado Oil and Gas Conservation Commission (<http://cogcc.state.co.us>) Source of well production, permit, and completion data in the counties associated with this report in Colorado

Wyoming Oil and Conservation Commission (<http://wogcc.state.wy.us>) Source of well production, permit, and completion data in the counties associated with this report in Wyoming

Louisiana Department of Natural Resources (<http://dnr.louisiana.gov>) Source of well production, permit, and completion data in the counties associated with this report in Louisiana

Ohio Department of Natural Resources (<http://oilandgas.ohiodnr.gov>) Source of well production, permit, and completion data in the counties associated with this report in Ohio

Oklahoma Corporation Commission (<http://www.occeweb.com/og/oghome.htm>) Source of well production, permit, and completion data in the counties associated with this report in Oklahoma

Summary

Overview of Activity for October 2022

- **Top five countries of destination, representing 62.6% of total U.S. LNG exports in October 2022**
 - France (48.9 Bcf), United Kingdom (46.0 Bcf), Netherlands (40.5 Bcf), South Korea (31.4 Bcf), and China (26.9 Bcf)
- **309.4 Bcf of exports in October 2022**
 - 4.9% increase from September 2022
 - 3.9% more than October 2021
- **97 cargos shipped in October 2022**
 - Sabine Pass (38), Cameron (37), Corpus Christi (20), Elba (2), Cove Point (0), and Freeport (0)
 - 98 cargos in September 2022
 - 94 cargos in October 2021

1a. Table of Exports of Domestically-Produced LNG Delivered by Region (Cumulative from February 2016 through October 2022)

Region	Number of Countries Receiving Per Region	Volume Exported (Bcf)	Percentage Receipts of Total Volume Exported (%)	Number of Cargos*
East Asia and Pacific	8	4,345.9	33.5%	1278
Europe and Central Asia	13	5,312.0	41.0%	1669
Latin America and the Caribbean**	13	2,124.2	16.4%	756
Middle East and North Africa	5	376.6	2.9%	110
South Asia	3	799.2	6.2%	238
Sub-Saharan Africa	0	0.0	0.0%	0
Total LNG Exports	42	12,957.9	100.0%	4,051

*Split cargos counted as both individual cargos and countries

**Number of cargos does not include the shipments by ISO container

1b. Shipments of Domestically-Produced LNG Delivered – by Country (Cumulative from February 2016 through October 2022)

Country of Destination	Region	Number of Cargos	Volume (Bcf of Natural Gas)	Percentage of Total U.S LNG Exports (%)
1. South Korea*	East Asia and Pacific	482	1,678.8	13.0%
2. Japan*	East Asia and Pacific	346	1,194.0	9.2%
3. Spain*	Europe and Central Asia	317	994.1	7.7%
4. China*	East Asia and Pacific	282	962.3	7.4%
5. France*	Europe and Central Asia	274	886.5	6.8%
6. United Kingdom*	Europe and Central Asia	252	839.8	6.5%
7. Netherlands*	Europe and Central Asia	206	677.4	5.2%
8. Brazil*	Latin America and the Caribbean	217	608.3	4.7%
9. India*	South Asia	179	605.8	4.7%
10. Mexico*	Latin America and the Caribbean	163	546.3	4.2%
11. Turkey*	Europe and Central Asia	170	542.1	4.2%
12. Chile*	Latin America and the Caribbean	132	419.3	3.2%
13. Taiwan*	East Asia and Pacific	98	310.8	2.4%
14. Italy*	Europe and Central Asia	93	302.1	2.3%
15. Argentina*	Latin America and the Caribbean	110	265.2	2.0%
16. Poland*	Europe and Central Asia	75	251.5	1.9%
17. Portugal*	Europe and Central Asia	78	247.7	1.9%
18. Greece*	Europe and Central Asia	72	172.2	1.3%
19. Kuwait	Middle East and North Africa	45	156.4	1.2%
20. Dominican Republic*	Latin America and the Caribbean	63	151.1	1.2%
21. Lithuania	Europe and Central Asia	45	140.3	1.1%
22. Belgium*	Europe and Central Asia	43	138.4	1.1%
23. Pakistan*	South Asia	40	128.9	1.0%
24. Jordan*	Middle East and North Africa	36	124.2	1.0%
25. Singapore*	East Asia and Pacific	33	107.3	0.8%
26. Croatia	Europe and Central Asia	35	105.4	0.8%
27. Thailand*	East Asia and Pacific	24	82.9	0.6%
28. Bangladesh*	South Asia	19	64.5	0.5%
29. Jamaica*	Latin America and the Caribbean	26	57.4	0.4%
30. United Arab Emirates	Middle East and North Africa	15	51.1	0.4%
31. Panama*	Latin America and the Caribbean	27	47.9	0.4%
32. Israel*	Middle East and North Africa	9	28.0	0.2%
33. Colombia*	Latin America and the Caribbean	18	24.2	0.2%
34. Egypt*	Middle East and North Africa	5	16.9	0.1%
35. Malta*	Europe and Central Asia	9	14.6	0.1%
36. Indonesia*	East Asia and Pacific	12	6.1	0.0%
37. Malaysia	East Asia and Pacific	1	3.7	0.0%
Total Exports by Vessel		4,051	12,953.4	
38. Barbados	Latin America and the Caribbean	304	1.3	0.0%
39. Bahamas	Latin America and the Caribbean	631	1.4	0.0%
Jamaica	Latin America and the Caribbean	123	1.3	0.0%
40. Haiti	Latin America and the Caribbean	128	0.4	0.0%
41. Antigua and Barbuda	Latin America and the Caribbean	31	0.0	0.0%
42. Nicaragua	Latin America and the Caribbean	1	0.0	0.0%
Total Exports by ISO		1218	4.5	
Total Exports by Vessel and ISO		5,269	12,957.9	

Note:

Volume and Number of Cargos are the cumulative totals of each individual Country of Destination by Region starting from February 2016.

Jamaica has received U.S. LNG exports by both vessel and ISO container. The volumes are totaled separately

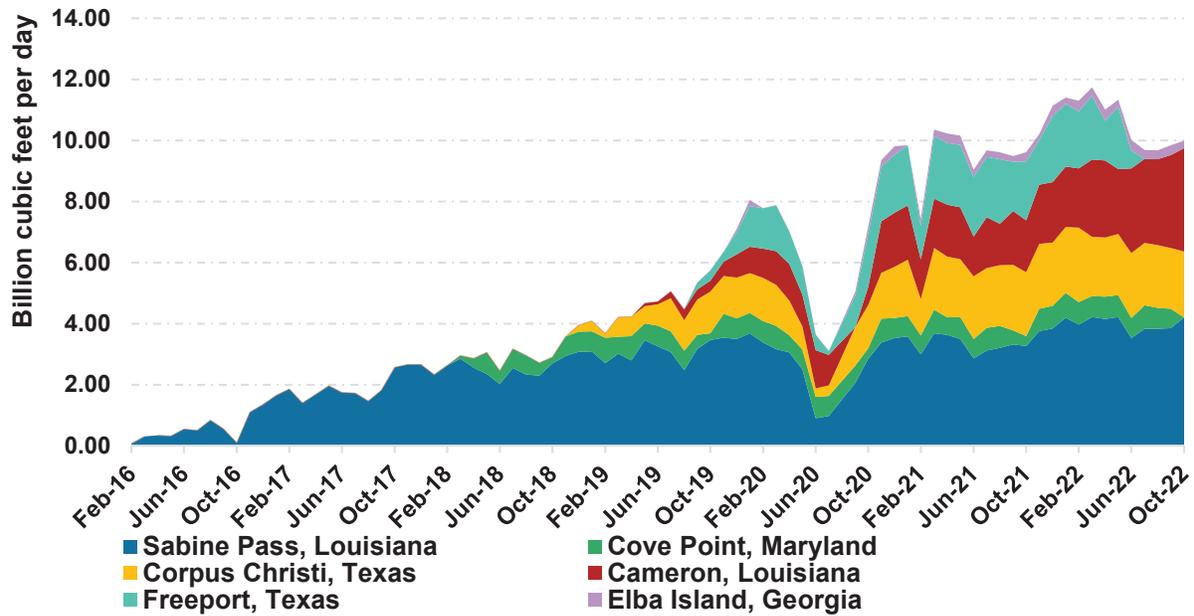
* Split cargos counted as both individual cargos and countries.

Vessel = LNG Exports by Vessel and ISO container = LNG Exports by Vessel in ISO Containers.

Does not include re-exports of previously-imported LNG. See table 2c for re-exports data.

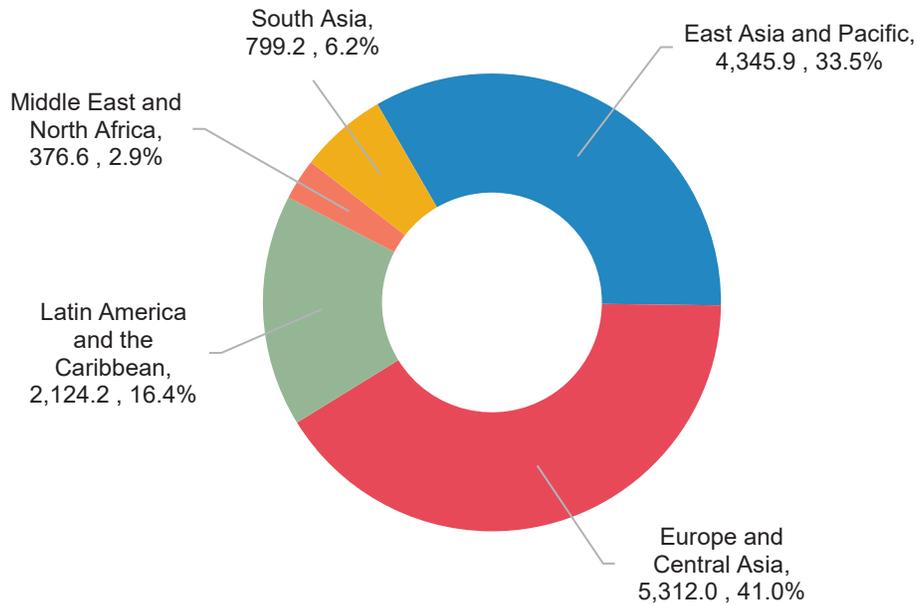
Totals may not equal sum of components because of independent rounding.

1c. Domestically-Produced LNG Exported by Point of Exit (February 2016 through October 2022)



The Cameron, LA point of exit includes exports from Cameron LNG and Venture Global Calcasieu Pass.

1d. Domestically-Produced LNG Exported by Region (Cumulative from February 2016 through October 2022) (Bcf, %)



Ministers' joint statement on status of negotiations with Blueberry River First Nations

Joint Statement

Victoria

Saturday, November 26, 2022 4:45 PM

Josie Osborne, Minister of Land, Water and Resource Stewardship; Murray Rankin, Minister of Indigenous Relations and Reconciliation; and Bruce Ralston, Minister of Energy, Mines and Low Carbon Innovation, have issued the following statement about the status of negotiations with Blueberry River First Nations:

“We continue to engage in respectful negotiations with Blueberry River First Nations in response to the BC Supreme Court’s direction in June 2021 to find a new approach to natural resource development that protects the Nations’ treaty rights and addresses cumulative impacts.

“Our negotiating teams have been working incredibly hard to develop solutions that address healing and restoration on the land and provide predictability for industry, while including Blueberry River First Nations in how natural resources are planned and authorized in their territory

“From the start, our joint focus has been on ensuring we arrive at an agreement that protects Blueberry River First Nations' Treaty 8 rights and that provides for a sustainable economy with good jobs and opportunity for people in northeastern B.C.

“We wish to affirm that we are very close to an agreement and are discussing final issues. As such, we have initiated early engagement with select industry groups and other Treaty 8 Nations on a proposed agreement to hear their feedback and consider adjustments

“Our commitment is to share more with British Columbians as soon as possible.”

<https://tass.com/economy/1549513>

12 DEC, 08:37

Launch of first line of Arctic LNG 2 set for December 2023

According to Russian Ambassador to Tokyo Mikhail Galuzin, around 2 mln tonnes of LNG will be added to gas supplies to Japan "with the full-scale launch of Arctic LNG-2"

SABETTA, December 12. /TASS/. The launch of Novatek's first line of the Arctic LNG 2 plant is still scheduled for December 2023, and the second and third lines - for 2024 and 2026, respectively, Deputy General Director for capital construction of Arctic LNG 2 Timofey Sazonov told reporters.

"The goal is to launch ... in December 2023. [Second and third stages] - in 2024 and 2026. We are not reconsidering [deadlines]," he said.

It was reported back in November that Russia may start deliveries of liquefied natural gas (LNG) to Japan from the Arctic LNG-2 project in 2023, which can reach 2 mln tonnes per year in the future.

"This project [Arctic LNG-2] is developing successfully. We hope that next year Japan will receive additional volumes of Russian LNG, in addition to what is already supplied from Sakhalin-2," Russian Ambassador to Tokyo Mikhail Galuzin said, drawing attention to the fact that Russia and Japan have areas "for mutually beneficial cooperation", among which he mentioned energy.

According to Galuzin, around 2 mln tonnes of LNG will be added to gas supplies to Japan "with the full-scale launch of Arctic LNG-2." He noted that now the volume of Japanese imports of Russian LNG reaches roughly 5-6 mln tonnes, which means that, taking into account fuel from the Arctic LNG-2 project, the share of Russian gas in the structure of Japanese imports may increase.

Arctic LNG-2 is Novatek's second LNG project. It includes the construction of three lines for the production of liquefied natural gas with a capacity of 6.6 mln metric tons per year each and stable gas condensate up to 1.6 mln metric tons per year. The launch of the first line is planned for December 2023, the launch of the second and third lines is expected in 2024 and 2026, respectively.

Highlights for the month

- Indigenous crude oil and condensate production during November 2022 was down by 1.1 % than that of November 2021 as compared to a de-growth of 2.2 % during October 2022. OIL registered a growth of 8.8 % and ONGC registered a growth of 0.186 % during November 2022 as compared to November 2021. PSC registered de-growth of 8.5 % during November 2022 as compared to November 2021. De-growth of 1.4 % was registered in the total crude oil and condensate production during April - November 2022 over the corresponding period of the previous year.
- Crude oil processed during November 2022 was 19.6 MMT, which was 8.9 % lower than November 2021 as compared to a de-growth of 2.6 % during October 2022. Growth of 6.8 % was registered in the total crude oil processing during April-November 2022 over the corresponding period of the previous year.
- Crude oil imports increased by 3.1% and 11.6% during November 2022 and April-November 2022 respectively as compared to the corresponding period of the previous year. The net import bill for oil & gas was \$12.3 billion in November 2022 compared to \$10.4 billion in November 2021. In this the crude oil imports constitutes \$12.3 billion, LNG imports \$1.6 billion and the exports were \$3.8 billion during November 2022.
- The price of Brent Crude averaged \$91.67/bbl during November 2022 as against \$93.33/bbl during October 2022 and \$81.44/bbl during November 2021. The Indian basket crude price averaged \$87.55/bbl during November 2022 as against \$91.70/bbl during October 2022 and \$80.64 /bbl during November 2021.
- Production of petroleum products saw a de-growth of 9.3 % during November 2022 over November 2021 as compared to a de-growth of 3.1 % during October 2022. Growth of 5.7 % was registered in the total POL production during April-November 2022 over the corresponding period of the previous year.
- POL products imports increased by 8.9% during November 2022 and by 8.6% during April-November 2022 respectively as compared to the corresponding period of the previous year. Increase in POL products imports during April-November 2022 were due to increase in imports of all products except liquified petroleum gas (LPG), aviation turbine fuel (ATF), superior kerosene oil (SKO) and fuel oil (FO) etc.

<ul style="list-style-type: none"> Exports of POL products decreased by 18.1% during Nvember 2022 and by 0.7% during April- November 2022 respectively as compared to the corresponding period of the previous year. Decrease in POL products exports during April- November 2022 were due to decrease in exports of motor spirit (MS), naphtha, superior kerosene oil (SKO), high speed diesel (HSD), fuel oil (FO) and bitumen etc.
<ul style="list-style-type: none"> The consumption of petroleum products during April-Nov 2022 with a volume of 145.21 MMT reported a growth of 11.6% compared to the volume of 130.14 MMT during the same period of the previous year. This growth was led by 8.1% growth in MS, 19.2% in HSD & 22.5% in ATF consumption besides Bitument and Lubes & Greases during the period. The consumption of petroleum products during Nov 2022 recorded a growth of 10.2% with a volume of 18.84 MMT compared to the same period of the previous year.
<ul style="list-style-type: none"> Ethanol blending with Petrol was 10.54% during Nov 2022 and cumulative ethanol blending during December 2021- Nov 2022 was 10.02%.
<ul style="list-style-type: none"> Total Natural Gas Consumption (including internal consumption) for the month of November 2022 was 5102 MMSCM which was 3.1 % lower than the corresponding month of the previous year. The cumulative consumption of 40944 MMSCM for the current year till November 2022 was lower by 6.3 % compared with the corresponding period of the previous year.
<ul style="list-style-type: none"> Gross production of natural gas for the month of November 2022 (P) was 2839 MMSCM which was lower by 1.1% compared with the corresponding month of the previous year. The cumulative gross production of natural gas of 22904 MMSCM for the current financial year till November 2022 was higher by 0.6% compared with the corresponding period of the previous year.
<ul style="list-style-type: none"> LNG import for the month of November 2022 (P) was 2322 MMSCM which was 5.9% lower than the corresponding month of the previous year. The cumulative import of 18577 (P) MMSCM for the current year till November 2022 was lower by 13.5% compared with the corresponding period of the previous year.

2. Crude oil, LNG and petroleum products at a glance

Details		Unit/ Base	2020-21	2021-22 (P)	Nov		April-Nov	
					2021-22 (P)	2022-23 (P)	2021-22 (P)	2022-23 (P)
1	Crude oil production in India [#]	MMT	30.5	29.7	2.4	2.4	19.9	19.6
2	Consumption of petroleum products*	MMT	194.3	204.2	17.1	18.8	130.1	145.2
3	Production of petroleum products	MMT	233.5	254.3	22.3	20.3	163.3	172.5
4	Gross natural gas production	MMSCM	28,672	34,024	2,869	2,839	22,777	22,904
5	Natural gas consumption	MMSCM	60,815	63,907	5,267	5,102	43,694	40,944
6	Imports & exports:							
	Crude oil imports	MMT	196.5	212.4	18.3	18.9	136.9	152.8
		\$ Billion	62.2	120.7	10.6	12.3	71.7	113.6
	Petroleum products (POL) imports*	MMT	43.2	42.1	3.4	3.7	26.4	28.7
		\$ Billion	14.8	25.2	2.4	2.1	15.5	18.5
	Gross petroleum imports (Crude + POL)	MMT	239.7	254.4	21.7	22.6	163.3	181.5
		\$ Billion	77.0	145.9	13.0	14.4	87.2	132.2
	Petroleum products (POL) export	MMT	56.8	62.8	5.2	4.3	40.1	39.8
		\$ Billion	21.4	44.4	3.7	3.8	25.5	40.6
	LNG imports*	MMSCM	33,031	30,776	2,469	2,322	21,472	18,577
		\$ Billion	7.9	13.4	1.2	1.6	8.2	12.8
	Net oil & gas imports	\$ Billion	63.5	114.9	10.4	12.2	69.9	104.3
7	Petroleum imports as percentage of India's gross imports (in value terms)	%	19.5	23.8	24.2	25.4	26.6	30.3
8	Petroleum exports as percentage of India's gross exports (in value terms)	%	7.3	10.6	10.5	12.7	10.9	15.4
9	Import dependency of crude oil (on POL consumption basis)	%	84.4	85.7	85.1	89.1	85.0	86.9

[#]Includes condensate; *Private direct imports are prorated for the period April'22 to Nov'22 for POL. LNG Imports figures from DGCIS are prorated for Oct-Nov 2022. Total may not tally due to rounding off.

3. Indigenous crude oil production (Million Metric Tonnes)								
Details	2020-21	2021-22	Nov			April-Nov		
			2021-22	2022-23 Target*	2022-23 (P)	2021-22	2022-23 Target*	2022-23 (P)
ONGC	19.1	18.5	1.5	1.6	1.5	12.3	12.8	12.4
Oil India Limited (OIL)	2.9	3.0	0.2	0.3	0.3	2.0	2.3	2.1
Private / Joint Ventures (JVs)	7.1	7.0	0.6	0.8	0.5	4.7	5.8	4.2
Total Crude Oil	29.1	28.4	2.3	2.7	2.3	19.0	20.9	18.7
ONGC condensate	1.1	0.9	0.08	0.0	0.1	0.6	0.0	0.7
PSC condensate	0.3	0.30	0.03	0.0	0.03	0.21	0.0	0.19
Total condensate	1.4	1.2	0.10	0.0	0.1	0.8	0.0	0.9
Total (Crude + Condensate) (MMT)	30.5	29.7	2.4	2.7	2.4	19.9	20.9	19.6
Total (Crude + Condensate) (Million Bbl/Day)	0.61	0.60	0.59	0.65	0.59	0.60	0.63	0.59

*Provisional targets inclusive of condensate.

4. Domestic and overseas oil & gas production (by Indian Companies)							
Details	2020-21	2021-22 (P)	Nov		April-Nov		
			2021-22 (P)	2022-23 (P)	2021-22 (P)	2022-23 (P)	
Total domestic production (MMTOE)	59.2	63.7	5.3	5.2	42.6	42.5	
Overseas production (MMTOE)	21.9	21.8	1.8	1.5	14.7	12.7	

Source: ONGC Videsh, GAIL, OIL, IOCL, HPCL & BPRL

5. High Sulphur (HS) & Low Sulphur (LS) crude oil processing (MMT)							
Details	2020-21	2021-22	Nov		April-Nov		
			2021-22	2022-23 (P)	2021-22	2022-23 (P)	
1 High Sulphur crude	161.4	185.0	16.4	15.0	117.7	128.7	
2 Low Sulphur crude	60.3	56.7	5.0	4.6	38.0	37.6	
Total crude processed (MMT)	221.8	241.7	21.5	19.6	155.7	166.3	
Total crude processed (Million Bbl/Day)	4.45	4.85	5.25	4.78	4.68	5.00	
Percentage share of HS crude in total crude oil processing	72.8%	76.6%	76.5%	76.4%	75.6%	77.4%	

6. Quantity and value of crude oil imports			
Year	Quantity (MMT)	\$ Million	Rs. Crore
2020-21	196.5	62,248	4,59,779
2021-22 (P)	212.4	120,675	9,01,262
April-Nov 2022(P)	152.8	113,618	8,99,560

7. Self-sufficiency in petroleum products (Million Metric Tonnes)							
Particulars		2020-21	2021-22 (P)	Nov		April-Nov	
				2021-22 (P)	2022-23 (P)	2021-22 (P)	2022-23 (P)
1	Indigenous crude oil processing	28.0	27.0	2.4	1.9	18.0	17.8
2	Products from indigenous crude (93.3% of crude oil processed)	26.1	25.2	2.2	1.8	16.8	16.6
3	Products from fractionators (Including LPG and Gas)	4.2	4.1	0.3	0.3	2.8	2.4
4	Total production from indigenous crude & condensate (2 + 3)	30.3	29.3	2.5	2.1	19.6	19.0
5	Total domestic consumption	194.3	204.2	17.1	18.8	130.1	145.2
% Self-sufficiency (4 / 5)		15.6%	14.3%	14.9%	10.9%	15.0%	13.1%

8. Refineries: Installed capacity and crude oil processing (MMTPA / MMT)										
Sl. no.	Refinery	Installed capacity (01.01.2022) MMTPA	Crude oil processing (MMT)							
			2020-21	2021-22	Nov			April-Nov		
					2021-22	2022-23 (Target)	2022-23 (p)	2021-22	2022-23 (Target)	2022-23 (p)
1	Barauni (1964)	6.0	5.5	5.6	0.5	0.5	0.6	3.3	4.2	4.5
2	Koyali (1965)	13.7	11.6	13.5	1.1	1.2	1.3	8.4	9.4	10.4
3	Haldia (1975)	8.0	6.8	7.3	0.7	0.7	0.7	5.4	5.6	5.7
4	Mathura (1982)	8.0	8.9	9.1	0.9	0.8	0.8	5.9	6.1	6.2
5	Panipat (1998)	15.0	13.2	14.8	1.3	1.3	0.7	9.9	9.2	9.1
6	Guwahati (1962)	1.0	0.8	0.7	0.08	0.1	0.1	0.38	0.7	0.7
7	Digboi (1901)	0.65	0.6	0.7	0.06	0.03	0.06	0.5	0.4	0.5
8	Bongaigaon(1979)	2.70	2.5	2.6	0.2	0.2	0.2	1.8	1.6	1.8
9	Paradip (2016)	15.0	12.5	13.2	1.1	1.3	1.331	8.0	8.5	8.1
	IOCL-TOTAL	70.1	62.4	67.7	6.0	6.1	5.8	43.5	45.8	47.1
10	Manali (1969)	10.5	8.2	9.0	0.8	0.9	0.9	5.3	6.7	7.4
11	CBR (1993)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CPCL-TOTAL	10.5	8.2	9.0	0.8	0.9	0.9	5.3	6.7	7.4
12	Mumbai (1955)	12.0	12.9	14.4	1.3	1.2	1.2	9.3	9.1	9.2
13	Kochi (1966)	15.5	13.3	15.4	1.4	1.4	1.4	9.7	10.1	10.0
14	Bina (2011)	7.8	6.2	7.4	0.7	0.6	0.7	4.7	4.9	5.1
	BPCL-TOTAL	35.3	32.4	37.2	3.4	3.2	3.3	23.7	24.1	24.2
15	Numaligarh (1999)	3.0	2.7	2.6	0.2	0.2	0.2	1.8	1.9	2.1

Sl. no.	Refinery	Installed capacity (1.01.2022) (MMTPA)	Crude oil processing (MMT)							
			2020-21	2021-22	Nov			April-Nov		
					2021-22	2022-23 (Target)	2022-23 (P)	2021-22	2022-23 (Target)	2022-23 (P)
16	Tatipaka (2001)	0.066	0.081	0.075	0.007	0.005	0.006	0.048	0.041	0.049
17	MRPL-Mangalore (1996)	15.0	11.5	14.9	1.5	1.4	1.5	9.1	10.3	11.2
	ONGC-TOTAL	15.1	11.6	14.9	1.5	1.4	1.5	9.1	10.3	11.3
18	Mumbai (1954)	9.5	7.4	5.6	0.5	0.4	0.8	2.6	5.7	6.4
19	Visakh (1957)	8.3	9.1	8.4	0.8	0.9	0.8	5.2	6.1	6.0
20	HMEL-Bathinda (2012)	11.3	10.1	13.0	1.1	0.9	1.0	8.7	7.7	8.4
	HPCL- TOTAL	29.1	26.5	27.0	2.4	2.3	2.6	16.5	19.4	20.8
21	RIL-Jamnagar (DTA) (1999)	33.0	34.1	34.8	3.0	3.0	2.6	22.9	22.9	23.3
22	RIL-Jamnagar (SEZ) (2008)	35.2	26.8	28.3	2.5	2.5	2.7	19.4	19.4	18.0
23	NEL-Vadinar (2006)	20.0	17.1	20.2	1.7	1.7	0.0	13.5	13.5	12.0
All India (MMT)		251.2	221.8	241.7	21.5	21.3	19.6	155.7	163.9	166.3
All India (Million Bbl/Day)		5.02	4.45	4.85	5.25	5.20	4.78	4.68	4.92	5.00

Note: Provisional Targets; Some sub-totals/ totals may not add up due to rounding off at individual levels.

9. Major crude oil and product pipeline network (as on 01.12.2022)										
Details		ONGC	OIL	Cairn	HMEL	IOCL	BPCL	HPCL	Others*	Total
Crude Oil	Length (KM)	1,284	1,193	688	1,017	5,301	937			10,420
	Cap (MMTPA)	60.6	9.0	10.7	11.3	48.6	7.8			147.9
Products	Length (KM)		654			10,899	2,596	3,775	2,386	20,310
	Cap (MMTPA)		1.7			55.4	23.0	34.1	9.4	123.6

*Others include GAIL and Petronet India. HPCL and BPCL lubes pipeline included in products pipeline data

11. Production and consumption of petroleum products (Million Metric Tonnes)												
Products	2020-21		2021-22 (P)		Nov 2021		Nov 2022 (P)		Apr-Nov 2021		Apr-Nov 2022 (P)	
	Prod	Cons	Prod	Cons	Prod	Cons	Prod	Cons	Prod	Cons	Prod	Cons
LPG	12.1	27.6	12.2	28.3	1.1	2.3	1.0	2.5	7.8	18.4	8.5	18.7
MS	35.8	28.0	40.2	30.8	3.7	2.6	3.3	2.9	25.6	20.1	27.7	23.3
NAPHTHA	19.4	14.1	20.0	14.3	1.6	1.2	1.2	1.0	13.2	9.5	11.3	8.4
ATF	7.1	3.7	10.3	5.0	1.1	0.5	1.2	0.6	6.2	3.0	9.5	4.7
SKO	2.4	1.8	1.9	1.5	0.2	0.1	0.1	0.0	1.2	1.0	0.6	0.4
HSD	100.4	72.7	107.2	76.7	9.5	6.5	8.4	7.8	69.1	48.8	73.9	56.1
LDO	0.7	0.9	0.8	1.0	0.08	0.07	0.06	0.06	0.5	0.7	0.4	0.5
LUBES	1.1	4.1	1.2	4.6	0.1	0.4	0.1	0.4	0.7	2.9	0.8	3.0
FO/LSHS	7.4	5.6	8.9	6.3	0.8	0.5	0.7	0.6	5.7	4.1	6.9	4.5
BITUMEN	4.9	7.5	5.1	7.9	0.4	0.6	0.4	0.7	2.9	4.4	3.0	4.9
PET COKE	12.0	15.6	15.5	15.8	1.4	1.1	1.1	1.1	9.8	8.9	9.9	10.2
OTHERS	30.2	12.8	30.9	12.1	2.4	1.2	2.6	1.2	20.4	8.4	19.9	10.7
ALL INDIA	233.5	194.3	254.3	204.2	22.3	17.1	20.3	18.8	163.3	130.1	172.5	145.2
Growth (%)	-11.0%	-8.9%	8.9%	5.1%	4.3%	-11.6%	-9.3%	10.2%	10.6%	5.8%	5.7%	11.6%

Note: Prod - Production; Cons - Consumption

15. LPG consumption (Thousand Metric Tonne)								
LPG category	2020-21	2021-22	Nov			April-Nov		
			2021-22	2022-23 (P)	Growth (%)	2021-22	2022-23 (P)	Growth (%)
1. PSU Sales :								
LPG-Packed Domestic	25,128.1	25,501.6	2,102.7	2,135.6	1.6%	16,604.3	16,637.6	0.2%
LPG-Packed Non-Domestic	1,886.0	2,238.8	194.8	264.1	35.6%	1,427.5	1,655.8	16.0%
LPG-Bulk	361.9	390.9	27.6	52.2	89.0%	244.2	262.6	7.5%
Auto LPG	118.4	122.0	10.9	9.3	-14.6%	80.1	73.4	-8.4%
Sub-Total (PSU Sales)	27,494.3	28,253.3	2,336.0	2,461.2	5.4%	18,356.1	18,629.4	1.5%
2. Direct Private Imports*	64.2	82.0	11.00	6.4	-42.2%	55.0	50.9	-7.5%
Total (1+2)	27,558.4	28,335.3	2,347.0	2,467.6	5.1%	18,411.1	18,680.3	1.5%

*Apr -Nov 2022 DGCIS data is prorated

16. LPG marketing at a glance														
Particulars (As on 1st of April)	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	1.12.22 (P)
LPG Active Domestic Customers	(Lakh)					1486	1663	1988	2243	2654	2787	2895	3053	3132
	Growth						11.9%	19.6%	12.8%	18.3%	5.0%	3.9%	5.5%	3.7%
LPG Coverage (Estimated)	(Percent)					56.2	61.9	72.8	80.9	94.3	97.5	99.8	-	-
	Growth						10.1%	17.6%	11.1%	16.5%	3.4%	2.3%	-	-
PMUY Beneficiaries	(Lakh)							200	356	719	802	800.4	899.0	957.0
	Growth								77.7%	101.9%	11.5%	-0.2%	12.2%	8.7%
LPG Distributors	(No.)	10541	11489	12610	13896	15930	17916	18786	20146	23737	24670	25083	25269	25333
	Growth	8.8%	9.0%	9.8%	10.2%	14.6%	12.5%	4.9%	7.2%	17.8%	3.9%	1.7%	0.7%	0.6%
Auto LPG Dispensing Stations	(No.)	604	652	667	678	681	676	675	672	661	657	651	601	567
	Growth	12.7%	7.9%	2.3%	1.6%	0.4%	-0.7%	-0.1%	-0.4%	-1.6%	-0.6%	-0.9%	-8.5%	-10.6%
Bottling Plants	(No.)	183	184	185	187	187	188	189	190	192	196	200	202	205
	Growth	0.5%	0.5%	0.5%	1.1%	0.0%	0.5%	0.5%	0.5%	1.1%	2.1%	2.0%	1.0%	3.0%

Source: PSU OMCs (IOCL, BPCL and HPCL)

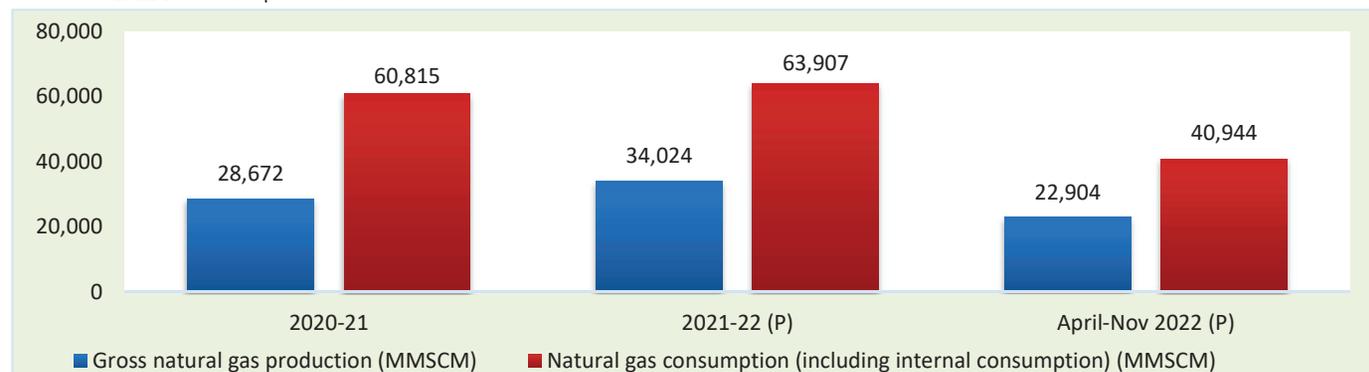
1. Growth rates as on 01.12.2022 are with respect to figs as on 01.12.2021. Growth rates as on 1 April of any year are with respect to figs as on 1 April of previous year.

2. The LPG coverage is calculated by PSU OMCs based upon the active LPG domestic connections and the estimated number of households. The number of households has been projected by PSU OMCs based on 2011 census data. Factors like increasing nuclearization of families, migration of individuals/ families due to urbanization and reduction in average size of households etc. impact the growth of number of households. Due to these factors, the estimated no. of households through projection of 2011 census data may slightly differ from the actual no. of households in a State/UT. Further, this methodology does not include PNG (domestic) connections.

18. Natural gas at a glance

(MMSCM)								
Details	2020-21 (P)	2021-22 (P)	Nov			April-Nov		
			2021-22 (P)	2022-23 (Target)	2022-23 (P)	2021-22 (P)	2022-23 (Target)	2022-23 (P)
(a) Gross production	28,672	34,024	2,869	2,938	2,839	22,777	23,668	22,904
- ONGC	21,872	20,629	1,727	1,685	1,619	13,785	13,592	13,377
- Oil India Limited (OIL)	2,480	2,893	249	306	251	1,949	2,484	2,037
- Private / Joint Ventures (JVs)	4,321	10,502	893	947	969	7,043	7,592	7,489
(b) Net production (excluding flare gas and loss)	27,784	33,131	2,798		2,779	22,222		22,367
(c) LNG import [#]	33,031	30,776	2,469		2,322	21,472		18,577
(d) Total consumption including internal consumption (b+c)	60,815	63,907	5,267		5,102	43,694		40,944
(e) Total consumption (in BCM)	60.8	63.9	5.3		5.1	43.7		40.9
(f) Import dependency based on consumption (%), {c/d*100}	54.3	48.2	46.9		45.5	49.1		45.4

Oct - Nov 2022 DGCIS data prorated.



19. Coal Bed Methane (CBM) gas development in India			
Prognosticated CBM resources		91.8	TCF
Established CBM resources		10.4	TCF
CBM Resources (33 Blocks)		62.8	TCF
Total available coal bearing areas (India)		32760	Sq. KM
Total available coal bearing areas with MoPNG/DGH		17886	Sq. KM
Area awarded		20460	Sq. KM
Blocks awarded*		36	Nos.
Exploration initiated (Area considered if any boreholes were drilled in the awarded block)		10667***	Sq. KM
Production of CBM gas	April-Nov 2022 (P)	455.31	MMSCM
Production of CBM gas	Nov 2022 (P)	54.97	MMSCM

*ST CBM Block awarded & relinquished twice- in CBM Round II and Round IV -Area considered if any boreholes were drilled in the awarded block.

**MoPNG awarded 04 new CBM Blocks (Area 3862 sq. km) under Special CBM Bid Round 2021 in September 2022.

***Area considered if any boreholes were drilled in the awarded block.

20. Common Carrier Natural Gas pipeline network as on 30.09.2022														
Nature of pipeline		GAIL	GSPL	PIL	IOCL	AGCL	RGPL	GGL	DFPCL	ONGC	GIGL	GITL	Others*	Total
Operational	Length	9,577	2,695	1,459	143	107	304	73	42	24				14,424
	Capacity	167.2	43.0	85.0	20.0	2.4	3.5	5.1	0.7	6.0				-
Partially commissioned#	Length	4,777			282						1,254	365		6,678
	Capacity				-						-	-		-
Total operational length		14,354	2,695	1,459	425	107	304	73	42	24	1,254	365	0	21,102
Under construction	Length	5,097	100		1,149						1,078	1,666	2,915	12,005
	Capacity	-	3.0		-						-	-	-	-
Total length		19,451	2,795	1,459	1,574	107	304	73	42	24	2,332	2,031	2,915	33,107

Source: PNGRB; Length in KMs ; Authorized Capacity in MMSCMD; *Others-APGDC, HEPL, IGGL, IMC, Consortium of H-Energy

Total authorized Natural Gas pipelines including Tie-in connectivity, dedicated & STPL is 35208 Kms (P)

21. Existing LNG terminals			
Location	Promoters	Capacity as on 01.12.2022	% Capacity utilisation (April-Oct 2022)
Dahej	Petronet LNG Ltd (PLL)	17.5 MMTPA	80.6
Hazira	Shell Energy India Pvt. Ltd.	5.2 MMTPA	47.4
Dabhol	Konkan LNG Limited	*5 MMTPA	22.5
Kochi	Petronet LNG Ltd (PLL)	5 MMTPA	17.0
Ennore	Indian Oil LNG Pvt Ltd	5 MMTPA	13.0
Mundra	GSPC LNG Limited	5 MMTPA	17.7
Total Capacity		42.7 MMTPA	

* To increase to 5 MMTPA with breakwater. Only HP stream of capacity of 2.9 MMTPA is commissioned

22. Status of PNG connections and CNG stations across India (Nos.), as on 31.10.2022(P)				
State/UT (State/UTs are clubbed based on the GAs authorised by PNGRB)	CNG Stations	PNG connections		
		Domestic	Commercial	Industrial
Andhra Pradesh	147	241,015	405	32
Andhra Pradesh, Karnataka & Tamil Nadu	28	170	0	1
Assam	1	46,589	1,313	439
Bihar	69	83,778	51	2
Bihar & Jharkhand	1	5,347	0	0
Chandigarh (UT), Haryana, Punjab & Himachal Pradesh	24	24,303	105	19
Dadra & Nagar Haveli (UT)	7	9,915	53	53
Daman & Diu (UT)	4	5,134	46	42
Daman and Diu & Gujarat	13	1,555	3	0
Goa	11	10,326	15	26
Gujarat	966	2,835,650	21,648	5,743
Haryana	287	283,733	792	1,348
Haryana & Himachal Pradesh	9	0	0	0
Haryana & Punjab	16	0	0	0
Himachal Pradesh	7	3,304	0	0
Jharkhand	62	92,478	2	0
Karnataka	226	358,744	478	267
Kerala	91	22,034	18	14
Kerala & Puducherry	9	0	0	0
Madhya Pradesh	192	177,348	301	391
Madhya Pradesh and Chhattisgarh	3	0	0	0
Madhya Pradesh and Rajasthan	24	143	0	0
Madhya Pradesh and Uttar Pradesh	16	0	0	0
Maharashtra	608	2,528,474	4,536	804
Maharashtra & Gujarat	50	130,928	3	12
National Capital Territory of Delhi (UT)	464	1,320,168	3,322	1,760
Odisha	43	73,599	5	0
Puducherry & Tamil Nadu	8	65	0	0
Punjab	177	49,962	246	214
Rajasthan	194	172,655	54	206
Tamil Nadu	151	13	0	5
Telangana	130	176,138	71	90
Tripura	18	57,104	506	62
Uttar Pradesh	674	1,263,905	2,051	2,406
Uttar Pradesh & Rajasthan	37	18,958	36	340
Uttar Pradesh and Uttrakhand	16	6,263	0	0
Uttrakhand	29	63,758	46	72
West Bengal	41	0	0	0
Total	4,853	10,063,556	36,106	14,348

Source: PNGRB

Note: 1. All the GAs where PNG connections/CNG Stations have been established are considered as Operational, 2. Under normal conditions. Operation of any particular GA commences within around one year of authorization. 3. State/UTs wherever clubbed are based on the GAs authorised by PNGRB.

Small changes mean energy advice campaign adds up to big savings

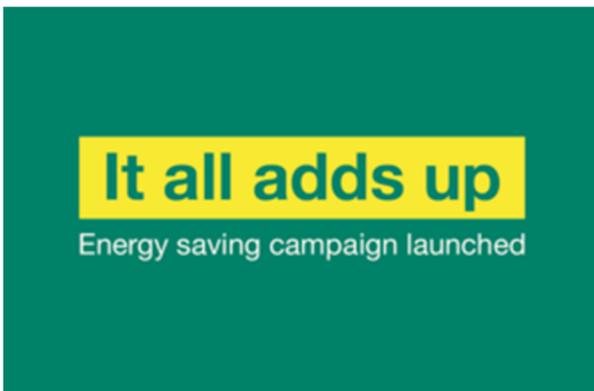
Government launches 'It All Adds Up' campaign with simple actions to cut bills by bringing down the amount of energy needed to keep homes warm and stay safe

From:

[Department for Business, Energy & Industrial Strategy](#) and [The Rt Hon Grant Shapps MP](#)

Published

17 December 2022



- 'It All Adds Up' energy saving campaign launched today by government with advice that could help UK households cut hundreds of pounds off their bills this winter
- Campaign features tips on simple, low or no-cost actions that households can take to immediately cut energy use and save money while ensuring people are able to stay safe and warm this winter
- Advice also available on longer-term measures to improve the energy efficiency of homes that can bring down bills not just this winter but in years to come

Simple advice, with no or very low-cost actions that households can take to reduce their energy use and bills this winter, is now available to the public under a new government information campaign being launched today.

The £18 million 'It All Adds Up' energy saving campaign will raise public awareness of straightforward actions that people can take to cut their bills by bringing down the amount of energy needed to keep their homes warm and stay safe this winter.

The guidance focuses on simple measures which are not already adopted by the majority of households in the UK. How energy use can be reduced may be different for each individual household, but simple measures in the campaign can offer significant financial savings this winter without reducing comfort or putting people's health at risk.

The 'It All Adds Up' campaign is being launched on a new website today and promotes some of the government's top recommended actions to help households save money on their energy bills at no or little cost, including:

- reducing the temperature a boiler heats water to before it is sent to radiators (known as the boiler flow temperature) from 75°C to 60°C, which will not reduce the temperature of your home but could save around £100 annually
- turning appliances off at the plug, which could save approximately £70 per year
- reducing heating loss from the property such as putting draught excluders around doors or by adding clear film across windows, which could save around £60 a year

Business and Energy Secretary Grant Shapps said:

No-one is immune to rising energy bills this winter, so it's in everyone's interest to use every trick in the book to use less energy while keeping homes warm and staying safe.

For very little or no cost, you can save pounds. It all adds up, so I urge people to take note of the advice in this new campaign and follow the easy steps to cut your fuel bills.

Information on the 'It All Adds Up' campaign can be found at a new GOV.UK website, which will run alongside the government's wider 'Help for Households' campaign. The new energy saving campaign will feature adverts across TV, radio, digital platforms and on digital billboards, with a television advert rolled out in the coming weeks.

In addition to these simple tips, there is also advice on other actions that households can take to improve the energy efficiency of their homes, as well as further details of government funding schemes to improve the energy efficiency of households across the country.

The 'It All Adds Up' campaign highlights longer-term energy efficiency upgrades, including installing loft and wall insulation or fitting double glazing, that people can make to their homes to save their energy use and bring down bills.

Richard Neudegg, director of regulation and policy at Uswitch.com said:

We know many households are actively looking to find safe ways to reduce their energy use to save on bills, and there are straightforward steps to take by making small changes at home. So we welcome renewed efforts to highlight practical tips that can make a real difference.

Keeping track of energy usage can help people understand what's most driving their bills and help identify where to make changes. To support households, Uswitch has developed Utrack, a free app which can help people see exactly what they are using and highlight ways to save money.

Juliette Sanders, Director of Strategic Communications at Energy UK, said:

Energy UK welcomes the Government's efforts in helping people to improve their energy efficiency. Many people are struggling to pay their energy bills and whilst additional support is available from both Government and energy suppliers, taking steps to cut down wasted energy will enable people to lower their bills immediately. We're also pleased that advice on long-term energy efficiency measures is part of the campaign.

It's essential that this goes hand in hand with policies that will enable delivery to as many homes as possible, and with the roll out of smart meters so people can manage their energy use, and use it at times it is cheapest.

Jonathan Brearley, the CEO of Ofgem, said:

I very much welcome the launch of the 'It All Adds Up' campaign. We know from the analysis we've seen that even small things, such as turning off radiators in rooms that are not in use and adapting boiler flow, can have a big impact, not only on customer bills, but in boosting our wider security of supply.

This will complement Ofgem's Energy Aware campaign, which provides information on ways to reduce energy use, cut costs, and points consumers towards financial schemes and other avenues of support that can help them through this difficult winter.

Dame Clare Moriarty, Chief Executive of Citizens Advice, said:

This winter, many people will be worried about how much they might have to spend to heat their homes. These tips should help cut down the cost of staying warm.

However, we know lots of people are living in cold, dark homes because they're stretched to their limit and simply have nothing left to cut back on. If you're in this

situation, speak to your energy supplier or contact Citizens Advice for support. We're here to help you find a way forward.

Making homes and businesses more energy efficient and so bringing down fuel bills is part of the Government's wider long-term commitment, announced as part of the Autumn Statement, to reduce the UK's final energy consumption from buildings and industry by 15% by 2030 against 2021 levels.

Improving the energy efficiency of homes is the best long-term method of cutting household energy use and bringing down bills. That is why the government is accelerating the pace of upgrading the energy efficiency of housing with £6 billion of funding committed to 2028 in addition to £6.6 billion in this parliament.

A further £4 billion has been committed through ECO4 scheme, which is delivering home insulation measures to low income and more vulnerable households, and the £1 billion ECO+ scheme, which will install measures in households who have previously not been able to access support through the Energy Company Obligation scheme.

The 'It All Adds Up' campaign comes in addition to an unprecedented package of government support that is helping households meet their energy costs this winter, including the Energy Price Guarantee, saving a typical household over £900, the Energy Bills Support Scheme providing a £400 discount to millions and the most vulnerable receiving £1,200 each this year.

To publicise the launch of the new energy saving campaign website further, Business and Energy Minister Lord Callanan held a roundtable meeting on Friday 16 December with energy suppliers and consumer groups.

Notes to editors:

- Further advice can be found at the new ['It All Adds Up'](#) campaign website.
- Thanks to government support, the number of homes with an energy efficiency rating of C or above is at 46% and rising, up from just 14% in 2010.
- The majority of government support schemes target those on low income and vulnerable households in the worse performing homes, including the Social Housing Decarbonisation Fund, Home Upgrade Grant and Local Authority Delivery scheme. The government is also improving energy efficiency in public buildings through the Public Sector Decarbonisation Scheme.
- Wider energy advice and more information on government funding schemes is available at the [Help For Households](#) website.

- For further advice on the support available for improving energy efficiency and reducing energy bills, <https://www.gov.uk/improve-energy-efficiency> or by calling 0800 444202.



The Independent

All the energy saving tips in government's new £18m campaign from blocking door gaps to boiler use

Story by Emily Atkinson • 6h ago

Pugging gaps in doors and reducing boiler flow [temperatures](#) are among a series of tips the [government](#) is urging cash-strapped Britons to take as part of major campaign to ease the burden of soaring [energy](#) bills.

The £18 million initiative, dubbed It All Adds Up, spotlights tips on “simple, low or no-cost actions” to bring about “big savings” as freezing temperatures sweep through the UK.

The campaign was launched on Saturday in order to push families squeezed by the burgeoning cost of living towards taking “straightforward” measures to combat sky-high energy prices.

Recommendations include reducing boiler flow temperatures from 75C to 60C and turning off appliances at the plug, which the government says could save about £170 combined each year.

Business secretary Grant Shapps said: “It’s in everyone’s interest to use every trick in the book to use less energy while keeping homes warm and staying safe. For very little or no cost, you can save pounds.”

Critics of the campaign insist it is not enough, however, with Lib Dem energy spokeswoman Wera Hobhouse saying ministers had “failed to insulate millions of homes.”

“Advice and tips are all very well, but we also need urgent investment to insulate people’s homes and cut [energy bills](#) in the long term,” she said. “That is the only way we will tackle the climate emergency, cut emissions and cut people’s bills.”

A scheme to give out loft and cavity wall insulation is set to run from April 2023 to March 2026 at the cost of £1bn to the government – weighing in at a third of £3bn called for by industry chiefs.

But the ECO+ plan has been attacked by Labour for helping a “tiny fraction” of struggling in the face of rocketing households costs.

Former prime minister Liz Truss opposed the idea of a public information campaign to help families weather the economic storm, insisting her government did not want to take on the role of a “nanny state”.

Ms Truss’s successor Rishi Sunak has relented to demands for more help for households.

Here *The Independent* takes a look at what the suggestions you will soon see emblazoned across posters and feature on TV and radio commercials – and how much money they could save you.

To save £455: Install solar panels on roof, upgrade double glazing

The Energy Saving Trust estimates that you can save about £455 per year by installing solar electricity panels on your roof, and upgrading from single to double glazing could reduce the cost of your bills by £235 a year, the government says

To save £355: Install roof and loft insulation

Citing research by the Energy Saving Trust, the government says that if you do not have any loft insulation, then adding 270mm thickness could save you £355 a year.

If you already have 120mm, increasing this to 270mm could save you £35 a year.

To save £110: Install underfloor insulation

The government says installing underfloor insulation could save you £110 a year. It is worth noting, though, that the initial installation cost can be considerable.

To save £100: Reduce boiler flow temperature

Reducing flow temperature, the temperature of the water that your boiler sends to radiators, is not the same as lowering your thermostat and will not noticeably reduce the temperature of your home, the government says.

In so doing, ministers explain you could save £100.

To save £70: Turn down radiators, switch off power at socket, use tumble dryer less, insulate hot water cylinder

They suggest turning radiator valves down to between 2.5 and three (roughly 18C) when rooms are not being used – which they say could save you up to £70 a year.

Switching off radiators completely in rooms you are not using is less energy efficient, as this means your boiler has to work harder to increase the temperature again than if kept at a low setting, the advice adds.

Turning off the power switch at the socket or unplugging appliances such as computers, televisions, smart devices and video game consoles could also save up to £70 a year, the government says.

People are also advised to use a clothes airer to dry clothes outside, or inside with a window open for ventilation. Ministers say using the tumble dryer less could save £70 a year.

Insulate your hot water cylinder using a hot water cylinder jacket can reduce the amount of heat the it loses and keeps water hot for longer, again saving you up to £70 a year.

To save £60: Find and fix draughts, install smart thermostat

The Government says draught-proofing is one of the cheapest and most effective actions you can take to stop or prevent heat escaping, adding that it could save you up to £60 a year.

They suggest blocking gaps around windows, doors, chimneys and floors that let the cold air in and warm air out.

They also suggest window film, a form of temporary secondary glazing which helps stop heat escaping through glass.

In addition, smart thermostats and heating controls offer greater flexibility and control over your energy use, and could save you up to £60 a year, according to the Government advice.

To save £55: Use energy-saving lightbulbs

Switching to energy efficient bulbs, such as LEDs, could save you up to £55 a year, according to ministers.

To save £40: Use colder wash settings

The advice says changing from 40C to 30C means you could get three cycles instead of two using the same amount of energy, depending on your washing machine, and it could save you up to £40 a year.

Other government advice:

- **Close curtains and blinds at night:** You can help stop warm air escaping through windows and reduce heating costs, especially if radiators are situated below the windows.
- **Track your energy use in an app:** There are apps such as Utrack by Uswitch, which is free, and allows you to track your hourly energy use over days, weeks, months or years if you have a smart meter.
- **Install a smart meter:** Smart meters provide you with near real-time information about how much energy you are using, allowing you to track your spending and have greater control over your usage.
- **Upgrade to more energy efficient appliances:** All electrical appliances such as fridges, freezers, washing machines, dishwashers and TVs have an energy rating A-G, A being high and G lowest.
- **Replace your boiler with a heat pump with the help of a grant:** Grants of up to £6,000 are set to be made available by the government to contribute to the cost of a heat pump to properties across England and Wales.

Burst of bitter cold to freeze large part of US before Christmas

By Renee Duff, AccuWeather meteorologist

Published Dec. 17, 2022 2:32 PM JST | Updated Dec. 18, 2022 7:12 PM JST

00:48 Christmas week to bring surge of Arctic air and heavy snow potential

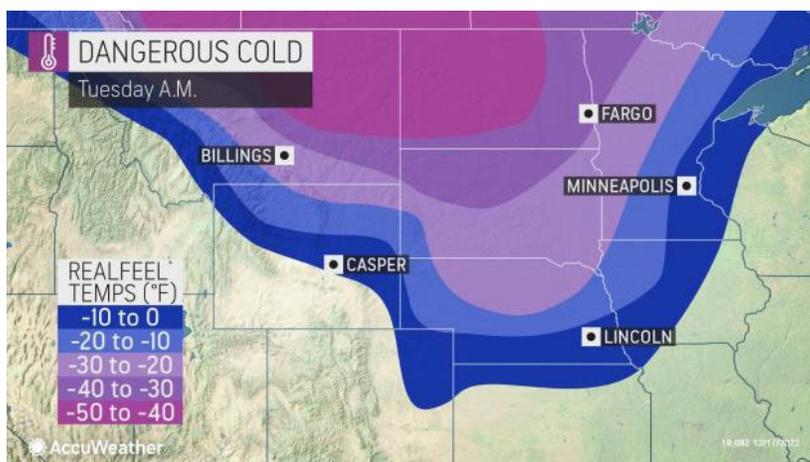
AccuWeather forecasters are increasingly confident that a late-week storm will cause major travel disruptions in the final days before Christmas of 2022.

AccuWeather meteorologists continue to track a plunge of bitterly cold air that will send the eastern two-thirds of the United States into a deep freeze ahead of Christmas, challenging decades-old records and causing heating demands to sky rocket.

Subfreezing and, in some cases, subzero temperatures are expected to grip areas from the northern Rockies to the East and South. The mercury could dip to 25-50 degrees Fahrenheit below late-December averages during the height of the cold.

"The Arctic air can envelop much of the central and eastern part of the country just prior to the holiday weekend, threatening the coldest lead up to the Christmas holiday in decades," AccuWeather Meteorologist Elizabeth Danco said.

Continue reading for a region-by-region expert analysis from AccuWeather forecasters on the exact timing and magnitude of the cold.



Northern Rockies to Midwest

Frigid air is already in place across the northern Plains in the wake of a powerful and prolonged storm system that unleashed [days of blizzard conditions](#) during the last half of the week. Old Man Winter will up the ante even further as the first of two waves of intense cold arrive in North America during the early part of this week. "The area that got hit hard with blizzard conditions will now have to contend with another outbreak of intense cold," AccuWeather Meteorologist Matt Benz said.

By the middle of the week, a reinforcing burst of Arctic air will send temperatures well below zero. Temperatures could dip as low as 30-40 degrees Fahrenheit below zero in some areas of Montana or North Dakota, which would come close to a stretch of extreme cold observed back in 1983 and 1989. Records from the cold outbreaks during those years still set the standard for cold air around Christmastime in much of the northern and eastern U.S.

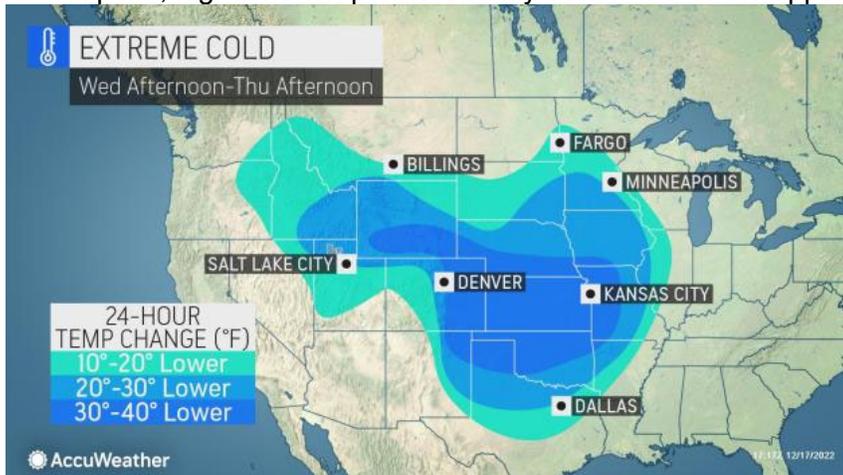
In [Grand Forks](#) and [Fargo](#), North Dakota, temperatures map dip close to the respective record lows of 29 and 31 degrees below zero on Thursday night. These records were originally set in 1951 and 1983, respectively.



"The cold burst in places such as [Minneapolis](#), [Chicago](#) and [Des Moines](#) will be more more typical of January or February, as opposed to December," Benz said. In these cities, the fiercest cold is likely to settle in during Thursday and Friday as holiday travel ramps up in full force. When factoring in gusty winds from a large storm that is expected to develop prior to Christmas, AccuWeather experts say it will be downright dangerous for individuals who do not have enough warm layers or proper shelter to be outside for even a short amount of time.

South Central and Southeastern states

Frigid conditions will spill south and east during the latter portion of the week, leaving residents from [Dallas](#) to [Little Rock](#), Arkansas, [Nashville](#) and [Atlanta](#) shivering ahead of the holiday weekend. At their lowest point, nighttime temperatures may bottom out in the upper single digits and teens in these cities.



"Near-freezing temperatures could also threaten crops in far southern Texas during Hanukkah and around Christmas," AccuWeather Senior Meteorologist Bill Deger said.

Depending on the exact speed of the cold rush, Friday may be the coldest day across the Southeast with highs in the 20s across the interior and in the 30s along much of the Gulf coast, with gusty winds creating even lower AccuWeather RealFeel® Temperatures.

"There is the likelihood of hard freezes along the Interstate 20 and 10 corridors," Deger said, adding that preventative measures should be taken by those heading away from home for the holidays to prevent [frozen pipes](#) and water damage. Temperatures may moderate for Christmas itself next Sunday, but the burst of bitterly cold air will certainly be a wakeup call across the region following a very mild first half of December.

Northeast

AccuWeather meteorologists say how quickly and with what intensity the cold envelops the East remains somewhat in question. A [large storm expected to develop along the leading edge of the Arctic air](#) may act to delay the arrival of the colder air along the Atlantic Seaboard.



"Even with a slightly less-severe outcome as the air mass reaches the Atlantic coast, it is expected to be a colder Christmas than in recent years in many parts of the East," Deger said.

In [New York City](#), for example, the high temperature on Christmas Day over the past three years has been 52 in 2021, 61 in 2020 and 47 in 2019. All of those high temperatures were above the average of 42 for the day. AccuWeather's latest forecast for the city puts the high this Christmas right around 30. The lowest high temperature ever recorded on Christmas there was just 13 in 1983.

[Washington, D.C.](#), had a balmy Christmas in 2021 with a temperature of 68, but the forecast there could be nearly 40 degrees lower this year. Similar temperatures contrasts from last Christmas to this Christmas can be expected throughout the Northeast.

Railroad Commission Taking Expedited Action in West Texas Seismicity Response

December 13, 2022

AUSTIN – Following a 5.4 magnitude earthquake on November 16 in Reeves County, the Railroad Commission of Texas is implementing several revisions to the seismicity reduction response plan in the Northern Culberson-Reeves Seismic Response Area (SRA).

The SRA was created to address the intensity and frequency of earthquakes in the area and reduce the occurrence of high-magnitude seismicity such that recurrence of 3.5 magnitude events is decreasing by December 31st, 2023.

The response plan sets curtailments on the injection volumes of produced water (which is water produced during oil and gas production) into disposal wells. The scope of the plan is being revised following reviews of seismicity data and injection volumes.

The SRA boundary is being expanded northward to the New Mexico border, which will increase the size of the SRA from 2,366 square miles to 2,601 square miles. There are 78 active disposal wells in the revised SRA.

The target for reducing daily injection volumes in deep disposal wells is being reduced even further. Operators of deep disposal wells in the Revised Response Plan have agreed to reduce the collective volume of disposal from the original target of 298,000 barrels per day by June 30, 2023 to 162,000 barrels per day by that date. This would be about a 68% drop in disposal volume compared to January 2022 before the plan went into effect.

More changes are on the way. RRC staff continue to study revisions to the shallow disposal well injection volume schedules in the SRA and will be looking at changes along with possible new data collection efforts.

The potential lag time between changes in injection rates and changes in seismicity varies; historical activity indicates a potential lag time of 12-18 months.

As part of the recent revisions, the RRC will also promote expanded data collection to support seismicity research to inform policymakers on future data needs for effective regulation to protect residents and the environment. The data collection will include a voluntary survey of available historical and current reservoir pressure, encouraging the use and reporting of continuous down-hole pressure monitoring data and assessing the origins of disposal volumes — whether from in-state or out-of-state sources.

The Revised Response Plan and other documents can be found by scrolling to the *Northern-Culberson Reeves* section of the [RRC Seismicity Response webpage](#).

Railroad Commission Responding to 5.4 Magnitude Earthquake Near Midland, Deploying Inspectors

December 17, 2022

AUSTIN – The Railroad Commission activated personnel Friday evening in response to a 5.4 magnitude earthquake about a dozen miles north of Midland in Martin County and will take any necessary actions to protect public safety and the environment.

Today, RRC inspectors will be examining disposal activity at injection well sites near the earthquake, which took place within the Gardendale Seismic Response Area (SRA).

In December 2021, the RRC ordered the indefinite suspension of all produced water disposal in deep injection wells in the SRA. Staff will review permit requirements for other injection wells in the area as it prepares for a response to reduce the frequency and intensity of earthquakes.

Agency personnel are continuing to closely monitor seismic data from the United States Geological Survey, the TexNET Seismic Monitoring Program and private operator monitoring stations.

RRC staff will continue its work to keep residents and the environment safe.

Corrosion Left Keystone Pipeline ‘Less than Half the Thickness of a Dime,’ Says U.S. Government Accountability Office



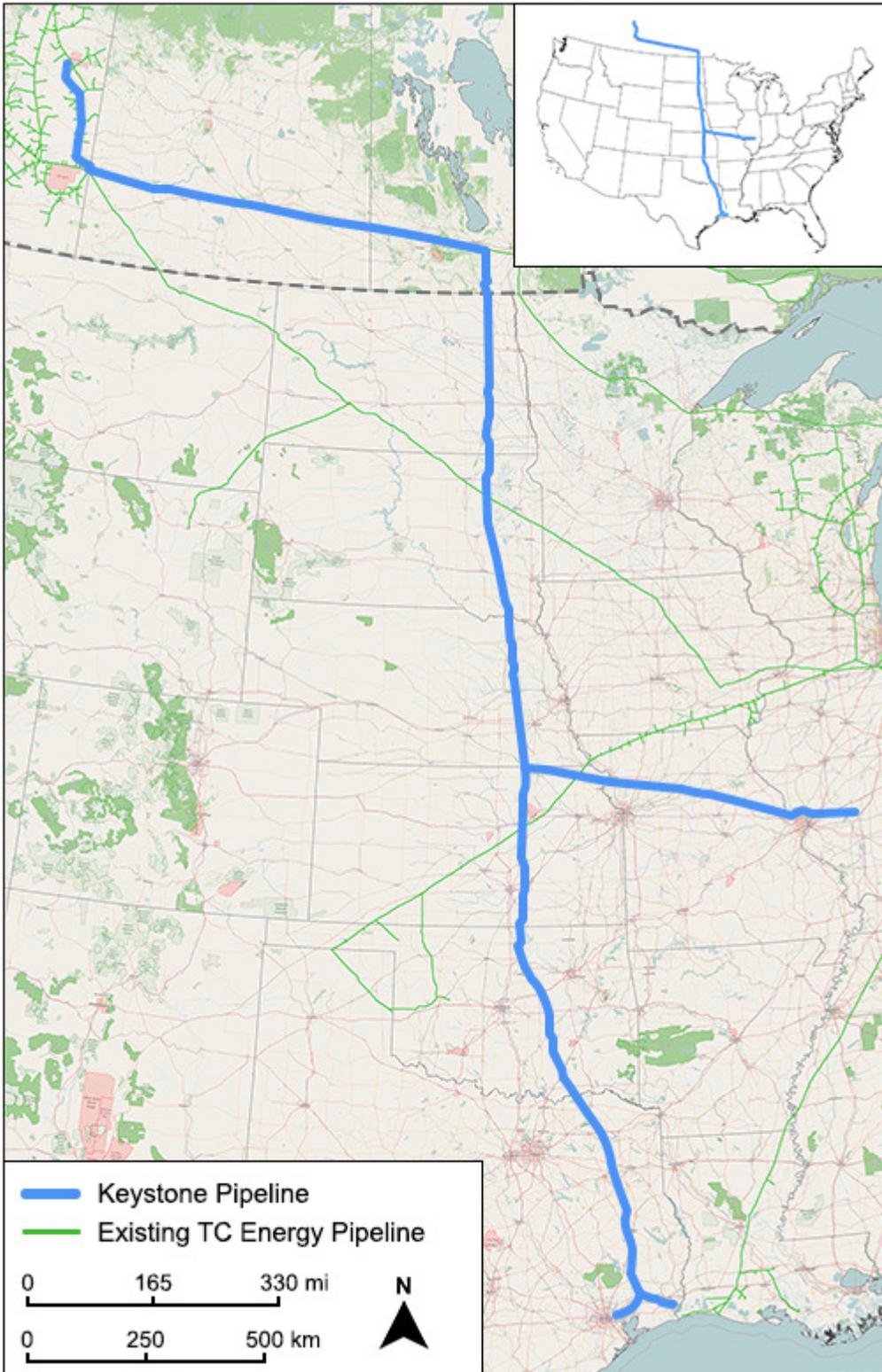
BY **GORDON JAREMKO**

DECEMBER 16, 2022

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Total oil spills from the Keystone Pipeline have grown to 25,975 bbl since TC Energy Corp. opened the conduit in 2010 to transport Canadian crude south to the Midwest and Gulf of Mexico.

Keystone Pipeline System



Source: TC Energy Corp.

The estimated **14,000 bbl leak began on Dec. 7** into a Kansas creek and farm, halting flows for a week and leaving TC unable to state the cause as of yet. The leak has more than doubled to an 11,975 bbl spill count as of mid-2021 by the U.S. Government Accountability Office (GAO).

The count, in a report titled Pipeline Safety: Information on Keystone Accidents and Department of Transportation Oversight, followed a 17-month performance audit. The GAO examined Keystone as the only U.S. oil line allowed to exceed standard industry operating pressure in its pipe.

The cause of the **Kansas spill remains under investigation**. High pressure did not cause Keystone leaks documented until mid-2021, said the 38-page GAO report to the U.S. House of Representatives' Energy and Commerce Committee and Transportation Committee.

An inquiry for the Pipeline and Hazardous Materials Safety Administration (PHMSA) blamed the mishaps on construction issues such as pump station vibration, a failed weld, a dent inflicted by a work vehicle, and an "atypical" steel seam that weakened the pipe.

Risks caused by corrosion are also severe. The GAO described an October 2012 spill disaster threat that TC and the PHMSA spotted and prevented on four pipe sections in sensitive, populated areas on a Keystone leg across Missouri and Illinois.

"In all four locations, the amount of metal loss – that is, corrosion – was over 60% deep. In one location, 97% of the metal had corroded, leaving a remaining pipeline wall thickness of 0.0120 inch – less than half the thickness of a dime," said the GAO.

The **PHMSA granted Keystone** its lone standing as a high-pressure U.S. line during its design in 2007. The permit lets the conduit work at 80% of specified minimum yield strength (SMYS). The U.S. industry standard is 72%.

Use of the high-pressure permit spread gradually after Keystone deliveries began in 2010 and the entire network qualified as of 2017. The line also had its previous biggest spills, in North Dakota and South Dakota, in 2017 and 2019.

Canada adopted an 80% SMYS rule for high-strength oil pipe in 2004. In the U.S., TC accepted 51 conditions to **secure the Keystone pressure permit**. Others follow the lower SMYS standard as cheaper to obey than the Keystone conditions, reported the GAO. Safer pipelines for natural gas have obtained 94 high-pressure permits.

By a standard that industry critics favor, Keystone spills stand out. The 25,975 bbl total would fill an entire long course or Olympic-sized swimming pool plus nearly two-thirds of a second one, each 50 meters long, 25 meters wide and two meters deep.

But by industrial shipping standards, the spills are small. Total leaks to date work out to 4.3% of one day of traffic on the 2,6875-mile Keystone route for 600,000 b/d of Canadian exports to the U.S. Midwest and Texas coast of the Gulf of Mexico.

As of mid-2021, Keystone delivered more than three billion bbl of Alberta oil and the high capacity flows have continued, noted the GAO. PHMSA has accelerated inspections and about doubled special attention for construction flaws, added the audit agency.

Keystone's North and South Dakota leaks led to six of 22 mishaps since 2010 that affected people or the environment. "According to PHMSA measures for these more severe types of accidents, from 2010 to 2020 TC Energy performed better than nationwide averages, but worse in the past five years due to the 2017 and 2019 spills," reported the GAO.

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GAO@100 Highlights

Highlights of [GAO-21-588](#), a report to congressional requesters

Why GAO Did This Study

Since it began operating in 2010, Keystone has transported over 3 billion barrels of crude oil from Canada to refineries in Illinois, Oklahoma, and Texas, according to its operator, TC Energy. Prior to construction, TC Energy requested and obtained a special permit from PHMSA to operate certain portions of the pipeline at a higher stress level than is allowed under PHMSA's regulations. Since TC Energy was the first and remains the only hazardous liquid pipeline operator to request a waiver of this particular regulation, the Keystone special permit is unique.

GAO was asked to review PHMSA's oversight of the Keystone Pipeline. This report discusses: (1) PHMSA's actions to approve the Keystone special permit and allow the pipeline to operate at a higher stress level, (2) how Keystone accidents compare to accidents on all U.S. crude oil pipelines since 2010, and (3) PHMSA's actions in response to Keystone safety issues.

GAO reviewed applicable statutes and regulations, the special permit, and PHMSA enforcement actions. It also analyzed PHMSA's pipeline accident data from 2010 to 2020 to describe Keystone's accidents and compare TC Energy to PHMSA's performance measures. GAO also interviewed TC Energy representatives, PHMSA officials, and 17 stakeholders selected to provide a range of perspectives representing industry associations; pipeline safety and technical stakeholders; and environmental, tribal, and state organizations.

View [GAO-21-588](#). For more information, contact Heather Krause at (202) 512-2834 or KrauseH@gao.gov.

July 2021

PIPELINE SAFETY

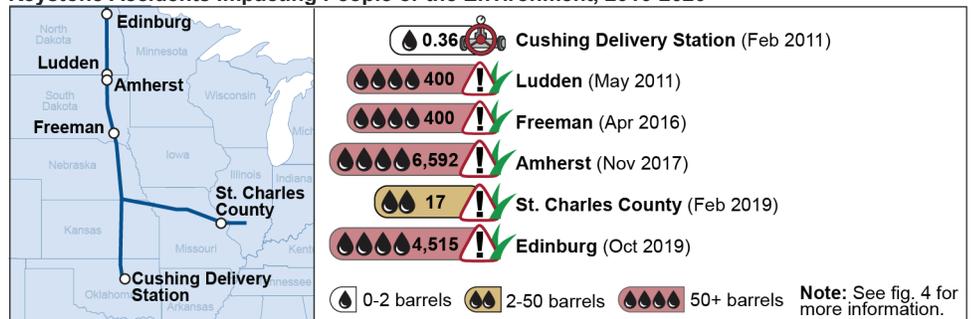
Information on Keystone Accidents and DOT Oversight

What GAO Found

The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) required TC Energy to take additional safety measures specified in a special permit as conditions of allowing certain portions of the Keystone Pipeline (Keystone) to operate at a higher stress level than allowed by regulation. PHMSA reviewed technical information and drew on its experience granting similar permits to natural gas pipelines to develop 51 conditions with which TC Energy must comply. Most pipeline safety and technical stakeholders GAO interviewed agreed the conditions offset the risks of operating at a higher stress level. However, PHMSA did not allow TC Energy to fully operate Keystone at this higher stress level until 2017, after TC Energy replaced pipe affected by industry-wide pipeline quality issues.

Keystone's accident history has been similar to other crude oil pipelines since 2010, but the severity of spills has worsened in recent years. Similar to crude oil pipelines nationwide, most of Keystone's 22 accidents from 2010 through 2020 released fewer than 50 barrels of oil and were contained on operator-controlled property such as a pump station. The two largest spills in Keystone's history in 2017 and 2019 were among the six accidents that met PHMSA's criteria for accidents "impacting people or the environment." According to PHMSA's measures for these more severe types of accidents, from 2010 to 2020 TC Energy performed better than nationwide averages, but worse in the past five years due to the 2017 and 2019 spills.

Keystone Accidents Impacting People or the Environment, 2010-2020



Source: PHMSA data and Map Resources. | GAO-21-588

In response to each of Keystone's four largest spills, PHMSA issued Corrective Action Orders requiring TC Energy to investigate the accidents' root causes and take necessary corrective actions. These investigations found that the four accidents were caused by issues related to the original design, manufacturing of the pipe, or construction of the pipeline. PHMSA also issued other enforcement actions and assessed civil penalties to TC Energy for deficiencies found during inspections, such as inadequate corrosion prevention and missing pipeline markers. Based in part on its experience overseeing Keystone, PHMSA officials said they have increased resources to conduct inspections during construction of other pipelines and are establishing a more formal process to document and track the compliance of all special permits, including Keystone's permit.

July 22, 2021

The Honorable Frank Pallone, Jr.
Chairman
Committee on Energy and Commerce
House of Representatives

The Honorable Peter A. DeFazio
Chairman
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Bobby L. Rush
Chairman
Subcommittee on Energy
Committee on Energy and Commerce
House of Representatives

The Honorable Donald M. Payne, Jr.
Chairman
Subcommittee on Railroads, Pipelines, and Hazardous Materials
Committee on Transportation and Infrastructure
House of Representatives

About 84,000 miles of pipelines transported crude oil from production areas to refineries in the United States as of 2020. Although pipelines are relatively safe when compared to transportation alternatives such as truck and rail, pipeline accidents can release large amounts of crude oil into the environment, damaging natural resources and wildlife. Within the U.S. Department of Transportation, the Pipeline and Hazardous Materials Safety Administration (PHMSA) oversees safety for pipelines carrying oil, natural gas, and other products.¹ PHMSA's oversight includes setting and enforcing the federal minimum pipeline safety standards for the construction, operation, maintenance, and inspection of interstate pipelines. Operators may apply for—and PHMSA has the authority to issue—special permits that waive compliance with one or more pipeline

¹PHMSA's general authority is under the Pipeline Safety Laws codified at 49 U.S.C. § 60101 et seq.

safety regulations if PHMSA determines that the permit is not inconsistent with pipeline safety.²

The Keystone pipeline runs 2,687 miles from Canada into the United States and according to the operator has transported over 3 billion barrels of crude oil since it began operating in 2010. The oil it transports from Canada to refineries in Illinois, Oklahoma, and Texas is a dense and highly viscous form of crude oil derived from oil sands, called “bitumen.” Prior to Keystone’s construction, the pipeline’s operator, TransCanada (now TC Energy), requested and was granted a special permit from PHMSA that allowed the company to use pipe made of higher grade steel in order to operate some sections of the pipeline at a higher stress level than would otherwise be allowed under regulation.³

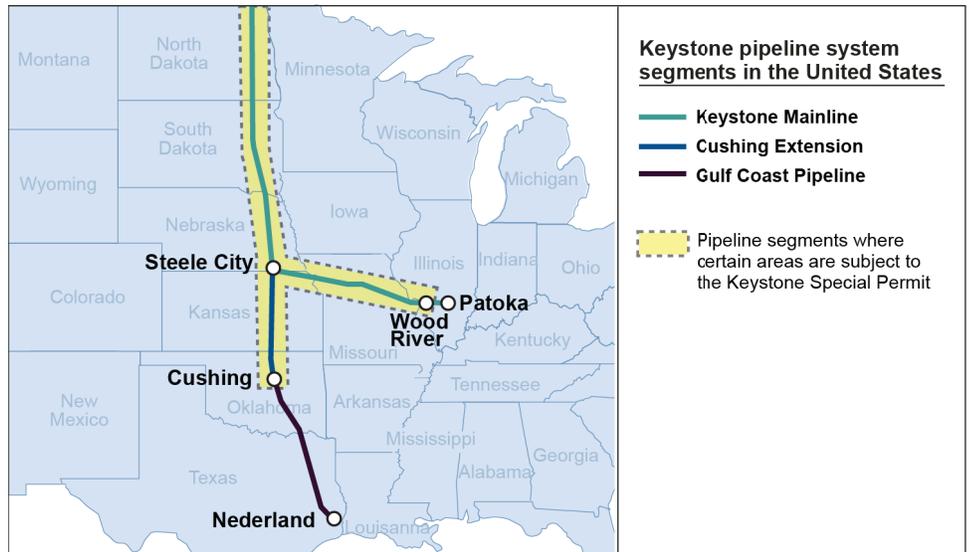
The Keystone special permit applies to certain portions of two pipeline segments, and in this report, we refer collectively to those segments as “Keystone.” The first segment is the 1,025-mile, 30-inch diameter pipeline referred to as the Mainline from the Canadian border at North Dakota, to Wood River, Illinois. The second segment is the 291-mile, 36-inch diameter pipeline referred to as the Cushing Extension from Steele City, Nebraska, to Cushing, Oklahoma. See figure 1. This report focuses on these segments and does not include the Gulf Coast Pipeline or Keystone XL. The Keystone XL pipeline was originally proposed in 2008 and was intended to cross the U.S.-Canada border in Montana and travel through South Dakota and Nebraska before joining the existing Keystone pipeline at Steele City, Nebraska. On June 9, 2021, TC Energy announced that it had terminated Keystone XL, after the project’s presidential permit was revoked in January 2021.⁴

²49 U.S.C. § 60118(c); 49 C.F.R. § 190.341.

³PHMSA, Grant of Special Permit to TransCanada Keystone Pipeline, Docket No. PHMSA-2006-26617 (Apr. 30, 2007).

⁴Presidential permits are distinct from special permits issued by PHMSA. The Secretary of State has the authority to receive applications for presidential permits for the construction, connection, operation, or maintenance of pipelines and other physical infrastructure at the borders of the United States. The process involves consulting relevant federal agencies, determining whether the application meets the standards for granting a presidential permit, and if so, issuing the permit. Exec. Order No. 11423, § 1 (Aug. 16, 1968), as amended. The presidential permit to construct Keystone XL, issued under the Trump administration in 2019, was revoked by a January 20, 2021 Executive Order under the Biden administration. TC Energy was previously denied a presidential permit for the pipeline under the Obama administration in 2015.

Figure 1: Map of TC Energy Keystone Pipeline System in the United States



Sources: PHMSA and TC Energy data and Map Resources. | GAO-21-588

A number of accidents have occurred on Keystone, including an October 2019 rupture near Edinburg, North Dakota which released more than 4,500 barrels of oil. You asked us to review Keystone accidents and PHMSA’s oversight of this pipeline. This report examines (1) PHMSA’s actions to approve the Keystone special permit and allow the pipeline to operate at a higher stress level, (2) how Keystone accidents compare to accidents on all U.S. crude oil pipelines since 2010, and (3) PHMSA’s actions in response to Keystone safety issues.

To describe the actions that PHMSA took to approve the Keystone special permit and allow the pipeline to operate at a higher stress level, we reviewed applicable statutes and regulations, the 2007 special permit, and related PHMSA and TC Energy documentation. These documents included: TC Energy’s application and additional documents the company provided in response to PHMSA requests; a PHMSA-commissioned technical report; PHMSA advisory meeting proceedings; and public comments submitted in response to PHMSA’s notice and request for comments on TC Energy’s application. We also conducted semi-structured interviews with 17 stakeholders to gain their perspectives on

PHMSA's approval of the special permit.⁵ The stakeholders were selected to capture a range of known interests (industry, safety, environmental, state, and tribal interests). These stakeholders were identified by reviewing documentation such as the PHMSA advisory meeting noted above and a National Academies report on the safety of crude oil pipelines, as well as by asking for recommendations in interviews. Stakeholder views cannot be generalized to represent the views of all Keystone stakeholders.

To compare Keystone accidents to all U.S. crude oil pipeline accidents, we analyzed PHMSA accident data. We used these data to describe Keystone accidents from 2010 through 2020 in terms of the amount of oil released, the accident location and cause, and whether the accident met PHMSA's definition for an accident impacting people or the environment.⁶ For purposes of this report, we characterize such accidents as "more severe" than those that did not meet PHMSA's definition for impacting people or the environment. We compared the averages of these more severe accidents for Keystone's operator, TC Energy, to national averages for operators of pipelines transporting crude oil, refined petroleum products, and biofuel from 2010 (the first year of Keystone operations) through 2020 (the latest full year of PHMSA data available). Specifically, we used PHMSA's performance measures—accidents impacting people or the environment per 1,000 miles of pipeline and barrels of oil spilled per billion barrel-miles—to compare TC Energy to 3-, 5-, and 11-year averages across pipeline operators nationwide. We assessed the reliability of these data by (1) performing manual testing, (2)

⁵These stakeholders were: representatives from three industry associations (Association of Oil Pipelines, American Petroleum Institute, and Interstate Natural Gas Association of America); seven pipeline technical and safety stakeholders (National Transportation Safety Board's Pipeline and Hazardous Materials Division; Pipeline Safety Trust; Kiefner and Associates; Accufacts, Inc.; Kent Muhlbauer; Evan Vokes; and Jeff Wiese); and representatives from seven environmental, state, and tribal organizations (Dakota Rural Action; Bold Nebraska; Paul Blackburn, Environmental Attorney; Natural Resources Defense Council; South Dakota Public Utilities Commission and South Dakota Department of Environment and Natural Resources, North Dakota Department of Environmental Quality; and Great Plains Tribal Chairmen's Association).

⁶PHMSA defines an accident as impacting people or the environment if it meets one of two criteria: (1) regardless of the accident's location, any of the following occur: a fatality, injury requiring in-patient hospitalization, ignition, explosion, evacuation, wildlife impact, contamination of specific water sources, or damage to public or private, non-operator property or (2) where the accident's location is not totally contained on operator-controlled property, any of the following occur: an unintentional release equal to or greater than 5 gallons in a high consequence area, an unintentional release of 5 barrels or more outside of a high consequence area, surface water contamination, or soil contamination.

reviewing documentation about the data and the system that produced them, and (3) interviewing PHMSA officials and TC Energy representatives. We determined these data were sufficiently reliable for these purposes. To gain their perspectives on Keystone accidents, we interviewed PHMSA officials, TC Energy representatives, and the 17 stakeholders described above.

To identify actions PHMSA has taken in response to Keystone's safety issues, we reviewed PHMSA enforcement actions for Keystone from 2010 through 2020 and TC Energy's responses to these actions. PHMSA's enforcement actions included Warning Letters, Notices of Probable Violations, and Corrective Action Orders. TC Energy's responses to PHMSA's enforcement actions include Root Cause Failure Analysis reports of accidents.⁷ We analyzed the enforcement actions against TC Energy to identify the most common issues, such as repeated noncompliance with the same regulations or special permit conditions. To further describe PHMSA's enforcement actions and the actions TC Energy took in response, we interviewed PHMSA officials, TC Energy representatives, and the 17 stakeholders described above for their perspectives.

We conducted this performance audit from April 2020 to July 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The U.S. energy pipeline network includes about 530,000 miles of pipelines transporting hazardous liquids and natural gas over long distances to users. As of 2020, about 228,000 miles of these pipelines carried hazardous liquids such as crude oil, refined oil products, or other liquids such as anhydrous ammonia. Slightly more than one-third of these

⁷We report on the findings of the Root Cause Failure Analyses but did not independently review or evaluate the methodology used in these reports.

hazardous liquid pipelines (about 84,000 miles) transported crude oil to refineries for processing into petroleum products, similar to Keystone.⁸

Pipeline accidents can occur from a variety of causes, including construction damage, corrosion, mechanical failure, control system failure, and operator error. Natural forces, such as floods and earthquakes, can also damage pipelines. Although relatively few people have been injured or killed due to pipeline accidents, a single accident can have catastrophic consequences for public safety and the environment. For example, in July 2010, a pipeline operated by Enbridge ruptured near Marshall, Michigan, releasing an estimated 19,500 barrels of crude oil into a creek, wetlands, and the Kalamazoo River.

PHMSA's Roles and Responsibilities

PHMSA is responsible for setting and enforcing the federal minimum safety standards for the design, construction, operation, maintenance, and inspection of interstate hazardous liquid and natural gas pipelines.⁹ These standards include technical requirements such as:

- **Maximum operating pressure as a percentage of Specified Minimum Yield Strength (SMYS).** PHMSA regulations specify that the maximum operating pressure for hazardous liquid pipelines is 72 percent of a pipeline's SMYS.¹⁰ SMYS represents the stress level at which a steel pipeline will begin to deform. It can vary depending on the grade (strength) of steel used to manufacture the pipe, so maximum operating pressure is defined as a percentage of SMYS. For example, higher grade steel allows for thinner but stronger pipeline walls, which in turn allows for operation at a higher percentage of SMYS. Pipelines manufactured using lower-grade steel would need thicker walls to withstand the same pressure as pipelines

⁸In addition to the 530,000 miles of hazardous liquid and natural gas transmission pipelines, the nation's 2.8 million miles of pipeline also includes 2.3 million miles of natural gas distribution pipelines that deliver gas to end users, such as businesses and homes, and about 21,000 miles of regulated gathering pipelines that carry natural gas and hazardous liquids from production areas and wells to processing plants.

⁹PHMSA also has the authority to set the minimum safety standards for intrastate pipelines. However, states may assume some regulatory, inspection, and enforcement responsibilities for those pipelines after certifying to PHMSA that they have adopted and are enforcing the federal minimum safety standards. States with certifications may adopt additional or more stringent safety standards as long as they are compatible with federal standards.

¹⁰See 49 C.F.R. §§ 195.106, 195.406(a). PHMSA's hazardous liquid pipeline safety regulations are located in 49 C.F.R. Part 195.

designed with stronger steel. Operating at a higher SMYS allows operators to reduce overall steel material expense since higher grade steel pipelines have thinner walls.

- **Corrosion prevention technologies.** PHMSA regulations include specifications to protect pipelines from corrosion. For example, PHMSA generally requires pipelines to have external coatings and cathodic protection systems. External coatings are protective layers of plastic material or other chemical compounds that are bonded to the metallic surface of a pipe to protect it from outside elements. Cathodic protection systems help prevent or mitigate external corrosion by applying an electrical current onto a buried pipeline.¹¹ Corrosion prevention is particularly important for pipelines operating at a higher SMYS using thinner but higher grade steel, as the thinner pipeline walls may have less corrosion allowance—that is, the amount of material that may corrode without affecting the integrity of the pipeline.

In addition, since 2000, PHMSA has required certain pipeline operators to develop and maintain integrity management programs to systematically manage risks in areas where accidents would have the most severe consequences, called high consequence areas.¹² For example, operators must periodically assess the integrity of pipelines in these areas through various methods, including by inserting electronic in-line inspection devices into the pipeline to identify potential risks such as corrosion or other damage.¹³

PHMSA officials periodically inspect pipelines to oversee operators' compliance with federal requirements and may issue enforcement actions when an inspector identifies probable violations of pipeline safety laws, regulations, or a PHMSA order, such as the conditions of a special

¹¹Corrosion is an electro-chemical reaction that causes metal loss from a pipe that is in contact with the ground. Cathodic protection provides a substitute electro-chemical reaction to minimize corrosion. Specifically, cathodic protection involves voltage transformers, called rectifiers, and groundbeds that contain anodes, which are highly active metals that "sacrifice" by corroding rather than having the corrosion occur on the pipeline.

¹²High consequence areas generally include high population areas, other populated areas, certain navigable waterways, and areas unusually sensitive to environmental damage. 49 C.F.R. § 195.450.

¹³In 2019, PHMSA issued a final rule requiring hazardous liquid pipeline operators to also conduct these integrity assessments on pipeline segments outside of high consequence areas. Pipeline Safety: Safety of Hazardous Liquid Pipelines, 84 Fed. Reg. 52,260, 52,269 (Oct. 1, 2019).

permit.¹⁴ PHMSA may also issue enforcement actions in the course of investigating an identified safety condition or a pipeline accident. According to officials, PHMSA's Office of Pipeline Safety has 124 authorized inspector positions whose responsibilities include inspecting 555 companies that operate about 530,000 miles of interstate pipelines. PHMSA has broad discretion in deciding what enforcement action, if any, to take against a particular operator to ensure compliance, and the enforcement actions range in severity:¹⁵

- *Warning Letters* notify operators when PHMSA inspections or other oversight activities reveal less serious violations or program deficiencies. Warning Letters direct the operator to correct the issues or be subject to potential, future enforcement actions.
- *Notices of Amendment* identify alleged inadequacies in the operator's plans and procedures to ensure safe operation of the pipeline, propose revisions to the plans or procedures, and instruct the operator as to how to respond to the allegations.
- *Notices of Probable Violation* allege the existence of one or more probable violations of pipeline safety laws, regulations, or related orders. These notices are accompanied by either a proposed compliance order identifying the remedial actions the operator is required to take, proposed civil monetary penalties, or both.¹⁶ This is the only type of enforcement action that may include proposed civil monetary penalties. If PHMSA finds that a violation was committed, then it issues a final order, which includes the compliance order, the assessment of civil monetary penalties, or both, as applicable.

¹⁴The pipeline safety laws are codified at 49 U.S.C. § 60101 et seq., and the pipeline safety regulations are located in 49 C.F.R. Parts 190-199. PHMSA's regulations governing its enforcement of pipeline safety are located in 49 C.F.R. Part 190.

¹⁵PHMSA officials note that in addition to those listed, there is another enforcement tool that PHMSA can issue but has not issued to TC Energy for Keystone. Specifically, a Notice of Proposed Safety Order alleges that a particular pipeline facility has a condition or conditions that pose a pipeline integrity risk to the public safety, property, or the environment, and proposes requiring the operator to take necessary corrective action. If after issuing such a notice, PHMSA finds that such an integrity risk exists, PHMSA may issue a Safety Order.

¹⁶These enforcement actions must contain the options available to the operator for responding to the notice. The options include but are not limited to submitting written responses contesting the allegations, requesting mitigation or elimination of the proposed civil penalty, objecting to the compliance order, or requesting a hearing. Failure to respond constitutes a waiver of a right to contest the allegations.

-
- *Corrective Action Orders* direct an operator to take immediate corrective actions to ensure safe pipeline operation. PHMSA may issue a corrective action order if it finds that the pipeline or pipeline facility is or would be hazardous to life, property, or the environment, such as after an accident occurs. These orders do not allege probable violations.

PHMSA also collects and shares pipeline-related data, including data on accidents. For example, for each accident that releases over 5 gallons of product, PHMSA requires hazardous liquid pipeline operators to submit a report that includes information such as amount, location, timing, impacts, and cause of the release. To provide transparency into pipeline operators' safety records, PHMSA publishes information on its website on pipeline accidents by operator. This information covers each operator's network of pipelines carrying crude oil or refined petroleum products. PHMSA also reports nationwide averages for accidents—such as the average number of accidents and average amount of product spilled per billion barrel transported—which enables comparisons between an individual operator and the industry as a whole.

Keystone Special Permit

PHMSA issued the Keystone special permit in April 2007 after TC Energy applied for a waiver of the regulatory requirement for hazardous liquid pipelines to operate at a maximum stress level of 72 percent of SMYS for certain segments of the pipeline. The special permit allows TC Energy to construct the pipeline using higher-grade steel in order to operate at 80 percent of SMYS along the Keystone Mainline and Cushing Extension. Except for this waived requirement, all other pipeline safety regulations apply to the segments covered by the special permit. Certain portions within those segments are not covered by the special permit, such as those operating in high consequence areas and within pump stations.¹⁷ In those pipeline portions, Keystone remains wholly subject to PHMSA's hazardous liquid pipeline safety regulations. The special permit is in effect for the life of the pipeline, although PHMSA has the authority to modify, suspend, or revoke the permit in certain circumstances designated in regulations.

¹⁷Pump stations are located at regular intervals along the pipeline to boost pressure to desired levels. Without these pumps, pipelines experience pressure losses over the length of the pipeline. Many pump stations are unstaffed and located in sparsely populated areas.

To grant a special permit, PHMSA must determine that the requested waiver is not inconsistent with safety,¹⁸ which PHMSA officials interpret to mean that the waiver provides a level of safety equal to or greater than that which would be provided if the pipeline were operated under existing regulations. When approving a special permit, PHMSA can also impose conditions to offset the safety risks posed by waiving the operator's compliance with a regulation. Between 2000 and 2020, PHMSA granted 99 special permits: 94 for natural gas pipelines and five for hazardous liquid pipelines. Keystone's special permit is the only one PHMSA has granted that allows a hazardous liquid pipeline to be designed and operated at 80 percent of SMYS. No other hazardous liquid pipeline operator has requested a special permit to waive the same regulation. According to PHMSA officials, during inspections of the Keystone pipeline, the agency evaluates the operator's overall performance data, as well as compliance with the terms of the special permit.

PHMSA Developed Conditions to Offset Safety Risks and Required TC Energy to Replace Low-Quality Pipe

Technical Information and PHMSA's Experience Informed Special Permit Conditions

PHMSA gathered technical information from TC Energy related to the potential operation of the Keystone pipeline at 80 percent of SMYS. PHMSA's regulations require special permit applications to include information spanning 12 categories, including, for example, pipeline design and construction and how proposed safety measures would mitigate safety or environmental risks. TC Energy included this information in its November 2006 application. PHMSA then requested, and TC Energy provided, 22 additional items, such as the pipe's predicted fatigue life at 80 percent of SMYS and the reason TC Energy sought the special permit. TC Energy stated that the special permit would reduce steel costs by approximately 10 percent while still maintaining high standards of safety. TC Energy also proposed additional actions, such as

¹⁸49 U.S.C. § 60118(c); 49 C.F.R. § 190.341.

more frequent assessments of the pipeline using in-line inspection tools, to help ensure safety.

PHMSA also requested and incorporated input from a technical advisory committee, an engineering consultant, pipeline safety experts, and the public regarding the technical aspects of the special permit request. For example, it solicited comments from an external technical advisory committee containing members from industry, federal and state government, and pipeline safety groups. It also commissioned a study that analyzed and made recommendations regarding the potential fatigue and fracture of a pipeline operating at 80 percent of SMYS. For example, the study recommended requiring the operator to perform a full in-line inspection within 3 years of the pipeline starting operations, a stipulation that PHMSA later made a condition of the special permit. In addition, according to the special permit, PHMSA requested and incorporated input from experts in areas such as steel fracture mechanics and leak detection. Finally, in response to publishing TC Energy's special permit request in the *Federal Register* in February 2007, PHMSA received two comments. One comment was from a pipeline safety expert who supported the application and recommended a number of conditions, such as quality control practices during pipeline installation, which PHMSA incorporated into the special permit.¹⁹

In reviewing the Keystone special permit application, PHMSA officials said they also drew on their experience with granting similar special permits for natural gas pipelines, as well as on the experiences of other countries regulating crude oil pipelines operating at a higher stress level. In 2005, PHMSA started receiving requests for special permits that would allow operators to increase the maximum allowable operating pressure to 80 percent of SMYS for certain natural gas pipeline segments. PHMSA evaluated these special permit applications against safety criteria such as pipe design, construction, operations and maintenance, integrity management, and reporting requirements. PHMSA would later require TC Energy to submit information across similar categories. A PHMSA official also said that the Keystone special permit conditions were similar to those the agency included in natural gas special permits, such as addressing risks from corrosion and cracking. In addition, according to officials, PHMSA considered how regulatory agencies in Europe and Australia oversaw crude oil pipelines operating at 80 percent of SMYS. As PHMSA

¹⁹As PHMSA notes in the Keystone special permit, the other commenter did not provide substantive comments relevant to the special permit request.

noted in Keystone’s 2007 special permit, Canadian safety standards already allowed operators there to design and operate hazardous liquid pipelines at 80 percent of SMYS, which TC Energy had been doing since 2004 in Canada.

Based on the technical information and its experience with the natural gas pipeline industry, PHMSA issued the special permit with 51 conditions that the agency determined would offset the risks of operating the relevant Keystone segments at 80 percent of SMYS in non-high consequence areas. The special permit conditions are in effect for the entire lifecycle of the pipeline, from design and construction to ongoing maintenance and reporting. Three quarters (38) of the conditions relate to constructing, operating, and maintaining the pipeline to ensure safety, including three conditions requiring periodic in-line inspections to proactively identify issues such as corrosion and cracking. See Table 1 for a summary of the 51 special permit conditions.

Table 1: Keystone Special Permit Conditions the Pipeline and Hazardous Materials Safety Administration (PHMSA) Developed to Provide for Safe Operation at 80 Percent of Specified Minimum Yield Strength

Condition number	Pipeline lifecycle stage	Description
1 – 10	Planning and Design	Pipe Manufacturing, Coating, Transportation, and Mill Testing Requirements to ensure that the pipe is adequately manufactured, protected, delivered, and inspected before it goes into the ground.
11 – 24	Construction	Field Coating, Fittings, Design, Corrosion, and Construction Requirements to ensure that the pipe is adequately welded and coated in the field, operates at a safe pressure rating for its installation location, and is modified to mitigate potential corrosion issues. In addition, the operator must create a quality assurance plan for the pipe’s installation, as construction defects could lead to material failure during operation.
25 – 48	Operations and Maintenance	Operations and Maintenance Requirements to ensure that the pipeline is maintained properly through measures including the installation of a control room system that detects leaks so trained operators can provide remote monitoring and control of the pipeline. The pipeline must also be appropriately marked, inspected, evaluated, and repaired.
49 – 51	Reporting	Reporting and Records Retention Requirements to ensure that the operator submits immediate reports to PHMSA for any leak in the special permit area, as well as longer term reports, such as annual reports addressing 12 specific areas. These areas include inspection results and internal programs for corrosion management and damage prevention.

Source: PHMSA Keystone special permit information. | GAO-21-588

Most safety and technical stakeholders we interviewed regarded the terms of the Keystone special permit as offsetting the risks of operating the pipeline under a higher stress level. All seven of the safety and

technical stakeholders we interviewed acknowledged that operating at 80 percent of SMYS poses risks. For example, one noted that the thinner-walled pipe used for Keystone—albeit made of higher-grade steel—could be less resistant to outside forces, cracking, and corrosion than pipe made with thicker walls. However, five of the seven stakeholders generally agreed that PHMSA designed the Keystone special permit conditions in a way that required TC Energy to offset those risks. For example, three noted that the Keystone special permit conditions require TC Energy to conduct more frequent in-line inspections using more advanced technologies. In addition, one industry association stakeholder we interviewed said that the percentage of SMYS is just one of many factors engineers consider to ensure safety. All four environmental stakeholders we interviewed said that although they have safety concerns with Keystone, they could not comment on approval of the special permit because they were not involved during PHMSA’s development of the conditions in 2006-2007. For example, one environmental stakeholder said that his organization was more involved with the Keystone XL pipeline, which TC Energy proposed after the Keystone special permit was approved by PHMSA.

One industry stakeholder noted that his organization would prefer PHMSA update the hazardous liquid pipeline regulations to allow all pipelines that meet the conditions to operate at increased SMYS, but PHMSA officials stated they do not intend to take this action. Due to the experience PHMSA gained from natural gas pipeline special permits, the agency amended its regulations in 2008 to allow certain natural gas pipeline segments to operate at 80 percent of SMYS if operators met specific requirements. However, since Keystone’s special permit is the only one of its kind, PHMSA has less experience overseeing hazardous liquid pipelines operating above 72 percent of SMYS. PHMSA officials said that because there is low demand from industry for special permits waiving this regulation, they have not sought to amend their regulations to generally allow hazardous liquid pipelines to operate at a higher stress level. These officials speculated the low demand from industry for special permits waiving the regulation was in part because operators do not want to be subject to additional conditions that are more onerous than the safety regulations that would have otherwise applied.

PHMSA Required TC Energy to Replace Low-Quality Pipe before Operating Keystone at a Higher Stress Level

After issuing the special permit in 2007, PHMSA identified industrywide pipeline quality issues and as a result initially prohibited the operation of any Keystone segment at 80 percent of SMYS. Through inspections of new construction in 2008, PHMSA identified pipe manufacturing quality issues across the pipeline industry, including one or more manufacturers that had supplied pipe used to construct Keystone. Specifically, some pipe mills had manufactured pipe that failed to meet strength specifications required by regulations, which could cause the steel to deform at pressures lower than intended and the pipeline to expand as a result. To address these issues, in 2009 PHMSA issued an Advisory Bulletin and accompanying guidance, directing operators to use in-line inspection tools to identify pipeline segments with steel that had expanded. The same year PHMSA required TC Energy, which had started Keystone construction in June 2008, to conduct inspections along its entire U.S. pipeline to identify and replace any affected pipeline sections prior to operating the pipeline at the higher SMYS allowed under the special permit. As a result, Keystone began operating in June 2010 at 72 percent of SMYS.

PHMSA allowed TC Energy to gradually phase in Keystone operations at 80 percent of SMYS as inspections and repairs were completed. More specifically, in 2015, TC Energy completed its inspections to detect areas with the expanded pipe, and began excavating and replacing 32 affected pipeline joints in 2016.²⁰ PHMSA conducted inspections to verify TC Energy's process for identifying the expanded pipe and conducting the repair work. For segments that TC Energy found unaffected by pipeline quality issues, PHMSA allowed the company to operate Keystone at 80 percent of SMYS beginning in 2016. For segments where TC Energy found expanded pipe, PHMSA approved a phased increase in operating pressure up to 80 percent of SMYS after TC Energy completed the replacements. By 2017, all sections of the pipeline subject to the special permit were operating at 80 percent of SMYS.

²⁰According to TC Energy officials, a joint is a segment of the pipe that is welded together in the field to form the pipeline and is typically 40 feet but can be 80 feet depending on the type of pipe.

PHMSA Required TC Energy to Address Construction and Other Issues, and Used Lessons Learned to Improve Oversight Nationwide

PHMSA Issued Corrective Action Orders in Response to Keystone's Largest Accidents

In response to each of Keystone's four largest spills, PHMSA issued Corrective Action Orders requiring TC Energy to take several actions, including engaging a PHMSA-approved independent consultant to conduct a Root Cause Failure Analysis which found the accidents stemmed from construction issues.²⁹ For each such order—which PHMSA may issue when the agency determines that a pipeline is or would be hazardous to life, property, or the environment—PHMSA required TC Energy to shut down the pipeline and obtain PHMSA approval to restart the pipeline. The Root Cause Failure Analysis, conducted by a third party, indicated that the four accidents were caused by issues related to the original design, manufacturing of the pipe, or construction of the pipeline that are distinct from the issue with low-quality pipe that delayed Keystone from operating at 80 percent SMYS. Table 2 provides a summary of the reports' causation findings, as well as actions TC Energy took in response to the Corrective Action Orders. Examples of TC Energy actions include conducting inspections across the pipeline to detect similar issues and replacing components if needed. In addition, TC Energy representatives note that they have been working to evolve and improve the company's in-line inspection tools in order to detect pipeline flaws before they become accidents.

²⁹Three of the four Corrective Action Order cases have been closed by PHMSA, meaning that TC Energy complied with the terms. While PHMSA has not yet closed the Order most recently issued in November 2019, according to TC Energy representatives, PHMSA has removed a temporary pressure restriction and TC Energy has complied with the relevant terms.

Table 2: The Causes of Keystone Accidents Resulting in PHMSA Issuing Corrective Action Orders and TC Energy Actions in Response to the Orders

Accident date and location	Barrels released	Causes according to Root Cause Failure Analysis	TC Energy Actions in response to the PHMSA Corrective Action Orders
May 2011- Ludden Pump Station, North Dakota and Severance Pump Station, Kansas	408.5	Design of the pipeline system did not adequately take into account the vibrations that occurs at pump stations, so pump station components failed as a result.	Between May 2011 and March 2012, replaced damaged components, inspected connections to determine risk areas, modified connections that posed a risk, and conducted verification testing to ensure effectiveness at pump stations.
April 2016- Near Freeman, South Dakota	400	The weld (called a girth weld) joining two pipe segments of differing thicknesses failed and caused a leak.	Conducted in-line inspection to detect defects on similar girth welds across the affected segment by June 2016. No other similar weld defects were detected.
Nov. 2017- Near Amherst, South Dakota	6,592	A fatigue crack, likely originating from mechanical damage to the pipe exterior by a vehicle during installation that grew to a critical size.	Used technology to detect cracks on the affected segment and excavated several anomalies by September 2018 but did not find issues similar to the flaw that caused the accident.
Oct. 2019- Near Edinburg, North Dakota	4,515	The pipe was manufactured with an atypical seam weld geometry severe enough to initiate a fatigue crack.	Launched a crack in-line inspection program with a new technology platform across the system to detect similar cracks. This work is ongoing.

Source: GAO analysis of PHMSA and TC Energy information. | GAO-21-588

Although the relevant pipeline segments were operating at a stress level greater than 72 percent of SMYS at the time of Keystone’s two largest accidents, PHMSA officials stated that this did not cause the ruptures. As noted previously, PHMSA did not allow Keystone to operate at 80 percent of SMYS until TC Energy identified and replaced 32 pipe joints that contained low strength steel. For the segment of the pipeline where the two largest spills occurred, TC Energy did not identify any affected pipe joints requiring replacement, and began operating this segment at 80 percent of SMYS in 2016. PHMSA officials stated that based on their review of the Root Cause Failure Analysis reports, they not believe that the operating stress level of the pipeline would have had an effect, as both accidents were caused by a fatigue failure related to pre-existing flaws or defects.

PHMSA’s accident data suggest that construction issues may be a more frequent contributor to Keystone’s accidents impacting people or the environment when compared to causes for such accidents for pipelines nationwide. PHMSA reports that from 2010 to 2020, 12 percent of all accidents impacting people or the environment (119 of 981) on pipelines carrying crude oil, refined oil products, or biofuels were caused by a material failure of the pipe or weld, such as defects in the steel material or welds used in manufacturing the pipe or joining pipe during construction.

By comparison, half (3 of 6) of Keystone’s accidents impacting people or the environment were caused by material failure of pipe or weld. Specifically, the two accidents in South Dakota in 2016 and in 2017 were caused by issues in the construction, installation, or fabrication of the pipeline, while the 2019 North Dakota accident was caused by defects in the original pipe manufacturing.

In contrast to Keystone, PHMSA reports that the leading cause of accidents impacting people or the environment on pipelines carrying crude oil, refined oil products, or biofuels from 2010 to 2020 was corrosion, accounting for 30 percent of such accidents.³⁰ On Keystone, none of these more severe accidents have been caused by corrosion. However, according to PHMSA officials and TC Energy representatives, a February 2019 Keystone accident in St. Charles County, Missouri, which released 17 barrels, was caused by the failure of a pipeline wrap that was applied in 2012 to address previous corrosion issues.³¹

PHMSA Issued Additional Enforcement Actions for TC Energy to Address Deficiencies in Corrosion Prevention and Other Areas

In addition to the Corrective Action Orders, PHMSA also issued enforcement actions regarding corrosion prevention and other deficiencies discovered during inspections. See table 3.

Table 3: Enforcement Actions PHMSA Issued to TC Energy for Keystone Deficiencies Identified during Inspections

Date enforcement action issued	Type of enforcement action	Topics of Deficiencies Found	Civil monetary penalty assessed
Jan. 13, 2012	Warning Letter	Pipeline markers Cathodic protection	N/A
Aug. 28, 2013	Notice of Amendment	Public awareness program	N/A
Nov. 20, 2015	Notice of Probable Violation	Cathodic protection	\$135,400 ^a

³⁰In addition to corrosion (30 percent) and material failure of pipe or weld (12 percent) mentioned above, the other causes nationally were: equipment failure (23 percent), incorrect operation (12 percent), excavation damage (11 percent), natural force damage and other outside force damage (9 percent), and other causes (3 percent).

³¹The cause for this accident according to PHMSA data was “incorrect operation- wrong equipment specified or installed.” Furthermore, the causes for the other two Keystone accidents IPE were: “equipment failure- threaded connection or coupling failure” (for the 2011 release of 400 barrels at Ludden Pump Station in North Dakota) and “incorrect operation- tank or vessel overfill or overflow” (for the 2011 leak of 0.36 barrels at the Cushing Delivery Station in Oklahoma).

Date enforcement action issued	Type of enforcement action	Topics of Deficiencies Found	Civil monetary penalty assessed
June 13, 2019	Notice of Probable Violation	Atmospheric corrosion	N/A
March 11, 2020	Notice of Probable Violation	Pipeline markers	\$170,300 ^b

Source: PHMSA. | GAO-21-588

^aThis penalty was assessed in a Final Order on May 31, 2017. The proposed amount in the 2015 Notice was \$187,200.

^bThis penalty was assessed in a Final Order on November 6, 2020.

Corrosion Prevention

During a 2011 PHMSA inspection in North and South Dakota, PHMSA noted that TC Energy was unable to demonstrate that it had complied with one of the conditions of the special permit. That condition requires TC Energy to conduct a test to find stray currents, such as from nearby power lines or pipelines, which could interfere with the cathodic protection system for the pipeline. As a result of this inspection, PHMSA issued a Warning Letter to TC Energy in January 2012. A couple of months later, in March 2012, TC Energy provided the stray current test results to PHMSA as required by this condition of the special permit and a proposed mitigation plan, such as installing additional grounded facilities.

Issues with Keystone’s cathodic protection culminated months later when thinned pipe was discovered that according to PHMSA came extremely close to causing a pipeline failure that could have impacted a high consequence area. Specifically, during an October 2012 in-line inspection, TC Energy discovered significantly thinned pipe due to accelerated corrosion in four locations along the mainline segment between Salisbury, Missouri and Patoka, Illinois. TC Energy reported that it immediately depressurized the pipeline, isolated the affected section, notified PHMSA, and completed appropriate repairs. In all four locations, the amount of metal loss (i.e., corrosion) was over 60 percent deep. In one location, 97 percent of the metal had corroded, leaving a remaining pipeline wall thickness of 0.0120 inch—less than half the thickness of a dime.

As a result of these issues, PHMSA issued a Notice of Probable Violation and a Final Order determining that TC Energy had committed violations of the regulations and assessing civil monetary penalties of \$135,400. A subsequent TC Energy report found the primary cause for the metal loss anomalies was the inadequacy of the original cathodic protection design and electrical current interference from nearby pipelines. PHMSA found

that TC Energy began taking corrective measures to address these deficiencies in 2012, and completed this work in 2013. This work included installing 13 additional impressed current systems on the pipeline and adding six groundbeds at pump stations, among other things. TC Energy reported that its repair timeframes were due to factors outside of its control, such as acquiring land access permission and environmental permitting. Representatives from TC Energy acknowledge that the original cathodic protection had problems and noted that their design philosophy has changed since then, a change that has benefitted other pipelines operated by the company.

Other Areas

In addition to the issues with cathodic protection, PHMSA also issued enforcement actions related to additional deficiencies found during inspections.

- **Public awareness program:** PHMSA identified inadequacies with TC Energy's public awareness program and plan during a 2011 inspection and issued a Notice of Amendment in 2013. PHMSA found, among other things, that TC Energy's public awareness plan did not include a written process for conducting an annual implementation review, as required by regulation. Based on feedback the PHMSA inspector provided during the 2011 inspection, TC Energy updated its program in 2012 before the Notice of Amendment was issued. PHMSA closed the case in 2015.
- **Coatings:** PHMSA issued a 2019 Notice of Probable Violation in response to deficiencies PHMSA found in a 2018 inspection of coatings applied to pipe to prevent atmospheric corrosion on above ground pipeline sections, such as at pump stations. In its 2019 response, TC Energy said it began remediating the issue in 2018 and would complete the work in 2019. PHMSA closed the case in September 2020, noting the TC Energy had complied with the terms.
- **Markers:** PHMSA has twice found that TC Energy had not placed all required visual markers along the pipeline.³² First, in the 2012 Warning Letter, PHMSA found TC Energy had not placed line markers at all road crossings. PHMSA cited condition #40 of the special permit, which requires line-of-sight pipeline markings except in areas

³²Markers warn that a transmission pipeline is located in the area, identify the product transported in the line, and provide the name of the pipeline operator and a telephone to call in the event of an emergency.

where it is impractical.³³ Second, in a 2020 Notice of Probable Violation, PHMSA alleged 20 instances of missing markers in the special permit area that it observed during a 2018 inspection, which would be a violation of condition #40. It also proposed a civil penalty of \$170,300. PHMSA issued a final order in November 2020 finding that TC Energy had committed this violation and assessed a civil penalty of \$170,300.³⁴

PHMSA Applied Lessons Learned from Keystone to Improve Pipeline Construction and Special Permit Oversight Nationwide

PHMSA officials told us that they have applied “lessons learned” since the time that Keystone was built by increasing the amount of staff resources it devotes to inspecting pipelines under construction. According to PHMSA officials, PHMSA inspectors spent 351 inspection days on site during Keystone’s construction, from June 2008 to November 2010.³⁵ PHMSA did not issue any formal enforcement actions to TC Energy during construction, but PHMSA officials told us that inspectors brought up issues that were addressed at the construction site, such as improper welds and weld inspections. To address common issues such as poor quality control for welding and inadequate construction practices that PHMSA identified across 35 pipeline construction projects in the 2008 construction season, PHMSA held a workshop in April 2009 to alert the industry to construction issues that could affect pipeline integrity. Since then, the agency has placed increased focus on inspections during construction to improve oversight of additional pipelines. Specifically, PHMSA officials said that the agency now expects each of their inspectors to spend 20 to 25 percent of their time on construction inspections. Further, according to these officials, the number of days inspectors have spent on construction inspections has approximately doubled since 2010.

³³Line-of-sight refers to being able to stand at one marker and see the next marker in order to determine the path of the pipe below. The special permit is more stringent than 49 CFR § 195.410, which requires pipeline markers at all road crossings but does not require that operators maintain the line-of-sight spacing.

³⁴PHMSA closed the enforcement action in January 2021, as it had determined that TC Energy had complied with the terms of the final order and paid the civil penalty amount.

³⁵We have previously reported that, given the size of PHMSA’s inspection staff relative to the federally regulated pipeline network, PHMSA uses a risk-based inspection approach that allows it to allocate inspection resources to pipelines considered higher risk. GAO, *Pipeline Safety: Additional Actions Could Improve Federal Use of Data on Pipeline Materials and Corrosion*, [GAO-17-639](#) (Washington, D.C.: Aug. 3, 2017).

Oil Market Highlights

Crude Oil Price Movements

The OPEC Reference Basket (ORB) averaged \$89.73/b in November, falling m-o-m by \$3.89, or 4.2%. The ICE Brent front-month fell \$2.74, or 2.9%, to average \$90.85/b, and NYMEX WTI decreased by \$2.64, or 3.0%, to average \$84.39/b. The Brent/WTI futures spread narrowed further m-o-m, contracting by 10¢ to average \$6.46/b. The market structure of ICE Brent and NYMEX WTI weakened significantly, and the first-to-third month spreads moved temporarily into contango in late November. The combined futures and options net long positions of hedge funds and other money managers fell significantly in both ICE Brent and NYMEX WTI.

World Economy

The world economic growth forecast is revised up marginally to 2.8% for 2022, after slightly better-than-expected 3Q22 GDP growth in a few economies. The 2023 global economic growth forecast remains unchanged at 2.5%. For the US, GDP growth in 2022 is revised up to 1.7%, while the forecast for next year remains unchanged at 0.8%. Euro-zone economic growth for 2022 remains at 3%, and is also unchanged for 2023 to stand at 0.3%. Japan's economic growth forecast remains at 1.5% for 2022 and 1% for 2023. China's 2022 growth forecast remains at 3.1% for 2022 and at 4.8% for 2023. The forecasts for India remain at 6.5% for 2022 and 5.6% for 2023. Brazil's economic growth forecast is revised up to 2.4% for 2022, but remains unchanged at 1% for 2023. The 2022 forecast for Russia is revised up to a contraction of 5% followed by growth of 0.2% in 2023. With this, risks to global economic growth remain skewed downward due to challenges including high inflation, monetary tightening by major central banks, high sovereign debt levels in many regions and some ongoing supply chain issues. Moreover, geopolitical risks and the pace of the COVID-19 pandemic during winter remain uncertain.

World Oil Demand

The world oil demand forecast for 2022 remains unchanged at 2.5 mb/d. The oil demand was adjusted higher in the 3Q22, amid better-than-anticipated transportation fuel consumption in OECD, offset by a downwardly-revised estimate for 4Q22 due to a slowdown in the non-OECD amid reduced mobility and sluggish industrial activity in China. For 2023, world oil demand growth also remains unchanged at 2.2 mb/d, with the OECD growing by 0.3 mb/d and non-OECD growth forecast at 1.9 mb/d. This forecast is subject to many uncertainties including global economic developments, COVID-19 containment measures mainly in China and ongoing geopolitical tensions.

World Oil Supply

Non-OPEC liquids supply is forecast to grow by 1.9 mb/d for 2022, broadly unchanged from last month's assessment. Upward revisions to liquids production in OECD Americas, Russia and Latin America were offset by downward revisions to OECD Europe, Other Eurasia and Other Asia. The main drivers of liquids supply growth for the year are expected to be the US, Canada, Guyana, Russia, China and Brazil, while production is expected to decline mainly in Norway and Thailand. For 2023, non-OPEC liquids production growth remains largely unchanged and is expected to grow by 1.5 mb/d. The main drivers of liquids supply growth are expected to be the US, Norway, Brazil, Canada, Kazakhstan and Guyana, whereas oil production is forecast to decline mainly in Russia and Mexico. Nonetheless, large uncertainties persist around geopolitical development in Eastern Europe, as well as the US shale output potential next year. OPEC NGLs and non-conventional liquids are forecast to grow by 0.1 mb/d in 2022 to average 5.39 mb/d and by 50 tb/d to average 5.44 mb/d in 2023. OPEC-13 crude oil production in November decreased by 744 tb/d m-o-m to average 28.83 mb/d, according to available secondary sources.

Product Markets and Refining Operations

Refinery margins in the Atlantic Basin underwent a downward correction in November. This was due to the increasing refinery intakes as heavy refinery repair works subsided. The recovery in product output levels exerted pressure on product crack spreads, particularly those of gasoil/diesel. In Asia, however, margins continued to improve, supported by lower Dubai prices. Strong regional product demand led to stronger markets for all products across the barrel with the exception of gasoil/diesel. Global refinery processing rates began to recover during the month of November and rose by 2.1 mb/d in response to a decline in offline capacity amid the end of peak refinery maintenance. Refinery intakes are expected to continue to recover in December, increasing by almost the same amount, according to preliminary data.

Tanker Market

Dirty freight rates continued to move higher in November, with strong gains on all monitored routes. Aframax rates saw the strongest gains as refiners loaded-up on Russian crude ahead of EU sanctions. An ongoing shift to longer-haul routes due to trade dislocations also weighed on tanker availability. Aframax rates on the intra-Mediterranean route rose 43% m-o-m in November and stood well above the levels seen in recent years. Suezmax rates saw similar support, with rates on the US Gulf to Europe route up 31% m-o-m. VLCCs showed continued steady gains, up around 21% on average. Clean spot freight rates on medium-range vessels were up 13% both East and West of Suez, amid tight tonnage availability.

Crude and Refined Products Trade

US crude imports recovered from a six-month low to average 6.3 mb/d in November, while US crude exports reached a fresh record high of 4.2 mb/d, according to estimates based on weekly data. China's crude imports continued to recover in October, averaging 10.2 mb/d. China's product exports fell back from a 15-month high with declines across most major products. India's crude imports recovered the previous month's losses, averaging 4.2 mb/d in October. Product exports from India declined by around 21%, with diesel outflows sharply lower. Japan's crude imports continued to slip from a two-year high to average 2.7 mb/d in October, in line with seasonal developments, but still showed 15 months of consecutive y-o-y gains. Tanker tracking data showed crude imports into the OECD Europe region remained steady in 3Q22 before dipping in November. Imports of Russian crude into OECD Europe were down by close to 1.0 mb/d y-o-y in November, ahead of the implementation of EU sanctions, although flows to Turkey increased sharply reaching as high as 400 tb/d, according to tanker tracking data, up from relatively minor levels last year.

Commercial Stock Movements

Preliminary October data sees total OECD commercial oil stocks up m-o-m by 22.5 mb. At 2,748 mb, they were 15 mb less than the same time one year ago, 167 mb lower than the latest five-year average and 197 mb below the 2015-2019 average. Within the components, crude and product stocks rose m-o-m by 12.9 mb and 9.5 mb, respectively. At 1,335 mb, OECD crude stocks were 8 mb higher than the same time a year ago, but 80 mb lower than the latest five-year average and 118 mb lower than the 2015-2019 average. OECD product stocks stood at 1,413 mb, representing a deficit of 23 mb from the same time a year ago, 87 mb lower than the latest five-year average and 79 mb below the 2015-2019 average. In terms of days of forward cover, OECD commercial stocks rose m-o-m by 1.0 day in October to stand at 59.1 days. This is 0.6 days below October 2021 levels, 4.0 days less than the latest five-year average and 3.3 days lower than the 2015-2019 average.

Balance of Supply and Demand

Demand for OPEC crude in 2022 remained unchanged from the previous month's assessment to stand at 28.6 mb/d, which is around 0.5 mb/d higher than in 2021. Demand for OPEC crude in 2023 also remained unchanged from the previous month's assessment to stand at 29.2 mb/d, which is 0.6 mb/d higher than in 2022.

Feature Article

Review of 2022 and outlook for 2023

The global economy continued its recovery path throughout much of 2022, albeit at varying levels among regions, and with a notable slowdown towards the end of the year.

The Eurozone saw unexpectedly strong growth in 1H22 before decelerating in 2H22, amid rising inflation that prompted European Central Bank monetary tightening and concerns about a possible energy crunch in the winter heating season. The US economy faced challenges in 1H22, but recovered somewhat in 2H22, supported by ongoing healthy consumption levels. In the non-OECD, China's strict zero-COVID policy has dampened GDP growth in 2022. India witnessed strong economic growth in 1H22, but decelerated slightly in 3Q22 amid high inflation levels. For 2022, world GDP growth is estimated at 2.8%.

Going forward, several challenges still lie ahead. For example, persistently high inflation may necessitate further monetary tightening measures by major central banks. Rising interest rates will be a cause for concern for countries with high sovereign debt levels. Tight labour markets, amid calls for higher wages, will add pressure, as will continued supply chain issues. However, a resolution of the geopolitical conflict in Eastern Europe and a relaxation of China's zero-COVID policy could provide some upside potential. Global GDP growth for 2023 is forecast at 2.5%.

Global oil demand growth is estimated at 2.5 mb/d y-o-y in 2022. In OECD Americas and Europe, lower-than-expected transportation fuel demand outpaced jet fuel demand recovery, leading to y-o-y growth of 1.4 mb/d for the OECD. In the non-OECD, y-o-y growth of 1.2 mb/d is expected. Renewed lockdowns in China weighed heavily on oil demand, with the country registering an oil demand contraction in 2022.

For 2023, world oil demand is expected to increase by 2.2 mb/d y-o-y. OECD oil demand is forecast to increase by 0.3 mb/d. This is mostly in OECD Americas, while other OECD regions are not expected to see noticeable growth. In the non-OECD, oil demand is forecast to increase by 1.9 mb/d, with China and India seeing the largest growth.

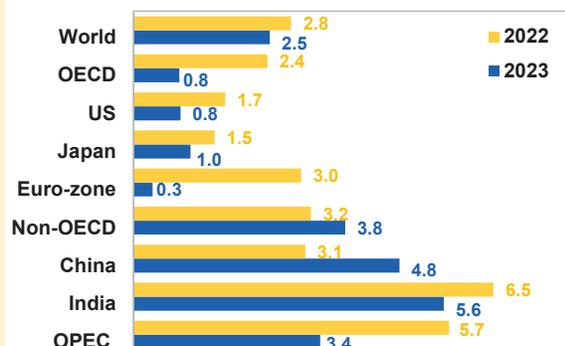
This forecast assumes the successful containment of COVID-19 and a resumption of pre-pandemic economic growth in China, while India's oil demand is projected to be supported by continued healthy economic growth.

Non-OPEC supply growth in 2022 is estimated at 1.9 mb/d. The main drivers of growth are estimated to have been the US, Canada, Guyana, Russia, China and Brazil. US shale oil companies continued to focus on shareholder returns, with higher production costs amid supply chain shortages and inflation limiting overall production growth.

In 2023, non-OPEC supply is forecast to expand by 1.5 mb/d y-o-y. US tight oil output and offshore start-ups in Latin America and the North Sea are expected to drive growth. The US is expected to lead the way with a share of about 75% of total growth, followed by Norway, Brazil, Canada, Kazakhstan and Guyana. Non-OPEC upstream sector investment in 2022 is estimated at around \$424 billion, up around 19% y-o-y. It is forecast at \$459 billion in 2023, up by 8% y-o-y.

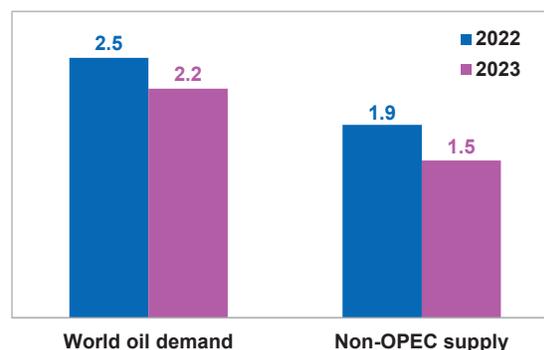
As the year 2022 draws to a close, the recent global economic growth slowdown with all its far-reaching implications is becoming quite evident. The year 2023 is expected to remain surrounded by many uncertainties, mandating vigilance and caution. This is reflected in the continued pro-active and pre-emptive joint efforts of the DoC to provide stability and balance to the global oil market, amid rapidly evolving market conditions.

Graph 1: 2022-2023 real GDP growth in key countries and regions (%)



Source: OPEC.

Graph 2: World oil demand and non-OPEC supply growth in 2022-2023 (mb/d)



Source: OPEC.

World Oil Demand

World oil demand growth in 2022 is expected to remain at 2.5 mb/d y-o-y, the same as last month's assessment. Growth estimates were adjusted higher in 3Q22, amid better-than-expected transportation fuel consumption in the OECD region. However, these were offset by a downwardly-revised estimate for 4Q22 due to slower economic activity in the OECD and reduced mobility and lower industrial production in China due to the government's zero-COVID policy.

Total oil demand is projected to average 99.6 mb/d in 2022. In the OECD region, oil demand is expected to rise by around 1.4 mb/d to 46.2 mb/d y-o-y. OECD Americas demand is expected to rise the most in 2022, led by the US, on the back of recovering gasoline and diesel demand. Light distillates are also projected to support demand growth this year.

In the non-OECD region, total oil demand for the year is expected to rise by roughly 1.2 mb/d to 53.4 mb/d. In India, the Middle East and Other Asia, a recovery in economic activity is forecast to result in a steady increase in industrial and transportation fuel demand in 2022.

In 2023, world oil demand growth is expected to remain at 2.2 mb/d for an average of 101.8 mb/d, supported by expected geopolitical improvements and the containment of COVID-19 in China. The OECD is projected to grow by 0.3 mb/d, to reach 46.5 mb/d. OECD Americas is expected to climb firmly, with US oil demand rising above 2019 levels, mainly due to the recovery in transportation fuels and light distillate demand. However, OECD Europe and Asia Pacific are not projected to surpass the 2019 consumption levels.

Table 4 - 1: World oil demand in 2022*, mb/d

World oil demand	2021	1Q22	2Q22	3Q22	4Q22	2022	Change 2022/21	
							Growth	%
Americas	24.32	24.77	24.98	25.35	25.19	25.08	0.76	3.13
<i>of which US</i>	20.03	20.38	20.41	20.62	20.74	20.54	0.50	2.51
Europe	13.13	13.15	13.43	14.09	13.90	13.65	0.52	3.94
Asia Pacific	7.38	7.85	6.99	7.25	7.81	7.47	0.09	1.24
Total OECD	44.83	45.77	45.40	46.69	46.91	46.20	1.37	3.06
China	14.97	14.74	14.42	14.69	15.32	14.79	-0.18	-1.17
India	4.77	5.18	5.16	4.95	5.35	5.16	0.39	8.11
Other Asia	8.63	9.09	9.27	8.73	8.85	8.98	0.36	4.12
Latin America	6.23	6.32	6.36	6.55	6.40	6.41	0.18	2.91
Middle East	7.79	8.06	8.13	8.50	8.17	8.22	0.42	5.44
Africa	4.22	4.51	4.15	4.25	4.53	4.36	0.14	3.24
Russia	3.61	3.67	3.42	3.45	3.59	3.53	-0.08	-2.32
Other Eurasia	1.21	1.22	1.16	1.00	1.21	1.15	-0.06	-5.07
Other Europe	0.75	0.79	0.75	0.73	0.80	0.77	0.01	1.62
Total Non-OECD	52.18	53.58	52.81	52.84	54.20	53.36	1.18	2.25
Total World	97.01	99.35	98.21	99.54	101.11	99.56	2.55	2.62
Previous Estimate	97.03	99.36	98.35	99.32	101.25	99.57	2.55	2.62
Revision	-0.02	-0.01	-0.14	0.22	-0.14	-0.02	0.00	0.00

Note: * 2022 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.

Table 4 - 2: World oil demand in 2023*, mb/d

World oil demand	2022	1Q23	2Q23	3Q23	4Q23	2023	Change 2023/22	
							Growth	%
Americas	25.08	25.00	25.24	25.66	25.45	25.34	0.26	1.05
of which US	20.54	20.51	20.52	20.85	20.87	20.69	0.15	0.74
Europe	13.65	13.19	13.46	14.12	13.95	13.68	0.03	0.24
Asia Pacific	7.47	7.88	7.04	7.29	7.83	7.51	0.04	0.48
Total OECD	46.20	46.07	45.73	47.07	47.23	46.53	0.33	0.72
China	14.79	14.63	15.37	15.34	15.92	15.32	0.53	3.56
India	5.16	5.41	5.44	5.21	5.59	5.41	0.25	4.94
Other Asia	8.98	9.42	9.61	9.10	9.20	9.33	0.35	3.85
Latin America	6.41	6.48	6.48	6.70	6.54	6.55	0.15	2.29
Middle East	8.22	8.45	8.46	8.84	8.46	8.55	0.33	4.06
Africa	4.36	4.71	4.34	4.43	4.72	4.55	0.19	4.36
Russia	3.53	3.65	3.44	3.62	3.77	3.62	0.09	2.52
Other Eurasia	1.15	1.22	1.16	1.02	1.22	1.16	0.01	0.72
Other Europe	0.77	0.80	0.76	0.75	0.82	0.78	0.02	2.32
Total Non-OECD	53.36	54.77	55.05	55.02	56.23	55.27	1.91	3.59
Total World	99.56	100.85	100.78	102.08	103.46	101.80	2.25	2.26
Previous Estimate	99.57	101.26	100.83	101.76	103.40	101.82	2.24	2.25
Revision	-0.02	-0.41	-0.04	0.32	0.06	-0.02	0.00	0.00

Note: * 2022 and 2023 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.

OECD

OECD Americas

Update on the latest developments

Contrary to expectations, **US oil demand in September** bounced back to grow by 0.3 mb/d y-o-y from 30 tb/d y-o-y growth in August. Economic activity in the US is impacted by high core inflation, which stood at 5.2% in September, and gave the impetus for the US Federal Reserve bank to commence with monetary tightening measures. However, industrial activity continued its declining trend, with the manufacturing PMI dropping further in September to only 50.9, just within the expansion range.

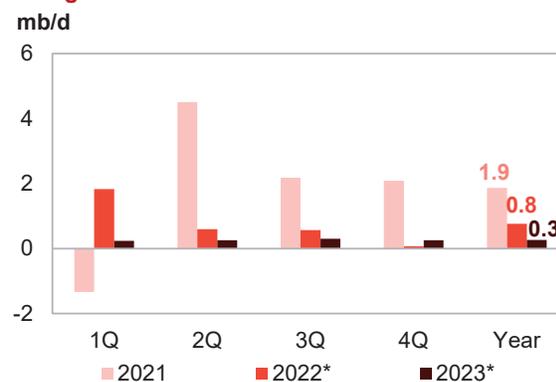
Oil demand in September was led by 0.2 mb/d y-o-y growth of other products. LPG and residual fuels posted 0.1 mb/d y-o-y growth each. Jet/kerosene recorded marginal annual growth of 60 tb/d.

However, gasoline demand has been on a declining trend since 2Q22. The decline in US gasoline demand during the summer was also partly due to gasoline prices, which led to curtailments of some discretionary trips due to their unaffordability, especially for US households whose income falls below a certain threshold.

With the conclusion of the summer driving season, automobile gasoline consumption in the US typically decreases between August and September. In line with this trend, gasoline weakened by 0.1 mb/d y-o-y in September.

On the other hand, naphtha and its feedstock, ethane, were among the major products that saw increased demand during 2020 and 2021. However, naphtha has been on a declining trajectory since March. This turnaround reflects a squeeze in petrochemical profitability, as poor demand for petrochemicals continued to weigh on demand for naphtha-fed steam cracker grades. In September, naphtha demand softened, declining by 60 tb/d y-o-y.

Graph 4 - 1: OECD Americas oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

Table 4 - 3: US oil demand, mb/d

By product	Sep 21	Sep 22	Change Sep 22/Sep 21	
			Growth	%
LPG	3.32	3.44	0.12	3.7
Naphtha	0.19	0.13	-0.06	-32.1
Gasoline	8.93	8.82	-0.12	-1.3
Jet/kerosene	1.49	1.55	0.06	4.1
Diesel	4.03	4.01	-0.02	-0.5
Fuel oil	0.34	0.46	0.12	36.1
Other products	2.13	2.35	0.23	10.6
Total	20.43	20.76	0.33	1.6

Note: Totals may not add up due to independent rounding. Sources: EIA and OPEC.

Near-term expectations

In **4Q22**, US GDP is projected to contract by 6% y-o-y. In addition, the recent monetary tightening to contain persistently elevated inflation will weigh on consumers' purchasing power with a consequent decline in household spending that will potentially affect oil demand in the US. In 4Q22, oil demand is expected to grow by 60 tb/d y-o-y. The beginning of winter in 4Q22 will also aid the demand for heating fuels. In addition, on the back of continued steady improvements in air travel demand, jet/kerosene will remain positive. However, the risk is skewed to the downside.

In **1Q23**, US GDP is not foreseen to record any growth. Slow growth combined with the downward trend in industrial activity is likely to weigh on oil demand in 1Q23. Oil demand is projected to grow by 0.1 mb/d y-o-y in 1Q23, mostly supported by distillates and heating fuels, while improvements in air travel will support jet/kerosene demand. Road mobility activity is expected to soften due to reduced economic activity in the winter, thus dampening gasoline demand. The risks are still skewed to the downside in 1Q23.

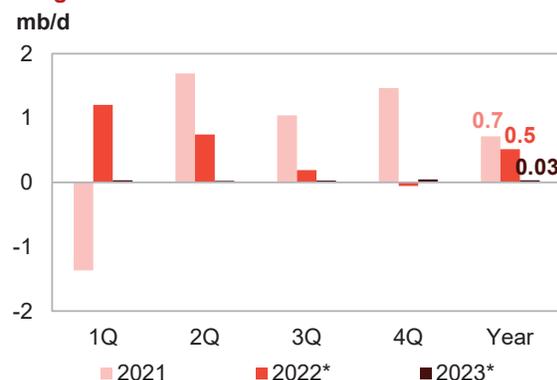
OECD Europe

Update on the latest developments

Oil demand in OECD Europe contracted by 60 tb/d, y-o-y in **September** after growth of 0.2 mb/d in August. The region is battling high inflation and supply chain bottlenecks induced by geopolitical crises, which weigh heavily on economic activity and negatively affect oil demand. In September, the European Union's annual inflation rate was 10.9%, up from 3.6% a year earlier. Despite this, the aviation sector remained resilient, as airline activity has maintained stable growth, achieving 78.3% growth in international revenue passenger-kilometers (RPKs) over the year to September and reaching 78.4% of pre-pandemic levels. On the back of this, jet/kerosene posted growth of 0.3 mb/d (32%) y-o-y.

LPG also remained positive with a 70 tb/d y-o-y increase. LPG demand in the region was aided by a rise in energy requirements and enhanced affordability due to government subsidies for LPG market cylinders in some countries in the region. Similarly, residual fuel also grew by 60 tb/d y-o-y, mostly driven by rising demand from the industrial sector due to soaring natural gas prices. However, gas diesel suffered the biggest contraction, dropping by 0.3 mb/d y-o-y. Demand for diesel was mostly affected by soaring prices and scarcity of supply due to geopolitical crises. For that reason, industries cut production in Europe, with the industrial PMI declining from 49.7 in August to 48.5 in September.

Graph 4 - 2: OECD Europe's oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

Similarly, naphtha weakened by 0.2 mb/d y-o-y as European petrochemical industries reduced their requirements for feedstock due to a lower demand outlook for plastic goods amid an economic downturn and inflationary pressures in the region. These factors weighed on the demand for naphtha in the region. Finally, high inflation and rising gasoline prices impacted consumers' purchasing power and mobility in the region with negative effects on gasoline demand, which slowed by 50 tb/d y-o-y.

Table 4 - 4: Europe's Big 4* oil demand, mb/d

By product	Sep 21	Sep 22	Change Sep 22/Sep 21	
			Growth	%
LPG	0.37	0.40	0.03	7.5
Naphtha	0.56	0.46	-0.10	-17.9
Gasoline	1.22	1.18	-0.04	-3.6
Jet/kerosene	0.58	0.77	0.19	33.6
Diesel	3.44	3.27	-0.17	-4.9
Fuel oil	0.18	0.21	0.03	13.9
Other products	0.52	0.51	-0.01	-1.7
Total	6.87	6.79	-0.08	-1.1

Note: * Germany, France, Italy and the UK. Totals may not add up due to independent rounding.

Sources: JODI, UK Department for Business, Energy & Industrial Strategy, Unione Petrolifera and OPEC.

Near-term expectations

Looking ahead, the GDP of the region is expected to be at about 0.4% in 4Q22. Furthermore, ongoing geopolitical tension and a counter-seasonal slowdown amid low economic activity and inflationary pressures in the region will weigh on mobility and manufacturing activity during winter. These factors may result in gasoline and diesel demand declines during the fourth quarter. However, rising natural gas prices are expected to support gas-to-oil switching, particularly during winter. Therefore, demand for fuel oil and residuals is expected to improve due to switching. Furthermore, sustained growth in air travel activity, both international and regional, will boost demand for jet/ kerosene during 4Q22. However, oil demand in the region is projected to weaken by 50 tb/d y-o-y .

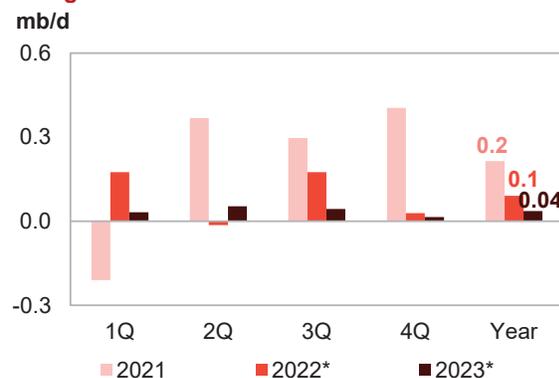
In 1Q23, persistent inflationary pressures observed recently could raise the risk of recession in the region. Accordingly, the economy of the region is projected to decelerate by 0.8% in 1Q22. Slowing growth momentum and ongoing geopolitical tensions in the region could exacerbate supply chain bottlenecks for manufacturing activity. The combined effects of these factors are expected to take a toll on oil demand, which is projected to grow marginally by 30 tb/d y-o-y. Nevertheless, expected gas-to-oil switching due to rising natural gas prices and steady improvements in air travel activity are expected to support demand for fuel oil and jet/ kerosene in the region during 1Q23. However, risks are still skewed toward a more severe and protracted downturn.

OECD Asia Pacific

Update on the latest developments

Oil demand in OECD Asia Pacific nosedived in September by 0.2 mb/d y-o-y, declining after strong growth of 0.6 mb/d y-o-y in August. The region's two strongest economies – Japan and South Korea – have been facing some daunting economic challenges, which are weighing on their economic activity and, consequently, on oil demand in the region. The two countries are facing rising inflation of about 5.7 and 3.7 y-o-y in September. Apart from facing high prices for farm and oil products, South Korea has had to deal with a trucker strike, which has worsened manufacturing supply chain bottlenecks and is disrupting industrial activity in Asia's fourth-largest economy. Additionally, concrete has run out at building sites, negatively impacting construction activity. Those factors have been negatively impacting oil demand. Overall, manufacturing activity in the two large manufacturing

Graph 4 - 3: OECD Asia Pacific oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

World Oil Demand

hubs have not been doing very well. In September, the manufacturing PMIs in Japan and South Korea were at 49 and 48.2, respectively, both below the threshold of 50.

Oil demand in September was driven by jet/kerosene, which recorded 70 tb/d y-o-y growth. According to IATA Air Passenger Market Analysis, airlines based in the Asia Pacific region continued to record the strongest y-o-y growth rates for international revenue passenger-kilometers (RPKs) in September. In seasonally adjusted terms, recent developments showed a sustained recovery but with a significant lag compared to other regions. In September 2022, international RPKs were down 58.5% compared to September 2019. Gasoline also recorded 50 tb/d y-o-y growth, with demand growth predominantly coming from Japan and Australia. Finally, residual fuels posted a marginal growth of 40 tb/d y-o-y.

Petrochemical feedstock demand was still weak, as China's ongoing zero-COVID policy continued to affect the petrochemical industry in Japan and South Korea, with naphtha suffering big declines of 0.3 mb/d y-o-y and LPG sliding by only 10 tb/d y-o-y.

Table 4 - 5: Japan's oil demand, mb/d

By product	Oct 21	Oct 22	Change Oct 22/Oct 21	
			Growth	%
LPG	0.34	0.30	-0.04	-11.5
Naphtha	0.71	0.61	-0.10	-14.2
Gasoline	0.72	0.81	0.09	13.0
Jet/kerosene	0.33	0.35	0.01	4.2
Diesel	0.76	0.76	0.01	0.7
Fuel oil	0.24	0.27	0.03	12.3
Other products	0.23	0.26	0.03	12.7
Total	3.33	3.37	0.03	1.0

Note: Totals may not add up due to independent rounding. Sources: JODI, METI and OPEC.

Near-term expectations

Looking ahead, the GDP of the region is projected to grow by 1.9% in 2022 as COVID-19 wanes and mobility gradually improves in Japan and Australia. Furthermore, as South Korea temporarily lowered fuel taxes by 20% in an effort to ease the impacts of surging oil prices on the country's consumer inflation, a reduction in taxes on gasoline, diesel and LPG will remain in place for six months until the end of April next year. This policy aims to support the demand for these fuels in the country.

In addition, air travel activity continued to recover. Accordingly, gasoline and jet/kerosene are projected to remain steady in **4Q22**. Furthermore, petrochemical feedstock requirements and diesel demand in Japan and South Korea are expected to add to the oil demand requirement in 4Q22. Fuel substitution may also provide support to oil demand as a result of high natural gas prices. Accordingly, oil demand is projected to grow by 0.03 mb/d y-o-y, reaching 7.81 mb/d.

In 2023, the GDP of the region is projected to grow by 1.2%, mainly due to expected slow performance in global economic activity and spillover effects related to geopolitical tensions in the region. These factors are expected to weigh on economic and manufacturing activity in the region during **1Q23**, with oil demand forecast to grow by 0.03 mb/d y-o-y at 7.88 mb/d. Air travel recovery combined with vibrant petrochemical feedstock requirements is expected to drive demand for jet/kerosene and naphtha to support oil demand in the region.

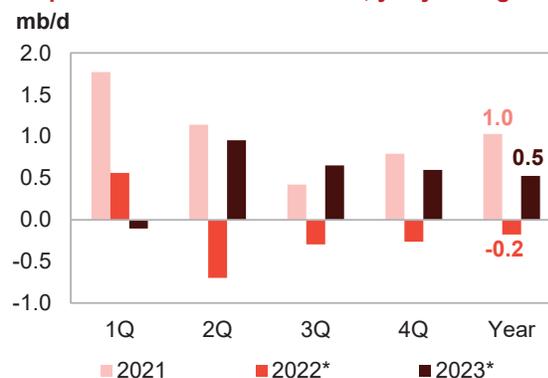
Non-OECD

China

Update on the latest developments

Oil demand in China softened in **October** after recording strong growth in September. In October, China posted a decline of 0.2 mb/d, y-o-y, down from a growth of 0.6 mb/d in September. Despite ongoing zero-COVID restrictions, diesel demand was still strong, with 0.7 mb/d y-o-y growth in October. Diesel is the most important refined product in China's oil demand, mostly consumed by the industrial and petrochemical sectors and in freight and fueling trucks and commercial vehicles. The manufacturing PMI in October has shown signs of improvement to 49.2 from 48.5 in September.

Graph 4 - 4: China's oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

Most of the diesel demand in October was supported by the petrochemical industry as petrochemical feedstock consumption, mostly from the Shandong independent refineries, whose requirements edged up 2.6% in October. Demand for naphtha (including internally produced naphtha for use in refinery-integrated plants) and LPG as feedstock for olefins and aromatics remain stable. Accordingly, naphtha and LPG grew by 0.2 mb/d and 0.1 mb/d y-o-y.

However, demand for transportation fuels remained weak in October, as zero-COVID mobility restrictions continued and several cities in China went into full/partial lockdowns, affecting mobility. Gasoline weakened further by 0.4 mb/d y-o-y in October from a decline of 0.2 mb/d in September. Similarly, jet fuel remained weak at 0.3 mb/d y-o-y as AITA reported that restrictions in some provinces led to contractions in domestic and international air travel activity in China. Finally, other products also weakened by 0.5 mb/d y-o-y, from a decline of 0.2 mb/d in October.

Table 4 - 6: China's oil demand*, mb/d

By product	Oct 21	Oct 22	Change Oct 22/Oct 21	
			Growth	%
LPG	2.30	2.42	0.12	5.4
Naphtha	1.53	1.72	0.19	12.6
Gasoline	3.31	2.91	-0.39	-11.9
Jet/kerosene	0.61	0.30	-0.31	-51.1
Diesel	3.60	4.34	0.73	20.4
Fuel oil	0.69	0.58	-0.11	-16.4
Other products	2.47	2.01	-0.45	-18.4
Total	14.51	14.29	-0.22	-1.5

Note: * Apparent oil demand. Totals may not add up due to independent rounding.

Sources: Argus Global Markets, China OGP (Xinhua News Agency), Facts Global Energy, JODI, National Bureau of Statistics China and OPEC.

Near-term expectations

Looking ahead, the economy of China is projected to grow by 3.1% despite the ongoing zero COVID-19 lockdowns. Demand for petrochemical feedstock has been relatively resilient as China continues to build new petrochemical capacities. Consumption of petrochemical feedstock will thus remain steady. However, overall demand is not expected to be robust as lockdowns will take a toll on transportation and industrial fuels. Gasoline, diesel and jet/kerosene are expected to be the largest categories in China's oil product consumption and are expected to soften in **4Q22**. This could weigh on overall oil demand, which is expected to decline by 0.3 mb/d y-o-y.

World Oil Demand

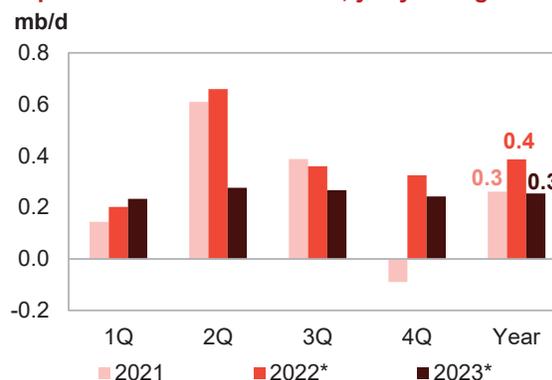
China has eased pandemic restrictions in 10 new measures for dealing with COVID-19 issued on 7 December, marking the biggest shift away from the restrictive zero-COVID strategy the country has maintained for over two years. The measures include a reduction of mass testing frequency and scale, home isolation for asymptomatic and mild COVID-19 cases and a ramp-up of vaccination for the elderly. By the end of 1Q23, China is expected to relax COVID-19-related restrictions in most regions. China's oil demand is thus expected to improve marginally from the contraction in 4Q22 but will remain on a negative trajectory. In 1Q23, China's oil demand is projected to decline by 55 tb/d y-o-y. Nevertheless, China's GDP is projected to grow by 4.8%. This, combined with the expected loosening of COVID-19-related restrictions, will pave the way for an uptick in mobility and manufacturing activity. Similarly, domestic and international air travel should improve considerably. Furthermore, petrochemical requirements for feedstock are expected to remain stable from 2Q23 onwards. Accordingly, these factors are expected to boost oil demand from 2Q23 onwards up to 4Q23.

India

Update on the latest developments

Oil demand in India has remained healthy for nine consecutive months. In October, oil demand posted growth of 0.1 mb/d y-o-y at 4.7 mb/d, significantly larger than the 4.6 mb/d growth recorded at the same time in 2021. Demand was supported by an uptick in economic and social activity during the post-monsoon season and the Diwali festival. Diesel was the main driver of growth in October's oil demand, with support coming from the agricultural sector activity as the sowing season of rabi crops and harvest season aided diesel consumption in irrigation, pumps and tractor mobility. Furthermore, manufacturing sector activity remained steady, as indicated by the manufacturing PMI, which increased to 55.3 in October 2022 from 55.1 in September 2022.

Graph 4 - 5: India's oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

Accordingly, diesel posted a growth of 80 tb/d, (6%) y-o-y. Other products grew by 80 tb/d y-o-y, mostly supported by post-monsoon increases in road construction activity, which boosted demand for bitumen. Gasoline demand also remained positive at 70 tb/d y-o-y growth, fuelled by an uptick in economic activity, festivities and an influx of tourists, as well as rises in mobility due to the full operation of schools, colleges and offices during the month. To a lesser extent, jet/ kerosene grew by 10 tb/d y-o-y, slightly lower than the 20 tb/d increase seen in September. Air passenger traffic for October 2022 stood at 26% more than in October 2021; however, it was still short of the level seen in October 2019 by 8%. Naphtha and LPG saw declines of 80 bd/d and 30 tb/d y-o-y, respectively.

Table 4 - 7: India's oil demand, mb/d

By product	Oct 21	Oct 22	Change Oct 22/Oct 21	
			Growth	%
LPG	0.99	0.96	-0.03	-3.1
Naphtha	0.29	0.21	-0.08	-28.2
Gasoline	0.78	0.84	0.07	8.5
Jet/kerosene	0.20	0.21	0.01	5.7
Diesel	1.43	1.51	0.08	5.5
Fuel oil	0.30	0.30	0.00	0.4
Other products	0.63	0.71	0.08	12.9
Total	4.62	4.75	0.13	2.7

Note: Totals may not add up due to independent rounding.

Sources: JODI, Petroleum Planning and Analysis Cell of India and OPEC.

Near-term expectations

Looking ahead, as the negative impacts of the monsoon season are now coming to an end, India's GDP growth is expected to be healthy at 6.5% in 2022, as economic and social activities are expected to rise. Gasoline demand in India is expected to expand due to state elections in Himachal Pradesh during November and Gujarat in December.

Similarly, middle distillates (gasoil and kerosene/jet fuel combined) will also grow significantly in **4Q22** due to agriculture, construction and airline travel activity. Due to these factors, oil demand in 4Q22 is projected to grow by 0.3 mb/d y-o-y. Demand in 4Q22 is projected to surpass the levels of 4Q21 by 0.14 mb/d.

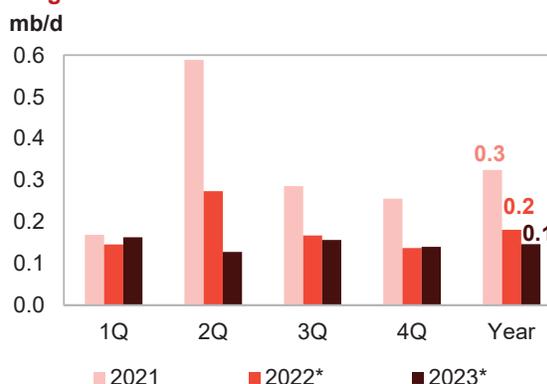
With projected healthy GDP growth of 6.55.6% in **1Q23**, economic and social activity are also expected to remain steady. In 1Q23, oil demand in India is forecast to grow by 0.2 mb/d y-o-y. The total demand is expected to surpass the same period in 2021 by 0.43 mb/d. Regarding products, gasoline is anticipated to be the strongest product in 1Q23, supported by an acceleration in mobility, an uptick in vehicle sales and overall steady economic growth. Diesel is expected to be supported by healthy growth in the industrial, construction and agricultural sectors during the period, and jet fuel will be aided by accelerations in domestic and international air travel demand. On the whole, there are favourable prospects for a positive outlook in India's oil demand during 1Q23.

Latin America

Update on the latest developments

Latin America posted healthy oil demand growth of 0.2 mb/d y-o-y in September. Despite the menace of COVID-19 in the region, economic activity has not performed badly in major oil-consuming countries of the region. Manufacturing PMI in Brazil increased from 53.2 in August to 53.9 in September. Furthermore, airline activity continues to improve in the region. Oil demand in September was led by 0.1 mb/d y-o-y growth of other fuels. On the back of healthy air travel activity, jet/kerosene remained firm at 50 tb/d y-o-y growth. Similarly, gasoil grew by 50 tb/d y-o-y, supported mainly by manufacturing and trucking activity improvements in the region. LPG remained at 10 tb/d y-o-y growth, the same as in August. However, gasoline eased by 10 tb/d y-o-y from 50 tb/d y-o-y growth in August. Residual fuels and naphtha also softened by 20 tb/d and 10 tb/d y-o-y, respectively.

Graph 4 - 6: Latin America's oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

Near-term expectations

Looking ahead, as of September **2022**, Brazil had administered the largest number of vaccines in the region, followed by Mexico and Argentina. The COVID-19 situation could foreseeably be fully contained very soon. The GDP of the region is expected to be relatively healthy at 3.3%. Mobility and manufacturing activity should propel the demand for gasoline and distillates. Similarly, as air travel recovery accelerates, jet/kerosene demand in the region is projected to improve. Therefore, oil demand in the region is projected to remain healthy, with a growth of 0.1 mb/d y-o-y at a level of 6.40 mb/d.

In 2023, the GDP of the region is projected to remain positive at 1.5%; however, still below 2022 levels. Nonetheless, as COVID-19 fades in the region, economic and social activity is expected to pick up to support oil demand, which is forecast to rise by 0.2 mb/d y-o-y at 6.48 mb/d in 1Q23, which is about 0.16 mb/d above the same period in 2022. The rise in oil demand will be largely linked to a positive economic outlook, supporting industrial fuel demand led by diesel. The outlook for growth sees Brazil taking the lead, followed by Argentina. In terms of fuel, transportation fuels are expected to grow the most in **1Q23**, supported by the continued recovery in mobility and air travel as containment measures for COVID-19 are relaxed and as the overall economy gains momentum.

Middle East

Update on the latest developments

Oil demand in the Middle East remains strong at 0.4 mb/d y-o-y, supported by requirements for power generation, other fuels and diesel. In September, demand for other products posted growth of 0.2 mb/d y-o-y and diesel grew by 0.1 mb/d y-o-y. Demand growth for other products and diesel was fuelled by the Saudi Arabian and Iraqi power generation sectors due to hot weather. Furthermore, mobility in the region remained relatively healthy, with gasoline demand growing by 30 tb/d y-o-y. Residual fuels remained on a positive growth trajectory at 30 tb/d y-o-y. The IATA Air Passenger Market Analysis for September suggested that airline activity in the Middle East continued on a positive trend, recording a growth of 149.7% y-o-y in September. The passenger load factor increased to 80.0% this month.

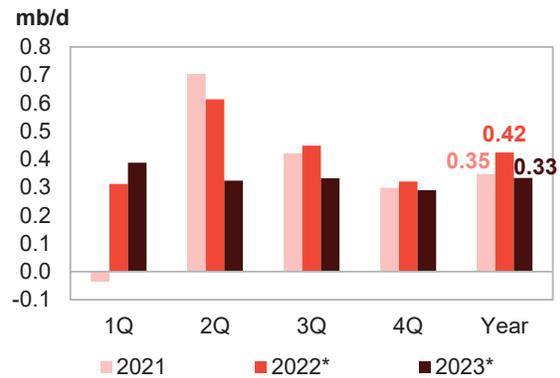
Seasonally adjusted traffic figures continued to suggest a strong upward trend in the region. Accordingly, jet/kerosene grew by 0.02 mb/d y-o-y. LPG remained at 20 tb/d y-o-y, the same as in August. However, naphtha has remained on a negative trajectory since February. In September, naphtha posted a 10 tb/d y-o-y decline.

Near-term expectations

Strong economic activity in the region will continue to support oil demand in the near future. Saudi Arabia's economy is expected to grow by 9.0% in **2022**. Similarly, the United Arab Emirates (UAE) is expected to grow robustly by 7.0% over 2022. The anticipated strong economic growth in the region is expected to support consumer spending and accelerate mobility and industrial activity. This will support the demand for gasoline and diesel. In addition, hot weather is expected to boost electricity demand due to the requirements for air conditioning. Hence, demand for residual and fuel oil will continue to accelerate in 4Q22, increasing oil demand by 0.3 mb/d y-o-y. Similarly, as the recovery in international air traffic persists, jet/kerosene demand will further support oil demand growth in the region.

In 2023, the oil demand momentum will increase from the pace of **4Q22** and is projected to grow by 0.4 mb/d y-o-y in **1Q23**. Economic growth in the region is expected to be robust across the board. Gasoline, transportation diesel and jet/kerosene are expected to lead oil demand growth, with gasoil/diesel and fuel oil demand for power generation further supporting strong oil demand growth momentum.

Graph 4 - 7: Middle East's oil demand, y-o-y change



Note: * 2022-2023 = Forecast. Source: OPEC.

World Oil Supply

Non-OPEC liquids supply in 2022 (including processing gains) is estimated to grow by 1.9 mb/d to average 65.6 mb/d. This is broadly unchanged from the previous assessment. Upward revisions to liquids production in OECD Americas, Russia and Latin America were offset by downward revisions to OECD Europe, Other Eurasia and Other Asia. However, it should be noted that uncertainty remains with regard to Russia's liquid output in December.

In the US, oil drilling activity has recovered to near pre-pandemic levels with the total rig count at its highest level since March 2020. However, producers are still challenged with labour and supply chain issues as well as cost inflation. Liquids production rose noticeably in September on the back of higher crude and condensate production, and steady growth is expected in the coming months. Accordingly, the US liquids supply growth forecast for 2022 is revised up slightly to average 1.1 mb/d. The production forecast for Other Eurasia was revised down, due to lower-than-anticipated production in Azerbaijan, as well as restricted output at an export terminal and a gas leak issue at the Kashagan field in Kazakhstan. Extended maintenance on UK offshore platforms, along with lower-than-anticipated output in Norway, reduced 4Q22 output in the North Sea region. The main drivers of liquids supply growth for 2022 are expected to be the US, Canada, Guyana, Russia, China and Brazil, while production is expected to see the largest declines in Norway and Thailand.

Non-OPEC liquids production growth in 2023 is forecast to grow by 1.5 mb/d to average 67.1 mb/d, largely unchanged from last month. Liquids supply in OECD countries is forecast to increase by 1.6 mb/d, while the non-OECD region is expected to show a decline of 0.2 mb/d. The main growth drivers are expected to be the US, Norway, Brazil, Canada, Kazakhstan and Guyana, whereas oil production is forecast to see declines in Russia and Mexico. Nonetheless, large uncertainties remain around European Union sanctions on Russian oil imports, other geopolitical developments in Eastern Europe, and US shale output potential in 2023.

OPEC NGLs and non-conventional liquids production in 2022 are forecast to grow by 0.1 mb/d to average 5.4 mb/d and to increase by 50 tb/d to average 5.4 mb/d in 2023. OPEC-13 crude oil production in November decreased by 744 tb/d m-o-m to average 28.83 mb/d, according to available secondary sources.

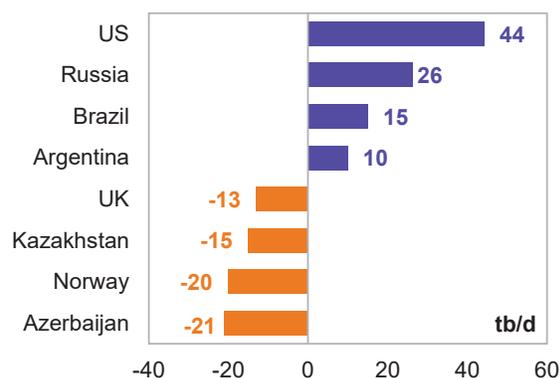
Non-OPEC liquids production in November, including OPEC NGLs, is estimated to have increased m-o-m by 0.8 mb/d to average 72.7 mb/d, up 2.1 mb/d y-o-y. As a result, preliminary data indicates that November's global oil supply increased by 43 tb/d m-o-m to average 101.5 mb/d, up by 3.2 mb/d y-o-y.

The **non-OPEC liquids supply forecast for 2022** remained broadly unchanged to average 65.6 mb/d. Y-o-y growth averaged 1.9 mb/d, unchanged compared to the previous month.

The overall **OECD** supply growth estimate for 2022 has remained steady. While OECD Europe saw downward revisions, OECD Americas was revised up from the previous month's assessment and there were no changes for OECD Asia Pacific.

The **non-OECD** supply growth forecast for 2022 was revised down by a minor 14 tb/d. A downward revision to Other Eurasia and Other Asia, was almost offset by upward revisions to Latin America and Russia.

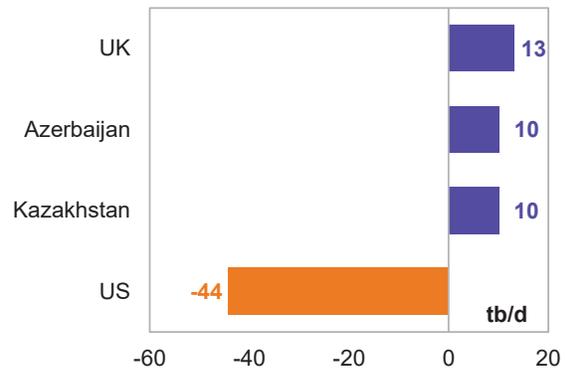
Graph 5 - 1: Major revisions to annual supply change forecast in 2022*, MOMR Dec 22/Nov 22



Note: * 2022 = Forecast. Source: OPEC.

Non-OPEC liquids production growth in 2023 is forecast to remain largely unchanged compared with the previous month's assessment, with downward revisions in OECD America offset by upward revisions in Other Eurasia and OECD Europe.

Graph 5 - 2: Major revisions to annual supply change forecast in 2023*, MOMR Dec 22/Nov 22

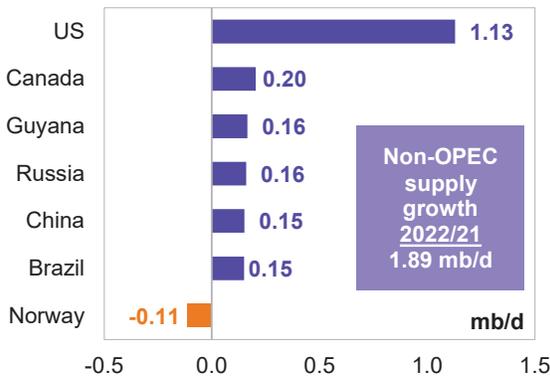


Note: * 2023 = Forecast. Source: OPEC.

Key drivers of growth and decline

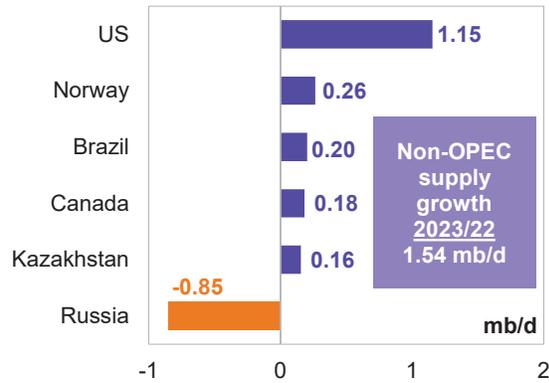
The **key drivers of non-OPEC liquids supply growth in 2022** are projected to be the US, Canada, Guyana, Russia, China and Brazil, while oil production is expected to see the largest declines in Norway and Thailand.

Graph 5 - 3: Annual liquids production changes for selected countries in 2022*



Note: * 2022 = Forecast. Source: OPEC.

Graph 5 - 4: Annual liquids production changes for selected countries in 2023*



Note: * 2023 = Forecast. Source: OPEC.

For **2023**, the key drivers of non-OPEC supply growth are forecast to be the US, Norway, Brazil, Canada, Kazakhstan and Guyana, while oil production is projected to see the largest declines in Russia and Mexico.

Non-OPEC liquids production in 2022 and 2023

Table 5 - 1: Non-OPEC liquids production in 2022*, mb/d

Non-OPEC liquids production	2021	1Q22	2Q22	3Q22	4Q22	2022	Change 2022/21	
							Growth	%
Americas	25.25	25.86	26.27	27.04	27.36	26.64	1.39	5.49
of which US	17.85	18.27	18.83	19.30	19.50	18.98	1.13	6.33
Europe	3.76	3.73	3.43	3.49	3.74	3.60	-0.16	-4.18
Asia Pacific	0.51	0.49	0.51	0.43	0.53	0.49	-0.02	-4.11
Total OECD	29.52	30.08	30.22	30.97	31.63	30.73	1.21	4.09
China	4.31	4.51	4.52	4.38	4.43	4.46	0.15	3.51
India	0.78	0.78	0.77	0.76	0.77	0.77	-0.01	-1.31
Other Asia	2.41	2.35	2.30	2.25	2.33	2.31	-0.10	-4.15
Latin America	5.95	6.11	6.18	6.45	6.63	6.34	0.39	6.54
Middle East	3.24	3.29	3.33	3.36	3.36	3.34	0.10	3.01
Africa	1.35	1.33	1.31	1.32	1.32	1.32	-0.03	-1.96
Russia	10.80	11.33	10.63	11.01	10.88	10.96	0.16	1.47
Other Eurasia	2.93	3.05	2.77	2.61	2.95	2.84	-0.08	-2.83
Other Europe	0.11	0.11	0.11	0.10	0.10	0.11	-0.01	-6.36
Total Non-OECD	31.87	32.85	31.92	32.24	32.76	32.44	0.57	1.79
Total Non-OPEC production	61.39	62.93	62.14	63.21	64.39	63.17	1.78	2.90
Processing gains	2.29	2.40	2.40	2.40	2.40	2.40	0.11	4.90
Total Non-OPEC liquids production	63.68	65.33	64.54	65.61	66.79	65.57	1.89	2.97
Previous estimate	63.68	65.33	64.54	65.53	66.90	65.58	1.90	2.98
Revision	0.00	0.00	0.00	0.08	-0.11	-0.01	-0.01	-0.01

Note: * 2022 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.

Table 5 - 2: Non-OPEC liquids production in 2023*, mb/d

Non-OPEC liquids production	2022	1Q23	2Q23	3Q23	4Q23	2023	Change 2023/22	
							Growth	%
Americas	26.64	27.60	27.70	28.05	28.43	27.95	1.31	4.91
of which US	18.98	19.75	20.05	20.24	20.47	20.13	1.15	6.09
Europe	3.60	3.95	3.93	3.82	3.95	3.91	0.31	8.69
Asia Pacific	0.49	0.51	0.48	0.50	0.49	0.50	0.00	0.97
Total OECD	30.73	32.06	32.11	32.38	32.87	32.36	1.63	5.29
China	4.46	4.51	4.50	4.47	4.47	4.49	0.03	0.64
India	0.77	0.80	0.78	0.77	0.76	0.78	0.01	1.14
Other Asia	2.31	2.37	2.37	2.34	2.36	2.36	0.05	2.36
Latin America	6.34	6.49	6.67	6.73	6.80	6.68	0.33	5.25
Middle East	3.34	3.35	3.36	3.39	3.39	3.37	0.04	1.08
Africa	1.32	1.32	1.34	1.35	1.37	1.35	0.02	1.87
Russia	10.96	9.95	10.10	10.17	10.22	10.11	-0.85	-7.76
Other Eurasia	2.84	3.09	3.05	3.02	3.06	3.06	0.21	7.44
Other Europe	0.11	0.10	0.10	0.10	0.10	0.10	0.00	-2.83
Total Non-OECD	32.44	31.97	32.28	32.35	32.54	32.29	-0.16	-0.48
Total Non-OPEC production	63.17	64.03	64.39	64.72	65.41	64.64	1.47	2.33
Processing gains	2.40	2.47	2.47	2.47	2.47	2.47	0.07	2.96
Total Non-OPEC liquids production	65.57	66.50	66.86	67.19	67.88	67.11	1.54	2.35
Previous estimate	65.58	66.51	66.86	67.20	67.89	67.12	1.54	2.35
Revision	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00

Note: * 2022-2023 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.

OECD

OECD liquids production in 2022 is forecast to increase y-o-y by 1.2 mb/d to average 30.7 mb/d. This has been unchanged compared with a month earlier, since the upward revisions for OECD America were offset by downward revisions in OECD Europe.

OECD Americas was revised up by 44 tb/d compared with last month's assessment. It is now expected to grow by 1.4 mb/d to average 26.6 mb/d.

OECD Europe is anticipated to decline y-o-y by 0.2 mb/d to average 3.6 mb/d.

OECD Asia Pacific is forecast to drop by 21 tb/d y-o-y to average 0.5 mb/d.

Graph 5 - 5: OECD quarterly liquids supply, y-o-y changes



Note: * 4Q22-4Q23 = Forecast. Source: OPEC.

For **2023**, oil production in the OECD is forecast to grow by 1.6 mb/d to average 32.4 mb/d. Growth is led by OECD Americas with 1.3 mb/d to average 27.9 mb/d. Yearly liquids production in OECD Europe is anticipated to grow by 0.3 mb/d to average 3.9 mb/d, while OECD Asia Pacific is expected to remain broadly unchanged to average 0.5 mb/d.

OECD Americas

US

US liquids production increased m-o-m by 262 tb/d in **September 2022** to average 19.5 mb/d. This was up by 1.8 mb/d compared with September 2021.

Crude oil and condensate production rose m-o-m by 289 tb/d in **September 2022** to average 12.3 mb/d, up by 1.3 mb/d y-o-y.

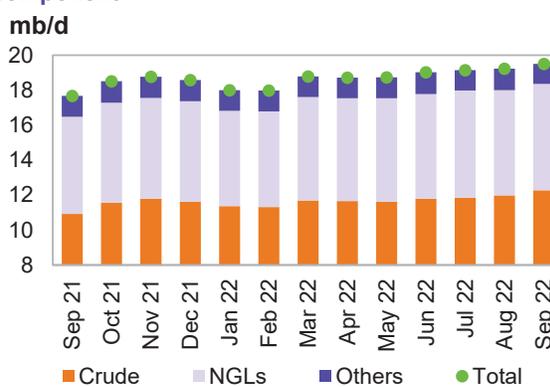
In terms of the **crude and condensate production breakdown by region (PADDs)**, production increased mainly in the US Gulf Coast (USGC). The region was up by 228 tb/d to average 8.8 mb/d. Production in the Midwest and West Coast regions rose by 45 tb/d and 14 tb/d, respectively, while the Rocky Mountain and the East Coast remained broadly unchanged m-o-m. Production growth in the main regions was primarily driven by higher completion and fracking activities and production recovering to normal levels in the Gulf of Mexico (GoM).

NGLs production was up by 65 tb/d m-o-m to average 6.1 mb/d in September. This was higher y-o-y by 0.5 mb/d. Production of **non-conventional liquids** (mainly ethanol) fell by 92 tb/d m-o-m to average 1.1 mb/d in September, according to the US Department of Energy (DoE). Preliminary estimates see non-conventional liquids averaging 1.2 mb/d in October 2022, up by 75 tb/d compared with the previous month.

GoM production rose m-o-m by 64 tb/d in September to average 1.8 mb/d, as production ramps up in the Gulf Coast offshore platforms. In the **onshore Lower 48**, September production increased m-o-m by 208 tb/d to average 10.0 mb/d.

Looking at **individual states**, New Mexico's oil production increased m-o-m by 75 tb/d to average 1.7 mb/d, which is 327 tb/d higher than a year ago. Texas production was up by 90 tb/d to average 5.1 mb/d, which is 163 tb/d higher than a year ago. In the Midwest, North Dakota production increased m-o-m by 43 tb/d to average 1.1 mb/d, up by a minor 5 tb/d y-o-y, while Oklahoma's production was broadly unchanged at an average 0.4 mb/d. Alaska's output was up by 17 tb/d m-o-m, and in Colorado, production remained steady.

Graph 5 - 6: US monthly liquids output by key component



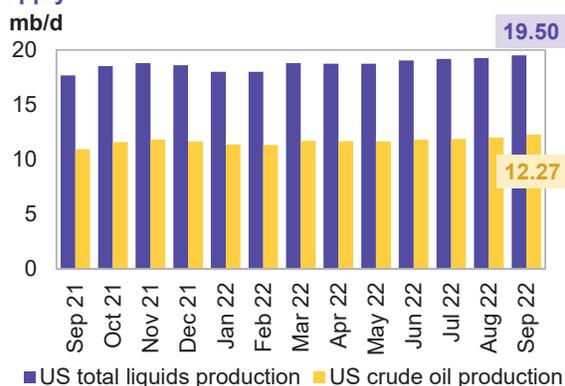
Source: OPEC.

Table 5 - 3: US crude oil production by selected state and region, tb/d

State				Change	
	Sep 21	Aug 22	Sep 22	m-o-m	y-o-y
Texas	4,982	5,055	5,145	90	163
Gulf of Mexico (GOM)	1,060	1,785	1,849	64	789
New Mexico	1,354	1,606	1,681	75	327
North Dakota	1,103	1,065	1,108	43	5
Colorado	434	434	435	1	1
Alaska	430	413	430	17	0
Oklahoma	398	414	415	1	17
Total	10,918	11,979	12,268	289	1,350

Sources: EIA and OPEC.

Graph 5 - 7: US monthly crude oil and total liquids supply



Sources: EIA and OPEC.

US tight crude output in September 2022 is estimated to have risen by 124 tb/d m-o-m to average 7.95 mb/d, according to the latest estimation. This was 0.4 mb/d higher than in the same month last year.

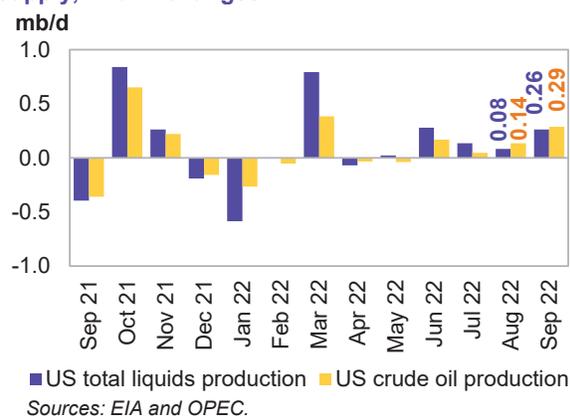
The m-o-m increase from shale and tight formations using horizontal wells came mainly from the Permian, which increased by 84 tb/d to average 4.6 mb/d. This was up by 0.4 mb/d y-o-y.

In the Williston Basin, Bakken shale production was up m-o-m by 45 tb/d to average 1.1 mb/d. This is up by a minor 5 tb/d y-o-y. Tight crude output at Eagle Ford in Texas fell marginally by 5 tb/d to average 0.9 mb/d. This is down by 65 tb/d y-o-y. Production in Niobrara-Codell in Colorado and Wyoming was unchanged at an average 0.45 mb/d.

US liquids production in 2022, excluding processing gains, is forecast to expand y-o-y by 1.1 mb/d to average 19.0 mb/d. This is revised up by 44 tb/d compared with the previous assessment due to higher-than-expected September output reported by the Energy Information Administration (EIA). Tight crude is forecast to grow by 0.6 mb/d in 2022 to average 7.9 mb/d. In addition, NGLs (mainly from unconventional basins) are projected to grow by 0.5 mb/d to average 5.9 mb/d, and production in the GoM is anticipated to increase by a minor 30 tb/d. Non-conventional liquids are projected to expand by 40 tb/d to average 1.2 mb/d. However, the expected growth is likely to be partially offset by y-o-y natural declines of 50 tb/d in onshore conventional fields.

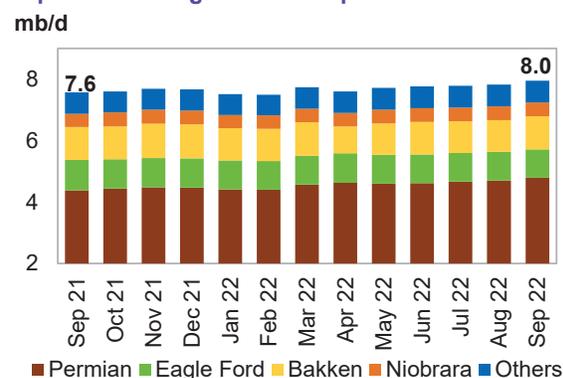
Given the current pace of oil field drilling and well completions, **crude oil and condensate production** is forecast to grow by 0.6 mb/d y-o-y to average 11.8 mb/d in 2022. This forecast assumes continued capital discipline, current inflation rates, continuing supply chain issues and oil field service limitations (labour and equipment). Tightness in the hydraulic fracking market has been one of the biggest issues for US producers in recent months, and this is expected to remain a challenge.

Graph 5 - 8: US monthly crude oil and total liquids supply, m-o-m changes



Sources: EIA and OPEC.

Graph 5 - 9: US tight crude output breakdown



Sources: EIA, Rystad Energy and OPEC.

US liquids production in 2023, excluding processing gains, is forecast to grow y-o-y by 1.2 mb/d to average 20.1 mb/d. This is revised down by 44 tb/d from the previous assessment. Higher drilling activities and fewer supply chain/logistical issues in the prolific Permian, Eagle Ford and Bakken shale sites are assumed for 2023. Crude oil output is anticipated to increase by 0.8 mb/d y-o-y to average 12.6 mb/d. Average tight crude output in 2023 is forecast at 8.6 mb/d, up by 0.8 mb/d y-o-y.

At the same time, NGLs production and non-conventional liquids, particularly ethanol, are forecast to increase y-o-y by 0.33 mb/d and 40 tb/d, to average 6.3 mb/d and 1.3 mb/d, respectively.

Graph 5 - 10: US liquids supply developments by component

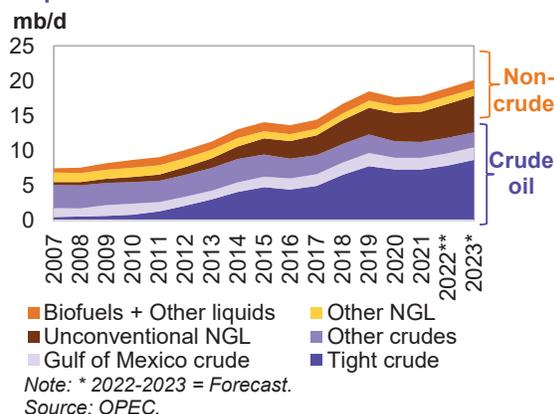


Table 5 - 4: US liquids production breakdown, mb/d

US liquids	Change		Change		Change	
	2021	2021/20	2022*	2022/21	2023*	2023/22
Tight crude	7.28	-0.03	7.87	0.59	8.65	0.78
Gulf of Mexico crude	1.71	0.04	1.74	0.03	1.82	0.09
Conventional crude oil	2.27	-0.07	2.22	-0.05	2.12	-0.09
Total crude	11.25	-0.06	11.82	0.56	12.60	0.78
Unconventional NGLs	4.30	0.22	4.86	0.55	5.25	0.39
Conventional NGLs	1.12	0.03	1.10	-0.03	1.04	-0.06
Total NGLs	5.42	0.25	5.95	0.53	6.29	0.33
Biofuels + Other liquids	1.17	0.02	1.21	0.04	1.25	0.04
US total supply	17.85	0.21	18.98	1.13	20.13	1.15

Note: * 2022-2023 = Forecast. Sources: EIA, OPEC and Rystad Energy.

US tight crude production in the Permian in 2022 is estimated to increase y-o-y by 0.5 mb/d to 4.7 mb/d. It is then forecast to grow by 0.6 mb/d y-o-y to average 5.3 mb/d in 2023.

The **Bakken** shale production decline that occurred in 2020 and 2021 is expected to continue in 2022. Tight crude production in the Bakken is estimated to drop by 27 tb/d in 2022 to average 1.1 mb/d. This is lower than the pre-pandemic average output of 1.4 mb/d. Drilling activities in North Dakota and available DUC wells are lower than the required levels to revive output. In 2023, growth is forecast to resume at 21 tb/d to average 1.1 mb/d.

The **Eagle Ford** in Texas saw output of 1.2 mb/d in 2019, but then declined in 2020 and 2021. It is estimated to stay steady in 2022 to average 1.0 mb/d. Growth of 40 tb/d is then forecast for 2023, to average just over 1.0 mb/d.

Niobrara production is estimated to grow y-o-y by 35 tb/d in 2022 and is then forecast to increase by 30 tb/d in 2023 to average 449 tb/d and 479 tb/d, respectively. Other shale plays are expected to show marginal increases totalling 34 tb/d and 40 tb/d in 2022 and 2023, given current drilling and completion activities.

Graph 5 - 11: US tight crude output by shale play, y-o-y changes

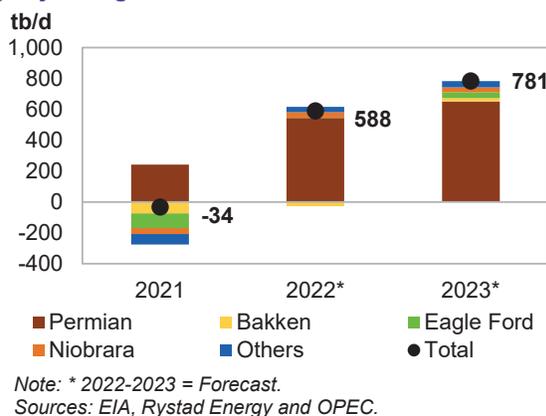


Table 5 - 5: US tight oil production growth, mb/d

US tight oil	Change		Change		Change	
	2021	2021/20	2022*	2022/21	2023*	2023/22
Permian tight	4.15	0.24	4.70	0.54	5.35	0.65
Bakken shale	1.08	-0.07	1.05	-0.03	1.07	0.02
Eagle Ford shale	0.96	-0.09	0.96	0.00	1.00	0.04
Niobrara shale	0.41	-0.04	0.45	0.04	0.48	0.03
Other tight plays	0.67	-0.07	0.71	0.03	0.75	0.04
Total	7.28	-0.03	7.87	0.59	8.65	0.78

Note: * 2022-2023 = Forecast. Source: OPEC.

US rig count, spudded, completed, DUC wells and fracking activity

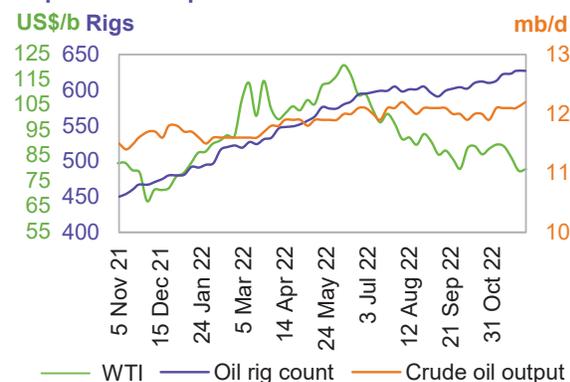
Total **US active drilling rigs** remained unchanged at 784 rigs in the week ending 2 December. This was up by 215 rigs compared with a year ago. The number of active offshore rigs rose w-o-w to 18, an increase of one. This is up from 13 in the same month a year earlier. Onshore oil and gas rigs decreased by one w-o-w to stand at 763 rigs, up by 209 rigs y-o-y, with three rigs in inland waters.

The **US horizontal rig count** fell by three w-o-w to 711, compared with 513 horizontal rigs a year ago. The number of drilling rigs for oil remained unchanged w-o-w at 627. At the same time, gas-drilling rig counts were steady at 155.

The Permian's rig count fell by two w-o-w to 350 rigs. However, rig counts remained steady in Eagle Ford, Williston and DJ-Niobrara at 71, 42 and 20, respectively. The rig count increased w-o-w by one in the Cana Woodford to 30.

There have been just two operating oil rigs in the Barnett basin, unchanged w-o-w.

Graph 5 - 12: US weekly rig count vs. US crude oil output and WTI price



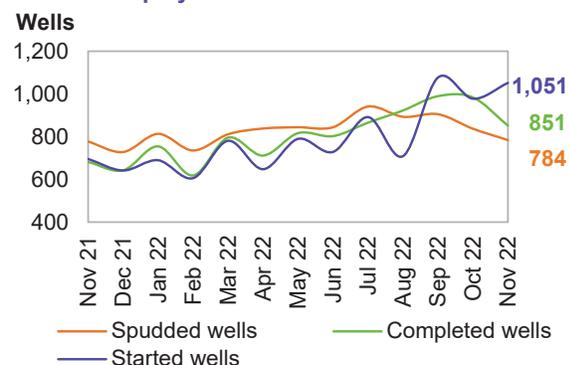
Sources: Baker Hughes, EIA and OPEC.

Drilling and completion (D&C) activities for spudded, completed and started oil producing wells in all US shale plays, based on the EIA-DPR regions, saw 837 horizontal wells spudded in October 2022 (as per preliminary data). This is down by 68 m-o-m, but 10% higher than in October 2021.

In October 2022, preliminary data indicates a lower number of completed wells at 983. However, this is up 36% y-o-y. Moreover, the number of started wells was estimated at 977, which is 34% higher than a year earlier.

Preliminary data for November estimates 784 spudded, 851 completed and 1,051 started wells, according to Rystad Energy.

Graph 5 - 13: Spudded, completed and started wells in US shale plays

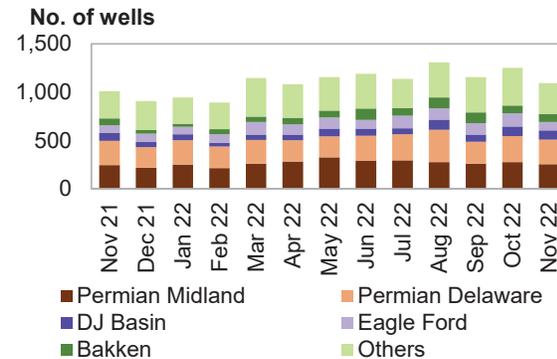


Note: Sep 22-Oct 22 = Preliminary data. Sources: Rystad Energy and OPEC.

In terms of identified **US oil and gas fracking operations by region**, Rystad Energy reported that 1,156 wells were fracked in September 2022. In October and November, it stated that 1,252 and 1,092 wells began fracking, respectively. These preliminary numbers are based on an analysis of high-frequency satellite data.

Preliminary October data on fracking showed that 275 and 272 wells were fracked in the Permian Midland Tight and Permian Delaware Tight, respectively. In comparison with September, there was a jump of 13 and 46 wells fracked in the Midland and Delaware tight, respectively, according to preliminary data. Data also indicated that 97 wells were fracked in the DJ Basin, 136 in the Eagle Ford and 81 in the Bakken during October.

Graph 5 - 14: Fracked wells count per month



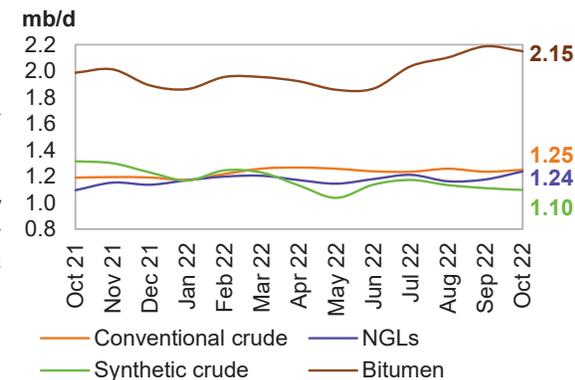
Note: Oct 22 - Nov 22 = Preliminary data.
Sources: Rystad Energy Shale Well Cube and OPEC.

Canada

Canada's liquids production in October is estimated to have increased m-o-m by 18 tb/d to average 5.8 mb/d, as seasonal 3Q22 maintenance was almost completed. This was the highest Canadian production on record.

Conventional crude production increased m-o-m by 15 tb/d to average 1.3 mb/d and NGLs output rose m-o-m by 54 tb/d to average 1.2 mb/d. At the same time, crude bitumen production output fell m-o-m by 37 tb/d in October, while synthetic crude dropped by 14 tb/d. Taken together, crude bitumen and synthetic crude production declined by 51 tb/d to 3.2 mb/d.

Graph 5 - 15: Canada's monthly liquids production development by type



Sources: National Energy Board and OPEC.

Canada's liquids supply in **2022** is estimated to grow by 0.2 mb/d to average 5.6 mb/d, unchanged from the previous assessment.

Canada's production is forecast to continue growing in 4Q22, as upgraders return from maintenance. Turnaround recoveries will combine with oil sands project ramp-ups and debottlenecks, alongside conventional growth. Moreover, the Terra Nova FPSO is expected to resume production by the end of the year, adding to supply.

For **2023**, Canada's liquids production is forecast to increase at a pace similar to 2022, rising by 0.2 mb/d to average 5.8 mb/d. Incremental production will come mainly from Alberta's oil sands, which saw an average output of 3.1 mb/d from January to October 2022.

Graph 5 - 16: Canada's quarterly liquids production and forecast



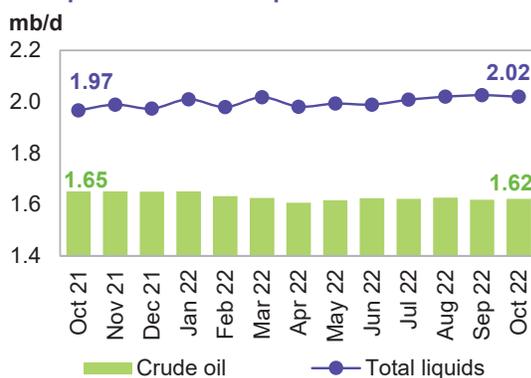
Note: * 4Q22-4Q23 = Forecast. Source: OPEC.

Mexico

Mexico's crude output remained largely flat m-o-m in **October** to average 1.6 mb/d, while NGLs output fell by a minor 8 tb/d. This saw Mexico's total October liquids output remain broadly unchanged m-o-m at an average 2.0 mb/d, according to Pemex.

For **2022**, Mexico's liquids production is estimated to average 2.0 mb/d, broadly unchanged from the previous month's assessment. The 50 tb/d growth in 2022 is expected to be driven by foreign-operated fields, while minor growth is also anticipated in Pemex-operated assets. High decline rates in Pemex's mature and heavy oil fields are set to mostly offset its other grades in 4Q22.

Graph 5 - 17: Mexico's monthly liquids and crude production development



Sources: PEMEX and OPEC.

For **2023**, liquids production is forecast to decline by 29 tb/d to average 1.98 mb/d, which is similar to the previous assessment. The total crude production decline in Pemex's mature fields is projected to outweigh production ramp-ups from Mexico's foreign-operated fields.

OECD Europe

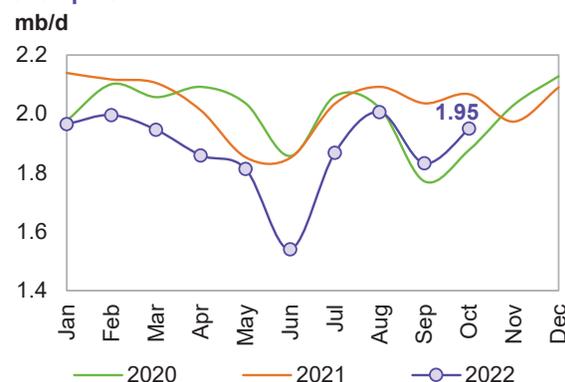
Norway

Norwegian liquids production in **October** increased by 118 tb/d m-o-m, to average 2.0 mb/d. This reflects a recovery from maintenance activities in September.

Norway's crude production rose by 106 tb/d m-o-m in October to average 1.7 mb/d, down by 75 tb/d y-o-y. Monthly oil production was 7.3% lower than the Norwegian Petroleum Directorate's (NPD) forecast.

At the same time, the production of NGLs and condensates increased by 12 tb/d m-o-m to average 0.2 mb/d, according to NPD data.

Graph 5 - 18: Norway's monthly liquids production development



Sources: NPD and OPEC.

For **2022**, production growth is revised down by 20 tb/d y-o-y to average 1.9 mb/d. This is mainly due to the downward revision in 4Q22 output on the back of lower-than-anticipated October output and the expected delay to planned start ups in this quarter.

Equinor has shut in gas output from the Aasgard B facility following a fire that broke out in mid-November. However, the impact seems to be limited on the platform's gas production, but natural gas liquids production could be affected. Technical issues have also arisen at the Yme field, which has only produced intermittently since first start-up at the end of last year. The field has been shut-in since mid-September after damage was found on parts of the process pipe system. However, phase 2 of Norway's giant Johan Sverdrup oil development is expected on stream in early-December 2022, according to Aker BP. The development, which produces relatively heavy and sour crude, generally accounts for more than a quarter of Norway's oil production.

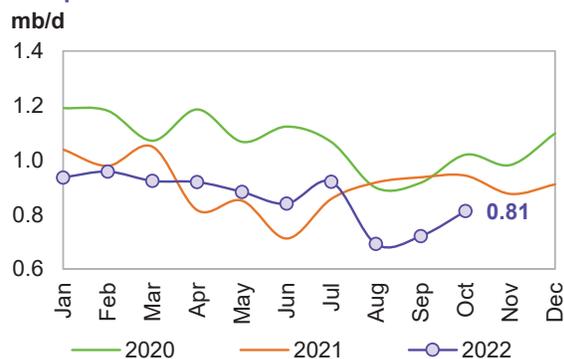
For **2023**, Norwegian liquids production is forecast to grow by 0.3 mb/d, broadly unchanged compared with the previous month, to average 2.2 mb/d. A number of small-to-large projects are scheduled to ramp up in 2023. The continuing Johan Sverdrup Phase 2 ramp-up is projected to be the main source of increased output for the coming year.

UK

UK liquids production increased m-o-m in **October** by 92 tb/d to average 0.8 mb/d. Crude oil output increased by 91 tb/d m-o-m to average 0.7 mb/d, according to official data, but this was lower by 133 tb/d y-o-y. NGLs output remained broadly unchanged at an average 88 tb/d. UK liquids output in October was down 14% from the same month a year earlier, which was mainly due to extended maintenance and natural declines.

For **2022**, UK liquids production is forecast to decline by 42 tb/d to average 0.9 mb/d. This was revised down by 13 tb/d from the previous assessment, owing to lower-than-expected October production and a lower forecast for 4Q22.

Graph 5 - 19: UK monthly liquids production development



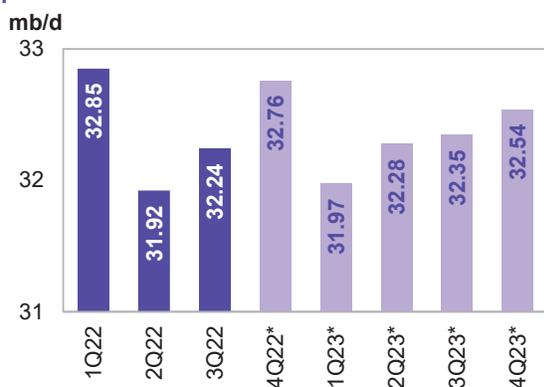
Sources: Department of Energy & Climate Change and OPEC.

For **2023**, UK liquids production is forecast to increase by 43 tb/d to average 0.9 mb/d. The Penguins FPSO delivery date has been already confirmed for November 2022. Shell has indicated that peak production from the redeveloped Penguins field is expected to reach 28 toe/d, given a one-year ramp up period after first oil.

Project sanctioning will be essential to maintain future oil and gas output, as UK output has been in long-term decline. It should be noted that the UK government in November approved an increase to the windfall tax, which will jump by ten percentage points to 35% in January 2023.

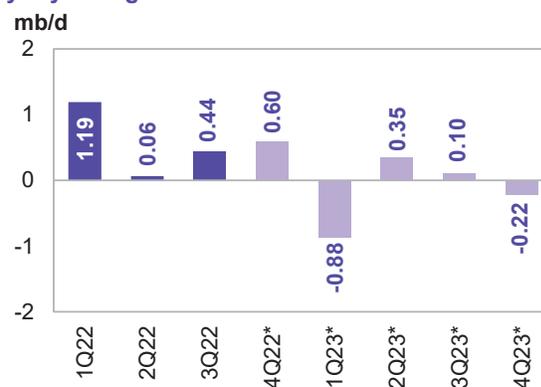
Non-OECD

Graph 5 - 20: Non-OECD quarterly liquids production and forecast



Note: * 4Q22-4Q23 = Forecast. Source: OPEC.

Graph 5 - 21: Non-OECD quarterly liquids supply, y-o-y changes

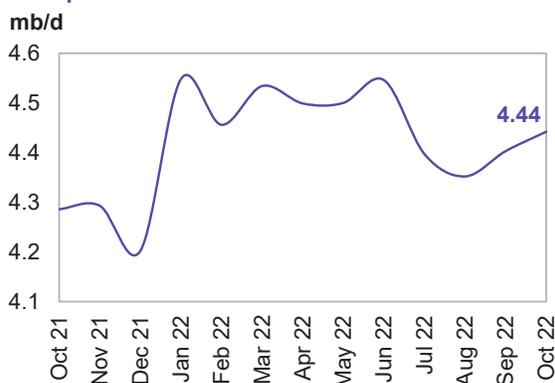


Note: * 4Q22-4Q23 = Forecast. Source: OPEC.

China

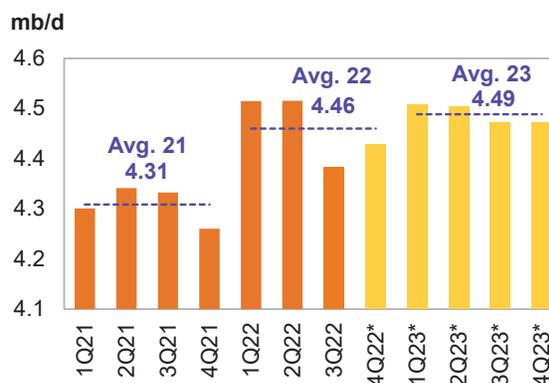
China's liquids production increased m-o-m in **October** by 39 tb/d to average 4.4 mb/d, which was up by 156 tb/d y-o-y, according to official data. Crude oil output in October averaged 4.0 mb/d, up by 41 tb/d compared with the previous month, and higher y-o-y by 121 tb/d. Liquids production over the first ten months of 2022 averaged 4.5 mb/d, higher by 3.4% compared with the same period last year.

Graph 5 - 22: China's monthly liquids production development



Sources: CNPC and OPEC.

Graph 5 - 23: China's quarterly liquids production and forecast



Note: * 4Q22-4Q23 = Forecast. Sources: CNPC and OPEC.

For **2022**, growth of 151 tb/d is estimated for an average of 4.5 mb/d. This is unchanged from the previous assessment. Natural decline rates are expected to be offset by additional growth through more infill wells and enhanced oil recovery projects amid efforts by state-owned oil companies to ensure energy supply security.

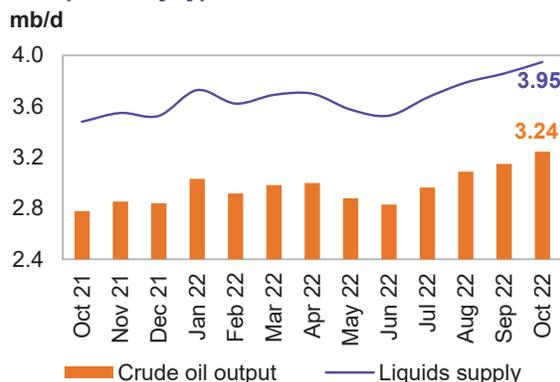
For **2023**, y-o-y growth of 30 tb/d is forecast for an average of 4.5 m/d, broadly unchanged from last month's assessment. New projects will slightly offset the mature onshore production declines. According to China's latest Five-Year Plan (FYP) and guidelines, from 2021 to 2025, the country aims to maintain liquids production well above 4 mb/d. To achieve this target, China will need to compensate for declining output rates at producing fields and accelerate the exploitation of deepwater reservoirs and challenging resources through infill drilling and expansion projects.

Latin America

Brazil

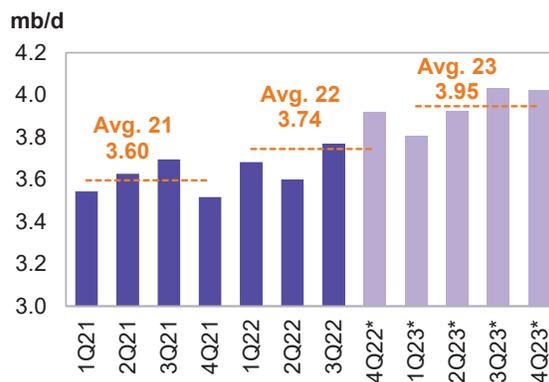
Brazil's crude output in October increased m-o-m by 96 tb/d, to average 3.2 mb/d. NGLs production was largely unchanged at an average of 93 tb/d and is expected to remain flat in November. Biofuels output (mainly ethanol) was flat in October at an average 612 tb/d, with preliminary data showing a flat trend in November too. Total liquids production increased by 91 tb/d in October to average 3.9 mb/d, the highest production rate on record. This is up by 0.5 mb/d y-o-y. Crude and condensate production rose for the fourth consecutive month through October, as new projects continued to ramp up production offshore and maintenance eased.

Graph 5 - 24: Brazil's monthly liquids production development by type



Sources: ANP, Petrobras and OPEC.

Graph 5 - 25: Brazil's quarterly liquids production



Note: * 4Q22-4Q23 = Forecast. Sources: ANP and OPEC.

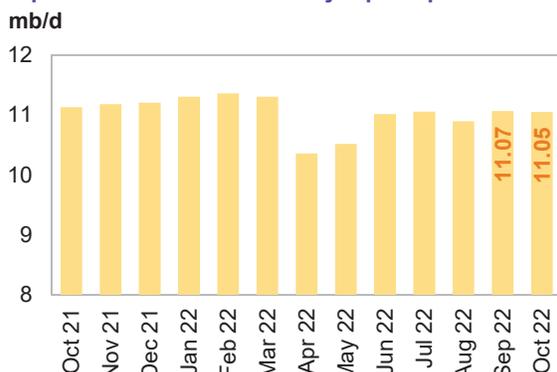
For **2022**, Brazil's liquids supply, including biofuels, is forecast to increase by 0.1 mb/d y-o-y to average 3.7 mb/d. This is up by 15 tb/d from the previous month's assessment, due to higher-than-expected production in October. Equinor's Peregrino Phase 2 (Platform C) started production in October and is set to continue to ramp up volumes in 4Q22 and into 2023. Growth in 2022 is being driven by the continued ramp up of the Sepia field and the start-up of Mero 1 in the pre-salt Santos basin, as well as Peregrino (Phases 1 and 2) in the Campos basin.

For **2023**, Brazil's liquids supply, including biofuels, is forecast to increase by 0.2 mb/d y-o-y to average 3.9 mb/d, broadly unchanged from the previous forecast. Crude oil output is set to increase through production ramp ups in the Mero (Libra NW), Buzios (Franco), Tupi (Lula), Peregrino, Sepia, Marlim and Itapu (Florim) fields. However, offshore maintenance is expected to cause interruptions in major fields. It should also be noted that Petrobras announced the platform ship Anita Garibaldi is bound for Brazil after it left its shipyard in China on October 6. The new FPSO system will be installed in the Marlim and Voador fields in the Campos basin, with production expected to begin in 3Q23.

Russia

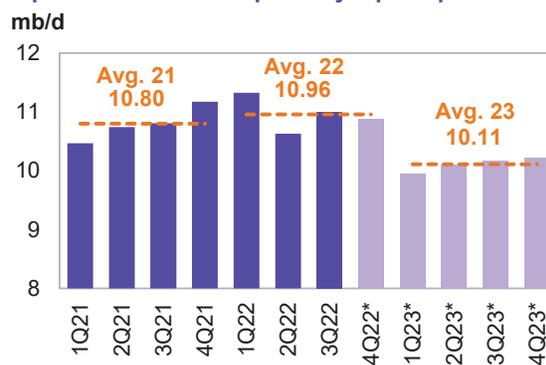
Russia's liquids production in October declined m-o-m by a minor 15 tb/d to average 11.1 mb/d. This includes 9.7 mb/d of crude oil and 1.3 mb/d of NGLs and condensate. A preliminary estimate for Russia's crude production in November 2022 shows a m-o-m increase of 96 tb/d to average 9.8 mb/d, while there is an expected decline of around 22 tb/d for NGLs and condensate.

Graph 5 - 26: Russia's monthly liquids production



Sources: Nefte Compass and OPEC.

Graph 5 - 27: Russia's quarterly liquids production



Note: * 4Q22-4Q23 = Forecast.

Sources: Nefte Compass and OPEC.

Russian liquids output in **2022** is forecast to increase y-o-y by 160 tb/d to average 11.0 mb/d. This is revised up by 26 tb/d from the previous month's assessment, mainly due to higher October output and higher-than-expected preliminary production data in November.

For **2023**, Russian liquids production is forecast to drop by 0.85 mb/d to average 10.1 mb/d. This is unchanged from the previous assessment. It should be noted that Russia's oil forecast remains subject to high uncertainty.

Caspian

Kazakhstan & Azerbaijan

Liquids output in Kazakhstan rose by 150 tb/d to average 1.7 mb/d in **October**. Crude production was up by 89 tb/d m-o-m to average 1.4 mb/d, and NGLs increased by 61 tb/d to average 0.3 mb/d. Higher oil output was due to the gradual ramp up of the Kashagan oil field, as well as the completion of planned maintenance at the Karachaganak gas condensate field. However, emergency repairs at the Caspian Pipeline Consortium (CPC) terminal on Russia's Black Sea coast reduced October's total monthly liquids output.

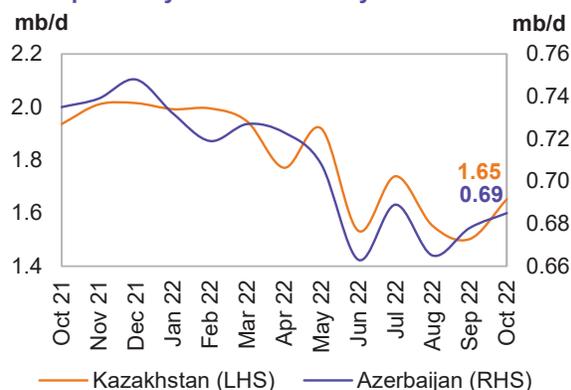
Kazakhstan's liquids supply for **2022** is now forecast to decline by 40 tb/d y-o-y to average 1.8 mb/d. This is down by 15 tb/d compared with the previous month's assessment and due to downward revisions applied to 4Q22. CPC stated that it restarted one of its Single Point Moorings (SPM) on 12 November following maintenance. Therefore, the CPC crude terminal on Russia's Black Sea coast is now operating with two of its three SPMs. At the same time, crude production at the Kashagan field recovered to nominal capacity of around 400 tb/d in the second week of November, after five months of constraints caused by planned and unplanned maintenance.

For **2023**, liquids supply is forecast to increase by 157 tb/d, up by a minor 10 tb/d compared with the previous forecast. This is due to base changes in 2022. In addition to the production ramp-up at the Kashagan oil field, oil output in the Tengiz field and gas condensate production in the Karachaganak field are also expected to rise marginally.

Azerbaijan's liquids production in October increased m-o-m by a minor 7 tb/d to average 0.7 mb/d, although this was down by 50 tb/d y-o-y. Crude production averaged 551 tb/d, with NGLs output at 134 tb/d, according to official sources.

For **2022**, liquids supply in Azerbaijan is estimated to decline y-o-y by 27 tb/d to average 0.7 mb/d. This has been revised down by 21 tb/d due to downward revisions in 3Q22 and lower-than-expected production in major oil fields in 4Q22. The main declines in legacy fields are expected to be offset by ramp-ups in other fields, such as the BP-led consortium's Shah Deniz field that has increased gas production capacity in the Azeri sector of the Caspian Sea.

Graph 5 - 28: Caspian monthly liquids production development by selected country



Sources: Nefte Compass and OPEC.

Azerbaijan's liquids supply for **2023** is forecast to rise by 59 tb/d to average 0.8 mb/d, according to the voluntary production adjustments agreed on at the 33rd OPEC and non-OPEC Ministerial Meeting. Growth is forecast to come from the Shah Deniz and Absheron condensate projects. Production could rise further after output starts up at the Azeri Central East project in 2023.

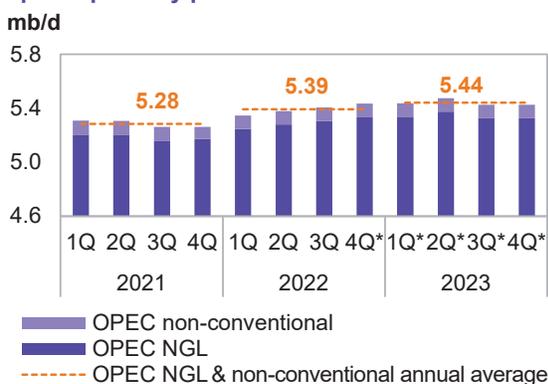
OPEC NGLs and non-conventional oils

OPEC NGLs and non-conventional liquids in 2022 are estimated to grow by 0.1 mb/d to average 5.4 mb/d, unchanged from the previous assessment.

NGLs output in 3Q22 is estimated to have averaged 5.31 mb/d, while OPEC non-conventional output remained steady at 0.1 mb/d. Taken together, 5.4 mb/d is expected for October, according to preliminary data.

In 2023, OPEC NGLs and non-conventional liquids **2023** are forecast to expand by around 50 tb/d for an average of 5.4 mb/d. NGLs production is projected to grow by 50 tb/d to average 5.3 mb/d, while non-conventional liquids are projected to remain unchanged at 0.1 mb/d.

Graph 5 - 29: OPEC NGLs and non-conventional liquids quarterly production and forecast



Note: * 4Q22-4Q23 = Forecast. Source: OPEC.

Table 5 - 6: OPEC NGL + non-conventional oils, mb/d

OPEC NGL and non-conventional oils	Change		Change		Change					
	2021	21/20	2022	22/21	1Q23	2Q23	3Q23	4Q23	2023	23/22
OPEC NGL	5.18	0.12	5.29	0.11	5.34	5.37	5.33	5.33	5.34	0.05
OPEC non-conventional	0.10	0.00	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.00
Total	5.28	0.12	5.39	0.11	5.44	5.47	5.43	5.43	5.44	0.05

Note: 2022-2023 = Forecast. Source: OPEC.

OPEC crude oil production

According to secondary sources, total **OPEC-13 crude oil production** averaged 28.83 mb/d in November 2022, lower by 744 tb/d m-o-m. Crude oil output increased mainly in Nigeria and Angola, while production in Saudi Arabia, the UAE, Kuwait and Iraq declined.

Table 5 - 7: OPEC crude oil production based on secondary sources, tb/d

Secondary sources	2020	2021	1Q22	2Q22	3Q22	Sep 22	Oct 22	Nov 22	Change Nov/Oct
Algeria	904	913	984	1,015	1,039	1,042	1,041	1,022	-19
Angola	1,245	1,117	1,152	1,171	1,155	1,131	1,064	1,102	38
Congo	289	265	263	268	267	278	260	259	-2
Equatorial Guinea	115	97	91	90	90	87	73	69	-4
Gabon	191	182	199	190	199	202	205	207	2
IR Iran	1,991	2,392	2,529	2,555	2,566	2,555	2,561	2,559	-1
Iraq	4,076	4,049	4,286	4,440	4,540	4,546	4,582	4,465	-117
Kuwait	2,439	2,419	2,612	2,690	2,801	2,822	2,806	2,685	-121
Libya	367	1,143	1,063	751	992	1,157	1,166	1,133	-32
Nigeria	1,578	1,372	1,376	1,211	1,064	1,015	1,066	1,158	92
Saudi Arabia	9,204	9,114	10,165	10,450	10,893	11,008	10,878	10,474	-404
UAE	2,804	2,727	2,954	3,045	3,168	3,192	3,186	3,037	-149
Venezuela	512	555	684	714	667	661	682	656	-26
Total OPEC	25,714	26,345	28,358	28,589	29,442	29,696	29,570	28,826	-744

Notes: Totals may not add up due to independent rounding, given available secondary sources to date. Source: OPEC.

Table 5 - 8: OPEC crude oil production based on direct communication, tb/d

Direct communication	2020	2021	1Q22	2Q22	3Q22	Sep 22	Oct 22	Nov 22	Change Nov/Oct
Algeria	899	911	984	1,016	1,050	1,058	1,060	1,021	-39
Angola	1,271	1,124	1,161	1,173	1,151	1,091	1,051	1,088	37
Congo	300	267	267	258	261	271	267	260	-8
Equatorial Guinea	114	93	95	91	83	75	57	56	-1
Gabon	207	181	197	184	198	191	170	191	21
IR Iran	..	..	..	..	..	..	..	..	..
Iraq	3,997	3,971	4,188	4,472	4,632	4,662	4,651	4,430	-221
Kuwait	2,438	2,415	2,612	2,694	2,799	2,818	2,811	2,676	-135
Libya	389	1,207	1,151	..	..	..	..	..	..
Nigeria	1,493	1,323	1,299	1,133	999	938	1,014	1,186	171
Saudi Arabia	9,213	9,125	10,224	10,542	10,968	11,041	10,957	10,468	-489
UAE	2,779	2,718	2,949	3,042	3,170	3,193	3,188	3,047	-141
Venezuela	569	636	756	745	673	666	717	693	-25
Total OPEC	..	..	..	..	..	..	..	..	..

Notes: .. Not available. Totals may not add up due to independent rounding. Source: OPEC.

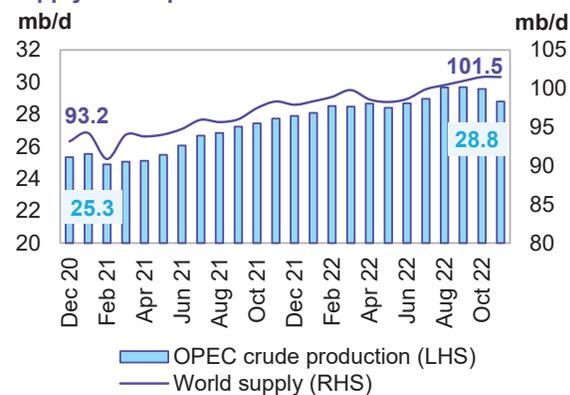
World oil supply

Preliminary data indicates that **global liquids production in November** increased by 43 tb/d to average 101.5 mb/d compared with the previous month.

Non-OPEC liquids production (including OPEC NGLs) is estimated to have increased m-o-m in November by 0.8 mb/d to average 72.7 mb/d. This was higher by 2.1 mb/d y-o-y. Preliminary estimated production increases in November were mainly driven by Other Eurasia, OECD Europe and Other Asia, which was partially offset by declines in Latin America.

The **share of OPEC crude oil in total global production** decreased by 0.7 pp to 28.4% in November, compared with the previous month. Estimates are based on preliminary data for non-OPEC supply, OPEC NGLs and non-conventional oil, while assessments for OPEC crude production are based on secondary sources.

Graph 5 - 30: OPEC crude production and world oil supply development



Commercial Stock Movements

Preliminary October data sees total OECD commercial oil stocks up m-o-m by 22.5 mb. At 2,748 mb, they were 15 mb less than the same time one year ago, 168 mb lower than the latest five-year average and 197 mb below the 2015–2019 average. Within the components, crude and product stocks rose m-o-m by 12.9 mb and 9.5 mb, respectively.

At 1,335 mb, OECD crude stocks were 8 mb higher than the same time a year ago, but 80 mb lower than the latest five-year average and 118 mb lower than the 2015–2019 average.

OECD product stocks stood at 1,413 mb, representing a deficit of 23 mb from the same time a year ago, 87 mb lower than the latest five-year average and 79 mb below the 2015–2019 average.

In terms of days of forward cover, OECD commercial stocks rose m-o-m by 1.0 day in October to stand at 59.1 days. This is 0.6 days below October 2021 levels, 4.0 days less than the latest five-year average and 3.3 days lower than the 2015–2019 average.

Preliminary data for November showed that total US commercial oil stocks fell by 6.9 mb m-o-m to stand at 1,217 mb. This is 16.6 mb, lower than the same month in 2021 and 67.4 mb, below the latest five-year average. Crude stocks fell by 22.9 mb, while product stocks rose by 16.0 mb.

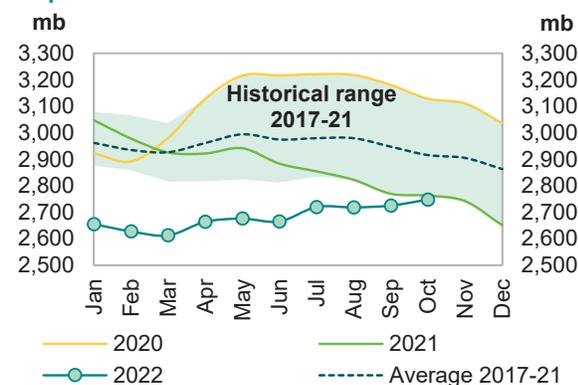
OECD

Preliminary **October** data sees **total OECD commercial oil stocks** up m-o-m by 22.5 mb. At 2,748 mb, they were 15 mb less than the same time one year ago, 168 mb lower than the latest five-year average and 197 mb below the 2015–2019 average.

Within the components, crude and product stocks rose m-o-m by 12.9 mb and 9.5 mb, respectively. Total commercial oil stocks in October rose in all OECD regions.

OECD commercial **crude stocks** stood at 1,335 mb in October. This is 8 mb higher than the same time a year ago, but 80 mb lower than the latest five-year average and 118 mb lower than the 2015–2019 average.

Graph 9 - 1: OECD commercial oil stocks



Sources: Argus, EIA, Euroilstock, IEA, METI and OPEC.

Compared with the previous month, OECD America saw a stock build of 8.0 mb, OECD Europe stocks rose by 0.8 mb, and stocks in OECD Asia Pacific increased by 4.1 mb.

Total product inventories stood at 1,413 mb in October. This is 23 mb below the same time a year ago; 87 mb lower than the latest five-year average and 79 mb below the 2015–2019 average. Product stocks in OECD Americas and OECD Asia Pacific rose by 3.3 mb and 4.1 mb, respectively. OECD Europe stocks rose by 2.1 mb.

Table 9 - 1: OECD's commercial stocks, mb

OECD stocks	Oct 21	Aug 22	Sep 22	Oct 22	Change Oct 22/Sep 22
Crude oil	1,328	1,315	1,322	1,335	12.9
Products	1,435	1,403	1,403	1,413	9.5
Total	2,763	2,718	2,725	2,748	22.5
Days of forward cover	59.7	58.2	58.1	59.1	1.0

Note: Totals may not add up due to independent rounding.

Sources: Argus, EIA, Euroilstock, IEA, METI and OPEC.

In terms of **days of forward cover**, OECD commercial stocks rose m-o-m by 1.0 day in October to stand at 59.1 days. This is 0.6 days below October 2021 levels, 4.0 days less than the latest five-year average and 3.3 days lower than the 2015–2019 average.

All three OECD regions were below the latest five-year average: the Americas by 4.0 days at 59.1 days; the Asia Pacific by 4.5 days at 44.6 days; and Europe by 4.1 days at 67.8 days.

OECD Americas

OECD Americas total commercial stocks rose by 11.3 mb m-o-m in October to settle at 1,497 mb. This is 52 mb less than the same month in 2021 and 76 mb lower than the latest five-year average.

Commercial **crude oil stocks** in OECD Americas rose m-o-m by 8.0 mb in October to stand at 747 mb, which is 26 mb lower than in October 2021 and 28 mb less than the latest five-year average. The monthly build in crude oil stocks can be attributed to lower crude runs, which fell by 0.7 mb/d to 15.98 mb/d as well as additional barrels released from strategic petroleum reserves (SPRs).

Total product stocks in OECD Americas also rose m-o-m by 3.3 mb in October to stand at 732 mb. This was 26 mb lower than the same month in 2021 and 49 mb below the latest five-year average. Lower total consumption in the region was behind the product stock build.

OECD Europe

OECD Europe total commercial stocks rose m-o-m by 2.9 mb in October to settle at 912 mb. This is 35 mb higher than the same month in 2021, but 46 mb below the latest five-year average.

OECD Europe's **commercial crude stocks** rose by 0.8 mb m-o-m to end the month of October at 401 mb, which is 17 mb higher than one year ago but 21 mb below the latest five-year average. The build in crude oil inventories came on the back of lower m-o-m refinery throughput in the EU-14, plus the UK and Norway, which declined by 400 tb/d to 9.54 mb/d.

Europe's **product stocks** also rose m-o-m by 2.1 mb to end October at 510 mb. This is 18 mb higher than a year ago but 25 mb below the latest five-year average.

OECD Asia Pacific

OECD Asia Pacific's total commercial oil stocks rose m-o-m by 8.2 mb in October to stand at 357 mb. This is 1.7 mb higher than a year ago, but 45 mb below the latest five-year average.

OECD Asia Pacific's **crude inventories** rose by 4.1 mb m-o-m to end October at 187 mb, which is 17 mb higher than one year ago, but 31 mb below the latest five-year average.

OECD Asia Pacific's **total product inventories** also rose m-o-m by 4.1 mb to end October at 170 mb. This is 15 mb lower than the same time a year ago and 13 mb below the latest five-year average.

US

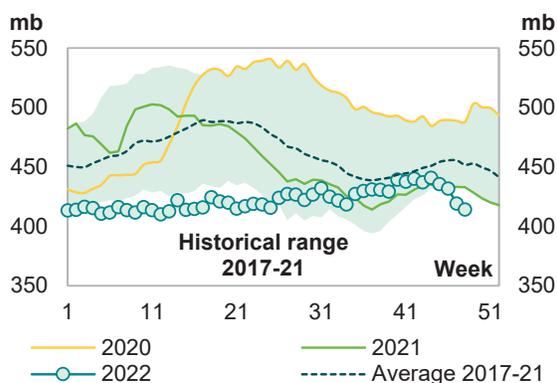
Preliminary data for November showed that **total US commercial oil stocks** fell by 6.9 mb m-o-m to stand at 1,217 mb. This is 16.6 mb, or 1.3%, lower than the same month in 2021 and 67.4 mb, or 5.2%, below the latest five-year average. Crude stocks fell by 22.9 mb, while product stocks rose by 16.0 mb.

US commercial crude stocks in November stood at 413.9 mb. This is 19.5 mb, or 4.5%, below the same month of the previous year, and 42.6 mb, or 9.3%, below the latest five-year average. The monthly drop in crude oil stocks can be attributed to higher crude runs, which rose by 0.94 mb/d to 16.92 mb/d.

In contrast, **total product stocks** rose in November to stand at 803.3 mb. This is 2.9 mb, or 0.4%, higher than November 2021 levels but 24.8 mb, or 3.0%, lower than the latest five-year average. The stock build was mainly driven by lower product consumption.

Gasoline stocks rose m-o-m by 12.5 mb to settle at 219.1 mb. This is 1.5 mb, or 0.7% lower than in the same month in 2021 and 11.0 mb, or 4.8%, lower than the latest five-year average.

Graph 9 - 2: US weekly commercial crude oil inventories



Sources: EIA and OPEC.

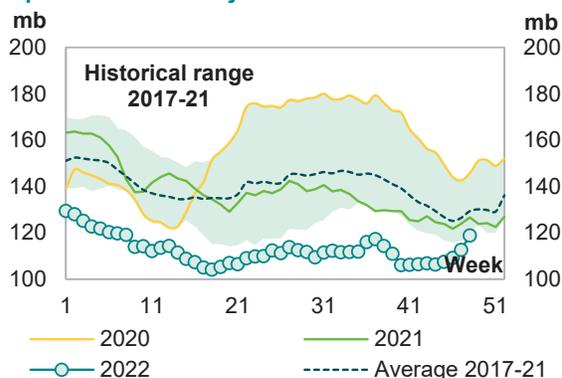
Commercial Stock Movements

Distillate stocks also rose m-o-m in November by 12.0 mb to stand at 118.8 mb. This is 12.9 mb, or 9.8%, lower than the same month of the previous year and 16.2 mb, or 12.0%, below the latest five-year average.

Jet fuel stocks rose m-o-m by 1.6 mb, ending November at 38.0 mb. This is 1.2 mb, or 3.3%, higher than the same month in 2021, but 1.1 mb, or 2.9%, below the latest five-year average.

In contrast, **residual fuel oil stocks** fell by 1.3 mb m-o-m in November. At 29.0 mb, this was 1.1 mb, or 3.9%, higher than a year earlier, but 1.3 mb, or 4.2%, less than the latest five-year average.

Graph 9 - 3: US weekly distillate inventories



Sources: EIA and OPEC.

Table 9 - 2: US commercial petroleum stocks, mb

US stocks	Nov 21	Sep 22	Oct 22	Nov 22	Change Nov 22/Oct 22
Crude oil	433.4	428.8	436.8	413.9	-22.9
Gasoline	220.6	209.6	206.6	219.1	12.5
Distillate fuel	131.7	110.5	106.8	118.8	12.0
Residual fuel oil	27.9	27.3	30.3	29.0	-1.3
Jet fuel	36.8	36.2	36.4	38.0	1.6
Total products	800.4	786.3	787.3	803.3	16.0
Total	1,233.7	1,215.1	1,224.1	1,217.2	-6.9
SPR	601.5	416.4	399.8	387.0	-12.8

Sources: EIA and OPEC.

Japan

In **Japan**, **total commercial oil stocks** in October rose m-o-m by 8.2 mb to settle at 133.5 mb. This is 12.2 mb, or 10.1%, higher than the same month in 2021 but 7.2 mb, or 5.1%, below the latest five-year average. Crude and product stocks rose m-o-m by 4.1 mb and 7.1 mb, respectively.

Japanese **commercial crude oil stocks** rose in October to stand at 71.6 mb. This is 15.7 mb, or 28.1% higher than the same month of the previous year, but 4.1 mb, or 5.1%, lower than the latest five-year average. The build came on the back of lower crude imports, which declined m-o-m by 1.2%.

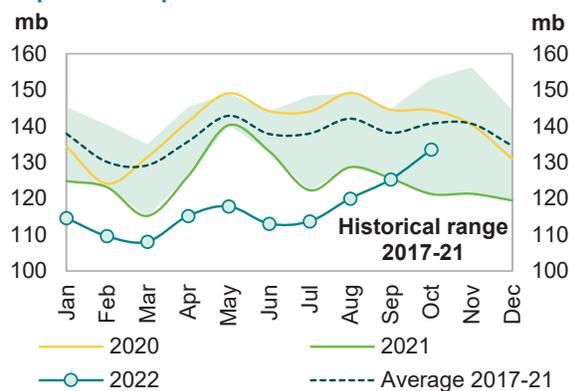
Japan's **total product inventories** also rose m-o-m by 4.1 mb to end October at 61.9 mb. This is 3.5 mb, or 5.3%, lower than the same month in 2021 and 3.1 mb, or 4.7%, below the latest five-year average.

Distillate stocks rose m-o-m by 2.8 mb to end October at 29.8 mb. This is 2.0 mb, or 6.3%, lower than the same month in 2021 and 2.3 mb, or 7.2%, below the latest five-year average. Within distillate components, kerosene, jet fuel and gasoil stocks went up by 11.3%, 4.6% and 13.1%, respectively.

Total residual fuel oil stocks rose m-o-m by 0.9 mb to end October at 12.4 mb. This is 0.3 mb, or 2.7%, higher than in the same month of the previous year but 0.4 mb, or 3.5%, below the latest five-year average. Within the components, fuel oil A and fuel oil B.C stocks rose by 6.7% and 7.9%, m-o-m, respectively.

Meanwhile, **gasoline stocks** remained unchanged m-o-m to stand at 9.8 mb in October. This was 1.9 mb, or 15.9% lower than a year earlier and 1.1 mb, or 9.8%, lower than the latest five-year average. The build came on higher gasoline production by 6.9% m-o-m.

Graph 9 - 4: Japan's commercial oil stocks



Sources: METI and OPEC.

Table 9 - 3: Japan's commercial oil stocks*, mb

Japan's stocks	Oct 21	Aug 22	Sep 22	Oct 22	Change Oct 22/Sep 22
Crude oil	55.9	64.2	67.5	71.6	4.1
Gasoline	11.7	9.7	9.8	9.8	0.0
Naphtha	9.8	8.1	9.5	9.9	0.4
Middle distillates	31.9	26.6	27.0	29.8	2.8
Residual fuel oil	12.0	11.4	11.5	12.4	0.9
Total products	65.4	55.8	57.8	61.9	4.1
Total**	121.3	120.0	125.3	133.5	8.2

Note: * At the end of the month. ** Includes crude oil and main products only.

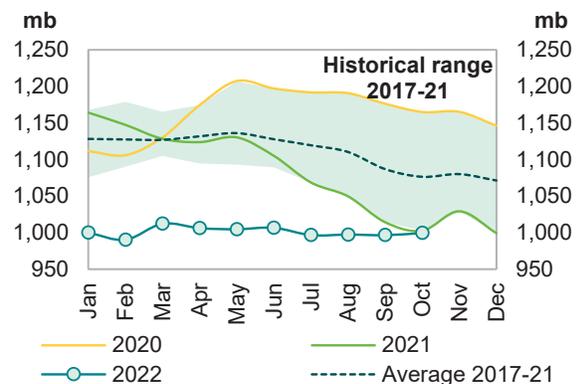
Sources: METI and OPEC.

EU-14 plus UK and Norway

Preliminary data for October showed that **total European commercial oil stocks** rose m-o-m by 2.9 mb to stand at 999.5 mb. At this level, they were 3.1 mb, or 0.3%, below the same month a year earlier and 76.6 mb, or 7.1% lower than the latest five-year average. Crude and product stocks rose m-o-m by 0.8 mb and 2.1 mb, respectively.

European **crude inventories** rose in October to stand at 432.7 mb. This is 4.6 mb, or 1.1%, higher than the same month in 2021 but 35.1 mb, or 7.5%, below the latest five-year average. The build in crude oil inventories came on the back of lower m-o-m refinery throughput in the EU-14, plus the UK and Norway, which declined by 400 tb/d to 9.54 mb/d.

Graph 9 - 5: EU-14 plus UK and Norway's total oil stocks



Sources: Argus, Euroilstock and OPEC.

Total European product stocks also rose m-o-m by 2.1 mb to end October at 566.7 mb. This is 7.8 mb, or 1.4%, lower than the same month of the previous year and 41.6 mb, or 6.8%, below the latest five-year average.

Gasoline stocks fell m-o-m by 0.5 mb in October to stand at 105.5 mb. At this level, they were 1.1 mb, or 1.1%, lower than the same time a year earlier, and 4.3 mb/d, or 3.9%, below the latest five-year average.

Distillate stocks also fell m-o-m by 0.6 mb in October to stand at 367.7 mb. This is 21.8 mb, or 5.6%, below the same month in 2021 and 41.7 mb, or 10.2%, less than the latest five-year average.

In contrast, **residual fuel stocks** rose m-o-m by 2.3 mb in October to stand at 62.0 mb. This is 6.5 mb, or 11.5%, higher than the same month in 2021, but 0.2 mb, or 0.3%, below the latest five-year average.

Naphtha stocks also rose by 0.9 mb in October, ending the month at 31.5 mb. This is 8.7 mb, or 38.3%, higher than October 2021 levels and 4.7 mb, or 17.4%, higher than the latest five-year average.

Table 9 - 4: EU-14 plus UK and Norway's total oil stocks, mb

EU stocks	Oct 21	Aug 22	Sep 22	Oct 22	Change Oct 22/Sep 22
Crude oil	428.1	436.8	431.9	432.7	0.8
Gasoline	106.6	110.3	106.0	105.5	-0.5
Naphtha	22.8	30.5	30.6	31.5	0.9
Middle distillates	389.6	361.3	368.3	367.7	-0.6
Fuel oils	55.6	58.4	59.7	62.0	2.3
Total products	574.5	560.5	564.6	566.7	2.1
Total	1,002.6	997.3	996.6	999.5	2.9

Sources: Argus, Euroilstock and OPEC.

Singapore, Amsterdam-Rotterdam-Antwerp (ARA) and Fujairah

Singapore

In October, **total product stocks in Singapore** fell m-o-m by 4.6 mb to 41.2 mb. This is 1.9 mb, or 4.4%, lower than the same month in 2021.

Light distillate stocks fell m-o-m by 1.0 mb in October to stand at 14.8 mb. This is 3.8 mb, or 34.9%, higher than the same month of the previous year.

Middle distillate stocks also fell m-o-m by 0.7 mb in October to stand at 6.8 mb. This is 3.2 mb, or 32.0%, lower than a year earlier.

Residual fuel oil stocks also dropped m-o-m by 2.9 mb, ending October at 19.6 mb. This is 2.5 mb, or 11.5%, lower than October 2021.

ARA

Total product stocks in ARA fell m-o-m in October by 0.2 mb. At 39.7 mb, they were 1.6 mb, or 4.2%, higher than the same month in 2021.

Gasoline stocks in October fell by 0.3 mb m-o-m to stand at 10.5 mb, which is 3.0 mb, or 39.3%, higher than the same month of the previous year.

Gasoil stocks also dropped by 0.7 mb m-o-m, ending October at 12.9 mb. This is 2.1 mb, or 13.8%, lower than levels seen in October 2021.

In contrast, **fuel oil stocks** rose by 0.3 mb m-o-m in October to stand at 7.1 mb, which is 0.6 mb, or 8.5%, higher than in October 2021.

Jet oil stocks also rose by 0.5 mb m-o-m to stand at 6.7 mb. This is 0.3 mb, or 4.5%, lower than levels seen in October 2021.

Fujairah

During the week ending 5 December 2022, **total oil product stocks in Fujairah** rose w-o-w by 0.34 mb to stand at 22.85 mb, according to data from Fed Com and S&P Global Platts. At this level, total oil stocks were 7.08 mb higher than at the same time a year ago.

Light distillate stocks rose by 0.80 mb to stand at 7.13 mb, which is 2.74 mb higher than a year ago.

Middle distillate stocks also rose w-o-w by 0.19 mb to stand at 3.16 mb, which is 0.81 mb higher than the same time last year. By contrast, **heavy distillate stocks** fell by 0.65 mb w-o-w to stand at 12.56 mb in the week to 5 December 2022, which is 3.54 mb higher than the same period a year ago.

Balance of Supply and Demand

Demand for OPEC crude in 2022 remains unchanged from the previous month's assessment to stand at 28.6 mb/d. This is around 0.5 mb/d higher than in 2021.

According to secondary sources, OPEC crude production averaged 28.4 mb/d in 1Q22, which is 0.3 mb/d lower than demand for OPEC crude. In 2Q22, OPEC crude production averaged 28.6 mb/d, which is 0.2 mb/d higher than demand for OPEC crude. In 3Q22, OPEC crude oil production averaged 29.4 mb/d, which is 0.9 mb/d higher than demand for OPEC crude.

Demand for OPEC crude in 2023 also remains unchanged from the previous assessment to stand at 29.2 mb/d. This is around 0.6 mb/d higher than in 2022.

Balance of supply and demand in 2022

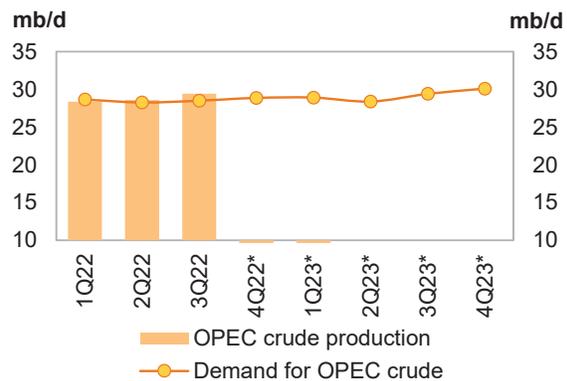
Demand for OPEC crude in 2022 remains unchanged from the previous MOMR to stand at 28.6 mb/d. This is around 0.5 mb/d higher than in 2021.

Compared with the previous assessment, 2Q22 was revised down by 0.1 mb/d, while 3Q22 was revised up by 0.1 mb/d. Both 1Q22 and 4Q22 were unchanged from the previous month.

Compared with the same quarters in 2021, demand for OPEC crude in 1Q22 and 2Q22 is estimated to be higher by 2.4 mb/d and 1.3 mb/d, respectively, while 3Q22 and 4Q22 are expected to be lower by 0.2 mb/d and 1.3 mb/d, respectively.

According to secondary sources, OPEC crude production averaged 28.4 mb/d in 1Q22, which is 0.3 mb/d lower than demand for OPEC crude. In 2Q22, OPEC crude production averaged 28.6 mb/d, which is 0.2 mb/d higher than demand for OPEC crude. In 3Q22, OPEC crude oil production averaged 29.4 mb/d, which is 0.9 mb/d higher than demand for OPEC crude.

Graph 10 - 1: Balance of supply and demand, 2022–2023*



Note: * 4Q22-4Q23 = Forecast. Source: OPEC.

Table 10 - 1: Supply/demand balance for 2022*, mb/d

	2021	1Q22	2Q22	3Q22	4Q22	2022	Change 2022/21
(a) World oil demand	97.01	99.35	98.21	99.54	101.11	99.56	2.55
Non-OPEC liquids production	63.68	65.33	64.54	65.61	66.79	65.57	1.89
OPEC NGL and non-conventionals	5.28	5.35	5.38	5.41	5.43	5.39	0.11
(b) Total non-OPEC liquids production and OPEC NGLs	68.96	70.68	69.92	71.01	72.22	70.96	2.00
Difference (a-b)	28.05	28.67	28.29	28.52	28.89	28.59	0.55
OPEC crude oil production	26.35	28.36	28.59	29.44			
Balance	-1.70	-0.31	0.30	0.92			

Note: * 2022 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.

Table 11 - 1: World oil demand and supply balance, mb/d

World oil demand and supply balance	2019	2020	2021	1Q22	2Q22	3Q22	4Q22	2022	1Q23	2Q23	3Q23	4Q23	2023
World demand													
Americas	25.40	22.45	24.32	24.77	24.98	25.35	25.19	25.08	25.00	25.24	25.66	25.45	25.34
of which US	20.58	18.35	20.03	20.38	20.41	20.62	20.74	20.54	20.51	20.52	20.85	20.87	20.69
Europe	14.31	12.41	13.13	13.15	13.43	14.09	13.90	13.65	13.19	13.46	14.12	13.95	13.68
Asia Pacific	7.95	7.17	7.38	7.85	6.99	7.25	7.81	7.47	7.88	7.04	7.29	7.83	7.51
Total OECD	47.66	42.03	44.83	45.77	45.40	46.69	46.91	46.20	46.07	45.73	47.07	47.23	46.53
China	13.81	13.94	14.97	14.74	14.42	14.69	15.32	14.79	14.68	15.32	15.32	15.89	15.31
India	4.99	4.51	4.77	5.18	5.16	4.95	5.35	5.16	5.41	5.44	5.21	5.59	5.41
Other Asia	9.06	8.13	8.63	9.09	9.27	8.73	8.85	8.98	9.42	9.61	9.10	9.20	9.33
Latin America	6.59	5.90	6.23	6.32	6.36	6.55	6.40	6.41	6.48	6.48	6.70	6.54	6.55
Middle East	8.20	7.45	7.79	8.06	8.13	8.50	8.17	8.22	8.45	8.46	8.84	8.46	8.55
Africa	4.34	4.05	4.22	4.51	4.15	4.25	4.53	4.36	4.71	4.34	4.43	4.72	4.55
Russia	3.57	3.39	3.61	3.67	3.42	3.45	3.59	3.53	3.63	3.45	3.59	3.75	3.61
Other Eurasia	1.19	1.07	1.21	1.22	1.16	1.00	1.21	1.15	1.21	1.16	1.02	1.22	1.15
Other Europe	0.76	0.70	0.75	0.79	0.75	0.73	0.80	0.77	0.80	0.76	0.75	0.82	0.78
Total Non-OECD	52.52	49.13	52.18	53.58	52.81	52.84	54.20	53.36	54.80	55.01	54.97	56.18	55.24
(a) Total world demand	100.18	91.16	97.01	99.35	98.21	99.54	101.11	99.56	100.87	100.74	102.04	103.41	101.77
Y-o-y change	0.97	-9.01	5.85	5.14	2.55	1.87	0.67	2.55	1.53	2.53	2.50	2.30	2.22
Non-OPEC liquids production													
Americas	25.84	24.75	25.25	25.86	26.27	27.04	27.36	26.64	27.60	27.70	28.05	28.43	27.95
of which US	18.49	17.64	17.85	18.27	18.83	19.30	19.50	18.98	19.75	20.05	20.24	20.47	20.13
Europe	3.70	3.89	3.76	3.73	3.43	3.49	3.74	3.60	3.95	3.93	3.82	3.95	3.91
Asia Pacific	0.52	0.52	0.51	0.49	0.51	0.43	0.53	0.49	0.51	0.48	0.50	0.49	0.50
Total OECD	30.07	29.16	29.52	30.08	30.22	30.97	31.63	30.73	32.06	32.11	32.38	32.87	32.36
China	4.05	4.15	4.31	4.51	4.52	4.38	4.43	4.46	4.51	4.50	4.47	4.47	4.49
India	0.83	0.78	0.78	0.78	0.77	0.76	0.77	0.77	0.80	0.78	0.77	0.76	0.78
Other Asia	2.72	2.51	2.41	2.35	2.30	2.25	2.33	2.31	2.37	2.37	2.34	2.36	2.36
Latin America	6.08	6.03	5.95	6.11	6.18	6.45	6.63	6.34	6.49	6.67	6.73	6.80	6.68
Middle East	3.19	3.19	3.24	3.29	3.33	3.36	3.36	3.34	3.35	3.36	3.39	3.39	3.37
Africa	1.51	1.41	1.35	1.33	1.31	1.32	1.32	1.32	1.32	1.34	1.35	1.37	1.35
Russia	11.51	10.54	10.80	11.33	10.63	11.01	10.88	10.96	9.95	10.10	10.17	10.22	10.11
Other Eurasia	3.07	2.91	2.93	3.05	2.77	2.61	2.95	2.84	3.09	3.05	3.02	3.06	3.06
Other Europe	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.11	0.10	0.10	0.10	0.10	0.10
Total Non-OECD	33.09	31.67	31.87	32.85	31.92	32.24	32.76	32.44	31.97	32.28	32.35	32.54	32.29
Total Non-OPEC production	63.16	60.83	61.39	62.93	62.14	63.21	64.39	63.17	64.03	64.39	64.72	65.41	64.64
Processing gains	2.37	2.16	2.29	2.40	2.40	2.40	2.40	2.40	2.47	2.47	2.47	2.47	2.47
Total Non-OPEC liquids production	65.53	62.98	63.68	65.33	64.54	65.61	66.79	65.57	66.50	66.86	67.19	67.88	67.11
OPEC NGL + non-conventional oils	5.21	5.17	5.28	5.35	5.38	5.41	5.43	5.39	5.44	5.47	5.43	5.43	5.44
(b) Total non-OPEC liquids production and OPEC NGLs	70.74	68.15	68.96	70.68	69.92	71.01	72.22	70.96	71.94	72.33	72.62	73.31	72.55
Y-o-y change	2.18	-2.60	0.82	2.72	1.25	2.03	2.01	2.00	1.26	2.41	1.60	1.08	1.59
OPEC crude oil production (secondary sources)	29.36	25.71	26.35	28.36	28.59	29.44							
Total liquids production	100.10	93.86	95.31	99.04	98.51	100.46							
Balance (stock change and miscellaneous)	-0.08	2.70	-1.70	-0.31	0.30	0.92							
OECD closing stock levels, mb													
Commercial	2,894	3,036	2,651	2,613	2,666	2,725							
SPR	1,535	1,541	1,484	1,442	1,343	1,248							
Total	4,429	4,578	4,134	4,055	4,009	3,973							
Oil-on-water	1,033	1,148	1,202	1,222	1,290	1,386							
Days of forward consumption in OECD, days													
Commercial onland stocks	69	68	57	58	57	58							
SPR	37	34	32	32	29	27							
Total	105	102	89	89	86	85							
Memo items													
(a) - (b)	29.43	23.02	28.05	28.67	28.29	28.52	28.89	28.59	28.93	28.41	29.42	30.10	29.22

Note: Totals may not add up due to independent rounding.

Source: OPEC.

Oil Market Report - December 2022

Flagship report
December 2022

About this report

The IEA Oil Market Report (OMR) is one of the world's most authoritative and timely sources of data, forecasts and analysis on the global oil market – including detailed statistics and commentary on oil supply, demand, inventories, prices and refining activity, as well as oil trade for IEA and selected non-IEA countries.

Highlights

- World oil demand is set to contract by 110 kb/d y-o-y in 4Q22, reaching 100.8 mb/d, up by 130 kb/d compared with last month's Report. Strong gasoil use in key consuming countries outweighs weak European and Asian petrochemical deliveries. Oil demand growth has been increased to 2.3 mb/d (+140 kb/d) for 2022 as a whole and to 1.7 mb/d next year (+100 kb/d), when it will reach 101.6 mb/d.
- World oil supply fell 190 kb/d in November to 101.7 mb/d, breaking a five-month uptrend, after Saudi Arabia and other Gulf countries curbed supply in line with lower OPEC+ output targets. A steeper drop is expected next month as the EU ban on Russian crude imports and the G7 price cap take effect. Following annual gains this year of 4.7 mb/d, growth of 770 kb/d in 2023 will raise supply to 100.8 mb/d.
- Global refinery throughputs surged 2.2 mb/d in November to the highest since January 2020, resulting in sharply lower diesel and gasoline cracks and refinery margins. After ten consecutive quarters of estimated stock draws, refined product balances are expected to be back in positive territory in the first half of 2023.
- Russian oil exports increased by 270 kb/d to 8.1 mb/d, the highest since April as diesel exports rose by 300 kb/d to 1.1 mb/d. Crude oil loadings were largely unchanged m-o-m, even as shipments to the EU fell by 430 kb/d to 1.1 mb/d. Loadings to India reached a new high of 1.3 mb/d. Export revenues, however, dropped \$0.7 bn to \$15.8 bn on lower prices and wider discounts for Russian-origin products.
- Global observed inventories fell by 23.2 mb in October as product stocks fell for the first time since March and crude oil saw a smaller build. OECD industry stocks increased by 17.3 mb, to 2 765 mb, narrowing the deficit versus the five-year average to 150.2 mb, but OECD government stocks fell by 19.9 mb. Preliminary data for the US, Europe and Japan show industry stocks increased by 3.1 mb in November.
- Benchmark crude oil futures plunged by around \$8-9/bbl over the course of November and a further \$5/bbl in early December, as macro-economic headwinds took centre-stage and apprehension about OPEC+ cuts and EU embargoes faded. Nearby time spreads slumped amid growing evidence of a comfortably supplied Atlantic Basin, sending the front-end of the Brent and WTI curves into contango for the first time this year. At the time of writing, ICE Brent traded at \$80/bbl and Nymex WTI at \$75/bbl.

Winter blues

A weak macroeconomic environment and ample supply have knocked around \$15/bbl off benchmark crude prices over the past month. The sell-off comes despite lower OPEC+ production, an EU embargo on Russian crude oil coming into full force and a relaxation of China's Covid restrictions that **could pave** the way for a quicker demand recovery in the world's second largest oil consumer. At the time of writing, ICE Brent futures were around \$80/bbl while NYMEX WTI had slumped to \$75/bbl.

Russian prices saw steeper declines. Urals in Northwest Europe fell nearly \$30/bbl to \$43/bbl by early December, well below the \$60/bbl price cap finally agreed by G7, Australia and the EU. The price cap aims to facilitate trade with Moscow by allowing third-party buyers to use EU maritime services as long as they conclude purchases below that limit. But Russia maintains it would rather cut output than to sell oil to countries that impose the cap.

For now, Russian oil continues to flow. In November, total oil exports increased by 270 kb/d to 8.1 mb/d, the highest since April. Crude oil loadings were unchanged on the month at just over 5 mb/d, despite a 430 kb/d drop in shipments to Europe. By contrast, product flows (in particular of diesel) surged, including to Europe. Russian oil production rose 90 kb/d to 11.2 mb/d, just 200 kb/d below pre-invasion levels.

Along with a recovery in Kazakh and Nigerian production after months of operational challenges, that increase went some way to offset lower supply from other OPEC+ producers. The bloc cut its collective output ceiling by 2 mb/d from November, but actual crude production fell by only a quarter of that as most of the members were already producing well below their targets. **As for non-OPEC+ countries, output rose for a third consecutive month and was up by an impressive 3.1 mb/d since the start of the year, largely due to strong performances in the US, Brazil and the North Sea.**

Preliminary data show OECD crude oil stocks drew in November, reflecting a sharp rise in refinery demand. Global refinery runs surged by an estimated 2.2 mb/d last month, to 82.3 mb/d, the highest since January 2020. Increased supply of diesel and gasoline coincided with a seasonal lull in transport fuel demand, boosting product stocks which pulled refinery margins lower. In the US and Europe, diesel cracks made record monthly falls from October's historical peaks, but remain high.

Despite the seasonal slowdown in world oil demand and continued macro-economic headwinds, recent oil consumption data have surprised to the upside. This was especially apparent in non-OECD regions, including China, India and the Middle East. By contrast, OECD oil demand remained depressed as weak European and Asian petrochemical activity outweighed ongoing gas-to-oil switching in manufacturing processes. **Oil demand is now forecast to rise by 2.3 mb/d in 2022 and a further 1.7 mb/d next year, up around 140 kb/d compared with last month's Report.**

While lower oil prices come as a welcome relief to consumers faced by surging inflation, **the full impact of embargoes on Russian crude and product supplies remains to be seen.** As we move through the winter months and towards a tighter oil balance in 2023, another price rally cannot be ruled out.

OPEC+ crude oil production¹
million barrels per day

	Oct 2022 Supply	Nov 2022 Supply	Nov Prod vs Target	Nov-2022 Target	Sustainable Capacity ²	Eff Spare Cap vs Nov ³
Algeria	1.04	1.02	0.01	1.01	1.02	-0.0
Angola	1.05	1.09	-0.36	1.46	1.17	0.08
Congo	0.25	0.25	-0.06	0.31	0.28	0.03
Equatorial Guinea	0.06	0.06	-0.06	0.12	0.09	0.03
Gabon	0.22	0.2	0.02	0.18	0.2	0.0
Iraq	4.6	4.45	0.02	4.43	4.7	0.25
Kuwait	2.8	2.68	0.0	2.68	2.8	0.12
Nigeria	1.01	1.13	-0.61	1.74	1.33	0.2
Saudi Arabia	10.9	10.48	0.0	10.48	12.22	1.74
UAE	3.46	3.29	0.27	3.02	4.12	0.83
Total OPEC-10	25.39	24.65	-0.77	25.42	27.94	3.29
Iran ⁴	2.51	2.54			3.8	
Libya ⁴	1.18	1.15			1.2	0.05
Venezuela ⁴	0.71	0.68			0.76	0.08
Total OPEC	29.79	29.02			33.7	3.42
Azerbaijan	0.55	0.55	-0.13	0.68	0.58	0.03
Kazakhstan	1.45	1.68	0.05	1.63	1.65	-0.03
Mexico ⁵	1.62	1.64		1.75	1.66	0.02
Oman	0.88	0.84	0	0.84	0.86	0.02
Russia	9.72	9.81	-0.67	10.48	10.2	
Others ⁶	0.87	0.85	-0.21	1.06	0.93	0.09
Total Non-OPEC	15.1	15.37	-0.96	16.44	15.88	0.16
OPEC+ 19 in cut deal⁴	38.86	38.38	-1.72	40.1	42.16	3.43
Total OPEC+	44.89	44.39			49.58	3.58

1. Excludes condensates. 2. Capacity levels can be reached within 90 days and sustained for an extended period. 3. Excludes shut in Iranian, Russian crude. 4. Iran, Libya, Venezuela exempt from cuts. 5. Mexico excluded from OPEC+ compliance. Only cut in May, June 2020. 6. Bahrain, Brunei, Malaysia, Sudan and South Sudan.

IEA World Oil Supply and Demand Forecasts: Summary (Table)

2022-12-14 09:00:00.2 GMT

By Kristian Siedenburg

(Bloomberg) -- Following is a summary of world oil supply and demand forecasts from the International Energy Agency in Paris:

	4Q	3Q	2Q	1Q	4Q	3Q	2Q	1Q		
	2023	2023	2023	2023	2022	2022	2022	2022	2023	2022
Demand										
Total Demand	103.4	102.7	100.6	99.7	100.8	100.7	98.7	99.5	101.6	99.9
Total OECD	47.0	46.9	45.7	46.2	46.5	46.6	45.4	45.8	46.5	46.1
Americas	25.2	25.4	25.1	24.9	24.9	25.3	25.0	24.8	25.1	25.0
Europe	13.9	14.1	13.5	13.4	13.9	14.1	13.4	13.2	13.7	13.6
Asia Oceania	7.9	7.4	7.1	8.0	7.7	7.2	7.0	7.9	7.6	7.4
Non-OECD countries	56.4	55.8	54.9	53.5	54.3	54.1	53.3	53.7	55.2	53.8
FSU	4.9	4.9	4.6	4.6	4.9	5.1	4.7	4.7	4.7	4.9
Europe	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
China	16.6	16.0	15.7	15.0	15.4	14.8	14.4	15.4	15.8	15.0
Other Asia	14.8	14.1	14.3	14.4	14.0	13.4	14.0	14.1	14.4	13.9
Americas	6.2	6.3	6.1	5.9	6.1	6.3	6.1	5.9	6.1	6.1
Middle East	8.8	9.7	9.3	8.7	8.8	9.6	9.2	8.5	9.1	9.0
Africa	4.2	4.1	4.1	4.2	4.2	4.1	4.1	4.2	4.1	4.2
Supply										
Total Supply	n/a	n/a	n/a	n/a	n/a	101.1	98.8	98.7	n/a	n/a
Non-OPEC	66.8	66.6	66.1	65.8	66.9	66.1	64.7	64.9	66.3	65.7
Total OECD	31.4	30.9	30.6	30.5	30.4	29.7	28.9	28.8	30.8	29.5
Americas	27.4	27.1	26.7	26.6	26.7	26.2	25.4	25.0	26.9	25.8
Europe	3.5	3.4	3.4	3.4	3.3	3.1	3.0	3.3	3.4	3.2
Asia Oceania	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5
Non-OECD	30.0	29.9	30.0	30.4	31.2	30.9	30.5	31.4	30.1	31.0
FSU	12.4	12.4	12.5	13.0	13.9	13.7	13.4	14.4	12.6	13.8
Europe	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
China	4.2	4.2	4.2	4.3	4.1	4.1	4.2	4.2	4.2	4.2
Other Asia	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.8	2.6	2.7
Americas	6.2	6.1	6.1	6.0	5.9	5.8	5.5	5.4	6.1	5.7
Middle East	3.2	3.2	3.2	3.2	3.2	3.3	3.2	3.2	3.2	3.2
Africa	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Processing Gains	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3
Total OPEC	n/a	n/a	n/a	n/a	n/a	34.9	34.1	33.8	n/a	n/a
Crude	n/a	n/a	n/a	n/a	n/a	29.5	28.7	28.5	n/a	n/a
Natural gas										
liquids NGLs	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.3	5.4	5.3
Call on OPEC crude										
and stock change *	31.2	30.7	29.2	28.6	28.5	29.2	28.7	29.3	29.9	28.9

NOTE: Figures are in million of barrels per day. (*) equals total demand minus non-OPEC supply and OPEC natural gas liquids.

IEA changed the way it measures OPEC supply, adopting the industry-standard approach of counting most of Venezuela's Orinoco heavy oil as "crude oil."

SOURCE: International Energy Agency

To contact the reporter on this story: Kristian Siedenburg in Vienna at ksiedenburg@bloomberg.net

To contact the editors responsible for this story: Joshua Robinson at jrobinson37@bloomberg.net

Mark Evans

IEA: November Crude Oil Production in OPEC Countries (Table)

2022-12-14 09:00:00.1 GMT

By Kristian Siedenburg

(Bloomberg) -- Following is a summary of oil production in OPEC countries from the International Energy Agency in Paris:

	Nov.	Oct.	Nov.
	2022	2022	MoM
Total OPEC	29.02	29.79	-0.77
Total OPEC10	24.65	25.39	-0.74
Algeria	1.02	1.04	-0.02
Angola	1.09	1.05	0.04
Congo	0.25	0.25	0.00
Equatorial Guinea	0.06	0.06	0.00
Gabon	0.20	0.22	-0.02
Iraq	4.45	4.60	-0.15
Kuwait	2.68	2.80	-0.12
Nigeria	1.13	1.01	0.12
Saudi Arabia	10.48	10.90	-0.42
UAE	3.29	3.46	-0.17
Iran	2.54	2.51	0.03
Libya	1.15	1.18	-0.03
Venezuela	0.68	0.71	-0.03

NOTE: Figures are in million of barrels per day. Monthly level change calculated by Bloomberg. Production data excludes condensates.

OPEC10 excludes Iran, Libya and Venezuela.

SOURCE: International Energy Agency

To contact the reporter on this story:

Kristian Siedenburg in Vienna at ksiedenburg@bloomberg.net

To contact the editors responsible for this story:

Joshua Robinson at jrobinson37@bloomberg.net

Mark Evans

To view this story in Bloomberg click here:

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IEA Report Wrap: Oil Market Tightening in 2023 May Boost Prices

2022-12-14 10:01:32.601 GMT

By Brian Wingfield

(Bloomberg) -- Summary of stories from IEA's monthly Oil Market Report on Wednesday:

- * Oil prices may rally next year as Russian exports sink
- ** Oil-demand growth in 2023 boosted to 1.7m b/d
- ** Cites growth in India, resilience in China
- ** Russian output to plunge 14% by end of 1Q amid sanctions
- ** Global markets are on track to tighten next year
- * See summary of key IEA world oil supply and demand forecasts

- ** Click here for detailed quarterly forecast table
- * OPEC crude output fell 770k b/d in November on Saudi cuts
- ** Production of OPEC-13 group slips to 29.02m b/d
- ** Saudi output fell 420k b/d to 10.48m b/d, in line with the kingdom's reduced OPEC+ quota
- ** See full table for the 13 members
- ** Output of full OPEC+ group fell by 500k b/d to 44.39m b/d
- ** OPEC+ supply — for the 19 countries participating in production cuts — was 1.72m b/d below the output target in November
- * Russia oil revenues dropped in November amid discounts
- * **Russia oil exports rise to highest since April on diesel**
- * India to remain fastest-growing oil consumer until 2Q 2023
- * West African light crude hit by rival supplies and weaker Asia
- * **More gas-to-oil switching to help offset Europe's supply crunch**
- * Global oil product inventories set for build in 1Q
- * NOTE: OPEC issued its own monthly report on Tuesday, reducing estimates for the amount of crude it needs to pump in the coming months. The US EIA issued its monthly short-term energy outlook on Dec. 6, lowering its demand outlook
- * NOTE: OPEC+ on Dec. 4 agreed to maintain oil production at current levels

--With assistance from Grant Smith, Bill Lehane, Sherry Su, John Deane, Rachel Graham, Julian Lee and Kristian Siedenburg.

To contact the reporter on this story:

Brian Wingfield in London at bwingfield3@bloomberg.net

To contact the editors responsible for this story:

Alaric Nightingale at anightingal1@bloomberg.net

Rakteem Katakey, Brian Wingfield

To view this story in Bloomberg click here:

<https://blinks.bloomberg.com/news/stories/RMVDV1T0AFB4>

Oil Prices May Rally Next Year as Russian Exports Sink, IEA Says

2022-12-14 09:00:00.16 GMT

By Grant Smith

(Bloomberg) -- **Oil prices could rally next year as sanctions squeeze Russian supplies and demand beats earlier expectations**, the International Energy Agency said.

Russia's output — which defied the agency's previous predictions of collapse this year — **is poised to plunge 14% by the end of the first quarter**, the Paris-based IEA said in a **report on Wednesday**. If that forecasts holds true, it could

reverse the recent trend in oil futures, which have retreated to \$80 a barrel in London after their worst weekly slump in four months.

"While lower oil prices come as a welcome relief to consumers faced by surging inflation, the full impact of

embargoes on Russian crude and product supplies remains to be seen,” the IEA said. “As we move through the winter months and toward a tighter oil balance in the second quarter, another price rally cannot be ruled out.”

The IEA, which advises major economies, bolstered forecasts for global oil demand in 2023 by 300,000 barrels a day amid vigorous growth in India and surprising resilience in China. Consumption will grow by 1.7 million barrels a day next year to average 101.6 million a day.

Still, it’s a softer warning on prices than recent messages from the agency, which a few weeks ago was highlighting the risk of a supply squeeze and urging the OPEC+ coalition to reverse its latest production cuts.

The IEA acknowledged that Russian exports have continued to swell despite its repeated predictions that an international boycott would slash shipments. Moscow’s oil shipments climbed to a seven-month high of 8.1 million barrels a day in November, although revenue fell due to lower prices, according to the report.

Russia’s resilience also contributed to shallower cutbacks than expected from OPEC+, the IEA said. The 23-nation group led by Saudi Arabia reduced supplies last month by just a quarter of the 2 million barrels-a-day it had announced, as many members were already pumping below their designated quotas.

But global markets are on track to tighten up in 2023, according to the IEA.

Russian output will finally begin to buckle this month as European Union sanctions over its invasion of Ukraine force the country to shut in about 400,000 barrels a day, the agency predicts.

Production will tumble from current levels of about 11.2 million barrels a day to 9.6 million a day by the end of the first quarter, according to the report. President Vladimir Putin said last week that the country would reduce output rather than sell to buyers at the capped price level demanded by the G-7.

Meanwhile, “buoyant” consumption of gasoil in emerging economies suggests that world oil demand will grow at a faster rate next year than previously estimated. India has led the expansion in recent months, but will be overtaken again by China next year as the Asian giant emerges from strict “Covid Zero” restrictions. the IEA said.

“While restriction levels in the country remain high, the stage is now set for a progressive reopening in 2023,” according to the report.

To contact the reporter on this story:

Grant Smith in London at gsmith52@bloomberg.net

To contact the editor responsible for this story:

James Herron at jherron9@bloomberg.net

To view this story in Bloomberg click here:

<https://blinks.bloomberg.com/news/stories/RMVCSRT1UM1Z>

IEA World Oil Supply/Demand Key Forecasts

2022-12-14 09:00:00.4 GMT

By Kristian Siedenburg

(Bloomberg) -- World oil demand 2023 forecast was revised to 101.6m b/d from 101.4m b/d in Paris-based Intl Energy Agency's latest monthly report.

* 2022 world demand was revised to 99.9 from 99.8m b/d

* Demand change in 2023 est. 1.7% y/y or 1.7m b/d

* Non-OPEC supply 2023 was revised to 66.3m b/d from 66.1m b/d

* Call on OPEC crude 2023 was revised to 29.9m b/d from 29.8m b/d

* Call on OPEC crude 2022 was unrevised at 28.9m b/d

** OPEC crude production in Nov. fell by 770k b/d on the month to 29.02m b/d

* Detailed table: FIFW NSN RMVCIIGFWR28 <GO>

* NOTE: Fcasts based off IEA's table providing one decimal point

To contact the reporter on this story:

Kristian Siedenburg in Vienna at ksiedenburg@bloomberg.net

To contact the editors responsible for this story:

Joshua Robinson at jrobinson37@bloomberg.net

Mark Evans

To view this story in Bloomberg click here:

<https://blinks.bloomberg.com/news/stories/RMVCK1GEZ1FK>

OPEC Crude Output Fell 770k B/D in November on Saudi Cuts: IEA

2022-12-14 09:00:00.5 GMT

By Amanda Jordan

(Bloomberg) -- OPEC's November crude output dropped 770k b/d from a month earlier to 29.02m b/d as Saudi Arabia and its Persian Gulf neighbors made substantial cuts to supply, the IEA said in its monthly market report.

* Saudi production fell 420k b/d to 10.48m b/d, in line with the kingdom's reduced OPEC+ quota

* UAE supply declined 170k b/d to 3.29m b/d, still above its target

* Iraqi production slipped 150k b/d to 4.45m b/d, just above its quota; Kuwaiti volumes fell 120k b/d to 2.68m b/d

* Output in Iran, exempt from the OPEC+ agreement, inched up 30k b/d to 2.54m b/d

* African volumes rose, with Nigerian supply expanding by 120k b/d to 1.13m b/d and Angolan output increasing 40k b/d to 1.09m b/d

* Libyan volumes slid 30k b/d to 1.15m b/d

* Venezuelan output fell 30k b/d to 680k b/d

* NOTE: On Tuesday, OPEC released its own production figures for November, estimating its 13 members pumped 28.83m b/d

To contact the reporter on this story:

Amanda Jordan in London at ajordan11@bloomberg.net

To contact the editors responsible for this story:

James Herron at jherron9@bloomberg.net

Dylan Griffiths

To view this story in Bloomberg click here:

<https://blinks.bloomberg.com/news/stories/RMVDRVT1UM0Y>

Russia Oil Revenues Dropped in November Amid Discounts, IEA Says

2022-12-14 09:00:00.6 GMT

By Bloomberg News

(Bloomberg) -- Russia's oil revenues dropped in November to the second-lowest level this year as rising exports couldn't offset widening discounts on the nation's barrels, according to the International Energy Agency.

Russia earned about \$15.8 billion from oil sales last month, the IEA estimated in its market report on Wednesday. The lowest monthly revenue this year was \$14.7 billion in September, which was in line with the 2021 average.

Energy exports are the single largest source of revenue for the Russian budget and Western nations aim to reduce the flow of money that's funding the Kremlin's attack on Ukraine. From Dec. 5, the European Union and G-7 imposed a \$60 a barrel price cap on Russian oil by restricting access to insurance and shipping services for any buyers that don't adhere to the threshold.



November's decline in revenue came as the price of Urals, the key Russian export crude blend, slid to about \$43 per barrel as of early December, the IEA said.

Russia's President Vladimir Putin last week said the price cap won't have a significant impact on the nation's budget but may harm the global energy market. The country may cut its oil production in response to the restrictions, he said.

READ: Russian Budget Surplus More Than Quadruples on Energy Cash Spike

Russia's exports of crude oil and products rose to 8.1 million barrels a day last month, the highest level since April, according to the IEA. However, new sanctions that came into force in December may force the country to cut output by some 400,000 barrels a day, the agency said.

It predicted further losses in the first quarter after the EU bans imports of Russian oil products. with output dropping by about 1.8 million barrels a day by the end of the period, compared to pre-invasion levels. This nation's average daily output next year will be about to 9.6 million barrels a day, it said, reiterating its earlier outlook.

Russia's oil producers pumped an average of 10.9 million barrels a day in November, according to industry data seen by Bloomberg.

To contact Bloomberg News staff for this story:

James Herron in London at jherron9@bloomberg.net

To contact the editor responsible for this story:

James Herron at jherron9@bloomberg.net

To view this story in Bloomberg click here:

<https://blinks.bloomberg.com/news/stories/RMVCOVT1UMOW>

Russia Oil Exports Rise to Highest Since April on Diesel: IEA

2022-12-14 09:00:00.8 GMT

By Sherry Su

(Bloomberg) -- Russian oil exports jumped by 270k b/d to 8.1m b/d in November, the highest since April, amid a surge in diesel exports, the IEA said in its monthly Oil Market Report. Shipments to India rose to a record 1.3m b/d.

* Overall, crude oil loadings were unchanged m/m, while diesel exports surged 300k b/d to 1.1m b/d, partially offset by a 100k b/d decline in fuel oil

** Export revenues dropped \$0.7 billion to \$15.8 billion due to lower prices and wider discounts for Russian-origin products

* Crude exports to the EU fell by 430k b/d to 1.1m b/d. Seaborne volumes dropped by 330k b/d to 500k b/d, below Druzhba pipeline deliveries (590k b/d) for the first time, the IEA said

** From Dec. 5, just 350k b/d of Druzhba and 100k b/d of seaborne volumes are permitted to continue flowing into EU countries amid sanctions: IEA

* Diesel loadings to the EU rose 210k b/d to 720k b/d, helping to drive diesel margins lower

** "After a two-month pause in June and July, the UK has imported one Russian fuel oil or vacuum gas oil cargo in each of the past four months"

* Russian crude oil exports to China were unchanged while loadings for Turkey fell by 150k b/d

* Russian port regulator Rosmorport has created a reverse lightering zone for clean products and LPG near Ust-Luga in the Baltic Sea: IEA

** Smaller tankers loading at Baltic ports will be able to do ship-to-ship transfers onto bigger vessels; ice breakers or ice class tankers are also expected

To contact the reporter on this story:

Sherry Su in London at lsu23@bloomberg.net

To contact the editors responsible for this story:

Alaric Nightingale at anightingal1@bloomberg.net

Brian Wingfield

To view this story in Bloomberg click here:

<https://blinks.bloomberg.com/news/stories/RMVCVHT0G1KW>

India to Remain Fastest-Growing Oil Consumer Until 2Q 2023: IEA

2022-12-14 09:00:00.9 GMT

By Julian Lee

(Bloomberg) -- India, the world's third-largest oil user, is expected to remain the fastest-growing oil market until China's easing Covid restrictions take that nation back to the top spot in 2Q 2023, the IEA says in its monthly report.

*** Indian oil demand growth overtook China and the US in 2Q 2022, with consumption rising by 670k b/d y/y**

** Demand for all major products except naphtha and jet/kerosene are back above their 2019 levels

* India has been less affected than the world's other big consumers this year by the impact of the war in Ukraine and the Covid-19 pandemic

*** Gasoil use, closely linked to economic activity, has led demand growth in India**

*** Gasoline consumption also "rose quickly" as people shunned public transport in favor of private vehicles**

* India's fuel prices have been held flat since June and are almost unchanged y/y

** In contrast, US diesel prices in October were up 50% y/y and 14% higher in China

* US oil demand growth has slowed in 2022 amid central bank efforts to tame inflation that has been stoked, in part, by Russia's invasion of Ukraine

* The Chinese government's strict Covid Zero policy has sent that country's oil demand growth into reverse

To contact the reporter on this story:

Julian Lee in London at jlee1627@bloomberg.net

To contact the editors responsible for this story:

Alaric Nightingale at anightingal1@bloomberg.net

Amanda Jordan

To view this story in Bloomberg click here:

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West African Light Crude Hit by Rival Supplies, Weaker Asia: IEA

2022-12-14 09:00:00.10 GMT

By Bill Lehane

(Bloomberg) -- **West African light sweet crude premiums to Dated Brent softened last month due to weak buying from Asia and a continuing flood of rival transatlantic light barrels into Europe, IEA says in monthly report.**

* Higher freight rates were a significant drag on demand from Europe, Asia, while the restarts of Bonny Light, Forcados also added more light sweet crude to the market, the IEA said

* Nigeria's Qua Iboe saw its premium to Dated slump by nearly half, shedding \$1.31 per barrel to \$1.41/bbl

* Brass River dropped by \$2.51/bbl to a 14c/bbl discount to Dated; Bonny Light - \$2/bbl to -13c/bbl

* Forcados -17c to +\$1.90/bbl, supported by resilient demand for middle distillate rich crude

* Angola's Girassol -83c to +\$1.67/bbl, Cabinda -\$1.32/bbl to +78c/bbl on weaker Asian demand

To contact the reporter on this story:

Bill Lehane in London at blehane@bloomberg.net

To contact the editors responsible for this story:

Alaric Nightingale at anightingal1@bloomberg.net

Andrew Reiersen

To view this story in Bloomberg click here:

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IEA Sees More Gas-to-Oil Switching, Helping Offset Supply Crunch

2022-12-14 09:00:00.49 GMT

By Jack Wittels and Rachel Graham

(Bloomberg) -- **Industrial users in Europe continued switching from natural gas to "considerably cheaper" gasoil, the International Energy Agency said in its monthly Oil Market Report.**

* This "helps offset fears of a gas supply crunch over the winter and into 2023 and 2024"

* IEA now expects roughly 550k b/d total switching-related deliveries in Europe this quarter and next, 80k b/d higher than in last month's report

** "This upwards revision is almost entirely comprised of gasoil"

* Global gasoil deliveries rose by 520k b/d y/y in 3Q, "exceeding expectations in almost all regions"

** Initial data for October indicate much of this strength

continued into early 4Q

** “We now expect quarterly gasoil demand to reach a standstill rather than contracting”

* Separately, naphtha deliveries in OECD Europe are currently at their weakest in more than 15 years

** Average 2022 demand expected to fall below 1m b/d for first time since at least 2005, at 990k b/d

** No recovery expected next year

To contact the reporters on this story:

Jack Wittels in London at jwittels1@bloomberg.net;

Rachel Graham in London at rgraham13@bloomberg.net

To contact the editors responsible for this story:

Alaric Nightingale at anightingal1@bloomberg.net

Brian Wingfield

To view this story in Bloomberg click here:

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Global Oil Product Inventories Set for Build in 1Q, IEA Says

2022-12-14 09:00:00.7 GMT

By Rachel Graham

(Bloomberg) -- Refined product inventories will build in the first three months of next year after drawing every quarter since 3Q 2020, the IEA said in its monthly market report.

* Global crude throughput is forecast to fall q/q to 80.9m b/d in 1Q

* For 2023 as a whole, crude runs are forecast to rise, partly as the Middle East adds capacity

** Kuwait’s 615k b/d Al-Zour refinery has started its first distillation unit, with the remaining two set to come online over the course of next year

* China runs could see a seasonal slowdown in January and February. Yet with run rates below 80%, there is “clear upside potential” depending on domestic and export demand

** The startup of Shenghong and trial runs at Jieyang resulted in a m/m increase in runs of 300k b/d in November, according to IEA estimates

* Global 2023 crude runs forecast at 82.1m b/d, about 100k b/d below 2019 levels

To contact the reporter on this story: Rachel Graham in London at rgraham13@bloomberg.net

Marketplace review

A year of disruption and dislocation in commodity markets



Saad Rahim
Chief Economist

Overview

As the global economy emerged from COVID-19 and picked up speed, initial expectations were for 2022 to be a less volatile year. By any measure, this turned out not to be the case.

Indeed, at the start of our financial year in October 2021, it seemed the lack of investment in new supply, combined with post-pandemic demand recovery, would result in significant tightness in numerous commodity markets.

The fact that markets were in a fragile state to begin with magnified the shock from Russia's invasion of Ukraine in February 2022 and led to unprecedented price volatility.

The war has upended historic commodity trade flows, led to record low inventories in many commodities and created uncertainty about supply. Sanctions added multiple layers of complexity and disruption.

Throughout the tumult, commodity prices have consistently struggled to reflect underlying supply and demand.

This is due primarily to three major macroeconomic headwinds that overwhelmed the fundamentals: Central Banks, led by the US Federal Reserve, raising interest rates rapidly to combat the highest inflation in decades; Europe's energy crisis; and China's zero-COVID-19 policies and property sector weakness.

Taking the first point, supply chain disruptions, a surge in demand as lockdown restrictions eased, record low inventories of housing and vehicles, and a lack of workers all contributed to inflationary pressures.

This was especially true in the US, as the population shifted from consuming goods to services, which in turn drove wages higher, resulting in yet more inflationary pressures. Europe, meanwhile, had to contend not just with these factors, but also with soaring energy costs resulting from Russian curtailment of gas supplies.

Central banks responded by sharply lifting benchmark policy rates in a very short period of time. Rising US yields and concerns about the impact of tighter financial conditions on the global economy saw the US dollar strengthen substantially, to the highest level in over 20 years against major currencies, and the highest ever in the case of many others. This was another challenge for commodity prices, which are denominated in US dollars.

While rising energy costs have contributed to inflation across the world, they have been particularly pronounced in Europe, due to the curtailment of Russian exports of gas. This was the second headwind.

Although Russian flows to Europe had already started to decline in 2021, it is only in the months following the invasion of Ukraine that the full weight of Moscow's cuts came to bear.

Over the course of the second and third quarters of 2022, flows dropped by 80 percent versus pre-invasion levels and sent power and gas prices in Europe soaring to record levels. Europe's benchmark gas price (TTF) rose from a long-term average of close to €20 per megawatt hour to well over €300/MWh, while power prices spiked to a record of over €700/MWh in some of the major, western European countries.

As a result, many big industrial consumers in Europe were forced to curtail output. The prospect of further cuts raised the spectre of a major industrial recession, dampening sentiment and the outlook for demand.

The third major macro-economic headwind was China's growth, which was weaker than expected for two main reasons.

The first of these was the impacts of China's zero-COVID-19 policies, which led to restrictions being imposed on large parts of the country in the second quarter of 2022.

Shanghai in particular saw an extended period of lockdown, and given its status as a main financial and manufacturing hub, the impacts on activity and sentiment were widespread. More broadly, the unpredictable nature of outbreaks and the stringency of lockdown restrictions meant consumer and investor confidence remained subdued for most of the year. The impact was magnified by the second factor: ongoing weakness in the property sector, brought about in part by the government's attempts to manage the indebtedness of key players in that sector.

Although growth outside the property sector rebounded materially in the third quarter of 2022, as shown by dwindling stockpiles of base metals and other production and investment indicators, the weakness in property has soured investor sentiment.

In this "macro versus micro" environment, commodity prices struggled to perform, and in many cases seemed to have completely disconnected from physical market realities.

Oil markets

Oil markets were buffeted on one side by constrained supply, due to under-investment and sanctions, and on the other side by potential demand weakness, caused by China's zero-COVID-19 lockdowns and higher prices.

By the middle of the year, prices seemed set to move higher thanks to stresses on the supply side, which looked difficult if not impossible to solve in the near term.

However, the underlying tightness in markets was masked as Organisation for Economic Cooperation and Development (OECD) governments chose to try and cushion the impact of higher prices on consumers by authorising unprecedented releases from their respective strategic reserves.

The impact was most acutely felt in the US, due to the release of 180 million barrels of crude into the market.

This oil flowed into commercial inventories, allowing them to hold at levels that by end of the year were well within historical ranges, giving the appearance of a well-supplied market.

As a result, however, the US Strategic Petroleum Reserve (SPR) fell to under 400 million barrels for the first time since 1984, as demand remained relatively robust despite high prices, leading to inventory draws.

A major reason why SPR releases were needed is because supply has continued to be constrained. Consensus projections coming into this year were for US oil production to grow by close to one million barrels per day (December-to-December), but instead, production has grown only approximately 0.3 million barrels per day.

The lack of growth reflects lower investment rates in the sector, as companies have prioritised shareholder returns and capital discipline over increasing capital expenditures and production.

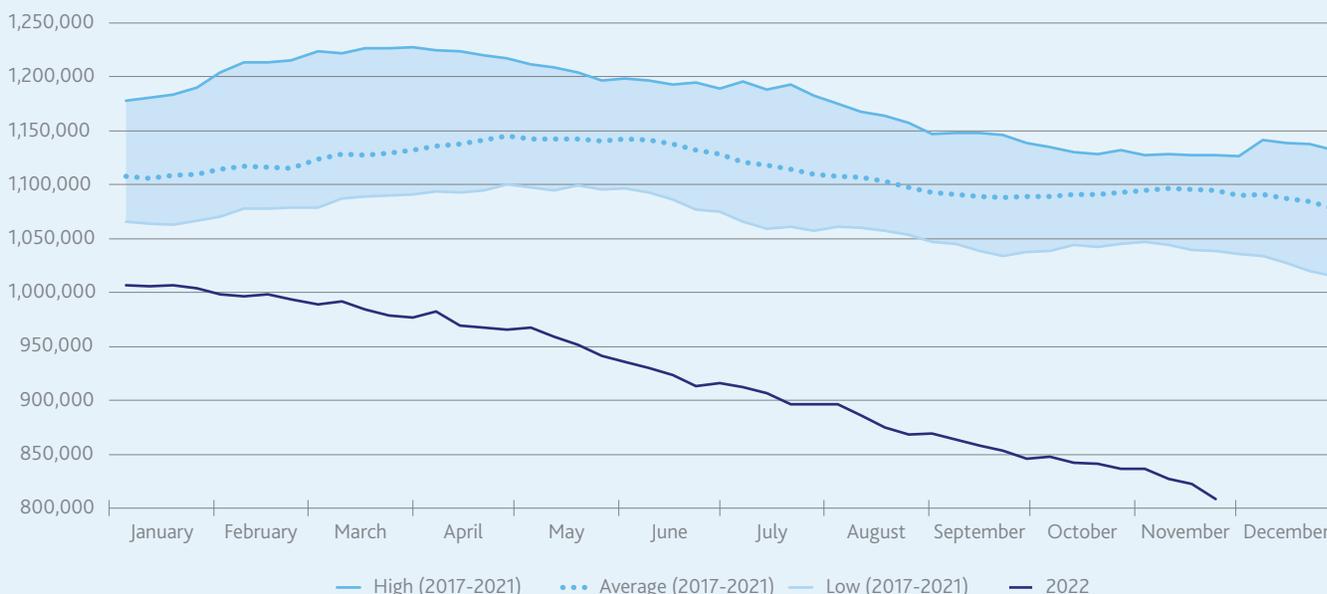
As such, while the rig count (as a proxy for overall investment) continued its post-pandemic rebound in the earlier part of the year, it has effectively flat-lined since June 2022, limiting the scope for further production gains.

The other notional source of additional supply has traditionally been OPEC and its allies. Not only did they recently agree to a two million barrel per day output cut, but their production capacity is falling short of expectations due to years of under-investment.

Even prior to the Russian invasion of Ukraine, OPEC+ producers were collectively under-performing their production quotas by over 1.5 million barrels per day, as the output of members outside the "core OPEC" countries of Saudi Arabia, Iraq, UAE and Kuwait hit multi-decade lows. New capacity is being brought on in the core group, but outside of the UAE it will take some years yet to reach the market.

US crude inventories including Strategic Petroleum Reserve

Stated in thousand barrels



Source: Energy Intelligence Agency (EIA)

And this is all before the extent of the impact of sanctions and the G7 price cap on Russian oil flows is known. While the overall intent of the EU and US is to redirect flows, not reduce them, the uncertainty involved in dealing with such an extensive and inter-connected market means that in reality there is likely to be at least some impact.

If nothing else, the redirection of Russian barrels from Europe to other markets such as India and China – and from Arabian Gulf and US barrels to Europe to compensate – has turned the shipping market on its head.

Increased transit times have effectively taken vessels out of the supply pool, pushing daily freight rates significantly higher than they were previously, with rates for some classes of clean product tankers reaching new records.

Oil demand overall has struggled to regain its pre-pandemic highs, but this is in large part due to the impact of China's zero-COVID-19 policies, which have restricted travel both domestically and internationally. Even when these policies were relaxed, the risk of further lockdowns impacted domestic travel plans and dampened demand.

But while growth might have been softer than anticipated, it was certainly not contractionary. Indeed, the International Energy Agency's latest report estimated 2022 oil demand growth at 2.1 million barrels per day – a strong increase relative to history.

Metals markets

The dominant theme in metals this year has been Chinese demand, overwhelming all other factors, including record low inventories for key metals such as copper.

The dual headwinds of China's zero-COVID-19 policy and weak property sector drove investor sentiment to the degree that even though demand was robust in the second half of the year and stocks dwindled, prices declined.

How metal prices perform from here will depend on China's exit from COVID-19 lockdowns, in terms of timing and sustainability, and also on the property sector not getting worse.

Perhaps no other metal has shown the 'macro versus micro' conflict better than copper. By the end of our fiscal year in September, copper stocks had fallen to the lowest level in modern history in terms of days of use, and the lowest absolute levels since 2007. And yet the price was USD3,000 per tonne below the record levels reached in March.

Still, the price has started to pick up since the start of October, helped by a strong rebound in Chinese copper demand. Contrary to what media reporting and sentiment might indicate, China's copper demand in the second half of 2022 should grow by close to seven percent year-on-year.

The pick-up has been led by many of the same sectors that drove ex-China growth in the first half of the year, but with particular emphasis on the expansion of the grid and electric vehicle production. Overall, global demand for refined copper is set to grow by a healthy 2.8 percent over 2022.

Global refined copper stocks in days of use

Stated in days of use



US dollar strength headwind for commodities

Stated in USD/metric tonne

Stated in Euro:USD



Source: Bloomberg Finance L.P., Trafigura Research

The year ahead

Looking forward, the world appears poised for more volatility and uncertainty. The war in Ukraine continues and could cause further disruption to global trade if the conflict escalates. Inflation may be coming off its peak, thanks in no small part to declining energy prices, but it remains too high for comfort.

As such, central banks are still in the mode of tightening financial conditions, and the full impacts have yet to be felt, especially as we are still not at the end of the rate-hiking cycle.

China may be looking towards a gradual re-opening, but a massive resurgence in COVID-19 cases could see Beijing revert to previous lockdown measures. A colder-than-normal winter plus any further disruptions to gas supplies could trigger a fresh spike in European energy prices.

And yet, as of now, global economic growth may be slower, but is far from contracting. Labour markets remain very healthy, consumer spending remains robust, and credit markets show no signs of stress. A continuing reversal in the US dollar, rates and inflation will all be tailwinds for global growth. Governments have embarked on major renewable and infrastructure investment programmes that should provide a source of sustained future demand, in particular for key metals.

However, renewed demand growth will run up against the realities of structural under-investment across commodities. Given how low inventories are for key raw materials already, together with a lack of readily available spare capacity, any sustained rebound in consumption could lead to significant tightness and a supply crunch.

Indeed, we appear to be running the risk of moving away from a world of commodity cycles to one of commodity spikes, where a lack of production capacity results in prices rising to levels that cause demand destruction, before falling. But even then, prices will remain elevated, given how long it takes to bring online new projects and the unyielding focus on capital discipline and shareholder returns of the major mining houses and big oil companies.

Performance review

Oil and Petroleum Products

A record performance for Trafigura's Oil and Petroleum Products Trading division for a third consecutive year.

Jose Maria Larocca
Ben Luckock
Hadi Hallouche
Co-Heads of Oil Trading

312.5_{mmt}

Total volume traded
(2021: 330.3mmt)

6.6_m

Average barrels traded
per day
(2021: 7.0m)

Oil and Petroleum Products volumes traded (mmt)

	2022	2021
Biofuel	0.7	0.6
Bitumen	0.2	0.3
Condensates	2.0	1.7
Crude oil	149.0	156.0
Fuel oil	36.7	38.4
Gasoline	24.3	24.8
Liquefied petroleum gas (LPG)	7.8	8.3
Liquefied natural gas (LNG) ¹	13.0	14.0
Middle distillates	41.4	46.7
Naphtha	13.6	16.2
Natural gas ¹	23.7	23.2
Total	312.5	330.3

¹ Million metric tonnes of oil equivalent.

Performance overview

The impact of the COVID-19 pandemic and the subsequent rebound in demand in most key economies placed further pressure on previously efficient global supply chains in the first half of our financial year. But these disruptions were eclipsed by the impact of Russia's invasion of Ukraine in February, which required a fundamental reworking of energy supply routes – in addition to the significant humanitarian impact of the war in Ukraine.

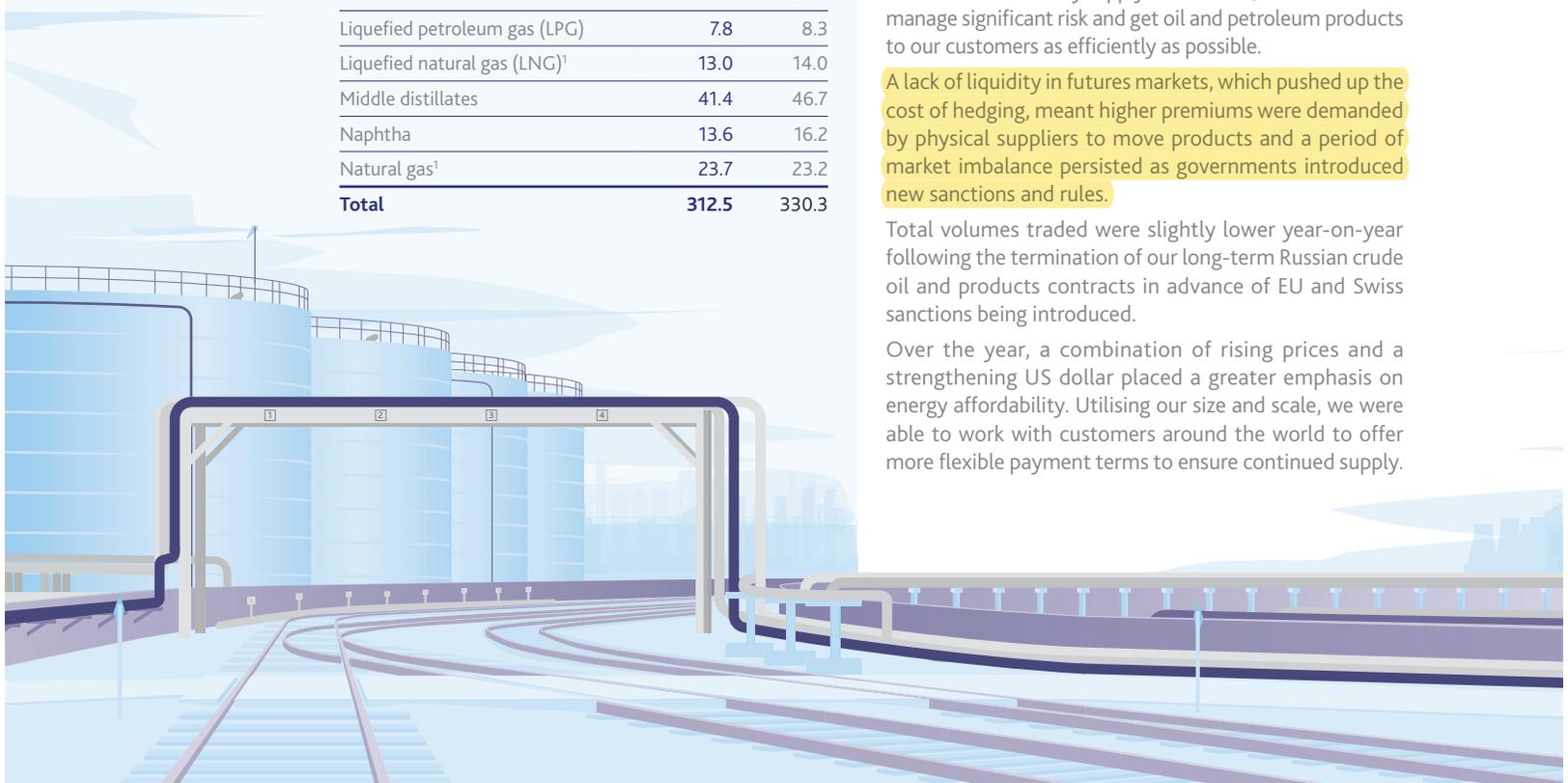
With an increased focus on security of supply, against a backdrop of heightened market volatility, our Oil and Petroleum Products division delivered a record result in 2022.

Key to this performance was a determination to help our customers adjust to changing trade flows, as well as close coordination between each of our trading teams. This allowed the division to identify supply bottlenecks, ensure we could manage significant risk and get oil and petroleum products to our customers as efficiently as possible.

A lack of liquidity in futures markets, which pushed up the cost of hedging, meant higher premiums were demanded by physical suppliers to move products and a period of market imbalance persisted as governments introduced new sanctions and rules.

Total volumes traded were slightly lower year-on-year following the termination of our long-term Russian crude oil and products contracts in advance of EU and Swiss sanctions being introduced.

Over the year, a combination of rising prices and a strengthening US dollar placed a greater emphasis on energy affordability. Utilising our size and scale, we were able to work with customers around the world to offer more flexible payment terms to ensure continued supply.



At the same time, we added a number of new commodities to our product offering including aviation gas, biofuels, base oil, petrochemicals and ammonia, a precursor to low carbon ammonia becoming a globally traded fuel source, in particular for the shipping industry and to transport hydrogen. These more specialised commodities are high value products that allow us to offer a wider service to customers and exploit synergies with other trading activities across the business.

Looking ahead, we expect the crude oil market to remain unsettled in 2023, as low global inventories and geopolitical instability run up against concerns of slowing global growth as central banks raise interest rates to fight inflationary pressures. Managing the repercussions from these changes will be the main priority for the division in 2023.

Crude oil

The global crude oil market was volatile in 2022, as demand remained strong but supply was pressured by the war in Ukraine and active market management by OPEC and its allies. This included a period of near record prices and backwardation¹.

The sanctions levied on Russia following the full invasion of Ukraine changed long-established trade flows and forced consumers in Europe and a number of other countries to look further afield for supplies.

Our global footprint and experienced teams enabled us to adapt to these fast-changing market dynamics. Clear communication and decisive action were key in understanding disrupted markets and providing security of supply for our customers.

Volumes were slightly lower, in part due to the decision to terminate long-term contracts to offtake Russian origin crude oil.

During the year, we struck supply deals with a number of refiners and secured new offtake arrangements with producers in Canada and West Africa. The Crude oil team also continued to build on Trafigura's long-established position in US shale oil, expanding its customer base and introducing Midland West Texas Intermediate to several end users that have not used the grade before. The decision to add US Midland West Texas Intermediate to the benchmark assessment for Brent should boost demand and customer acceptance.

Gasoline

Demand for gasoline remained below its pre-COVID-19 levels in 2022, with the shift to homeworking, particularly in the US, continuing to affect commuter traffic levels.

Following the invasion of Ukraine, there were concerns that sanctions placed on Russian exports of vacuum gas oil would affect US refinery runs and a reduction in Russian naphtha supply would shrink global gasoline supply. Consequently, we witnessed a large increase in refinery margins.

Against this backdrop, our Gasoline team performed strongly and volumes remained consistent with the same period in 2021. The highlight of the year was the expansion of our European business, which will continue to be an important driver for the Gasoline team over the next 12 months.

In the year ahead, several themes will shape the gasoline market, including the trend towards working from home and a policy change in China to increase refinery runs. At the same time, supply chain disruptions caused by the Russia-Ukraine conflict will continue to create regional imbalances and periodic distortions.

Naphtha and condensates

Faltering demand and ample supply were the main drivers of the naphtha market in 2022, as the conditions that prevailed in the previous financial year were almost reversed.

In Asia, the petrochemicals industry struggled as strict COVID-19 policies took their toll on economic activity in China, while European producers were hit with rising costs and slowing growth, impacting their margins. On the supply side, refinery runs picked up. The result was an oversupplied market and naphtha was forced to reprice at a level where a lot more of it could be used in gasoline blending. In condensates, it was a year where heavier grades did significantly better as a result of their higher middle distillates yield.

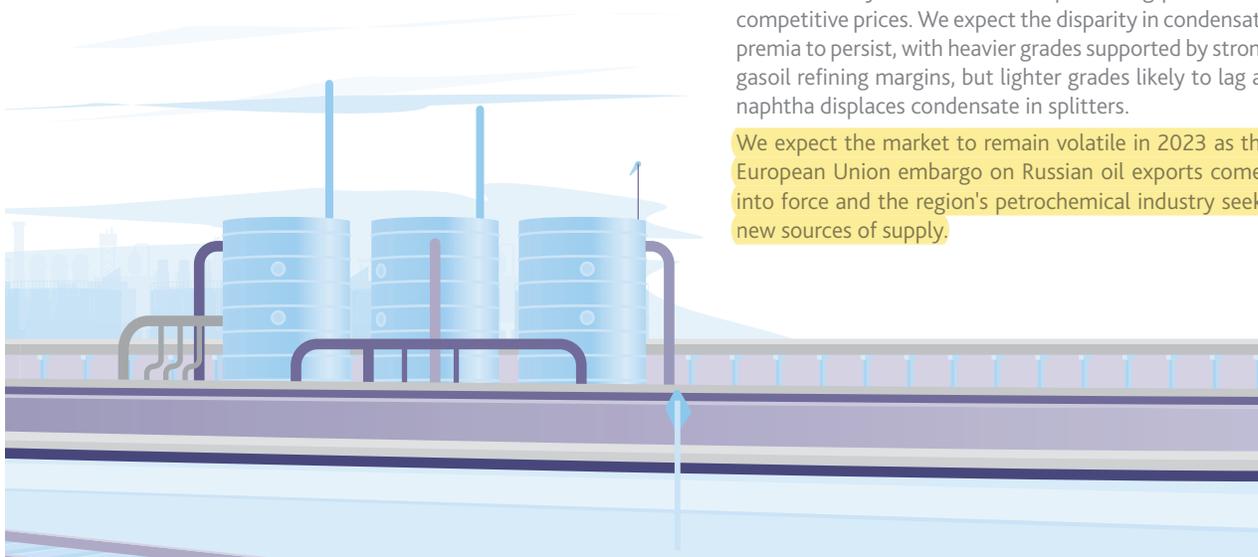
Our Naphtha and Condensates team seized on these changing market dynamics to deliver a strong performance over the year, using its global reach and diversified portfolio to help balance supply and demand. However, volumes were down on 2021 as a result of reduced activity in Russia following the invasion of Ukraine.

Given our global footprint and access to storage and shipping, the Naphtha and Condensates team is in a strong position to help its customers adapt to changing trade flows and market dynamics and to keep sourcing products at competitive prices. We expect the disparity in condensate premia to persist, with heavier grades supported by strong gasoil refining margins, but lighter grades likely to lag as naphtha displaces condensate in splitters.

We expect the market to remain volatile in 2023 as the European Union embargo on Russian oil exports comes into force and the region's petrochemical industry seeks new sources of supply.



www.trafigura.com/oil



¹ A market structure where prompt contracts trade above later-dated ones in a sign of tightening supplies.



▲ Marine fuel bunkering, Algoa Bay, South Africa.

Fuel oil

High prices, low stocks and volatility were the key features of bunker and fuel oil markets in 2022. On the supply side, traditional trade flows were disrupted by the war in Ukraine and the subsequent sanctioning of Russian oil. At the same time, fuel consumption continued its post-pandemic recovery as reflected by increased bunker demand. There was also greater use of fuel oil in power plants as a result of soaring gas prices. Together, this led to heavily backwarddated markets and record-high premia.

Our Fuel oil trading team performed exceptionally well in this challenging environment, stepping up as a stable and reliable supplier as many rivals struggled to access the finance or hedging tools needed to handle unprecedented market volatility. Although our traded volumes fell in Europe, we increased our presence in Asia and expanded our footprint in the Americas.

In addition to our strong performance in physical trading, we continued to expand our operations with TFG Marine, the bunkering joint venture between Trafigura Marine Logistics, Frontline and Golden Ocean, building our volumes and customer base year on year. We also established a new base oil trading book, a product used by refineries to make lubricating oil and greases, quickly finding synergies with our current customer base.

Looking forward, the key challenge for the Fuel oil team will be understanding and handling the impact on supply and demand of heightened geopolitical tensions, tighter monetary policy and a changing competitive landscape.

Distillates

The distillates market in 2022, was a story of strongly rising demand as the post-pandemic economic recovery continued. Gas-to-oil switching provided a further demand kicker. The global refining system struggled to increase production fast enough, while supply chains had to be consistently rearranged amid complex web of sanctions on Russian oil and diesel flows. In addition to those factors, extreme weather events and significantly higher gas prices in Europe resulted in a large volume of diesel being used.

Against this backdrop, it was a highly successful year for the Distillates team. Lower volumes meant we were able to focus on core markets and help key clients make sense of an increasing complex supply picture.

The team was able to extend its reach into industries that had previously relied on gas but were looking for cheaper options to power their operations. This highlighted the ability of Trafigura to draw on a deep pool of expertise to help create new supply chains.

We made sure storage positions did not become over troublesome in a heavily backwarddated market and we were alert to inflationary pressures in shipping and liquidity requirements to enable us to hedge price exposure.

The outlook for 2023 will depend on the balance between slowing global growth and the extent of gas-to-oil switching. The availability of cargoes as Europe's embargo on Russian diesel comes into force will be another factor in determining the direction of the distillates market.

Bitumen

Commodity prices and high energy costs were the main influences on the bitumen market in 2022. The year started slowly, in terms of paving activity, especially in developing countries, which struggled with the rising cost of bitumen. COVID-19 lockdowns in China weighed on demand in the Far East for the third year in a row. As we progressed through the year and the roadwork season started in the US and northwestern Europe, consumption started to pick up, creating business opportunities mainly in the Atlantic basin.

On the supply side, production was ample because of a strong pickup in transport fuel demand, which triggered higher refinery runs globally.

Our Bitumen team was able to react quickly to these regional trends and deliver a stronger performance on a year-on-year basis, using storage capacity and our large fleet of bitumen carriers to win tenders and supply customers. Volumes were broadly stable across the financial year.

The outlook for the year ahead is highly uncertain and dependent on the impact of tighter financial conditions as central banks raise interest rates and uncertainty over the rate of crude and fuel oil production next year.

Biofuels

Biofuel markets were rocked by extreme turbulence in 2022, with prices swinging from levels high enough to spark demand destruction to lows that made it a cheaper blending component than fossil fuels in some regions of the world.

Adding to the volatility, some countries in Europe also slashed their blending mandates to reduce prices at the pump for consumers and because of concerns about supplies of grain, vegetable oils and gas following events in Ukraine. As the war continues, other countries could do the same, placing a question mark over biofuel demand in the year ahead.

Notwithstanding these developments, we remain committed to continuing to find ways to grow and expand our customer base. The Biofuels team performed exceptionally well during the year, weathering a multitude of storms, while at the same time expanding our business in Europe, Latin America and Asia.

As we head into 2023, a strong focus will remain on any further changes to government policies and blending mandates. We will continue to look for synergies between our biofuels and the rest of our refined products business.

Liquefied petroleum gas

Unlike other parts of the oil industry, liquefied petroleum gas (LPG) experienced little impact from the war in Ukraine. The main driver of the market in 2022 was sluggish economic growth in Asia, and China in particular, as a result of strict COVID-19 policies and weakness in the property and petrochemicals sectors. This dented demand for LPG from the Chinese petrochemicals industry, which also had to contend with weak export markets in Europe.

On the supply side, we continued to see an increase in LPG exports, with strong flows out of the US and the Arabian Gulf. We expect production growth to continue in 2023, although infrastructure bottlenecks could crimp supplies from the US.

Over the financial year, our LPG business continued to expand its geographical reach and the scope of its operations. Our portfolio now includes ammonia, a fuel we expect to play a meaningful role in the energy transition.

While we expect more challenging conditions in 2023, large flows of LPG will still need to be moved between regions to balance the market. We expect to play a meaningful role in this process and also in helping Europe seek alternative sources of supply as trading flows of other products are further affected as a consequence of the war in Ukraine.

Liquefied natural gas and natural gas

In 2022, natural gas made headline news as prices rocketed to unprecedented levels deepening the energy crisis in Europe.

Over the past two years, Russia has been steadily reducing its sales to the bloc so that today they are now at a fraction of pre-pandemic levels.

To compensate, Europe has been forced to restart its fleet of coal-fired power stations, extend the life of ageing nuclear power plants and bid aggressively for every available cargo of liquified natural gas (LNG) on the market.

In this environment, our Integrated Gas and LNG team performed well. However, our immediate priority following Russia's invasion of Ukraine in February 2022 was ensuring the safety of colleagues in Kyiv, who had built a successful domestic trading business.

Our LNG and Natural gas team also got to work helping customers adapt to the new market realities caused by the war and the reordering of global energy flows.

Using our network of leased pipelines, we were able to carry gas from the Permian Basin, which straddles West Texas and southeastern New Mexico, to liquefaction plants on the coast, then across the Atlantic to deliver it to our regasification slots in Europe.

From here, our LNG and Natural gas team was able to trade and deliver the molecules to where they were needed. In many instances, the gas went into leased storage ahead of the winter.

This cohesive approach allows us to increase efficiencies, reduce costs and meet demand wherever it appears in the supply chain.

Of course, the year was not without its challenges. The sharp increase in margining requirements by futures exchanges and clearing brokers substantially increased the cost of moving physical cargoes, which reduced liquidity in both physical and financial markets and exacerbated volatility. The explosion at the Freeport LNG terminal, where we have an offtake agreement, removed LNG and significant flexibility from our portfolio at a time when the market needed them most.

However the size and scale of our operations meant that we were able to substantially mitigate any issues for our end buyers relating to the lost Freeport volumes and we continued to ensure safe and reliable LNG supply.

Looking forward, we expect gas and LNG markets to remain volatile. While Europe should avoid a blackout this winter by drawing on inventories and cutting demand, it will need to import huge volumes of LNG in 2023 given the massive reduction in flows from Russia. For LNG to continue to flow to Europe as opposed to other demand centres, the price will need to remain elevated and we expect security of supply to remain paramount for customers in Europe through next winter and beyond.

Performance review

Metals and Minerals

Despite market volatility due to numerous geopolitical events, the Metals and Minerals division recorded a robust performance in 2022.

23.3_{mmt}

Total volume non-ferrous concentrates and refined metals traded
(2021: 22.8mmt)

91.3_{mmt}

Total volume bulk minerals traded
(2021: 82.7mmt)

Performance overview

Demand from China was subdued for a number of metals compared to prior years due to successive and prolonged shutdowns as the government sought to contain rising cases of COVID-19. This was, however, partially offset by strong demand from western economies driven by the acceleration of the energy transition, namely investment in renewable energy and electric vehicles.

Despite the broadly positive fundamentals of underlying supply and demand for metals and minerals, London Metal Exchange (LME) prices were weighed down, in particular in the second half of our financial year. The key drivers for weaker prices include a strong US dollar and macroeconomic concerns as central banks increased interest rates to combat inflation and fears grew of recession in major economies.

Volumes remained broadly consistent with the prior year, with concentrates up eight percent and refined metals down by six percent. During the year we were alert for opportunities to expand our business and started to explore investment in lithium, a key battery metal.

**Gonzalo de Olazaval,
Kostas Bintas**
Co-Heads of Metals

Non-ferrous concentrates and refined metals traded (mmt)	2022	2021
Concentrates total	14.4	13.3
Refined metals total	8.9	9.5
Total	23.3	22.8

Ken Loughnan
Head of Bulk Minerals

Bulk minerals volumes traded (mmt)	2022	2021
Iron ore	31.0	23.1
Coal	60.3	59.6
Total	91.3	82.7





For some of our metals, inventories were and remain at record lows, while the power crisis in Europe has forced many smelters to curtail production, further tightening markets. Amid rising geopolitical tensions, there is also a sharper focus on security of supply, particularly around key energy transition metals such as copper, nickel and cobalt.

This was highlighted by the US Inflation Reduction Act, a USD369 billion flagship package to spur investment in green technologies. It was also evident in the EU's decision to increase its renewable energy production target to 45 percent by 2030 as the region seeks to wean itself off Russian fossil fuels. Ultimately, these policies and others are highly metals intensive. However, a lack of investment in new supply means large deficits could emerge in a number of the products we trade between now and the end of the decade.

Looking forward, we expect macro economic factors to continue to influence metals prices into 2023, albeit with the potential for greater supply disruptions as consumers become more selective about the origin and carbon footprint of the metal they consume.



[www.trafigura.com/
metals](http://www.trafigura.com/metals)

Non-ferrous concentrates and refined metals

Copper

For the copper market, 2022 started brightly with prices pushing steadily higher in a tight stock environment. Copper went on to hit a record high, at above USD10,600 per metric tonne, amid fears that Russia's invasion of Ukraine could curtail supplies.

The concerns proved to be misplaced but sentiment remained positive, with copper viewed by many investors as a beneficiary of the accelerating decarbonisation agenda in the US and Europe.

However, as attention shifted to aggressive monetary tightening, China's property market and increasing COVID-19 cases in the country's major cities, prices plunged, falling briefly below USD7,000. A strong US dollar also weighed on copper, which continued to trade at a narrow range to the year-end although it has since rallied to around USD8,500 per metric tonne at financial year end.

For most of the year, copper demand remained robust. Investment in energy infrastructure in Europe continued.

The same was true in China after a third year of summer power shortages. Combined with another year of spectacular growth in electric vehicle output, that provided enough demand to more than offset the loss of activity in the property sector.

On the supply side, we have seen a year of heightened disruptions, with many mines forced to lower production forecasts as a result of operational problems related to COVID-19 and local community issues.

These factors, combined with a drought in Chile, the world's largest copper producer, left the copper market running close to the disruption levels seen during the height of the pandemic in 2020. As we head into 2023, we expect to see a change in the traditional physical flows on the back of further self-sanctioning of Russian metal.

Despite this turbulence, the Copper team delivered a solid performance as we continued to reap the benefits of an integrated approach across refined copper and concentrates. Volumes were broadly stable and we continued to actively engage with our customers, helping them to determine the carbon footprint of the cargoes they are buying through cutting edge digital technology.

As financial conditions continue to tighten, we expect the market to further consolidate as clients recognise the value in dealing with counterparties that have the scale and financial strength to cope with increasingly volatile markets while delivering first-class customer service.

Even after several new projects come online in 2023, we expect to see increasingly large supply deficits and for a tight market to become the new normal for copper.



Alumina and aluminium

The aluminium market experienced unprecedented volatility in 2022, reflected by extreme price movements on the London Metal Exchange. In the space of three months between December 2021 and the start of March 2022 – the benchmark aluminium price rose 60 percent to a record high above USD4,000 per tonne as a result of strong demand and concerns over disruptions to Russian supply.

However, prices quickly reversed course as a deteriorating macroeconomic outlook and rising inflationary pressures weighed on the market. While demand fears persist, Europe's energy crisis and the war in Ukraine have exposed serious fault lines in the supply chain both for aluminium and its key ingredient alumina.

These risks were particularly noticeable in Europe in 2022, with soaring gas prices increasing aluminium production costs to more than USD15,000 a tonne at certain points of the year. This is because of the large amounts of electricity needed to transform alumina into refined metal. We estimate that a third of European aluminium production is now curtailed, and that further closure risks remain.

In China, which is the world's biggest producer of aluminium, lower-than-expected rainfall in the south-west forced further capacity cuts. The war in Ukraine also caused production disruptions, with one of the largest alumina refineries in the world curtailed because of its proximity to the conflict.

Our Alumina and Aluminium team was able to successfully meet these challenges in 2022, drawing on our long-established position in the physical market to serve our customers and expand our trading book. As the largest independent global alumina and aluminium trader by volume, our focus going forward will be on helping our customers manage these volatile and unpredictable market conditions. For 2023, the outlook hinges how producers and consumers adapt to less stability and more complicated logistics.

▼ Trafigura Group's equity investment: Prony Resources cobalt-nickel mine in new Caledonia.



Nickel and cobalt

The nickel market was challenging in 2022, caused by the technical squeeze on the London Metal Exchange in March, which saw prices hit USD100,000 per metric tonne. This further exaggerated the disconnect between prices in the physical and futures markets.

Fundamentally, the market remained well supplied during the year thanks in large part to increased production capacity in Indonesia and new facilities capable of converting nickel pig iron into battery grade metal. If plans for further expansions are realised, it could see Indonesia's share of global nickel supply rise to more than 50 percent next year.

On the demand side, there was healthy demand for battery grade nickel as global electric vehicle sales continued to grow rapidly, led by China but weaker for lower purity metal used by the stainless steel industry.

The outlook for the nickel market in 2023 is one of oversupply, driven by production growth in Indonesia and the ongoing weakness of the Chinese property sector, which is affecting stainless steel demand. Set against this, demand for battery-grade nickel is likely to remain robust although consumers are becoming more selective about the volumes they are prepared to buy, seeking assurance on sustainability, origin and carbon intensity.

Despite these volatile market conditions, the nickel team supplied record volumes to our customers, boosted by increased supply from Terrafame and Prony Resources. As a result, we are able to meet the needs of our growing customer base in both stainless steel and battery metals while also developing new products, such as lithium and other key battery metals, to meet the future needs of the market.

For cobalt, COVID-19 outbreaks and flooding in Durban, South Africa, created huge logistical challenges exporting material from the Democratic Republic of the Congo (DRC), in the first half of the financial year. This boosted prices that in turn incentivised higher output from small scale or individual mines, also in the DRC. This artisanal production doubled year-on-year to account for 20 percent of primary supply.

Despite a mild recovery in demand from the aerospace industry, sales of portable electronics dropped, while car manufacturers continued efforts to reduce cobalt in the batteries that power electric vehicles. Together, these factors lead to a significant market surplus that started to materialise by the end of our financial year in September and weighed on prices.

The highlight of the year was completing the largest pre-financing on record for a mine in the DRC. The USD600 million facility will allow our long-standing partner Shalina Resources to complete the Mutoshi mine in Kolwezi. This is expected to come online in 2023 and has the potential to provide a new source of supply of cobalt hydroxide for refiners around the world.

Overall, the demand profile for cobalt remains attractive due to the rising popularity of electric vehicles. However, as with nickel, the provenance of material is becoming increasingly important. While supply is sufficient to meet demand over the coming years, certain volumes may not be accepted by consumers. As a result, prices could diverge between responsibly sourced metal and metal that fails to meet industry standards.

Zinc and lead

Throughout the 2022 financial year, the zinc market experienced periods of extreme tightness in the physical market and declines in London Metal Exchange stocks to historically low levels.

A key driver of these trends was surging gas and power prices. A number of zinc smelters in Western Europe were placed on care and maintenance, including Nyrstar's Budel plant in the Netherlands. These closures and rising freight costs drove up premiums outside China for refined zinc.

In China, rolling lockdowns hit demand and the market was weaker. In zinc concentrates, mine supply was stable year on year and treatment charges trended higher.

The lead market was more subdued in 2022. There was continued strong demand for the metal outside China but inside the country demand and production dynamics were greatly affected by reduced mobility from the COVID-19 lockdowns. The concentrates market has seen strong continued demand from Chinese smelters and mine supply remained stable. The refined and concentrates markets are both expected to be balanced this year with low stocks of both globally.

The Zinc and Lead team responded well to these market conditions, drawing on its global reach to meet the evolving needs of its client base. In terms of volumes, we maintained our market position over the year.

We expect similar conditions in 2023 financial year with European power prices, demand growth in China and recession fears the key factors that will influence zinc and lead markets. Against that backdrop, our strategy will be to remain agile and respond to the changing needs of our customers.

▼ Finished zinc blocks at Nyrstar's smelting facility Budel, the Netherlands.



Bulk minerals

Coal

Coal prices scaled new heights during the 2022 financial year as record gas prices and sanctions against Russia boosted demand. Thermal coal, which is burned in power stations to generate electricity, rose as high as over USD400 per metric tonne for some brands as buyers in Asia and Europe scrambled for material in a market where there has been an almost total absence of investment in new mines outside of China.

Metallurgical coal, used to produce steel, had a more turbulent year, with prices pulling back from record levels of USD660 per metric tonne in early 2022 as mills in Europe cut production in response to slowing demand.

Against this backdrop, our global Coal Trading team performed strongly with volumes steady year on year and robust financial results.

There was strong demand for the team's services throughout the year, both from customers looking to replace expensive gas with cheaper coal and from those seeking an alternative to sanctioned Russian output.

The Coal team was able to respond rapidly to these changing requirements drawing on its strong relationships with producers around the world. On the demand side, we saw increased volumes being delivered to Europe as utility companies restarted mothballed power stations in response to an unprecedented energy crisis in the region.

Over the next 12 months, we expect thermal coal prices to remain at elevated levels because of the lack of new supply and the ongoing energy gas crisis in Europe, while metallurgical coal will be more subdued as recession fears mount. We will continue to meet the fuel requirements of our customers globally, whilst providing support for their energy transition goals.

Iron ore

The iron ore market traded in a wide range in the 2022 financial year, between USD87 and USD163 per tonne as optimism about the outlook for the global economy and Chinese policy stimulus gave way to pessimism as central banks rapidly raised interest rates and China persisted with its zero-COVID-19 policy.

Prices briefly rose above USD160 per metric tonne in March based on anticipation of easing lock-down restrictions in China and the likelihood of even more stimulus to fight the slump of the property market. As these expectations fell short in July, the steel making commodity moved steadily lower and ended September at below USD100 per metric tonne – roughly where it had been a year earlier.

The 2022 financial year saw bleaker demand in Europe, where soaring energy prices have forced steel mills to curtail production, weighed on the market in the latter months of the financial year although it displayed less volatility than other commodities.

On the supply side, output from Australia and Brazil was weaker than expected amid logistics-related challenges, but not enough to impact prices, while China continued to buy iron ore at roughly the rate predicted by forecasters despite weakness in the property market, as infrastructure and manufacturing activities expanded.

For our Iron ore team, it was another year of expanding trading volumes. We saw increased shipments from Porto Sudeste, our Brazilian iron ore terminal, a trend that will continue next year with the commissioning of the Tico-Tico mine in the south-eastern state of Minas Gerais. We also increased other export volumes through deals with the industry's major producers.

Looking forward, we expect iron ore to remain in a tight range until there is more certainty around the outlook for the global economy.

<https://english.news.cn/20221218/d2462347432b4ebd80c179f93bd3e1b1/c.html>

Xinhua Commentary: Lives protected to utmost in China's three-year battle against COVID-19

Source: Xinhua

Editor: huaxia

2022-12-18 11:27:30

BEIJING, Dec. 18 (Xinhua) -- China has shifted the focus of its COVID-19 response strategy from infection control to case treatment with the objective of preventing severe cases.

The shift was made in accordance with the weakened pathogenicity of the virus. It does not run counter to the hard truth that China is one of the world's best achievers in terms of saving lives from the COVID-19 pandemic.

Over the past three years, China has withstood waves of the pandemic and successfully dealt with over 100 cluster outbreaks. In a country with over 1.4 billion people, the COVID-19 death toll was some 5,000, according to health authorities.

Globally, the pandemic has caused 6.6 million deaths. In 2021, millions of lives were lost as governments of many countries swayed between lockdowns and reopenings.

One thing has become crystal clear now: China has honored what it has always said it would do -- putting the people and their lives above all else.

Back in early 2020, faced with the sudden COVID-19 outbreak, China mobilized resources across the country, launching an unprecedented operation to save lives in the hardest-hit city of Wuhan, Hubei Province.

From newborns to centenarians, no COVID-19 patients had ever been given up on. More than 3,600 patients aged above 80 were treated and recovered.

The initial success to rein in the virus helped China gain the initiative in the following stage of routine COVID-19 prevention and control, in which the country raced against time to vaccinate its people and develop rapid test kits and medication.

Over the past three years, China has developed effective COVID-19 diagnosis and treatment expertise and medicines, and kept improving its capacities in terms of medical treatment, pathogen detection and epidemiological investigation.

To date, more than 90 percent of its population have been vaccinated. This has helped China ride out waves of epidemic outbreaks brought about by coronavirus variants from Alpha to Delta.

The routine COVID-19 response emphasized the role of science and the importance of precision. China closely followed the development of the pandemic outside its border, assessed the efficacy of its response measures, and made continuous adjustments aimed at optimizing them.

With the virus becoming less lethal, and considering the ever-growing domestic vaccination rate, and the accumulation of experience in fighting COVID-19, China has recently further optimized its anti-virus approach to allow home quarantine for asymptomatic and mild cases and cut mass nucleic acid testing, among others.

But the government has stressed even more efforts on health monitoring and services for the elderly. It has accelerated efforts to set up more fever clinics and emphasized administering the second dose of booster shots to the vulnerable.

These policy steps, no doubt, have been based on in-depth research and specifically targeted the features of virus mutations.

But more importantly, they have all been centered on the people, with an eye to better safeguard the normal order of work and life for the people and better protect the elderly, the children and other key groups of the population.

China has managed to keep its COVID-19 severe cases and death rates among the lowest in the world. The average life expectancy of the Chinese people kept rising amid the pandemic, from 77.93 years in 2020 to 78.2 years in 2021.

That said, it is worth noting that China never considers anti-epidemic efforts and economic growth as an either-or choice. Rather, it stresses the importance of coordinating the two in a highly efficient way. After all, economic development can help improve people's lives.

In 2020, China was the first major economy across the globe that registered growth. The average annual growth rate for 2020 and 2021 reached 5.1 percent. The country has also successfully eradicated absolute poverty, a hard-won feat considering the disruptions caused by the pandemic.

After three years, the virus is weaker but we have grown stronger. The country now has more resources, better conditions and more confidence in triumphing over COVID-19. ■



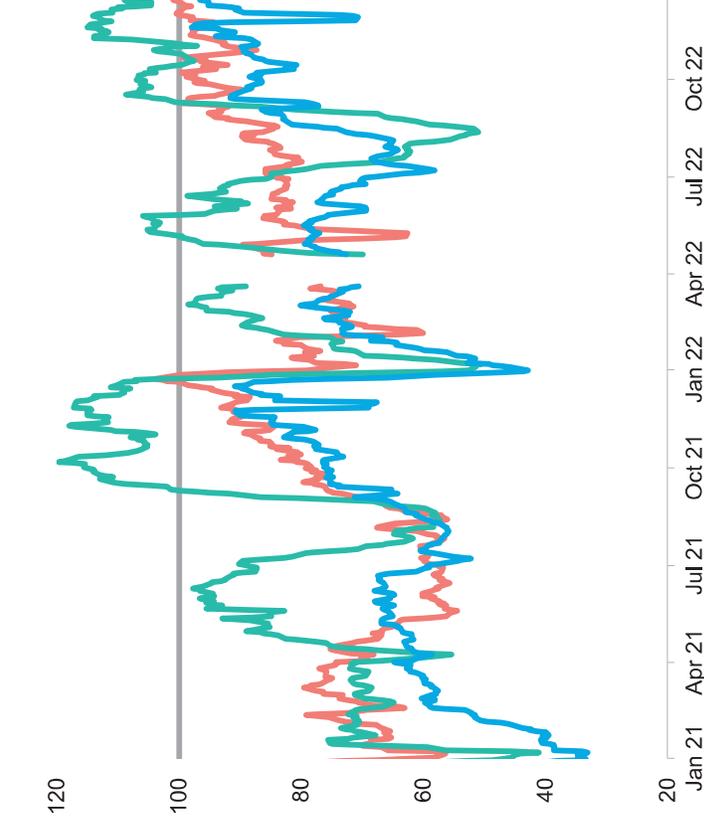
Google mobility data stopped updating in October 2022 and will therefore not be included in future updates.

Comparing the two mobility indicators

China traffic levels drop as rest of the world remains stable

TomTom congestion index

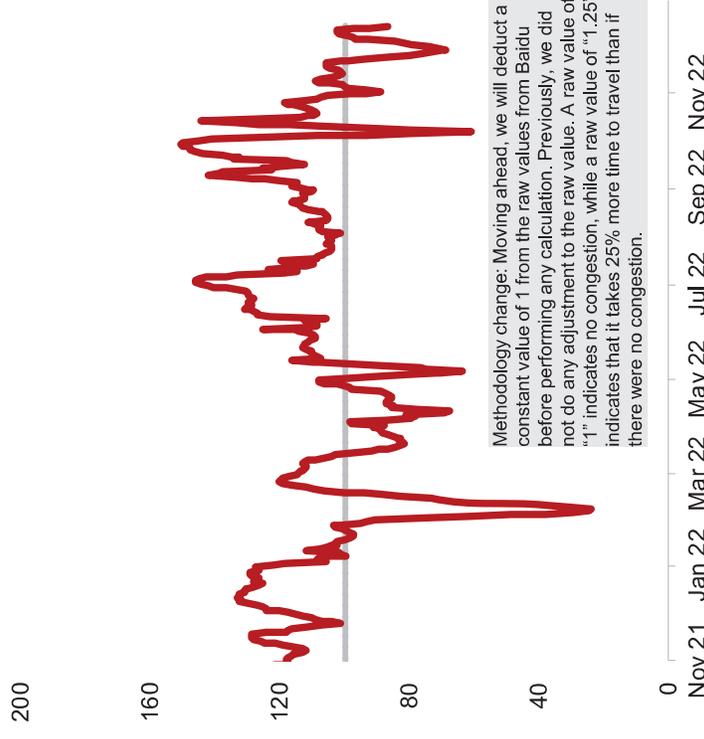
Indexed to the peak congestion of the average week in 2019 (five-day weekday moving average)



Source: TomTom road congestion data, BloombergNEF. Note: **Asia Pacific excludes China. Data updated to December 14, 2022.** Δ = change.

China-15 (Baidu) congestion index

Daily peak congestion levels, indexed to January 2021 (seven-day moving average)



Source: BloombergNEF, calculated from Baidu data. Note: Data updated to December 14, 2022. Δ = change.



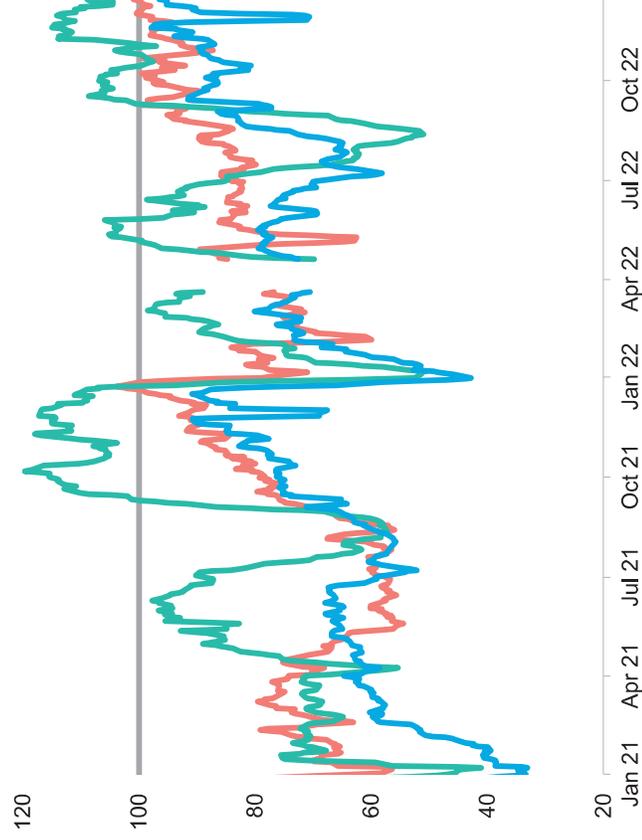
Apple Mobility reports were discontinued on April 14, 2022. We have resumed updating TomTom congestion data, which was previously updated to March 16.

TomTom congestion index

North America and APAC traffic levels eclipse previous year's, as Europe's remains subdued

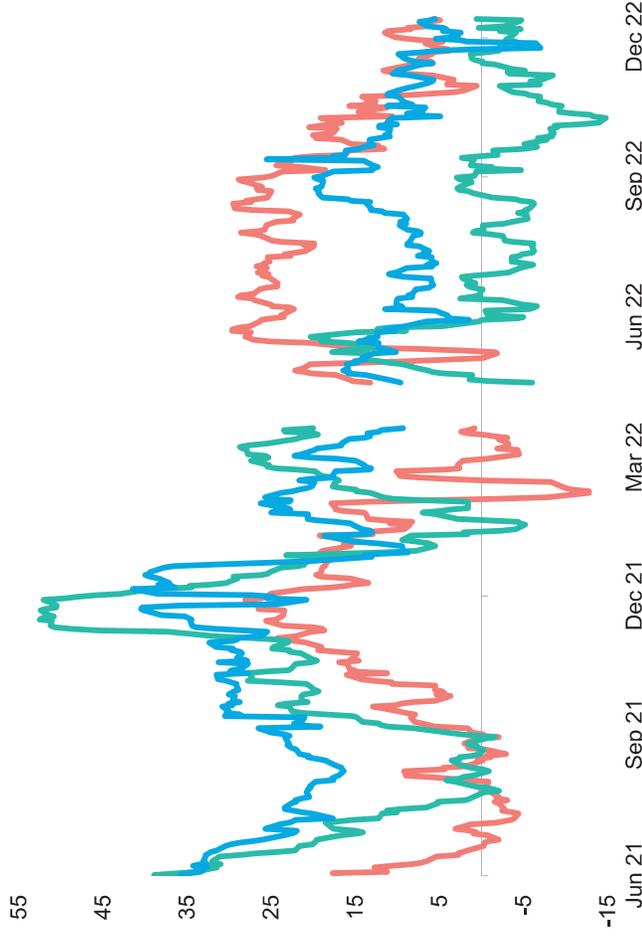
Regional road-congestion index

Indexed to the peak congestion of the average week in 2019 (five-day weekday moving average)



Index point change versus the previous year

Percentage point change vs the year before (seven-day moving average)



Source: TomTom Traffic Index, BloombergNEF. Note: **Asia Pacific excludes China**. Data updated to December 14, 2022, with weekly addition from November 23, 2022. Index point change versus the previous year is obtained by averaging the latest weekly values. Δ = change.

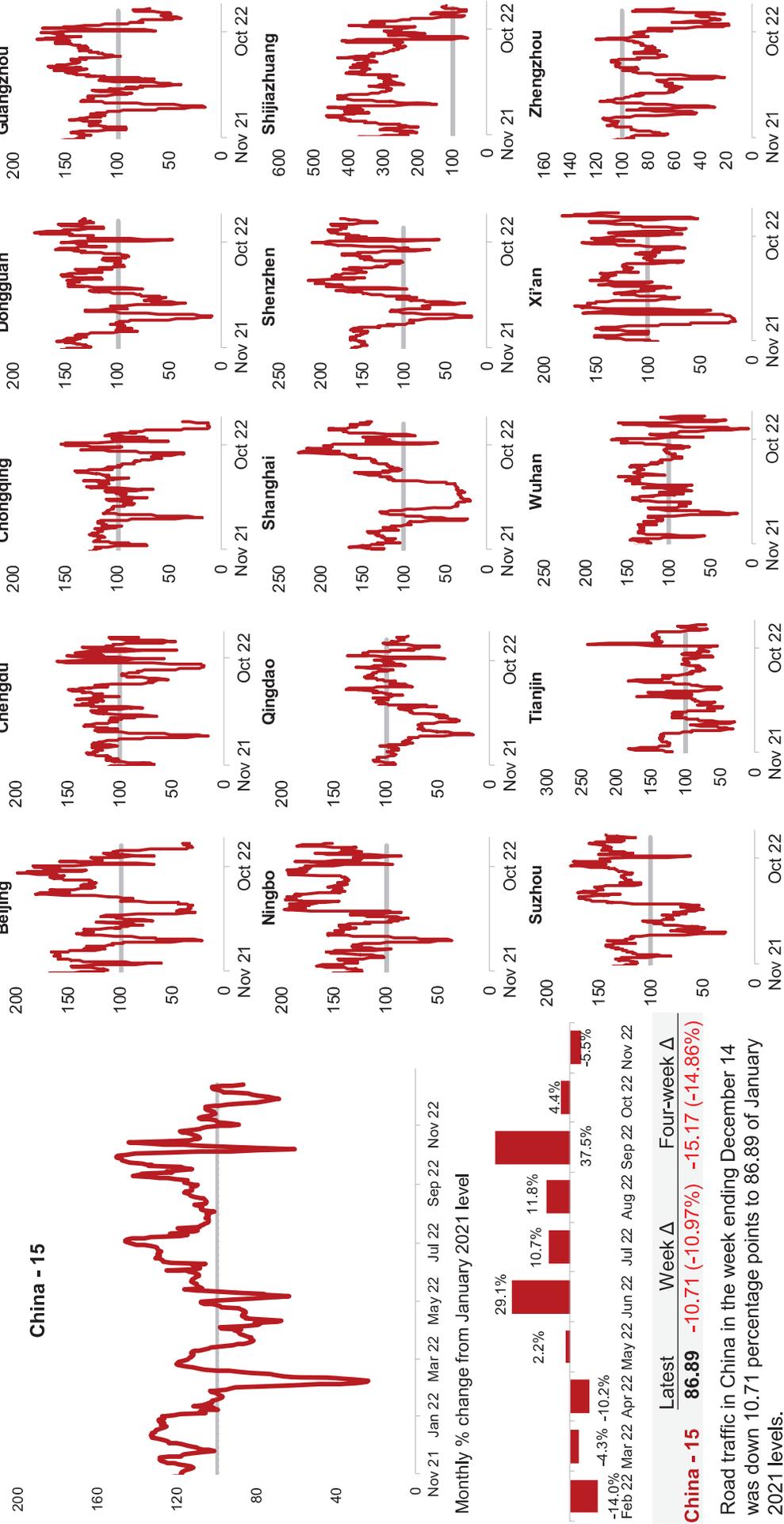


China (Baidu) congestion index

China falls yet again after strong rebound

China congestion index (calculated from Baidu data)

Daily peak congestion levels, indexed to January 2021 (seven-day moving average)



China - 15 86.89 -10.71 (-10.97%) -15.17 (-14.86%)

Road traffic in China in the week ending December 14 was down 10.71 percentage points to 86.89 of January 2021 levels.

Source: BloombergNEF, calculated from Baidu's data. Note: Data updated to December 14, 2022. City-level charts display the 15 cities with the highest number of vehicle registrations (excluding two- and three-wheelers). The China-15 congestion level is calculated by taking the weighted average of the congestion levels in the 15 cities and their vehicle registration numbers. Δ = change.

Oil price outlook – Snapshot: December 13, 2022

Disclaimer: Please note that BNEF does not offer investment advice. Clients must decide for themselves whether current market prices fully reflect the issues discussed in this note.

Category	Indicator	Signal	Comment
Fundamentals	Refinery margins		<ul style="list-style-type: none"> Global refinery margins were lower over the past week, as middle distillate cracks weakened.
	Crude stocks		<ul style="list-style-type: none"> In the week ending December 2, land crude-oil storage levels in BloombergNEF's tracked regions (the US, ARA and Japan) fell 0.2% to 542.0 million barrels (m bbl). The stockpile deficit against the five-year average (2015-19) widened from 55.5m bbl to 56.0m bbl. Including global floating crude stockpiles from the same week, total crude oil inventories decreased 2.0% to 631.8m bbl, while the stockpile surplus of 14.9m bbl flipped to a deficit of 2.1m bbl.
	Product stocks		<ul style="list-style-type: none"> In the week ending December 2, gasoline and light distillate stockpiles in BNEF's tracked regions (the US, ARA, Singapore, Japan and Fujairah) rose by 1.5% week-on-week to 262.0m bbl, with the stockpile deficit against the three-year average (2017-19) widening from 3.4m bbl to 5.8m bbl. Gasoil and middle distillate stockpiles in BNEF's tracked regions were up 4.3% to 151.8m bbl, with the stockpile deficit against the three-year average narrowing from 18.5m bbl to 12.1m bbl. Oil product stockpiles in tracked regions grew by 0.8% to 976.2m bbl, with the stockpile deficit against the three-year seasonal average narrowing from 5.2m bbl to 3.4m bbl. Altogether, crude and product stockpiles decreased by 0.3% to 1,608.0m bbl, with the stockpile surplus of 9.7m bbl flipping to a deficit of 5.5m bbl.
	Demand indicators		<ul style="list-style-type: none"> In the week to December 13, global jet fuel demand from commercial passenger flights is set to rise by 1.7% to 5.14 million barrels per day. Jet fuel consumption by international passenger flight departures is up 18,400 barrels per day (or +0.6%) week-on-week, while consumption by domestic passenger flight departures also grows by 65,400 barrels per day (or +3.2%). In the week to December 10, flight departures in the Eurocontrol area fell to 85.2% of the equivalent week in 2019, down from 86.1% last week. The four-week moving average also slipped to 85.9%, from 86.7%. Meanwhile, in the same week, US passenger throughput grew to 94.9% of the average week in 2019, up from 92.0% last week. The four-week moving average remained flat at 94.8%. In the week to December 7, TomTom's peak congestion data showed declines in Europe (-3.3%) and Asia Pacific ex-China (-0.8%), while North America showed a strong surge (+24.1%) but only partially offset the losses from a week ago. Versus the same week in 2021, North America is up 6.6 points week-on-week to 105.9%, Europe grew by 0.4 points to 97.3%, while Asia Pacific ex-China increased 3.4 percentage points to 109.9%. In the week to December 12, road congestion in China's 15 key cities surged by 6.8 percentage points to 99.4% of January 2021 levels, according to BNEF's calculation based on Baidu data. The country's congestion levels are seeing a boost following the relaxation of Covid-19 measures. In the week to December 5, global daily average new Covid-19 cases grew 17% to 539,000. Europe saw a 13% increase to 150,000 daily cases, while the Americas also saw cases surge 69% to 127,000 daily cases. The Asia Pacific number rose 6% to 249,000 daily cases, with the number in China more recently falling 41% to 20,277 cases in the week to December 11, but this drop is likely due to less testing being administered following the easing of the country's zero-Covid policy. Reports on the ground suggest that key cities in China are seeing a surge in demand for Covid-19 treatment. Weather in several cities across Western Europe and East Asia turned significantly colder over the past week.
Financial	Macro indicators		<ul style="list-style-type: none"> The dollar index averaged 105.1 over the past week and was 0.6% lower from the week before. The upcoming US CPI report for November could cause some volatility in the dollar index.
	Hedge fund positioning		<ul style="list-style-type: none"> In the week to December 6, Managed Money net positioning in the oil complex was down by 30.0m bbl (or -7.7%) week-on-week to 358.1m bbl, the lowest level since April 7, 2020, and stood at the fifth percentile of the past five years.
	Options chains and volatility		<ul style="list-style-type: none"> There was a notable decrease in open interest for Brent Feb-23 puts and WTI Jan-23 puts. Brent and WTI 1M volatility skewed slightly over the past week.
Outlook	Weekly call		<ul style="list-style-type: none"> BNEF is neutral on oil prices for the week ahead, with Brent Feb-23 trading at \$79.12/bbl and WTI Jan-23 trading at \$74.19/bbl at the time of writing. While the Covid-19 situation in China appears to be worsening, nationwide city congestion levels saw a strong rebound over the past week. Congestion data over the coming days will give some indication of whether the initial boost to driving demand is sustainable. While the outlook for the country's oil demand is nebulous in the near term, it could see a strong boost particularly after the winter season. Outside of China, high frequency mobility indicators showed a mixed trend, as congestion levels in Europe and Asia Pacific ex-China fell. Road congestion levels are likely to see a seasonal lull period due to the winter season. Weekly oil inventories saw a bullish move over the past week as the stockpile surplus against its seasonal average (2017-19) flipped from a surplus to a deficit. This bullish move was driven by a strong draw in crude inventories. However, the oil product stockpile deficit flipped briefly into a surplus for the first time at least since November 2021. The middle distillates stockpile deficit has also shrunk to the lowest level since December last year.

Past outlooks

Disclaimer: Please note that BNEF does not offer investment advice. Clients must decide for themselves whether current market prices fully reflect the issues discussed in this note

Date of report	Refinery margins	Crude stocks	Product stocks	Demand indicators	Commitment of traders	Options chain and volatility	BNEF week ahead call	Brent/WTI price at time of writing (\$/bbl)	Web Link
December 13	↓	↑	↔	↔	↓	↑	↔	Brent-Feb: 79.12 WTI-Jan: 74.19	
December 6	↓	↔	↓	↓	↓	↔	↓	Brent-Feb: 81.80 WTI-Jan: 76.04	
November 28	↔	↓	↓	↓	↓	↔	↔	Brent-Feb: 81.42 WTI-Jan: 74.17	
November 21	↑	↔	↓	↓	↓	↔	↓	Brent-Jan: 83.07 WTI-Jan: 76.03	
November 16	↔	↑	↔	↔	↑	↑	↔	Brent-Jan: 93.91 WTI-Dec: 86.81	
November 2	↔	↔	↓	↔	↑	↑	↔	Brent-Jan: 94.43 WTI-Dec: 88.22	
October 26	↔	↓	↔	↓	↓	↔	↔	Brent-Jan: 91.89 WTI-Dec: 85.77	
October 19	↔	↓	↔	↓	↑	↔	↓	Brent-Dec: 90.28 WTI-Dec: 82.78	
October 4	↔	↔	↑	↔	↓	↓	↔	Brent-Dec: 90.71 WTI-Nov: 85.26	
September 27	↔	↓	↓	↓	↓	↓	↔	Brent-Dec: 94.06 WTI-Nov: 87.83	
September 6	↓	↑	↔	↓	↔	↑	↓	Brent-Nov: 101.00 WTI-Oct: 95.40	
August 30	↔	↔	↓	↑	↑	↑	↑	Brent-Oct: 93.65 WTI-Sep: 87.83	
August 16	↔	↓	↔	↓	↓	↔	↓	Brent-Oct: 97.60 WTI-Sep: 91.50	
August 9	↔	↓	↔	↔	↓	↓	↔	Brent-Oct: 99.38 WTI-Sep: 93.42	

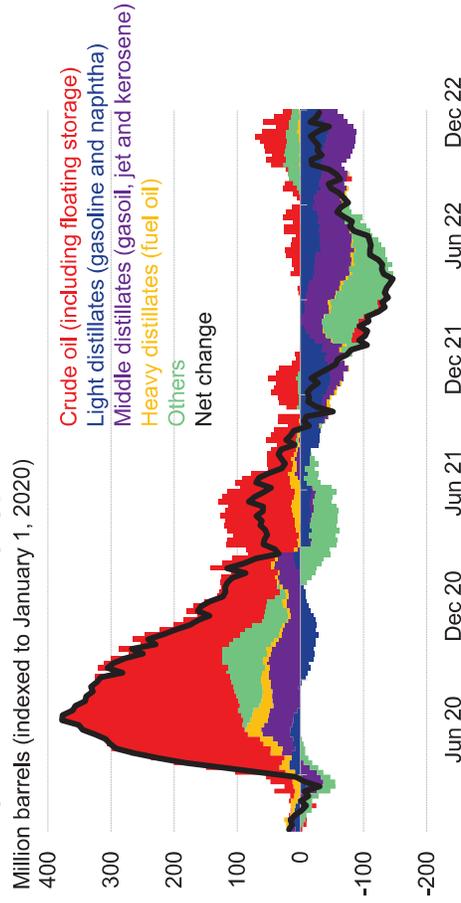
To view past reports on terminal, go to [NI BNEFOIL](#), search for the report and click on the icon to the far right:

24 ✓ Oil Price Indicators Weekly BNE 11/30

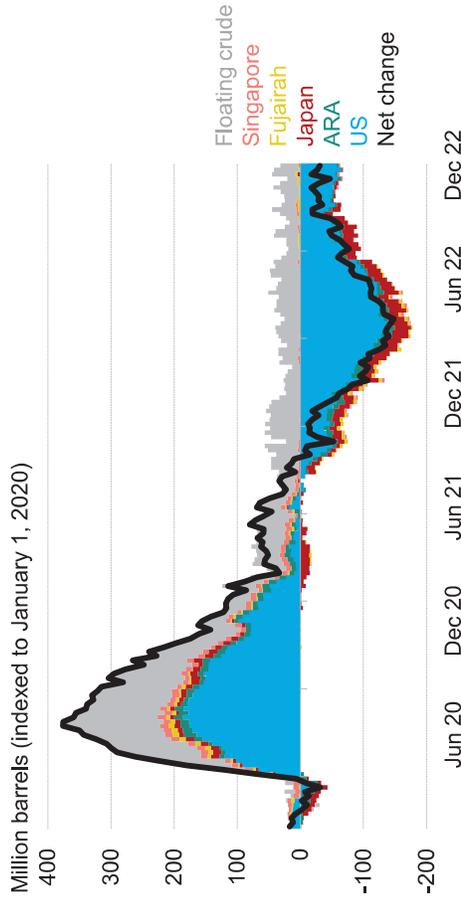
Weekly oil inventories

Oil inventories fell slightly over the past week

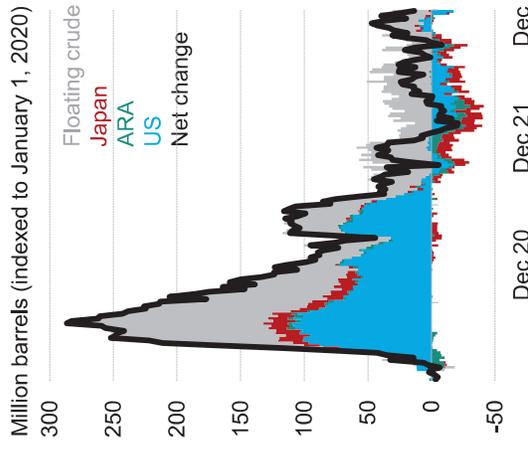
Weekly oil inventories by type



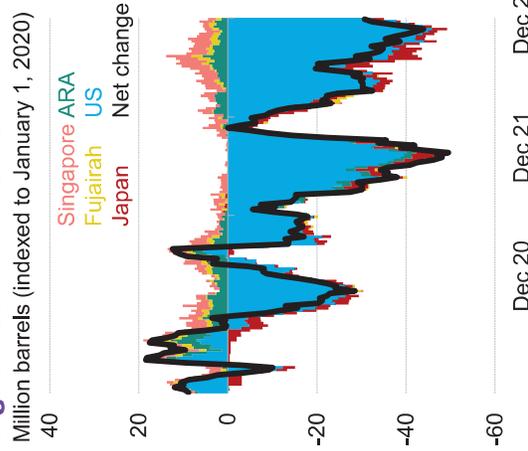
Weekly oil inventories by region



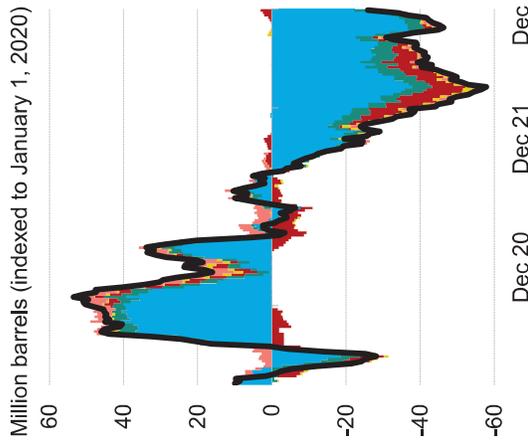
Crude inventories



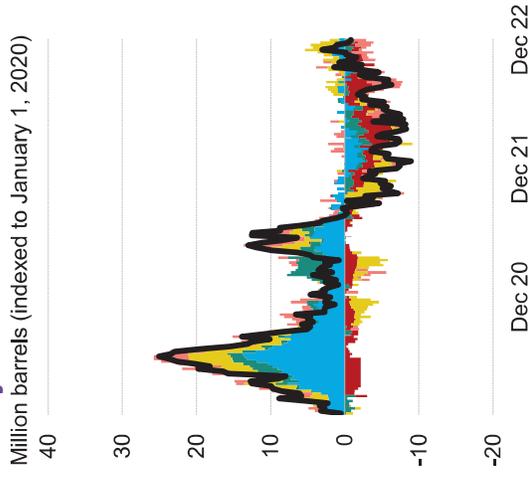
Light distillate inventories



Middle distillate inventories



Heavy distillate inventories



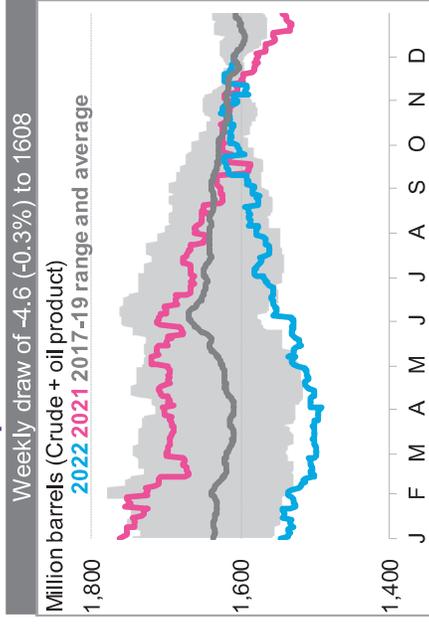
Source: BloombergNEF, US EIA, PJK, IE Singapore, FEDCom/Platts, PAJ, Vortexa, Genscape. Note: As of the week ending December 2, 2022.

Aggregated oil stockpiles

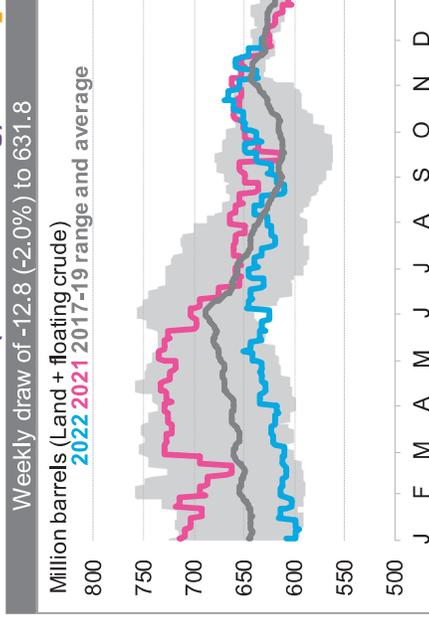
Bullish: Stockpile surplus of 9.7m bbl flipped to a deficit of 5.5m bbl

- Charts below use the **2017-19** (three-year) seasonal stockpiles. All calculations are recalibrated to measure against their respective three-year seasonal averages, so the values below may differ from the previous slides.
- Land crude inventories include the US, ARA, Japan and Shandong Teapots. Floating storage data are global. Oil product storage includes the US, ARA, Japan, Singapore, Shandong Teapots and Fujairah. Floating crude inventories may have been adjusted since the previous report – see slide 8 for further info.

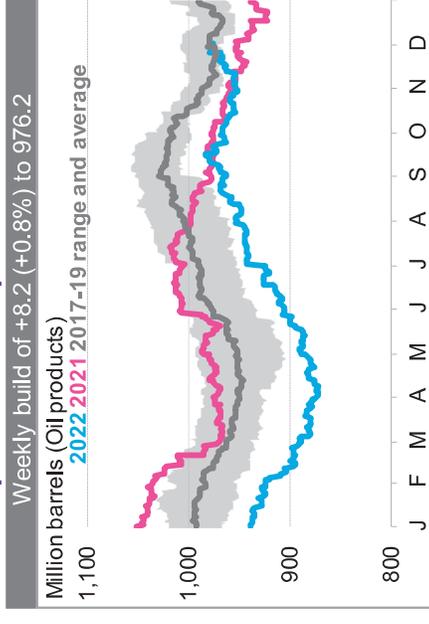
Total oil and product stocks =



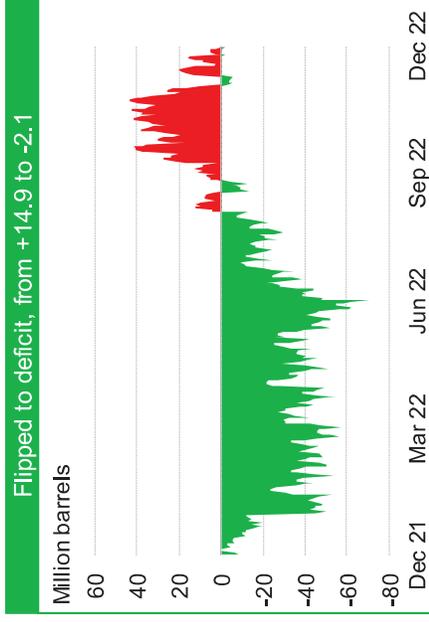
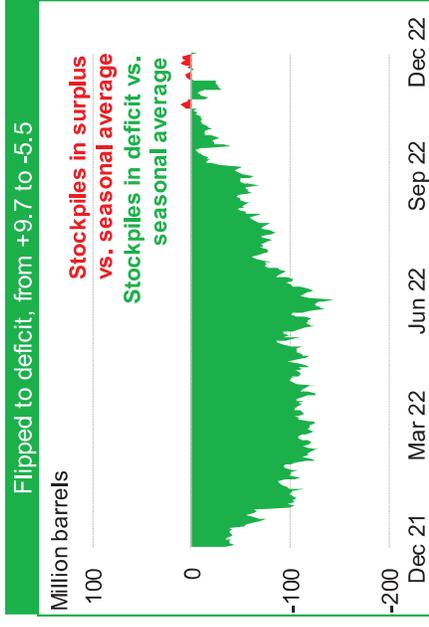
Total crude stocks (land + floating) +



Total oil product stockpiles



----- Charts below subtract current stockpiles by the 2017-19 (three-year) seasonal average -----



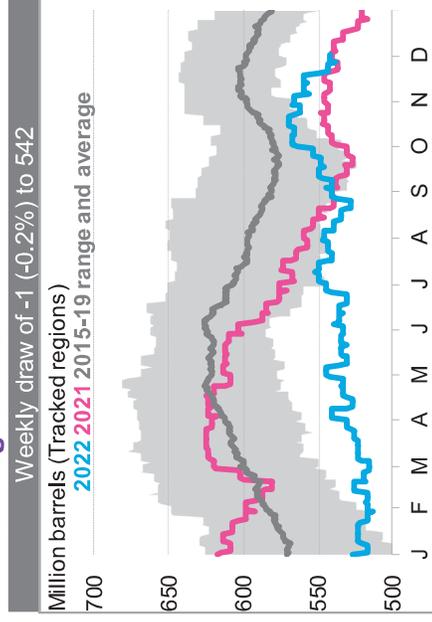
Source: BloombergNEF, US EIA, PJK, IE Singapore, FEDCom/Platts, PAJ, Vortexa, Genscape. Note: As of the week ending November 25, 2022.

Crude stocks: Land

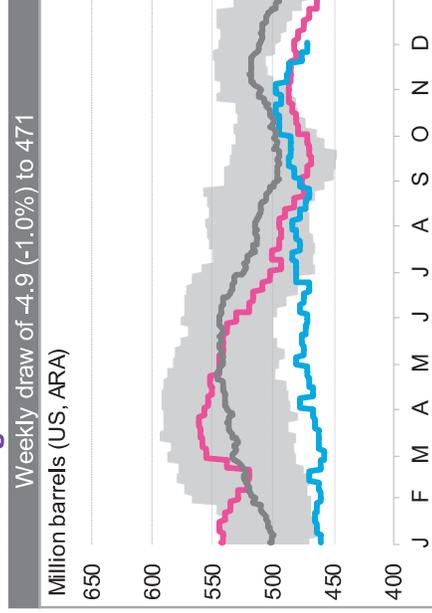
Neutral: Stockpile deficit widened from 55.5m bbl to 56.0m bbl

- Crude inventory rises when supply outstrips demand (meaning more physical oil is available than is needed). High or rising inventories are therefore a bearish factor for oil prices. Every year, storage levels fluctuate due to seasonal demand trends. The intra-year directional movement of stockpile levels is somewhat predictable, yet the magnitude of movement can differ significantly from expectations.
- A useful way to gauge if the intra-year storage levels differ from the norm is to measure the difference between the current and seasonal average inventory levels.

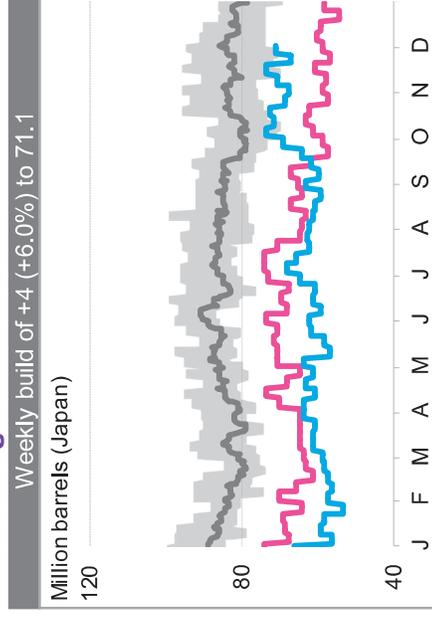
Land storage: Total



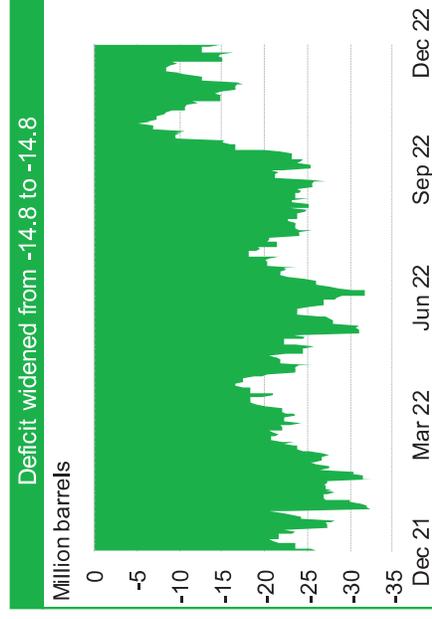
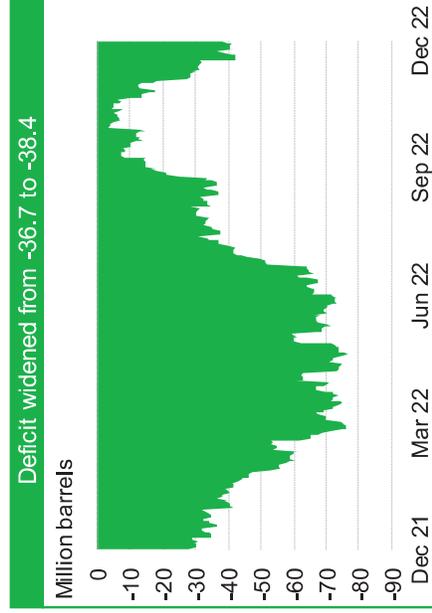
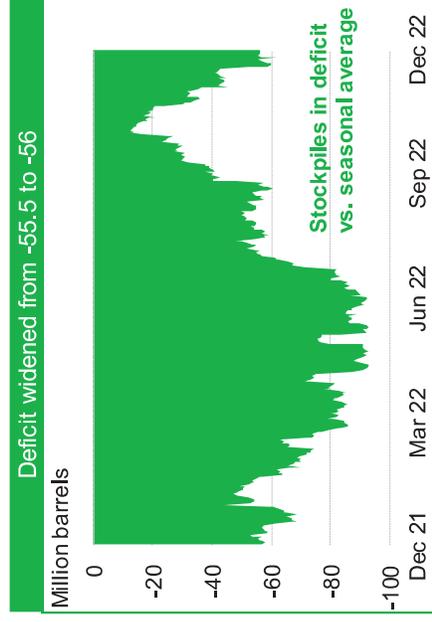
Land storage: West of Suez



Land storage: East of Suez



Charts below subtract current stockpiles by the 2015-19 (five-year) seasonal average



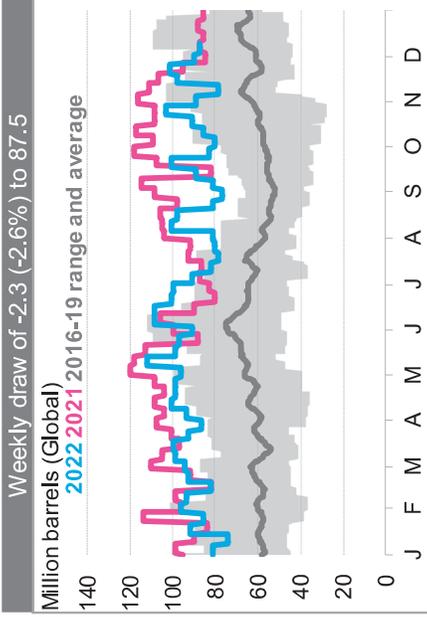
Source: BloombergNEF, US EIA, Genscape, PAJ. Note: As of the week ending December 2, 2022.

Crude stocks: Floating

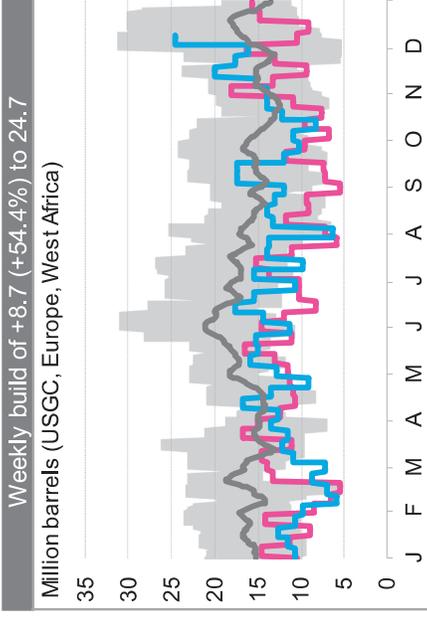
Neutral: Stockpile surplus remained rangebound

- Floating storage is only profitable if the strength of contango (future versus prompt price) is greater than the tanker costs. Therefore, tankers become floating storage when the profit from a storage play exceeds the cost of the forward freight agreement (FFA).
- The floating storage data used in the “Oil Price Outlook” slide is for the previous week (ie, the week before the latest data shown below).

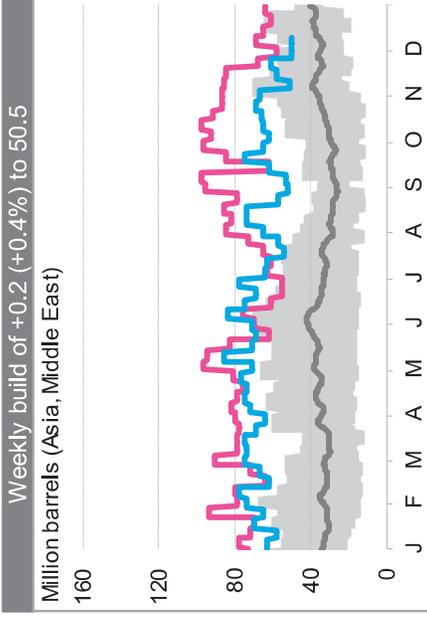
Floating storage: Total



Floating storage: West of Suez

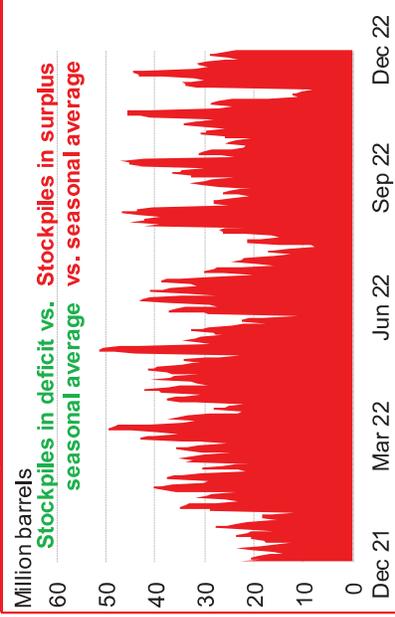


Floating storage: East of Suez



----- Charts below subtract current stockpiles by the 2016-19 (four-year) seasonal average -----

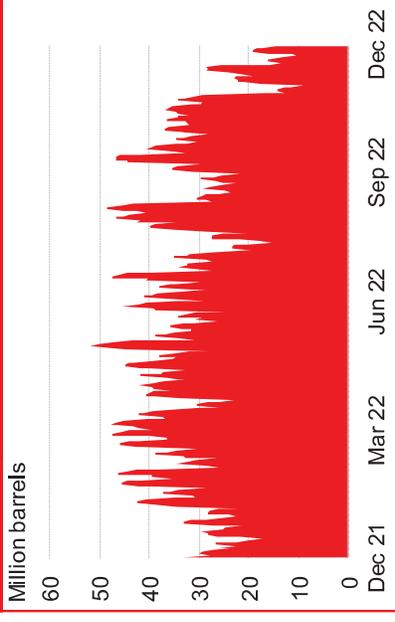
Surplus narrowed from +26.1 to +23.8



Surplus widened from +2.6 to +8.3



Surplus widened from +10.5 to +14.5



Source: BloombergNEF, Vortexa. Note: As of the week ending December 9, 2022. *Raw data from Vortexa are revised frequently, so the data in this report might change week-to-week.

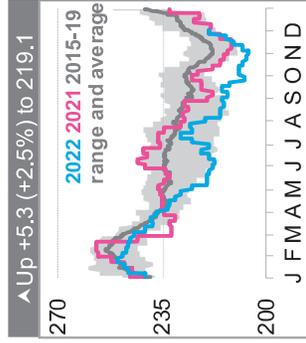
Product stocks: Current versus seasonal average

Neutral: Oil product stockpiles in tracked regions grew by 0.8% over the past week

- Chart legend are as follows: **2022**, **2021** and the 2015-19 range and average. For Fujairah and tracked regions, the **2017-19** (three-year) seasonal range is shown. Tracked regions include US, ARA, Singapore, Japan and Fujairah

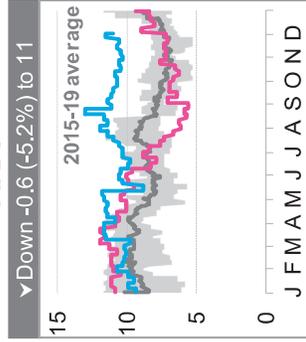
*Units are in million barrels

US

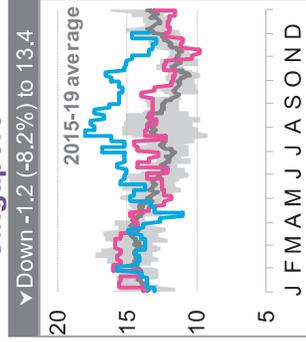


**Gasoline/
*light
distillates**

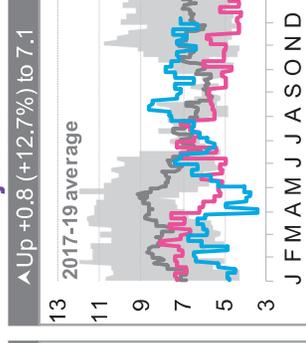
ARA



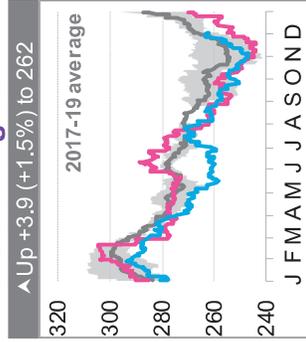
Singapore*



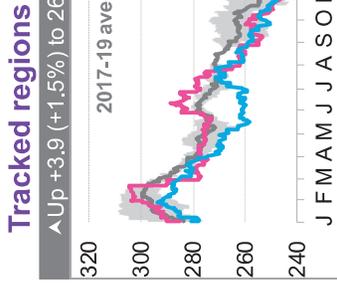
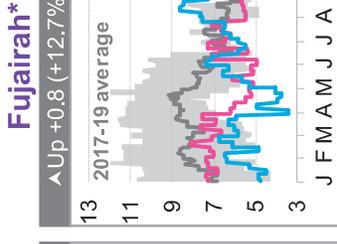
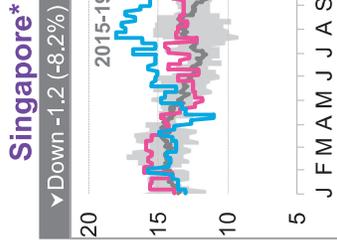
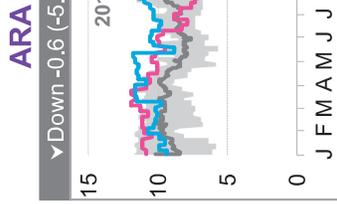
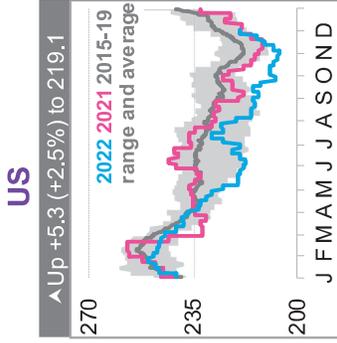
Fujairah*



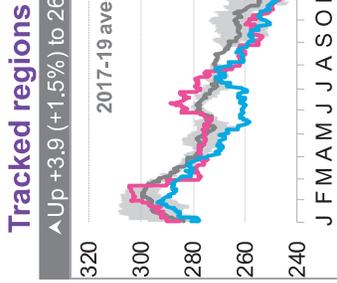
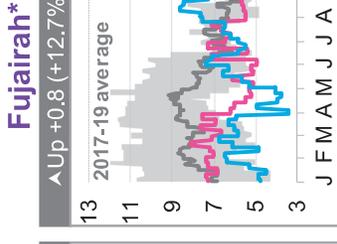
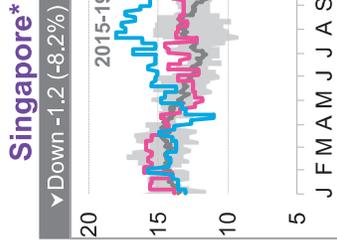
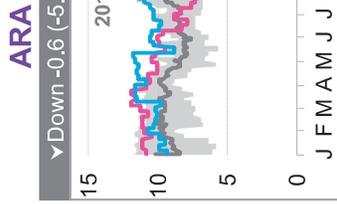
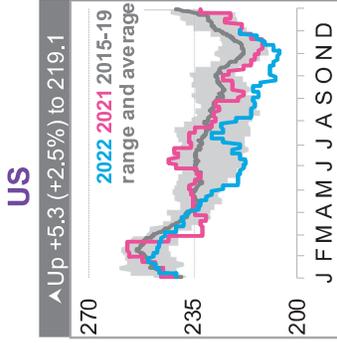
Tracked regions



**Gasoi/
*middle
distillates**



**Total oil
product**



Source: BloombergNEF, US EIA, PJK, IE Singapore, FEDCom/Platts, PAJ. Note: As of the week ending December 2, 2022.

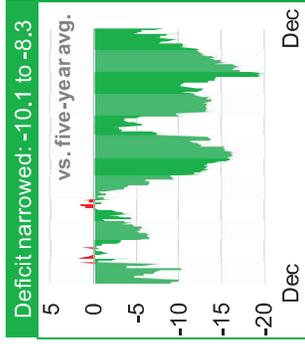
Product stocks: Current versus seasonal average

Neutral: Oil product stockpile deficit against the seasonal average narrowed from 5.2m bbl to 3.4m bbl

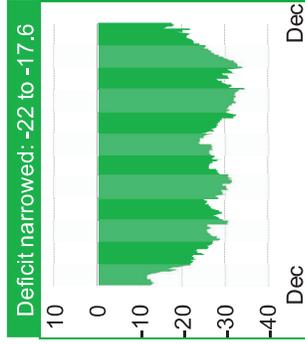
- The charts below compare each respective regional product stockpile level against the seasonal average defined in the previous slide.
- Red** signifies that the current stockpile levels are higher (in surplus) than the seasonal average, while **green** signals that the current stockpiles are lower (in deficit).

*Units are in million barrels

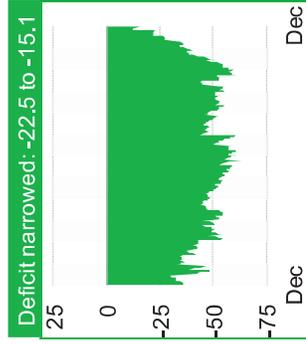
US



Gasoline/
*light
distillates

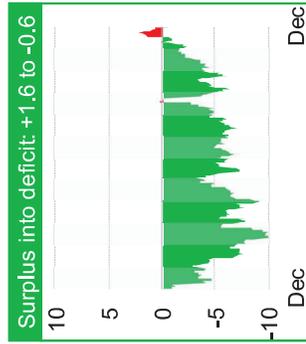
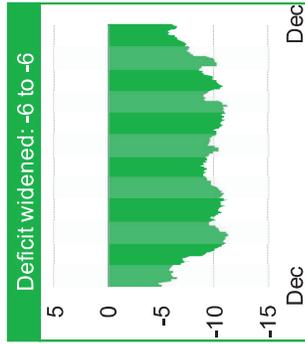
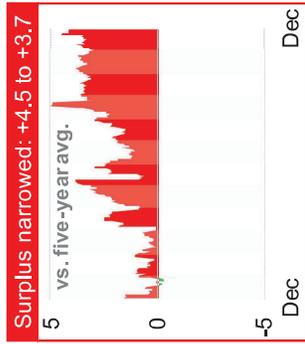


Gasoil/
*middle
distillates

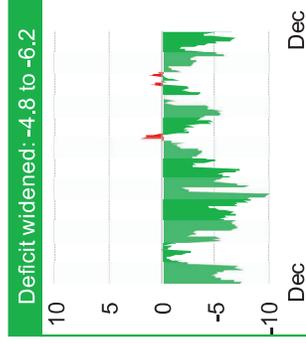
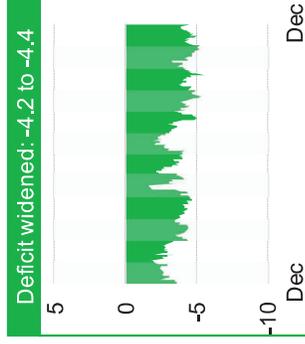
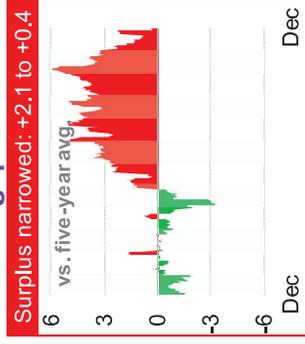


Total oil
product

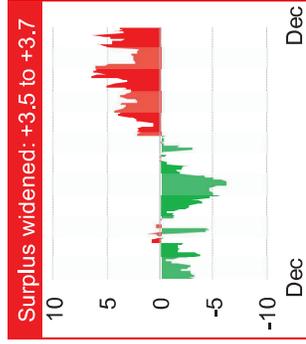
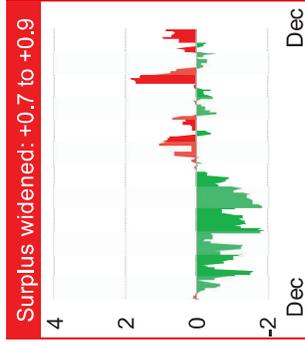
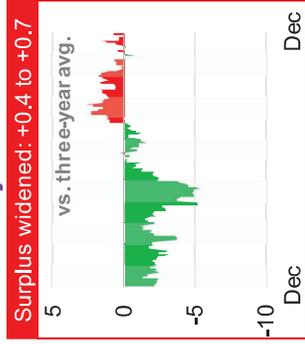
ARA



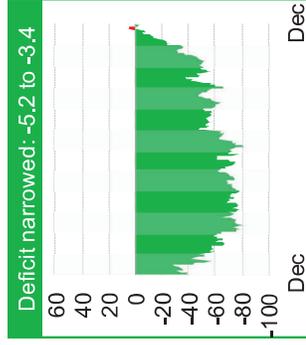
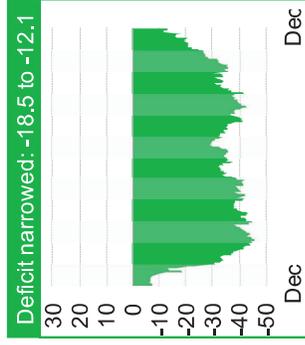
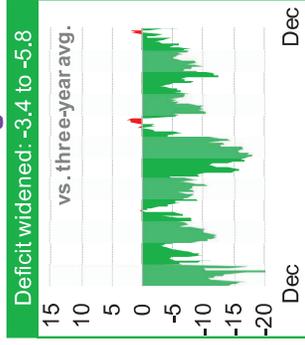
Singapore*



Fujairah*



Tracked regions



Source: BloombergNEF, US EIA, PJK, IE Singapore, FEDCom/Platts, PAJ. Note: As of the week ending December 2, 2022.



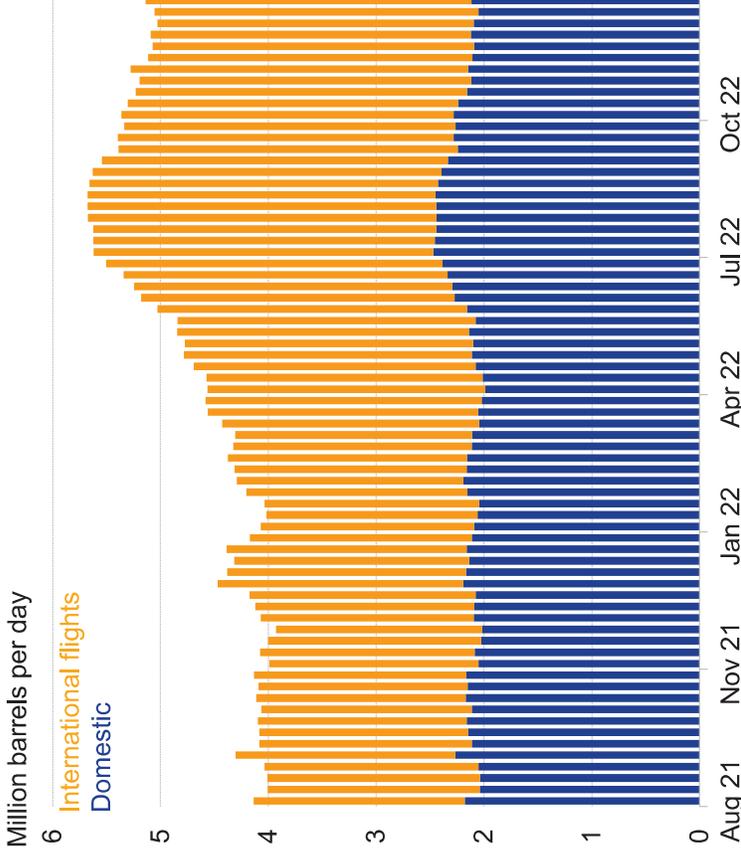
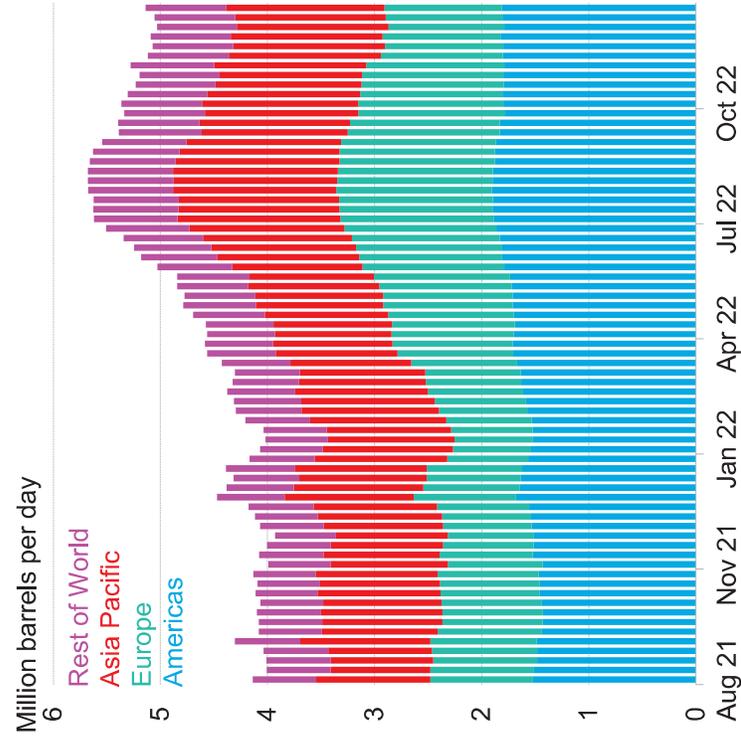
Demand indicators: Air traffic

Bullish: Scheduled jet fuel demand grew 1.7% over the past week

Our weekly global aviation report is available on the BNEF website or the Bloomberg Terminal

- Note that the data presented below are extracted from the Bloomberg Terminal's {DSET FLY <GO>}

Jet fuel demand for commercial passenger flights, by region (left) and by type (right)



K bbl per day	Latest	Week Δ	Four-week Δ	Year-on-year Δ
World	5,137	83.8 (+1.66%)	65.0 (+1.3%)	960.9 (+23.0%)
Americas	1,815	8.0 (+0.4%)	16.6 (+0.9%)	259.3 (+16.7%)
Asia Pacific	1,477	74.3 (+5.3%)	60.1 (+4.2%)	324.0 (+28.1%)
Europe	1,095	3.7 (+0.3%)	-10.4 (-0.9%)	235.2 (+27.4%)
Rest of World	751	-2.3 (-0.3%)	-1.4 (-0.2%)	142.4 (+23.4%)

K bbl per day	Latest	Week Δ	Four-week Δ	Year-on-year Δ
International	3,021	18.4 (+0.6%)	41.2 (+1.4%)	921.9 (+43.9%)
Domestic	2,117	65.4 (+3.2%)	23.7 (+1.1%)	39.1 (+1.9%)

Source: Bloomberg Terminal {DATA FLY <GO>}. Note: Latest data as of the week to December 13, 2022. Jet fuel demand is measured from the origin region.

DECEMBER 16, 2022

TIPRO HIGHLIGHTS CONTINUED UPSTREAM EMPLOYMENT GROWTH IN NOVEMBER

Austin, Texas - Citing the latest Current Employment Statistics (CES) report from the U.S. Bureau of Labor Statistics (BLS), the Texas Independent Producers and Royalty Owners Association (TIPRO) today highlighted new employment figures showing continued growth in monthly employment for the Texas upstream sector and strong demand for available talent throughout the industry.

According to TIPRO's analysis, direct Texas upstream employment for November 2022 totaled 209,900, an increase of 2,600 jobs from October employment numbers, subject to revisions. Texas upstream employment in November 2022 represented the addition of 37,600 positions compared to November 2021, including an increase of 7,900 jobs in oil and natural gas extraction and 29,700 jobs in the services sector.

Based on the top three occupations by standard occupational classification, oil and gas roustabouts make up approximately 5 percent of the Texas oil and natural gas industry workforce, followed by first-line supervisors of construction trades and extraction workers (4 percent) and oil and gas service unit operators (4 percent). When calculating direct, indirect, and induced employment for the upstream sector, for every position in Crude Petroleum Extraction, five jobs are created in other industries, followed by Natural Gas Extraction (four jobs), Drilling Oil and Gas Wells (two jobs) and Support Activities for Oil and Gas Operations (two jobs).

TIPRO in its analysis once again noted strong job posting data for upstream, midstream and downstream industries for the month of November. According to the association, there were 11,111 active unique jobs postings for the Texas oil and natural gas industry in November, including 3,596 new job postings added in the month by companies.

Among the 14 specific industry sectors TIPRO uses to define the Texas oil and natural gas industry, Support Activities for Oil and Gas Operations continued to dominate the rankings for unique job listings in November with 3,433 postings, followed by Crude Petroleum Extraction (1,523), and Petroleum Refineries (1,137), indicating a continued emphasis on increasing exploration and production activities in the state. The leading three cities by total unique oil and natural gas job postings were Houston (4,299), Midland (933) and Odessa (524), said TIPRO.

The top three companies ranked by unique job postings in November were John Wood Group with 586 positions, Baker Hughes (541) and KBR (412), according to TIPRO. Of the top ten companies listed by unique job postings last month, six companies were in the services sector, followed by two companies in oil and natural gas extraction and two midstream companies.

There were 1,234 advertised salary observations, or 11 percent of total oil and natural gas job postings, with a median salary of \$52,600. Based on TIPRO's analysis, the average annual wage for the Texas oil and natural gas industry is \$132,000, with average wages for the Texas upstream sector exceeding \$139,000 per year.

Top posted industry occupations for November included heavy tractor-trailer truck drivers (497), managers (309) and computer occupations (226). Top qualifications for unique job postings included Commercial Driver's License (CDL) (403), CDL Class A License (346) and Tanker Endorsement (143). When analyzing education requirements for unique industry job postings last month, TIPRO reports that 44 percent required a bachelor's degree, 34 percent a high school diploma or GED, and 23 percent had no education requirement listed as part of the criteria.

TIPRO also highlights new data released from the Texas comptroller's office showing production taxes paid by the oil and natural gas industry to the state of Texas generated \$980 million in tax revenue in November. According to the comptroller's data, in November, Texas oil producers paid \$570 million in production taxes, up 19 percent from November 2021. Natural gas producers, meanwhile, last month also paid \$410 million in state taxes, up 41 percent from November 2021. Funding from oil and natural gas production taxes is used to directly support Texas schools, roads, infrastructure and other essential services.

Additionally, TIPRO reports that oil and gas production is anticipated to continue to grow in the coming months. Oil output in the Permian Basin is forecasted to hit a record 5.58 million barrels per day (bpd) in January of 2023, according to the U.S. Energy Information Administration (EIA). In the Eagle Ford Shale in South Texas, oil output will rise by 10,000 bpd next month to total 1.24 million bpd. Overall, U.S. crude oil production is expected to go up by 94,000 bpd and will top 9.319 million bpd in January, projects the EIA. Natural gas production in the Permian Basin will also rise by 119 million cubic feet per day (Mmcf/D) and will hit record highs in January at 21.39 billion cubic feet per day (bcf/d). Natural gas output in the Eagle Ford Shale is also forecasted to reach 7.46 bcf/d in January, up 69 Mmcf/d from projected December levels. Altogether, EIA forecasts natural gas production in the United States to grow to 96.28 bcf/d in the first month of the new year.

“TIPRO’s labor analysis continues to show a high demand for employees in the Texas oil and natural gas industry,” commented Ed Longanecker, president of TIPRO. “Ensuring that we have an adequate pool of available talent to fill current and future positions in our sector will be critical to supporting economic growth in our state and providing energy security to our country and allies abroad,” concluded Longanecker.##



SAF Group created transcript of Energy Secretary Granholm at 132nd Meeting of the National Petroleum Council on Dec 14, 2022 https://www.youtube.com/watch?v=dD_sUdDPv4s

Items in “italics” are SAF Group created transcript

At -2:16:00, Granholm *“I just want to acknowledge the elephant in the room, which is that part of the challenge we’ve experienced together is really the butting heads between the oil and gas industry and the administration. And I raise this, and I know that a lot of people in the room, maybe those on line, have experienced frustration in the heat of disagreements and that at times, I do believe that we have talked past each other even though I think there are so many shared goals. So I am raising this not to rekindle those feelings, but really to underscore how appreciative I am that through these honest conversations, these disagreements, differences of opinion we have still found ways to work together. And for the public good, which we all care about. For example, we’ve been able to have productive conversations on production and refining issues. We have been able to turn to you for advice on the strategic petroleum reserve, on hours of service waivers, on ethanol requirements. We’ve coordinated on matters ranging from the movement of LNG supply to Europe, and the potential for impacts from the rail strike. We’ve turned to you recently, members of this organization and beyond for thoughts on whether the industry can help with providing infrastructure assistance to Ukraine in light of the bombing of infrastructure there. we’re really grateful for all of that. ”*

At -2:12.45, Granholm *“In that spirit, I want to be open and frank in this meeting as well. I want to say, first of all, that the Biden-Harris Administration’s commitment to a “managed” transition is as strong as ever. And I want to underscore the managed point because as you have noted in your reports and in your statements that moving too fast could end up creating unintended consequences that will hurt people, cause backlash. This has got to be done in a smart, and thoughtful way in partnership. The first part of this managed transition means meeting our energy needs right now. And that means today and, as we have talked about with many of you, increasing investment in production to unburden Americans and really around the world we have a unique position in the world as major energy supplier. And so, the world is really looking at America for assistance with that, with managing that transition. And really to, as we look at this sort of geopolitical realignment of the world around energy supply, the role here in this room, the oil and gas sector is just enormous. It’s enormous. So it means increasing production to meet that demand. It means finding, for example as we have spoken with a number of you, the right approach for, in the United States, increasing distillate storage where we need it”* at -2:09:30 Granholm *“... this managed transition obviously means as well keeping refineries operating safely. Safety I know is your first priority, it’s our first priority as well....”* At -2:08:40 Granholm *“...we understand that this transition puts a sector, for example like refining in a challenging position. We’re going to continue to work with refiners as you work with you as you manage capacity as you think about creative options to reduce emission in the future. That’s the now, but further ahead, this transition hinges, I think you all agree, on making sure it’s done well, making sure we acknowledge that fossil fuel is not going to go away anytime soon, but that there is a moment for diversification at hand right now. Our energy security, and when I say diversification I’m talking about expanding and growing the pie on this. our energy security, our economic security, our climate security, I think all compel us to meet our needs today but then expand, invest in a widening array of energy sources. We need this industry to play a lead role developing, deploying these additional resources.”*

At -2:03.40, Granholm *“.. this managed transition that we are pursuing is I have been saying is not going to eliminate the use of fossil fuels by 2050, as we have been having that 2050 Net Zero goal That’s the reason it’s call Net. IPCC, any credible climate analysts all acknowledge that fact so we’ve got to do all that we can to decarbonize. And work together*

on that decarbonization strategy even as we expand the pie and add renewables to this plate, that growing opportunity. But, it does point to lower use I think of fossil and the question is how the industry adapts to that as well. As we've long said, we're ready, we're eager to work with you on the answer to that question. And we know that question will lead to responsibly meeting our energy security needs to rapidly decarbonizing, especially the natural gas value chain, there is such a huge uptake to protecting American families and communities, and to maintaining American competitiveness."

Prepared by SAF Group <https://safgroup.ca/news-insights/>

14 DECEMBER 2022

Govt extending cost of living support

HON GRANT ROBERTSON

HON DR MEGAN WOODS

HON MICHAEL WOOD

- Petrol excise duty cut extended to February 28 then phased out by March 31 2023
- Half price public transport fares extended to the end of March 2023
- Extensions timed to link up with significant lifts on April 1 2023 to the Family Tax Credit, Superannuation, benefits, student allowances and increased childcare support.
- Half price public transport made permanent to around one million Community Service Card holders, including tertiary students, from April 1 2023.
- Half price fares for Total Mobility Scheme to be made permanent from April 1 2023.

The Government is providing more cost of living support by extending the petrol excise discount until the end of February then phasing it out by the end of March. Half price public transport will also be extended until the end of March.

“Many households are still struggling with the cost of living, which is why the Government is continuing to provide support for New Zealanders through the global economic uncertainty caused by COVID and the war in Ukraine,” Grant Robertson said.

“The fuel price and public transport discounts directly helped people struggling with cost of living pressures, while also helping to take the edge off inflation by about half a percent.

“The Government has invested over \$1 billion over the past year to reduce fuel prices. However it is not sustainable to continue to subsidise the cost of petrol indefinitely for everyone.

“We have to strike a balance between broad ongoing support and careful management of the Government accounts. That’s why we are transitioning to more targeted support for those most feeling the pinch.

“We have deliberately timed the full phase out of this support to coincide with lifts to support for families, students and seniors that will happen on the 1st of April.”

The petrol excise duty cut will remain at 25 cents per litre until the end of February, then the duty will increase 12.5 cents per litre until the end of March when it will be completely phased out.

Half price fares for public transport will be extended until the end of March, after which they will be made permanently half price for people with Community Service Cards.

Half price fares for the Total Mobility Scheme will also be made permanent from April 1 next year. This scheme provides subsidised taxi services for people who cannot use public transport because they have a disability.

The Road User Charges (RUC) discount will end on January 31 2023. RUC is not being extended because it is pre-purchased so RUC holders purchasing in December and January will be receiving the discount for some months afterwards. For example, buying 4,000km in January for \$250 would last the average driver until June – longer than the petrol reductions.

“The impact of the global fuel price crisis has eased to some degree in New Zealand with the price of Dubai crude reducing. Since we brought in the 25 cent per litre cut, retail prices for regular 91 have dropped by about 76 cents per litre (including the excise cut). People are still feeling cost of living pressures though so we’re pleased we’re able to do a bit more to help motorists,” Megan Woods said.

Michael Wood says cutting excise duty and providing half price public transport has made a real difference to people feeling cost of living pressures.

“It is important to get the balance right though, as these policies are not without significant costs. We’ve got to make sure they are sustainable when that duty and fares help make up the funding we use to fix our roads and invest in public transport, cycling and walking infrastructure.

“The Government has topped up the National Land Transport Fund to reflect the revenue shortfall so far. The top-up to the end of November this year was \$805 million and it is estimated it will total up to \$1.3 billion by the end of January 2023,” Michael Wood said.

“The extra extension of support through to the end of March is estimated to cost about \$116 million which we are paying for through savings made in other areas,” Grant Robertson said.

“As a Government we will have to make some tough decisions in the coming year as the global economy falters.

“New Zealanders should rest assured we are committed to supporting them while also continuing to take a careful and balanced approach to spending and debt.

“The cost of living remains the number one issue for New Zealanders and it is the number one priority for the Government. However fiscal conditions mean that our support for households needs to be targeted,” Grant Robertson said.

Europe's \$1 Trillion Energy Bill Only Marks Start of the Crisis

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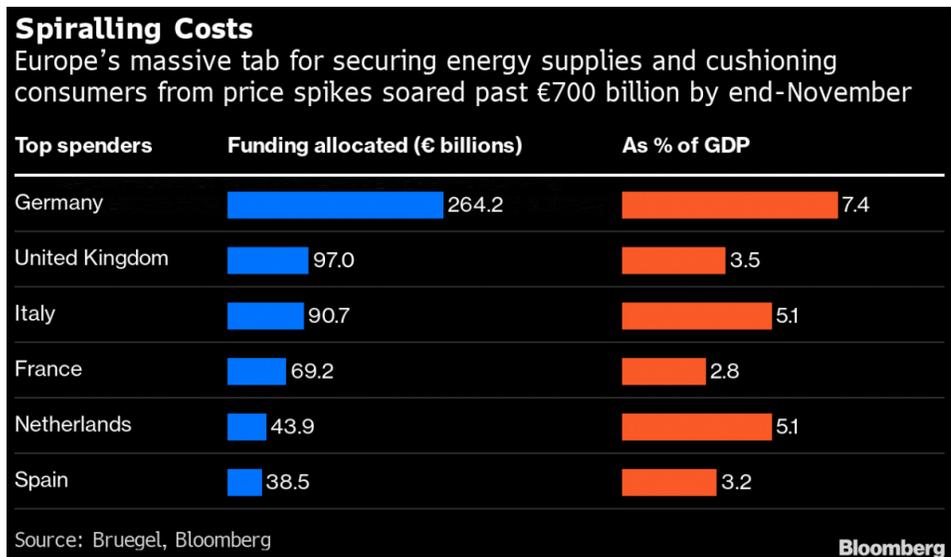
By Bloomberg News

(Bloomberg) -- Europe got hit by roughly \$1 trillion from surging energy costs in the fallout of Russia's war in Ukraine, and the deepest crisis in decades is only getting started.

After this winter, the region will have to refill gas reserves with little to no deliveries from Russia, intensifying competition for tankers of the fuel. Even with more facilities to import liquefied natural gas coming online, the market is expected to remain tight until 2026, when additional production capacity from the US to Qatar becomes available. That means no respite from high prices.

While governments were able to help companies and consumers absorb much of the blow with more than \$700 billion in aid, according to the Brussels-based think tank Bruegel, a state of emergency could last for years. With interest rates rising and economies likely already in recession, the support that cushioned the blow for millions of households and businesses is looking increasingly unaffordable.

"Once you add everything up — bailouts, subsidies — it is a ridiculously large amount of money," said Martin Devenish, a director at consultancy S-RM. "It's going to be a lot harder for governments to manage this crisis next year."

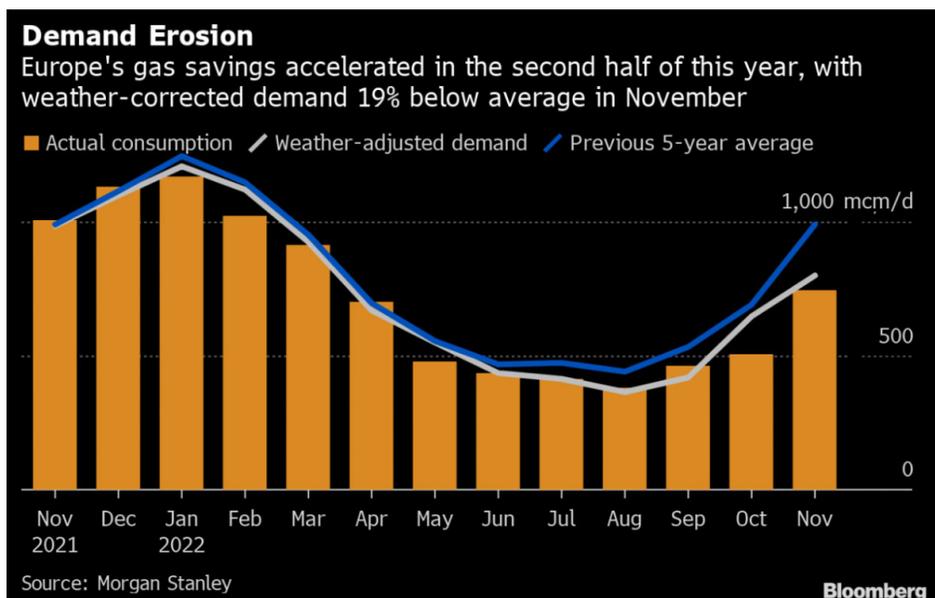


Government fiscal capacity is already stretched. About half of European Union member states have debt exceeding the bloc's limit of 60% of gross domestic product.

Read more: [Germany to Issue Record Federal Debt to Fund Energy Crisis Aid](#)

The roughly \$1 trillion, calculated by Bloomberg from market data, is a broad tally of more expensive energy for consumers and companies — some but not all of which was offset with aid packages. Bruegel has a similar estimate looking at demand and an increase in prices, which was published in a

report this month by the International Monetary Fund. A rush to fill storage last summer, despite near-record prices, has eased the supply squeeze for now, but freezing weather is giving Europe's energy system its first real test this winter. Last week, Germany's network regulator warned that not enough gas is being saved and two of five indicators, including consumption levels, have become critical. With supply tight, businesses and consumers have been asked to reduce usage. The EU managed to curb gas demand by 50 billion cubic meters this year, but the region still faces a potential gap of 27 billion cubic meters in 2023, according to the International Energy Agency. That assumes Russian supplies drop to zero and Chinese LNG imports return to 2021 levels. Click here for Bloomberg's blog on Europe's energy crunch "Getting gas is an absolute necessity and we will likely see widespread European hoarding," said Bjarne Schieldrop, chief commodities analyst at Swedish bank SEB AB, predicting a "seller's market" for at least the next 12 months. "The race is on to fill EU natural gas inventories" before next winter.

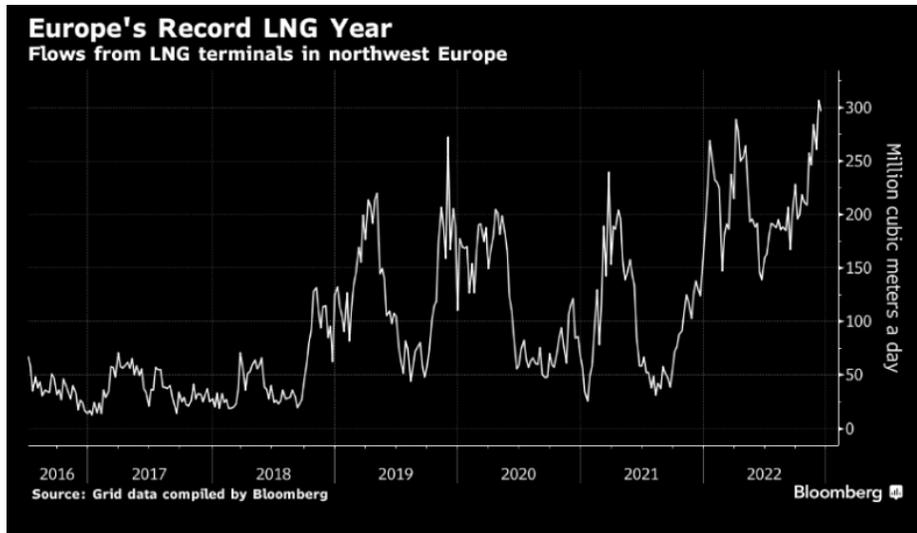


The main source of pipeline gas from Russia to Western Europe was Nord Stream, which was damaged in an act of sabotage in September. The region is still receiving a small amount of Russian supplies through Ukraine, but heavy shelling of energy infrastructure by the Kremlin puts the route at risk. Without this gas line, refilling storage will be challenging.

To head off a shortage, the European Commission has set minimum targets for inventories. By Feb. 1, reservoirs should be at least 45% full to avoid depletion by the end of the heating season. If the winter is mild, the goal is to leave storage levels at 55% by then.

LNG imports into Europe are at record levels and new floating terminals are opening in Germany to receive the fuel. Government-backed buying has helped Europe attract cargoes away from China, but colder weather in Asia and a potentially strong

economic recovery after Beijing eased Covid restrictions could make that more difficult.

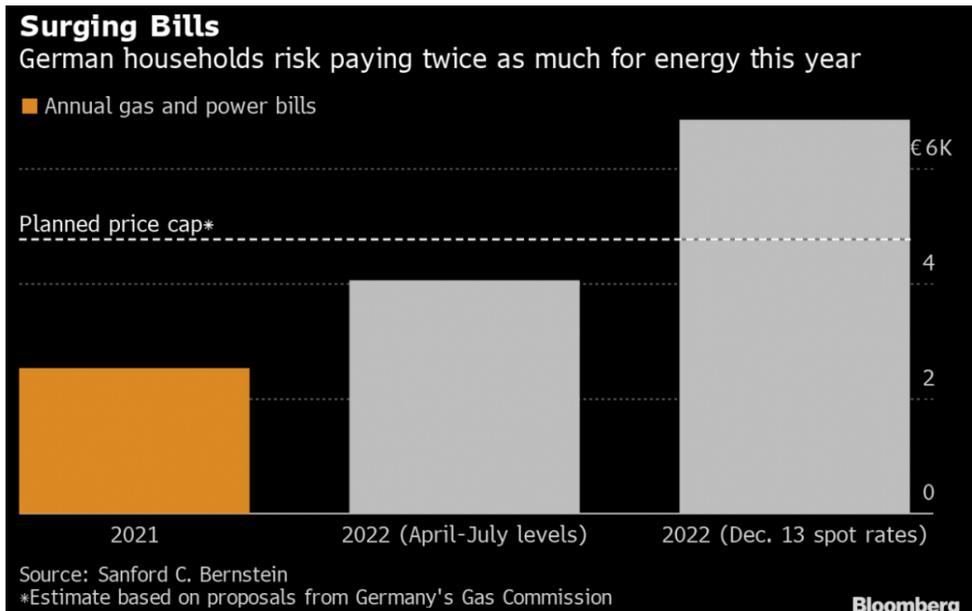


Chinese gas imports are likely to be 7% higher in 2023 than this year, according to China National Offshore Oil Corp.'s Energy Economics Institute. The state-owned company has started securing LNG supplies for next year, putting it in direct competition with Europe for spare shipments. China's historic drop in demand this year was equivalent to about 5% of global supply.

China isn't Europe's only problem. Other Asian countries are moving to procure more gas. Japan, the world's top LNG importer this year, is even considering setting up a strategic reserve, with the government also looking to subsidize purchases.

European gas futures have averaged about €135 a megawatt-hour this year after peaking at €345 in July. If prices go back up to €210, import costs could reach 5% of GDP, according to Jamie Rush, chief European economist at Bloomberg Economics. That could tip the shallow recession being forecast into a deep downturn, and governments will likely have to scale back programs in response.

"The nature of the support will change from an urgent, all-encompassing approach to more targeted measures," said Piet Christiansen, chief strategist at Danske Bank A/S. "The numbers will be smaller — but it will still be there through this transition."



Read more: Spending Big and Badly Shows Energy Crisis Risks for Europe

For the likes of Germany, which rely on affordable energy to make products from cars to chemicals, high costs mean losing competitiveness to the US and China. That puts pressure on Chancellor Olaf Scholz's administration to maintain support for the economy.

"Given the potentially enormous political and social repercussions of the energy price explosion and the shock to the backbone of the German economy, it is important for the German government to step in," said Isabella Weber, an economist at the University of Massachusetts Amherst, who's known as the inventor of Germany's gas price break.

The challenge is finding the balance between keeping factories running and homes heated in the near term while not choking off the incentives to invest in renewable power — widely seen as the most sustainable way out of the energy squeeze.

"The biggest task out of the crisis is to make the energy transition happen," said Veronika Grimm, an economic adviser to the German government. "We have to massively expand renewables."

--With assistance from Vanessa Dezem, Ann Koh, Dan Murtaugh and Shoko Oda.

To contact Bloomberg News staff for this story:

Rachel Morison in London at rmorison@bloomberg.net;

Elena Mazneva in London at emazneva@bloomberg.net;

Carolynn Look in Frankfurt at clook4@bloomberg.net;

Anna Shiryayevskaya in London at ashiryayevska@bloomberg.net;

Petra Sorge in Berlin at psorge10@bloomberg.net;

Stephen Stapczynski in Singapore at sstapczynsk1@bloomberg.net

To contact the editors responsible for this story:

Emma Ross-Thomas at erossthomas@bloomberg.net

Chris Reiter

To view this story in Bloomberg click here:

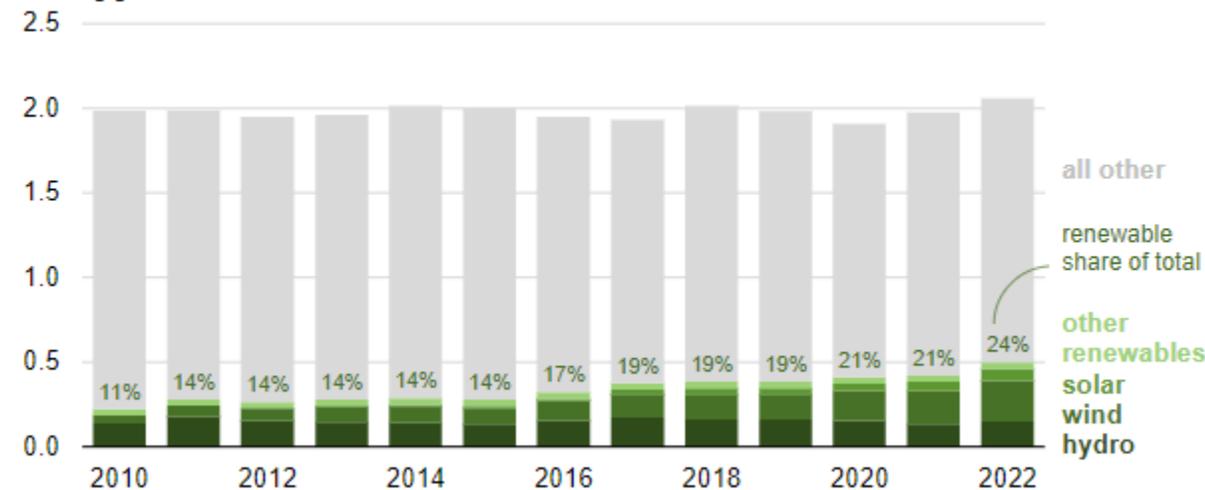
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In the first half of 2022, 24% of U.S. electricity generation came from renewable sources

From December 15 to December 30, *Today in Energy* will feature some of our favorite articles from 2022. Today's article was originally published on September 9.

U.S. electricity generation, first six months of the year (Jan–Jun, 2010–2022)

million gigawatthours



Data source: U.S. Energy Information Administration, *Electric Power Monthly*, June 2022

In the first six months of 2022, 24% of U.S. utility-scale electricity generation came from renewable sources, based on data from our *Electric Power Monthly*. The renewables' share increased from 21% for the same time period last year. Renewables are the fastest-growing electricity generation source in the United States.

Renewable generation sources include conventional hydropower, wind, solar, geothermal, and biomass. In the United States, most renewable electricity generation comes from hydropower, solar, and wind. Generation from renewable energy sources has grown rapidly as renewable capacity, mostly solar and wind, has been added to the grid.

In 2021, a record amount of new utility-scale solar capacity was installed in the United States. From June 2021 to June 2022, 17.6 gigawatts (GW) of new utility-scale solar capacity came online, bringing U.S. utility-scale solar capacity to 65.8 GW, according to our *Preliminary Monthly Electric Generator Inventory*. In June 2022, the United States had 137.6 GW of wind capacity, and 10% (14.3 GW) of that capacity was installed between June 2021 and June 2022. Based on planned additions reported to us by power plant owners and developers, another 7.0 GW of wind and 13.0 GW of solar capacity will come online by the end of the year.

Hydropower and wind generation, which, combined, make up the majority of U.S. renewable generation, typically peak in the first half of the year, when there are more windy days and the winter snowpack is melting. In the second half of 2022, we expect that renewables will make up a smaller share of generation than they did in the first half of the year (20%) as wind and hydroelectric generation decline, based on our latest *Short-Term Energy Outlook*.

Principal contributor: Elesia Fasching

Tags: [electricity generation](#), [renewables](#), [wind](#), [hydroelectric](#), [solar](#)

Executive Summary

While Ontario benefits from one of the cleanest electricity systems in North America (which contributes only three per cent of the province's total greenhouse gas emissions), the process of eliminating all emissions from the grid is a significant and complex undertaking that will require an extensive and collaborative effort to achieve.

The Pathways to Decarbonization report explores this effort, responding to the Minister of Energy's request to evaluate a moratorium on new natural gas generating stations in Ontario and to develop an achievable pathway to decarbonization in the electricity system.

Two scenarios – Moratorium and Pathways – are presented to address the Minister's request. These scenarios are not integrated power system plans. Rather, they are analyses that identify potential opportunities and challenges to consider, particularly as demand for electricity grows and Ontario's resource mix evolves. The Independent Electricity System Operator (IESO) brings the expertise and experience of the system operator to this study, and as such, the results contribute future-looking insights that can inform policy and strategy development. They make it clear that a carefully governed and orderly approach to the energy transition will be necessary to maintain reliability and manage costs.

One key insight of this analysis is that phasing gas generation out of the system will require ingenuity and the implementation of new technologies to reorient our current system, which is grounded in the flexibility that natural gas generators provide. This is in part because Ontario's natural gas fleet is capable of providing continuous, flexible energy year round and under all weather conditions, and there is currently no like-for-like replacement. This means natural gas will be needed until reliable replacements have been identified, put into service and have demonstrated their capability.



Another key takeaway is that in an environment of rapid economic growth and electrification, where demand for electricity will increase at unprecedented rates, a significant investment in new electricity system infrastructure in a relatively short period will be essential to meeting emissions reductions targets.

Understanding these issues provides a foundation for action and contributes to the ongoing conversation about the energy transition. As such, this report will inform the work of the Ontario government's Electrification and Energy Transition Panel (EETP) and the Cost-Effective Energy Pathways Study¹.

Moratorium on Natural Gas Generation

On the question of when a moratorium on new natural gas generation facilities can begin, the IESO looked at what resources would be needed to ensure reliability mid-decade and then after 2027. Against a backdrop of growing demand and increasing pressure on supply, we assessed the potential for capacity, energy and transmission expansion without additional natural gas generation after the IESO's current long-term procurement for new supply.

This assessment showed that a moratorium would be feasible beginning in 2027. At that point, the system would not require additional emitting generation to ensure reliability, provided that other forms of non-emitting supply can be added to the system in time to keep pace with demand growth. The results of this scenario would require investments of approximately \$26 billion in new infrastructure.

The Moratorium scenario also shows that once the current slate of nuclear refurbishments is completed and new non-emitting supply enters the system, emissions could begin to decrease significantly. In this scenario, 4,000 megawatts (MW) of natural gas generation is retired and emissions drop by 60 per cent. Natural gas generation would, however, be needed to continue to provide flexibility to the broader system and meet local needs in the Greater Toronto Area (GTA) – an issue that the IESO is actively evaluating further.

A Pathway to Decarbonization

In the development of a pathway to a decarbonized grid, the IESO adopted a more aggressive electrification demand forecast. The Pathways scenario illustrates a system designed to meet winter peaks that are almost three times higher than those we experience today. As a result, the system would likely require an additional 69,000 MW of non-emitting supply and 5,000 MW in demand reductions from conservation.

We therefore contemplated a decarbonized supply mix by 2050 with contributions from new nuclear, conservation, demand response, renewables and storage. The mix also includes low-carbon generation such as hydrogen and renewable natural gas – currently emerging technologies – at scale. The need for a significant increase in transmission capability was also identified.

¹ To inform the work of the EETP, the Ministry of Energy is undertaking a study to understand pathways for economy-wide decarbonization. The work will begin in December 2022.

Decarbonizing Ontario's Electricity System

Bridging the work of today with the needs of a decarbonized world will be challenging and complex. Ontario's electricity system is well positioned to make the transition, but will need to address a series of challenges in order to achieve decarbonization.

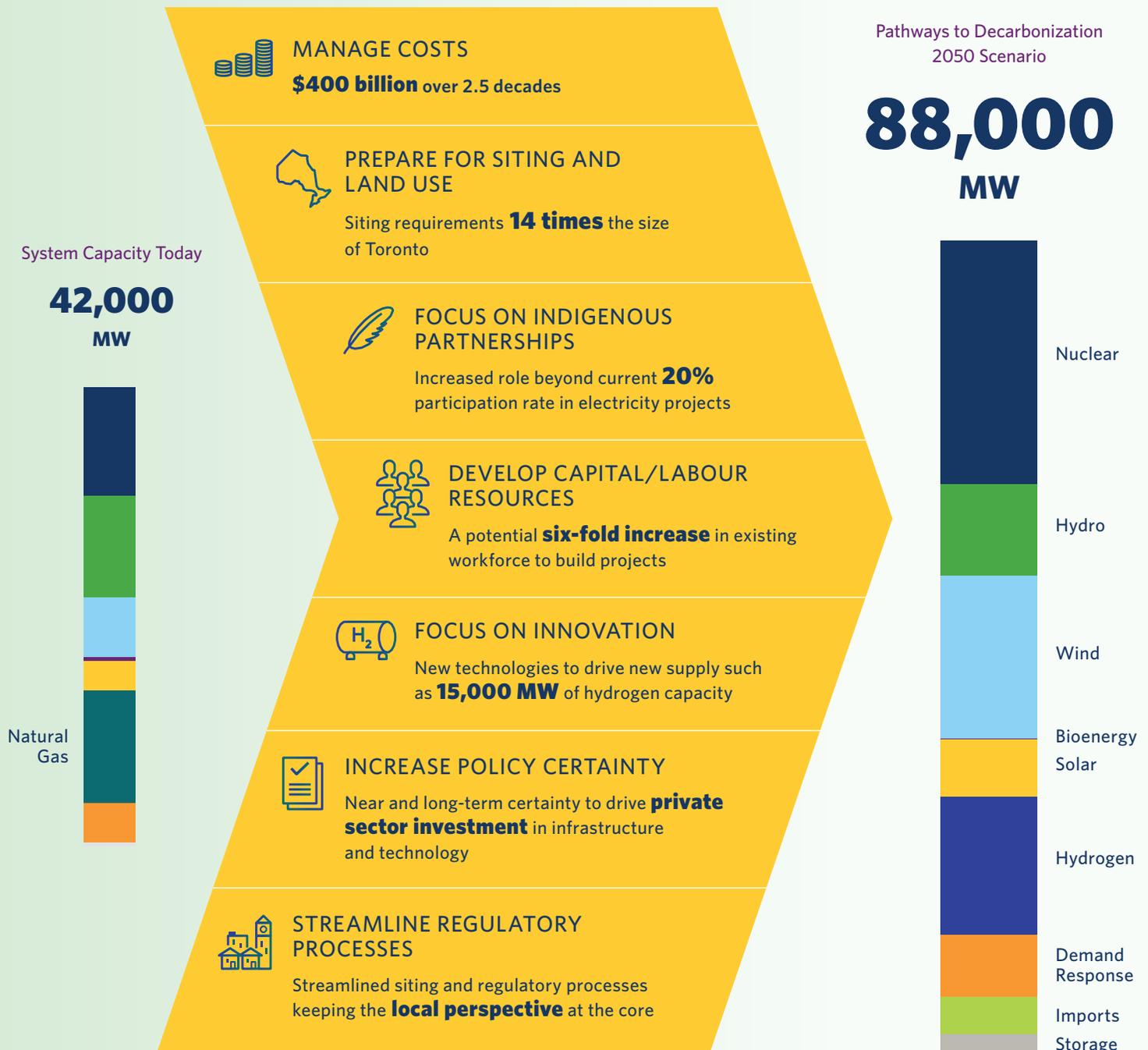


TABLE 2: MODELLING CONSIDERATIONS

Factor	How Incorporated in the Report
Weather patterns	Historical normal weather patterns were used for this report. The IESO did not perform sensitivities to assess the impact of changing weather on normal demand.
Low-carbon hydrogen manufacture	In this report the IESO has assumed that hydrogen is produced outside of Ontario and therefore has no impact on demand. Producing hydrogen at scale within the province is expected to increase demand and the need for resources (see Enbridge's Pathways to Net-Zero Emissions In Ontario), although further work is needed to better understand the impacts of hydrogen production and deployment on the electricity system. The IESO will consider these impacts in future scenarios.
Carbon capture, utilization and storage (CCUS)	Based on feedback from stakeholders, CCUS was determined to be ill-suited to peaking applications, which is the forecasted role for the continued use of emitting supply, and was therefore not available as a resources option.
Distribution system	This study focused solely on the transmission-connected grid, and no analysis was conducted on the impact to distributions systems.
Emissions removal, including direct air capture	Emissions removal, including direct air capture, was not considered, as the Minister's request was for a zero-emissions grid.
Wind	Onshore wind was capped at 15,800 MW, limited by site quality, regulatory requirements and distance to transmission infrastructure.
Low-carbon fuels	Imported blue hydrogen combusted in a new single-cycle turbine was used as a proxy for low-carbon fuels and was assumed to be available after 2035. Low-carbon fuels include pink, green and blue hydrogen, synthetic methane, renewable natural gas and biofuels, which can all be combusted in a turbine or used in a fuel cell. (For a discussion of some of the challenges facing low-carbon fuels see Appendix A, Tab 9.)
Storage	Batteries and pumped hydroelectric storage were used as proxies for storage more generally. The IESO recognizes that other types of storage could play a role in a decarbonized future. (See Appendix B, section 4 for a description of various different types of storage.)
Firm imports	External research (see Appendix C) was performed to assess the clean-energy transitions of each of Ontario's connected neighbours, as well as their future ability to export clean energy. To guarantee the cleanliness of firm-imported electricity, firm imports were only permitted from Québec. Manitoba was not considered due to the distance to major Ontario load centres and insufficient transmission capability to enable imports.

Assessing a Pathway to a Decarbonized Future

The Pathways scenario looks at the time frame for decarbonizing Ontario's electricity system in the context of high electricity demand based on substantial electrification in other sectors.

Using the same supply base case as the Moratorium scenario, Pathways focused on 2050, assuming non-emitting resources would be available for 25 years for solar and 30 years for biomass and wind from their commissioning dates. Hydroelectric facilities were assumed to be available for the duration of the study time frame. In this scenario, up to the year 2035, gas plants were allowed to operate until they reached 25 years of age. After 2035, they were retired at the end of their contract, but kept available for reliability. This approach to the life of gas plants was informed by the draft framework for the Clean Electricity Regulation released in 2022.

Adequacy assessments were performed only for 2050, and as a result the scenario only shows capacity and energy results for that year. An operability screen was not performed, but further work will be undertaken.

Demand Forecast

The Pathways scenario, which looks out to 2050, assumes high levels of electrification in the economy. The scenario was created based on theoretical, aggressive, policy-driven electrification in three major sectors: transportation, building heat and industrial process. To develop this scenario, we did not undertake a cost-optimization exercise comparing different decarbonization options on the demand-side. The upcoming work performed by Ontario's Cost-Effective Energy Pathways Study, commissioned by the Ministry of Energy, will provide more insight on the possible evolution of demand in Ontario.

Major scenario assumptions include:

- **Buildings:** A nine-year transition from predominantly fossil-fuelled space and water heating to electric heat pumps, by 2030 for new residential and commercial buildings in Toronto, and by 2035 for the rest of the province. Technological improvement in cold-weather heat pump technology was assumed.
- **Transportation:** Electrification of passenger vehicles aligned with federal regulations; incremental electrification of medium and heavy-duty vehicles, including municipal transit buses, rail transit, and other mobility; and freight vehicles assumed to be fuel cell powered with hydrogen fuel.
- **Industry:** Broad substitution of natural gas fuel to electricity, roughly 20 per cent of current levels by 2050. If the low-carbon hydrogen is manufactured in Ontario, this new industry will represent a significant new load that is not currently included.
- **Conservation:** Assumes savings consistent with the maximum achievable potential from the 2019 IESO Conservation Achievable Potential study.

Pathways: Conclusion and Outcomes

This scenario illustrates the magnitude of the effort required for Ontario to decarbonize its electricity system while responding to economic development and electrification. Focusing on 2050 to align with international targets, this study highlights the goals we are attempting to achieve. It demonstrates an immense build-out of the province's transmission, distribution systems and resources that could more than double Ontario's installed capacity, and that would need every known or potential resource available today. It also requires replacing the necessary services provided by gas, which no resource alone today can do.

We can garner many insights from this scenario, but it is also important to acknowledge its limits. This resource mix was assessed for energy and capacity adequacy in 2050; an operability assessment was not performed. In addition, we did not perform adequacy assessments for the years before 2050. Further planning work is necessary to understand how to manage the transition in a reliable way from now to 2050.

This scenario relies heavily on low-carbon fuels for intermediate, peaking and flexibility needs. Currently there is no like-for-like replacement for the operating characteristics of natural gas. Low-carbon fuels might be able to fill this gap and would be a valuable addition to the supply mix, but they do not yet exist at scale and there are many barriers to commercialization. (See Appendix A, Tab 9.) If low-carbon fuels do not materialize, replacing natural gas will be an even more complex task, requiring more research and analysis into understanding how generation, demand, transmission and storage can be combined to replace gas. It may be possible to overcome all of these barriers, but it will require concerted effort by government and innovators.

In terms of both transmission and supply, the Pathways scenario would need \$375 billion to \$425 billion in new infrastructure investment, and result in an annual total system cost of approximately \$60 billion by 2050. Alternatively, annual system costs can be considered per unit of demand at \$200 to \$215/MWh, an increase of between 20 per cent and 30 per cent from current unit rates.

Regarding consumer bills, it is difficult to determine a potential rate impact given the changing nature of energy consumption. However, an increased reliance on electricity will significantly increase the volume of consumption on bills compared to today's patterns. (Further information on system costs is available in Appendix A, Tab 8.) However, as noted above, some studies suggest that actual impact on total energy costs could be modest due to offsets and increased efficiency.¹²

¹² Canadian Climate Institute op. cit., p. 26

Natural Gas as a Transitional Resource to Ensure Operability

Natural gas generation currently plays a vital role in supporting grid reliability: it can generally provide continuous energy throughout the year, under all weather conditions; it can be ramped up or down within minutes to follow sudden or unexpected changes in demand or in the availability of other generators; and it provides reliability services that help stabilize voltages and frequencies on the transmission grid.

These important characteristics must remain available to Ontario's power system, which means that natural gas facilities are needed past 2035, or until reliable replacements have been identified, put into service and demonstrated their capability.

Developing a strategy to replace natural gas facilities requires a number of thorough, detailed assessments. As learned during Ontario's coal phase-out initiative, shutting down large facilities while maintaining reliability can take many years to achieve. Some of the learnings from Ontario's previous experiences include the following:

- Replacement resources should be procured, built, commissioned and operated at a satisfactory level of performance prior to the shutdown of facilities. Careful scheduling and demonstration of operation are critically important to ensuring that reliability can be maintained during transition years.
- Replacement resources are unlikely to have the same attributes as natural gas facilities. Low-carbon fuels such as renewable natural gas, for example, may be suitable replacements, but significant work must be done to ensure that they have both the right technical characteristics and that they are market ready in sufficient quantities by 2035. In the end it may be necessary to procure additional resources to ensure that all reliability attributes are replaced.
- Shutting down larger facilities can impact the transmission system. Studies should be conducted as each facility shuts down to understand the broader effects on the transmission system and to develop adequate infrastructure to maintain the security of the grid.

Coordinating outages is critical during the years where new replacement facilities and supporting infrastructure are under construction and commissioning. A staged approach allows facilities to shut down while broader impacts to the grid are managed effectively.

Replacing these facilities will be complex and will require detailed assessments and studies that will be a priority for the IESO going forward. In addition, it may require the development of new reliability standards.

Corporate Tax Rates around the World, 2022

Cristina Enache

Key Findings

- In 2022, 16 countries made changes to their statutory corporate income tax rates. Six countries—Colombia, South Sudan, Netherlands, Turkey, Chile, and Montenegro—increased their top corporate tax rates, while 10 countries—including France, Greece, and Monaco—reduced their corporate tax rates.
- Comoros (50 percent), Puerto Rico (37.5 percent), and Suriname (36 percent) are the jurisdictions with the highest corporate tax rates in the world, while Barbados (5.5 percent), Turkmenistan (8 percent), and Hungary (9 percent) levy the lowest corporate rates. Sixteen jurisdictions do not impose a corporate tax.
- The worldwide average statutory corporate income tax rate, measured across 180 jurisdictions, is 23.37 percent. When weighted by GDP, the average statutory rate is 25.43 percent.
- Asia has the lowest regional average rate at 19.52 percent, while South America has the highest regional average statutory rate at 28.38 percent. However, when weighted by GDP, Europe has the lowest regional average rate at 23.59 percent and South America has the highest at 32.64 percent.
- The average top corporate rate among EU27 countries is 21.16 percent, 23.57 percent in OECD countries, and 32 percent in the G7.
- The worldwide average statutory corporate tax rate has consistently decreased since 1980 but has leveled off in recent years.
- The average statutory corporate tax rate has declined in every region since 1980.

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Introduction

In 1980, corporate tax rates around the world averaged 40.11 percent, and 46.52 percent when weighted by GDP.^[1] Since then, countries have recognized the impact that high corporate tax rates have on business investment decisions; in 2022, the average is now 23.37 percent, and 25.43 when weighted by GDP, for 180 separate tax jurisdictions.^[2] Declines have been seen in every major region of the world, including in the largest economies. In the United States, the 2017 Tax Cuts and Jobs Act brought the country's statutory corporate income tax rate from the fourth highest in the world closer to the middle of the distribution.^[3]

Asian and European countries tend to have lower corporate income tax rates than countries in other regions, and many developing countries have corporate income tax rates that are above the worldwide average.

Today, most countries have corporate tax rates below 30 percent.

Notable Corporate Tax Rate Changes in 2022

Sixteen countries changed their statutory corporate income tax rates in 2022. Six countries increased their top corporate rates: Colombia (31 percent to 35 percent), South Sudan (25 percent to 30 percent), Netherlands^[4] (25 percent to 25.8 percent), Turkey (20 percent to 23 percent), Chile (10 percent to 27 percent), and Montenegro (9 percent to 15 percent).

Ten countries across four continents—Seychelles, Sierra Leone, Zambia, Bangladesh, Myanmar, Tajikistan, France, Greece, Monaco, and French Polynesia—reduced their corporate tax rates in 2022. The tax rate reductions ranged from just 1.5 percentage points in Monaco to a 5 percentage point reduction in Seychelles, Sierra Leone, Zambia, and Tajikistan.

Table 1. Notable Corporate Income Tax Rate Changes in 2022

Country	2021 Tax Rate	2022 Tax Rate	Change from 2021 to 2022
Africa			
Seychelles	30%	25%	-5 ppt
Sierra Leone	30%	25%	-5 ppt
South Sudan	25%	30%	+5 ppt
Zambia	35%	30%	-5 ppt
Asia			
Bangladesh	32.5%	30%	-2.5 ppt
Myanmar	25%	22%	-3 ppt
Tajikistan	23%	18%	-5 ppt
Turkey	20%	23%	+3 ppt
Europe			
France	28.4%	25.8%	-2.6 ppt
Greece	24%	22%	-2 ppt
Monaco	26.5%	25%	-1.5 ppt
Montenegro	9%	15%	+6 ppt
Netherlands	25%	25.8%	+0.8 ppt
Oceania			
French Polynesia	27%	25%	-2 ppt
South America			
Chile *	10%	27%	+17 ppt
Colombia	31%	35%	+4 ppt
Notes:			
* In response to the pandemic, Chile has adopted a temporary rate reduction to 10 percent for small businesses. In 2022, for large companies, a 27 percent corporate tax rate applies.			
Source: Statutory corporate income tax rates are from OECD, "Table II.1. Statutory corporate income tax rate," updated May 2022, https://stats.oecd.org/index.aspx?DataSetCode=Table_II1 ; PwC, "Worldwide Tax Summaries – Corporate Taxes," 2022, https://taxsummaries.pwc.com/ ; Bloomberg Tax, "Country Guides – Corporate Tax Rates," accessed November 2022, https://www.bloomberglaw.com/product/tax/toc_view_menu/3380 ; and researched individually, see Tax Foundation, "worldwide-corporate-tax-rates," GitHub, https://github.com/TaxFoundation/worldwide-corporate-tax-rates .			

Scheduled Corporate Tax Rate Changes in the OECD and Selected Jurisdictions

Among Organisation for Economic Co-operation and Development (OECD) countries, Austria, the United Kingdom, and Turkey have announced they will implement changes to their statutory corporate income tax rate over the coming years. Additionally, the United Arab Emirates and South Africa also plan to amend their corporate income tax rates in 2023.

- In **Austria**, the corporate income tax will be cut from 25 percent to 24 percent in 2023 and further to 23 percent in 2024.[\[5\]](#)
- In the **United Kingdom**, the standard statutory corporate income tax rate is due to increase from 19 percent to 25 percent on April 1, 2023.[\[6\]](#)
- In **Turkey**, the corporate income tax was temporarily increased from 20 percent to 25 in 2021 and 23 percent in 2022. However, in 2023 the corporate income tax will return to 20 percent.[\[7\]](#)
- The **United Arab Emirates** announced the introduction of a federal corporate tax in mid-2023. The proposed corporate income tax rate of 9 percent on taxable income above AED 375,000 (USD 100,000) would apply to all business activities, while a different rate might apply to large multinationals. However, the new corporate income tax will not apply to the extraction of natural resources as these activities are already subject to taxation in the Emirates.[\[8\]](#)
- In **South Africa**, the corporate income tax will be cut from the current 28 percent to 27 percent for fiscal assessment periods that end on March 31, 2023, or after.[\[9\]](#)

The Highest and Lowest Corporate Tax Rates in the World

One hundred and forty-two of the 225 separate jurisdictions surveyed for the year 2022 have corporate tax rates at or below 25 percent.[\[10\]](#) One hundred and eighteen have tax rates above 20 percent but below or at 30 percent. The average tax rate among the 225 jurisdictions is 22.22 percent.[\[11\]](#) The United States has the 81st highest corporate tax rate with a combined federal and state statutory rate of 25.81 percent.[\[12\]](#)

The 20 countries with the highest statutory corporate income tax rates span almost every region, albeit unequally. While eight of the top 20 countries are in Africa, Oceania appears only once and Europe twice. Of the remaining jurisdictions, four are in North America, and five are in South America.

Table 2. 20 Highest Statutory Corporate Income Tax Rates in the World, 2022

Country	Continent	Tax Rate
Comoros*	Africa	50%
Puerto Rico	North America	37.5%
Suriname	South America	36%
Argentina	South America	35%
Chad	Africa	35%
Colombia	South America	35%
Cuba	North America	35%
Equatorial Guinea	Africa	35%
Guinea	Africa	35%
Malta	Europe	35%
Sudan	Africa	35%
Sint Maarten (Dutch part)	North America	34.5%
American Samoa	Oceania	34%
Brazil	South America	34%
Venezuela (Bolivarian Republic of)	South America	34%
Cameroon	Africa	33%
Saint Kitts and Nevis	North America	33%
Mozambique	Africa	32%
Namibia	Africa	32%
Portugal	Europe	31.5%

*The normal corporate tax rate is 35 percent, which applies to both Comorian companies and foreign companies deriving Comorian-source income. However, public industrial and commercial enterprises or those where the state or certain public institutions are participants are subject to a corporate tax rate of 50 percent if their turnover exceeds 500 million Comorian francs; see Bloomberg Tax, "Country Guides: Comoros," <https://www.bloomberglaw.com/product/tax/document/25590833704>.

Sources: Statutory corporate income tax rates are from OECD, "Table II.1. Statutory corporate income tax rate," updated May 2022, https://stats.oecd.org/index.aspx?DataSetCode=Table_II1; PwC, "Worldwide Tax Summaries – Corporate Taxes," 2022, <https://taxsummaries.pwc.com/>. Bloomberg Tax, "Country Guides – Corporate Tax Rates," accessed November 2022, https://www.bloomberglaw.com/product/tax/toc_view_menu/3380; and researched individually, see Tax Foundation, "worldwide-corporate-tax-rates," GitHub, <https://github.com/TaxFoundation/worldwide-corporate-tax-rates>.

On the other end of the spectrum, the 20 countries with the lowest non-zero statutory corporate tax rates all charge rates at or below 15 percent. Nine countries have statutory rates of 10 percent, five being small European nations (Andorra, Bosnia and Herzegovina, Bulgaria, Kosovo, and Macedonia). The only two OECD members represented among the bottom 20 countries are Hungary and Ireland. Hungary reduced its corporate income tax rate from 19 to 9 percent in 2017. Ireland is known for its low 12.5 percent rate, in place since 2003.

Table 3. 20 Lowest Statutory Corporate Income Tax Rates in the World, 2022

<i>(Excluding Jurisdictions with a Corporate Income Tax Rate of Zero Percent)</i>		
Country	Continent	Tax Rate
Barbados	North America	5.5%
Turkmenistan	Asia	8%
Hungary	Europe	9%
Andorra	Europe	10%
Bosnia and Herzegovina	Europe	10%
Bulgaria	Europe	10%
Kosovo, Republic of	Europe	10%
Kyrgyzstan	Asia	10%
Paraguay	South America	10%
Qatar	Asia	10%
The former Yugoslav Republic of Macedonia	Europe	10%
Timor-Leste	Oceania	10%
China, Macao Special Administrative Region	Asia	12%
Republic of Moldova	Europe	12%
Cyprus	Europe	12.5%
Gibraltar	Europe	12.5%
Ireland	Europe	12.5%
Liechtenstein	Europe	12.5%
Albania	Europe	15%
Georgia	Asia	15%

Sources: OECD, "Table II.1. Statutory corporate income tax rate"; PwC, "Worldwide Tax Summaries – Corporate Taxes"; Bloomberg Tax, "Country Guides – Corporate Tax Rates"; and researched individually, see Tax Foundation, "worldwide-corporate-tax-rates."

Of the 225 jurisdictions surveyed, 16 currently do not impose a general corporate income tax. Except for the United Arab Emirates, all these jurisdictions are small, island nations. A handful, such as the Cayman Islands and Bermuda, are well known for their lack of corporate taxes.

Table 4. Countries without General Corporate Income Tax, 2022

Country	Continent
Anguilla	North America
Bahamas	North America
Bahrain*	Asia
Belize*	North America
Bermuda	North America
British Virgin Islands	North America
Cayman Islands	North America
Guernsey	Europe
Isle of Man	Europe
Jersey	Europe
Saint Barthelemy	North America
Tokelau	Oceania
Turks and Caicos Islands	North America
United Arab Emirates*	Asia
Vanuatu	Oceania
Wallis and Futuna Islands	Oceania

Sources: OECD, "Table II.1. Statutory corporate income tax rate"; PwC, "Worldwide Tax Summaries – Corporate Taxes"; Bloomberg Tax, "Country Guides – Corporate Tax Rates."

Notes: *Bahrain has no general corporate income tax but has a targeted corporate income tax on oil companies, which can be as high as 46 percent. See Deloitte, "International Tax – Bahrain Highlights 2022," last updated January 2022, <http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Tax/dttl-tax-bahrainhighlights-2022.pdf>. In Belize the corporate tax rate is 40% but as this rate applies only to the petroleum industry, the corporate tax rate in Belize has been included in this database as 0% to ensure consistency of treatment across all jurisdictions. See OECD, "Corporate Tax Statistics: Fourth Edition", November 2022, <https://www.oecd.org/tax/tax-policy/corporate-tax-statistics-fourth-edition.pdf>. The United Arab Emirates is a federation of seven separate emirates. Since 1960, each emirate has the discretion to levy up to a 55 percent corporate tax rate on any business. In practice, this tax is mostly levied on foreign banks and petroleum companies. For more information on the taxation system in the United Arab Emirates, see PwC, "Worldwide Tax Summaries – Corporate income tax (CIT) rates."

Regional Variation in Corporate Tax Rates

Corporate tax rates can vary significantly by region. South America has the highest average statutory corporate tax rate among all regions at 28.38 percent. Asia has the lowest average statutory corporate tax rate among all regions at 19.52 percent.

When weighted by GDP, South America has the highest average statutory corporate tax rate at 32.64 percent, while Europe has the lowest at 23.59 percent.

In general, larger and more industrialized nations tend to have higher corporate income tax rates than smaller nations. The G7, which is comprised of the seven wealthiest nations in the world, has an average statutory corporate income tax rate of 26.77 percent and a weighted average rate of 26.24 percent. OECD member states have an average statutory corporate tax rate of 23.57 percent and a rate of 25.83 percent when weighted by GDP. The BRICS^[13] have an average statutory rate of 27.40 percent and a weighted average statutory corporate income tax rate of 26.06 percent.

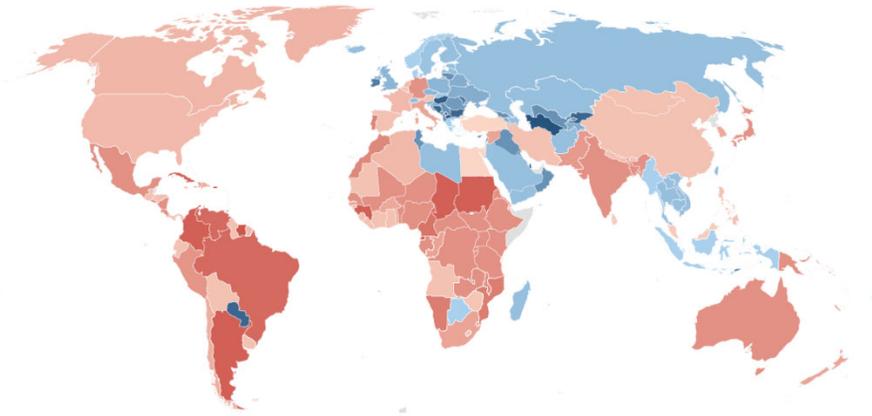
Table 5. Average Corporate Tax Rate by Region or Group, 2022

Region	Average Rate	Average Rate Weighted by GDP	Number of Countries Covered
Africa	27.60%	27.50%	50
Asia	19.52%	24.93%	47
Europe	19.74%	23.59%	39
North America	25.33%	26.13%	24
Oceania	23.75%	29.72%	8
South America	28.38%	32.64%	12
G7	26.32%	26.22%	7
OECD	23.57%	25.83%	38
BRICS	27.40%	26.06%	5
EU27	21.16%	25.28%	27
G20	26.77%	26.24%	19
World	23.37%	25.43%	180

Sources: Statutory corporate income tax rates are from OECD, "Table II.1. Statutory corporate income tax rate"; PwC, "Worldwide Tax Summaries – Corporate Taxes," Bloomberg Tax, "Country Guides – Corporate Tax Rates," and some jurisdictions researched individually, see Tax Foundation, "worldwide-corporate-tax-rates." GDP calculations are from the U.S. Department of Agriculture, "International Macroeconomics Data Set."

The following map illustrates the current state of corporate tax rates around the world. Countries in Africa and South America tend to have higher corporate tax rates than Asian and European jurisdictions. Oceania and North America's corporate tax rates tend to be close to the world average.

Corporate Tax Rates around the World
 Statutory Top Corporate Income Tax Rates, 2022



Sources: OECD, "Table II.1. Statutory corporate income tax rate;" KPMG, "Corporate tax rates table;" and some jurisdictions were researched individually.

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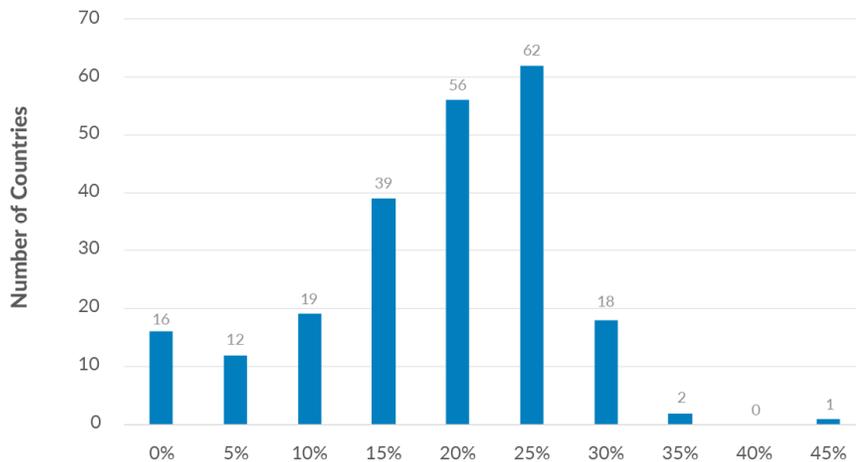
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Distribution of Corporate Tax Rates

Only three tax jurisdictions impose a corporate income tax at statutory rates greater than 35 percent. [14] The following chart shows a distribution of corporate income tax rates among 225 jurisdictions in 2022. A plurality of countries (118 total) impose a rate above 20 percent and below or at 30 percent. Eighteen jurisdictions have a statutory corporate tax rate above 30 percent and below or at 35 percent. Eighty-six jurisdictions have a statutory corporate tax rate below or at 20 percent, and 204 jurisdictions have a corporate tax rate below or at 30 percent.

Most Countries' Corporate Tax Rates Range between 20% And 30%

Distribution of Worldwide Corporate Tax Rates, 2022



Sources: OECD, "Table II.1. Statutory corporate income tax rate"; PwC, "Worldwide Tax Summaries – Corporate Taxes"; Bloomberg Tax, "Country Guides – Corporate Tax Rates;" and some jurisdictions researched individually.

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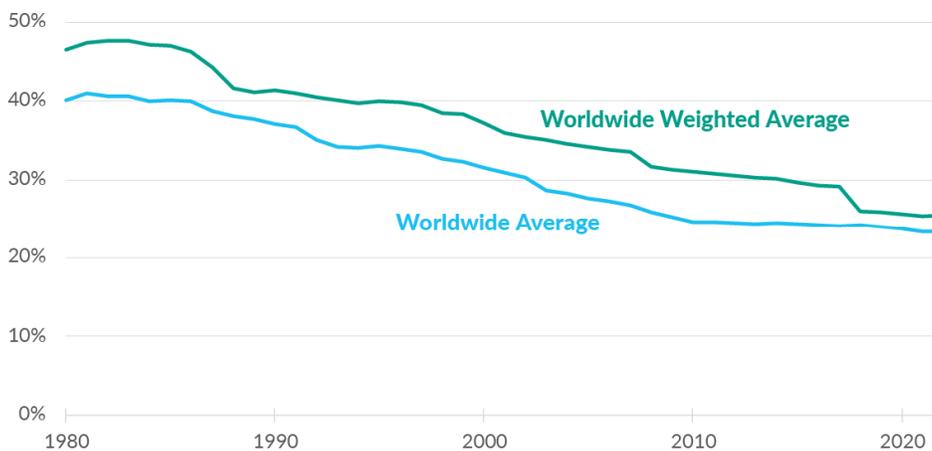
The Decline of Corporate Tax Rates since 1980 Levelled off in Recent Years

Over the past 42 years, corporate tax rates have consistently declined on a global basis. In 1980, the unweighted average worldwide statutory tax rate was 40.11 percent. Today, the average statutory rate stands at 23.37 percent—a 42 percent reduction.^[15] Despite a general decline in corporate tax rates around the world, OECD and non-OECD countries have also become more reliant on revenue from corporate income taxes. One cause for this change has been a shift in the jurisdictions included.^[16] Secondly, the negative revenue impact of the decline in corporate tax rates was generally offset by reducing or abolishing tax relief policies.^[17]

The weighted average statutory rate has remained higher than the simple average over this period. Prior to U.S. tax reform in 2017, the United States was largely responsible for keeping the weighted average higher, given its relatively high tax rate, as well as its significant contribution to global GDP. Figure 3 shows the significant impact the change in the U.S. corporate rate had on the worldwide weighted average. The weighted average statutory corporate income tax rate has declined from 46.52 percent in 1980 to 25.43 percent in 2022, representing a 45 percent reduction over the 42 years surveyed.

Corporate Tax Rates Have Continuously Declined over the past Decades but Have Levelled off in Recent Years

Statutory Weighted and Unweighted Corporate Income Tax Rates, 1980-2022



Note: The number of countries included in calculated averages varies by year due to missing corporate tax rates for years prior to 2022; that is, the 1980 average includes statutory corporate income tax rates of 73 jurisdictions representing roughly 60 percent of 1980 world GDP, compared to 180 jurisdictions representing above 95 percent of world GDP in 2022.

Sources: Statutory corporate income tax rates were compiled from various sources. GDP calculations are from the U.S. Department of Agriculture, "International Macroeconomics Data Set."

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Over time, more countries have shifted to taxing corporations at rates of 30 percent or lower, with the United States following this trend with its tax changes at the end of 2017. The largest shift occurred between 1990 and 2000, with 48 percent of countries imposing a statutory rate below 30 percent in 2000 and only 27 percent of countries in the dataset imposing a statutory rate below 30 percent in 1990. This trend continued between 2000 and 2010, with 78 percent of countries imposing a statutory rate below 30 percent in 2010.^[18]

Corporate Tax Rates between 20% And 25% Have Become the Most Common

Distribution of Worldwide Statutory Corporate Income Tax Rates by Decade, 1980-2022



Note: The number of countries included varies by decade due to missing corporate tax rates for years prior to 2022; that is, the 1980 data includes statutory corporate income tax rates of 80 jurisdictions, compared to 225 jurisdictions in 2022.
Source: Statutory corporate income tax rates were compiled from various sources.

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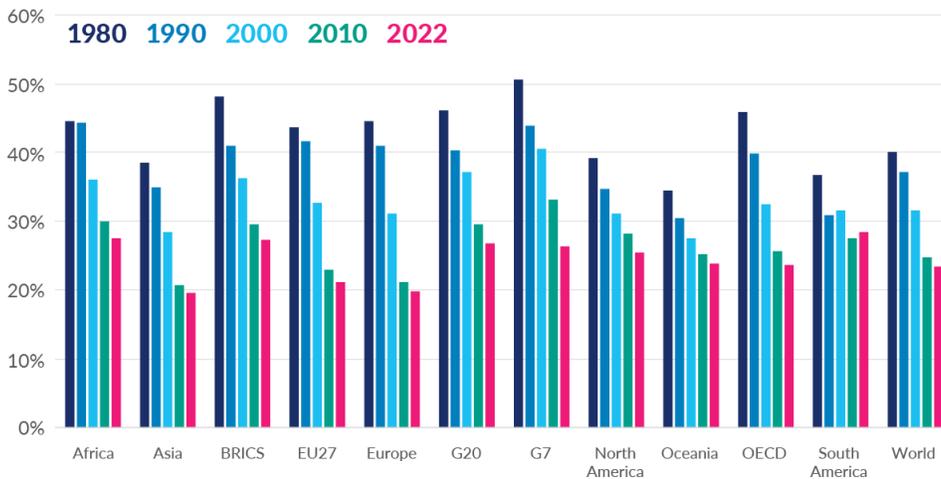
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All regions saw a net decline in average statutory rates between 1980 and 2022. The average declined the most in Europe, with the 1980 average of 44.6 percent dropping to 19.74 percent—a 56 percent decline. South America has seen the smallest decline, with the average only decreasing by 23 percent, from 36.66 percent in 1980 to 28.38 percent in 2022.

South America saw two periods, 1990-2000 and 2010-2022, during which the average statutory rate increased slightly by less than one percentage point, although the average rate decreased over the full 42-year period.

Corporate Tax Rates Have Declined in Every Region over Time

Average Statutory Corporate Income Tax Rate by Region and Decade



Note: The number of countries included in calculated averages varies by decade due to missing corporate tax rates for years prior to 2022; that is, the 1980 average includes statutory corporate income tax rates of 73 jurisdictions, compared to 180 jurisdictions in 2022.
Source: Statutory corporate income tax rates were compiled from various sources.

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Conclusion

Worldwide and regional average top statutory corporate tax rates have declined over the past four decades but have leveled off in recent years. Of 225 jurisdictions around the world, only six have increased their top corporate income tax rate in 2022, a trend expected to hold steady as countries have more efficient tax types to turn towards. [\[19\]](#)

Appendix

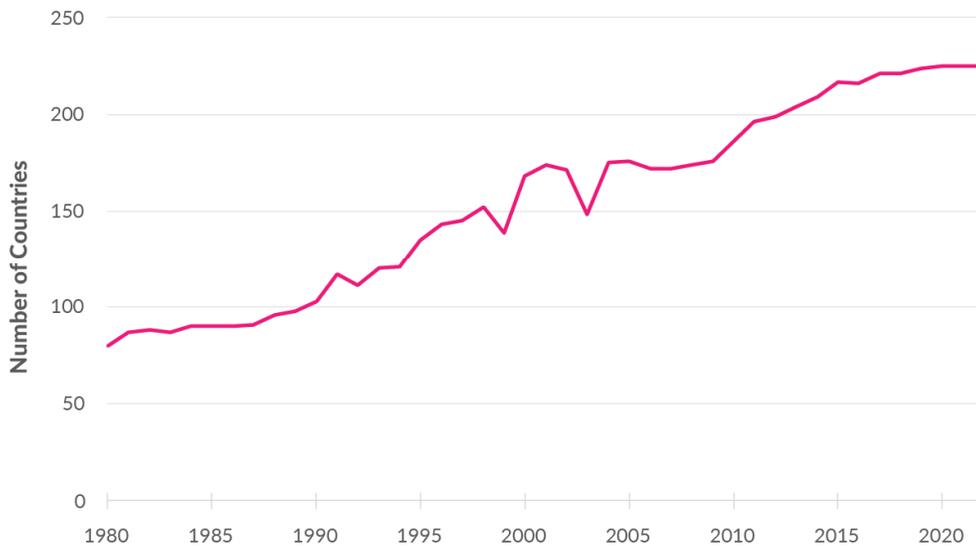
The Dataset

Scope

The dataset compiled for this publication includes the 2022 statutory corporate income tax rates of 225 sovereign states and dependent territories around the world. Tax rates were researched only for jurisdictions that are among the around 250 sovereign states and dependent territories that have been assigned a country code by the International Organization for Standardization (ISO). As a result, zones or territories that are independent taxing jurisdictions but do not have their own country code are generally not included in the dataset.

In addition, the dataset includes historic statutory corporate income tax rates from 1980 to 2021. However, these years cover tax rates of fewer than 225 jurisdictions due to missing data points. Please let Tax Foundation know if you are aware of any sources for historic corporate tax rates that are not mentioned in this report, as we constantly strive to improve our datasets.

Number of Countries for which the Dataset Includes a Corporate Tax Rate



Source: Author's calculations.

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To be able to calculate average statutory corporate income tax rates weighted by GDP, the dataset includes GDP data for 180 jurisdictions. When used to calculate average statutory corporate income tax rates, either weighted by GDP or unweighted, only these 180 jurisdictions are included (to ensure the comparability of the unweighted and weighted averages).

Definition of Selected Corporate Income Tax Rate

The dataset captures standard top statutory corporate income tax rates levied on domestic businesses. This means:

- The dataset does not reflect special tax regimes, including but not limited to patent boxes, offshore regimes, or special rates for specific industries.
- A number of countries levy lower rates for businesses below a certain revenue threshold. The dataset does not capture these lower rates.
- A few countries levy gross revenue taxes on businesses instead of corporate income taxes. Since the tax rates of a corporate income tax and a gross revenue tax are not comparable, these countries are excluded from the dataset.
- Some countries have a separate tax rate for nonresident companies. This dataset does not consider nonresident tax rates that differ from the general corporate rate.

Sources

Tax Rates for the Year 2022

For OECD countries, the statutory corporate income tax rates used are the *combined* corporate income tax rates provided by the OECD; see OECD, “Table II.1. Statutory corporate income tax rate,” updated May 2022, https://stats.oecd.org/index.aspx?DataSetCode=Table_II1. The main source for non-OECD jurisdictions is the statutory rates provided by PwC, “Worldwide Tax Summaries – Corporate Taxes,” 2022, <https://taxsummaries.pwc.com/>. The study also relies on Bloomberg Tax, “Country Guides – Corporate Tax Rates,” accessed in November

2022, https://www.bloomberglaw.com/product/tax/toc_view_menu/3380. Jurisdictions that are not part of these sources were researched individually. The source for each of these jurisdictions is listed in a GitHub repository; see Tax Foundation, “worldwide-corporate-tax-rates,” GitHub, <https://github.com/TaxFoundation/worldwide-corporate-tax-rates>.

Tax Rates for the Years 1980-2021

Tax rates for the time frame between 1980 and 2021 are taken from a dataset compiled by the Tax Foundation over the last few years. These historic rates come from multiple sources: PwC, “Worldwide Tax Summaries – Corporate Taxes,” 2010-2019; KPMG, “Corporate Tax Rate Survey,” 1998- 2003; KPMG, “Corporate tax rates table,” 2003-2019; EY, “Worldwide Corporate Tax Guide,” 2004-2019; OECD, “Historical Table II.1 – Statutory corporate income tax rate,” 1999, http://www.oecd.org/tax/tax-policy/tax-database.htm#C_CorporateCapital; the University of Michigan – Ross School of Business, “World Tax Database,” <https://www.bus.umich.edu/otpr/otpr/default.asp>; and numerous government websites.

Gross Domestic Product (GDP) for the years 1980-2022

GDP calculations are from the U.S. Department of Agriculture, “International Macroeconomics Data Set.” For years prior to 1999, U.S. Department of Agriculture, “International Macroeconomics Data Set – Historical Real Gross Domestic Product (GDP) and Growth Rates of GDP for Baseline Countries/Regions (in billions of 2010 dollars) 1980-2018,” Jan. 3, 2020, <https://www.ers.usda.gov/data-products/international-macroeconomic-data-set/>. For years following 1999, U.S. Department of Agriculture, “International Macroeconomics Data Set – Projected Real Gross Domestic Product (GDP) and Growth Rates of GDP for Baseline Countries/Regions (in billions of 2015 dollars) 2012-2033,” Jan. 10, 2022, <https://www.ers.usda.gov/data-products/international-macroeconomic-data-set/>; and U.S. Department of Agriculture, “International Macroeconomics Data Set – Historical Real Gross Domestic Product (GDP) and Growth Rates of GDP for Baseline Countries/Regions (in billions of 2015 dollars) 2000-2020,” Jan. 10, 2022, <https://www.ers.usda.gov/data-products/international-macroeconomic-data-set/>.

List of all Corporate Tax Rates in 2022

Table 6. Statutory Top Corporate Tax Rates around the World, 2021

ISO3	Country	Continent	Corporate Tax Rate
AFG	Afghanistan	AS	20.00%
ALA	Aland Islands	EU	20.00%
ALB	Albania	EU	15.00%
DZA	Algeria	AF	26.00%
ASM	American Samoa	OC	34.00%
AND	Andorra	EU	10.00%
AGO	Angola	AF	25.00%
AIA	Anguilla	NO	0.00%
ATG	Antigua and Barbuda	NO	25.00%
ARG	Argentina	SA	35.00%
ARM	Armenia	AS	18.00%
ABW	Aruba	NO	25.00%
AUS	Australia	OC	30.00%
AUT	Austria	EU	25.00%
AZE	Azerbaijan	AS	20.00%
BHS	Bahamas	NO	0.00%
BHR	Bahrain	AS	0.00%
BGD	Bangladesh	AS	30.00%
BRB	Barbados	NO	5.50%
BLR	Belarus	EU	18.00%
BEL	Belgium	EU	25.00%
BLZ	Belize	NO	0.00%
BEN	Benin	AF	30.00%
BMU	Bermuda	NO	0.00%
BTN	Bhutan	AS	25.00%
BOL	Bolivia (Plurinational State of)	SA	25.00%
BES	Bonaire, Sint Eustatius and Saba	NO	25.80%
BIH	Bosnia and Herzegovina	EU	10.00%
BWA	Botswana	AF	22.00%
BRA	Brazil	SA	34.00%
VGB	British Virgin Islands	NO	0.00%

BRN	Brunei Darussalam	AS	18.50%
BGR	Bulgaria	EU	10.00%
BFA	Burkina Faso	AF	27.50%
BDI	Burundi	AF	30.00%
CPV	Cabo Verde	AF	22.00%
KHM	Cambodia	AS	20.00%
CMR	Cameroon	AF	33.00%
CAN	Canada	NO	26.21%
CYM	Cayman Islands	NO	0.00%
CAF	Central African Republic	AF	30.00%
TCD	Chad	AF	35.00%
CHL	Chile	SA	27.00%
CHN	China	AS	25.00%
HKG	China, Hong Kong Special Administrative Region	AS	16.50%
MAC	China, Macao Special Administrative Region	AS	12.00%
COL	Colombia	SA	35.00%
COM	Comoros	AF	50.00%
COG	Congo	AF	28.00%
COK	Cook Islands	OC	20.00%
CRI	Costa Rica	NO	30.00%
CIV	Cote d'Ivoire	AF	25.00%
HRV	Croatia	EU	18.00%
CUB	Cuba	NO	35.00%
CUW	Curacao	NO	22.00%
CYP	Cyprus	EU	12.50%
CZE	Czechia	EU	19.00%
COD	Democratic Republic of the Congo	AF	30.00%
DNK	Denmark	EU	22.00%
DJI	Djibouti	AF	25.00%
DMA	Dominica	NO	25.00%
DOM	Dominican Republic	NO	27.00%
ECU	Ecuador	SA	25.00%
EGY	Egypt	AF	22.50%
SLV	El Salvador	NO	30.00%

GNQ	Equatorial Guinea	AF	35.00%
ERI	Eritrea	AF	30.00%
EST	Estonia	EU	20.00%
ETH	Ethiopia	AF	30.00%
FLK	Falkland Islands (Malvinas)	SA	26.00%
FRO	Faroe Islands	EU	18.00%
FJI	Fiji	OC	20.00%
FIN	Finland	EU	20.00%
FRA	France	EU	25.83%
PYF	French Polynesia	OC	25.00%
GAB	Gabon	AF	30.00%
GMB	Gambia	AF	27.00%
GEO	Georgia	AS	15.00%
DEU	Germany	EU	29.83%
GHA	Ghana	AF	25.00%
GIB	Gibraltar	EU	12.50%
GRC	Greece	EU	22.00%
GRL	Greenland	NO	26.50%
GRD	Grenada	NO	28.00%
GUM	Guam	OC	21.00%
GTM	Guatemala	NO	25.00%
GGY	Guernsey	EU	0.00%
GIN	Guinea	AF	35.00%
GNB	Guinea-Bissau	AF	25.00%
GUY	Guyana	SA	25.00%
HTI	Haiti	NO	30.00%
HND	Honduras	NO	25.00%
HUN	Hungary	EU	9.00%
ISL	Iceland	EU	20.00%
IND	India	AS	30.00%
IDN	Indonesia	AS	22.00%
IRN	Iran (Islamic Republic of)	AS	25.00%
IRQ	Iraq	AS	15.00%
IRL	Ireland	EU	12.50%
IMN	Isle of Man	EU	0.00%
ISR	Israel	AS	23.00%

ITA	Italy	EU	27.81%
JAM	Jamaica	NO	25.00%
JPN	Japan	AS	29.74%
JEY	Jersey	EU	0.00%
JOR	Jordan	AS	20.00%
KAZ	Kazakhstan	AS	20.00%
KEN	Kenya	AF	30.00%
KIR	Kiribati	OC	30.00%
XKX	Kosovo, Republic of	EU	10.00%
KWT	Kuwait	AS	15.00%
KGZ	Kyrgyzstan	AS	10.00%
LAO	Lao People's Democratic Republic	AS	20.00%
LVA	Latvia	EU	20.00%
LBN	Lebanon	AS	17.00%
LSO	Lesotho	AF	25.00%
LBR	Liberia	AF	25.00%
LBY	Libya	AF	20.00%
LIE	Liechtenstein	EU	12.50%
LTU	Lithuania	EU	15.00%
LUX	Luxembourg	EU	24.94%
MDG	Madagascar	AF	20.00%
MWI	Malawi	AF	30.00%
MYS	Malaysia	AS	24.00%
MDV	Maldives	AS	15.00%
MLI	Mali	AF	30.00%
MLT	Malta	EU	35.00%
MRT	Mauritania	AF	25.00%
MUS	Mauritius	AF	15.00%
MEX	Mexico	NO	30.00%
FSM	Micronesia (Federated States of)	OC	30.00%
MCO	Monaco	EU	25.00%
MNG	Mongolia	AS	25.00%
MNE	Montenegro	EU	15.00%
MSR	Montserrat	NO	30.00%
MAR	Morocco	AF	31.00%

MOZ	Mozambique	AF	32.00%
MMR	Myanmar	AS	22.00%
NAM	Namibia	AF	32.00%
NRU	Nauru	OC	25.00%
NPL	Nepal	AS	25.00%
NLD	Netherlands	EU	25.80%
NCL	New Caledonia	OC	30.00%
NZL	New Zealand	OC	28.00%
NIC	Nicaragua	NO	30.00%
NER	Niger	AF	30.00%
NGA	Nigeria	AF	30.00%
NIU	Niue	OC	30.00%
MNP	Northern Mariana Islands	OC	21.00%
NOR	Norway	EU	22.00%
OMN	Oman	AS	15.00%
PAK	Pakistan	AS	29.00%
PAN	Panama	NO	25.00%
PNG	Papua New Guinea	OC	30.00%
PRY	Paraguay	SA	10.00%
PER	Peru	SA	29.50%
PHL	Philippines	AS	25.00%
POL	Poland	EU	19.00%
PRT	Portugal	EU	31.50%
PRI	Puerto Rico	NO	37.50%
QAT	Qatar	AS	10.00%
KOR	Republic of Korea	AS	27.50%
MDA	Republic of Moldova	EU	12.00%
ROU	Romania	EU	16.00%
RUS	Russian Federation	EU	20.00%
RWA	Rwanda	AF	30.00%
BLM	Saint Barthelemy	NO	0.00%
SHN	Saint Helena	AF	25.00%
KNA	Saint Kitts and Nevis	NO	33.00%
LCA	Saint Lucia	NO	30.00%
MAF	Saint Martin (French Part)	NO	20.00%

VCT	Saint Vincent and the Grenadines	NO	30.00%
WSM	Samoa	OC	27.00%
SMR	San Marino	EU	17.00%
STP	Sao Tome and Principe	AF	25.00%
SAU	Saudi Arabia	AS	20.00%
SEN	Senegal	AF	30.00%
SRB	Serbia	EU	15.00%
SYC	Seychelles	AF	25.00%
SLE	Sierra Leone	AF	25.00%
SGP	Singapore	AS	17.00%
SXM	Sint Maarten (Dutch part)	NO	34.50%
SVK	Slovakia	EU	21.00%
SVN	Slovenia	EU	19.00%
SLB	Solomon Islands	OC	30.00%
ZAF	South Africa	AF	28.00%
SSD	South Sudan	AF	30.00%
ESP	Spain	EU	25.00%
LKA	Sri Lanka	AS	24.00%
PSE	State of Palestine	AS	15.00%
SDN	Sudan	AF	35.00%
SUR	Suriname	SA	36.00%
SWZ	Swaziland	AF	27.50%
SWE	Sweden	EU	20.60%
CHE	Switzerland	EU	19.70%
SYR	Syrian Arab Republic	AS	28.00%
TWN	Taiwan	AS	20.00%
TJK	Tajikistan	AS	18.00%
THA	Thailand	AS	20.00%
MKD	The former Yugoslav Republic of Macedonia	EU	10.00%
TLS	Timor-Leste	OC	10.00%
TGO	Togo	AF	27.00%
TKL	Tokelau	OC	0.00%
TON	Tonga	OC	25.00%
TTO	Trinidad and Tobago	NO	30.00%
TUN	Tunisia	AF	15.00%

TUR	Turkey	AS	23.00%
TKM	Turkmenistan	AS	8.00%
TCA	Turks and Caicos Islands	NO	0.00%
UGA	Uganda	AF	30.00%
UKR	Ukraine	EU	18.00%
ARE	United Arab Emirates	AS	0.00%
GBR	United Kingdom of Great Britain and Northern Ireland	EU	19.00%
TZA	United Republic of Tanzania	AF	30.00%
USA	United States of America	NO	25.81%
VIR	United States Virgin Islands	NO	23.10%
URY	Uruguay	SA	25.00%
UZB	Uzbekistan	AS	15.00%
VUT	Vanuatu	OC	0.00%
VEN	Venezuela (Bolivarian Republic of)	SA	34.00%
VNM	Viet Nam	AS	20.00%
WLF	Wallis and Futuna Islands	OC	0.00%
YEM	Yemen	AS	20.00%
ZMB	Zambia	AF	30.00%
ZWE	Zimbabwe	AF	24.72%

Notes: Continent abbreviations are as follows: "AF" is Africa, "AS" is Asia, "EU" is Europe, "OC" is Oceania, "NO" is North America, and "SA" is South America. Countries are assigned to continents based on ISO standards; see DataHub.io, "Comprehensive country codes: ISO 3166, ITU, ISO 4217 currency codes and many more," https://datahub.io/core/country-codes#resource-country-codes_zip.

Sources: Statutory corporate income tax rates are from OECD, "Table II.1. Statutory corporate income tax rate," PwC, "Worldwide Tax Summaries - Corporate Taxes;" Bloomberg Tax, "Country Guides - Corporate Tax Rates"; and some jurisdictions researched individually, see Tax Foundation, "worldwide-corporate-tax-rates."

References

[1] Unless otherwise noted, calculated averages of statutory corporate income tax rates only include jurisdictions for which GDP data is available for all years between 1980 and 2022. For 2022, the dataset includes statutory corporate income tax rates of 225 jurisdictions, but GDP

data is available for only 180 of these jurisdictions, reducing the number of jurisdictions included in calculated averages to 180. For years prior to 2022, the number of countries included in calculated averages varies by year due to missing corporate tax rates; that is, the 1980 average includes statutory corporate income tax rates of 73 jurisdictions, compared to 180 jurisdictions in 2022.

[2] Statutory corporate income tax rates are from OECD, “Table II.1. Statutory corporate income tax rate,” updated May

2022, https://stats.oecd.org/index.aspx?DataSetCode=Table_II1; PwC, “Worldwide Tax Summaries – Corporate Taxes,” 2022, <https://taxsummaries.pwc.com/>. Bloomberg Tax, “Country Guides – Corporate Tax Rates,” accessed November

2022, https://www.bloomberglaw.com/product/tax/toc_view_menu/3380; and researched individually, see Tax Foundation, “worldwide-corporate-tax-rates,”

GitHub, <https://github.com/TaxFoundation/worldwide-corporate-tax-rates>. GDP calculations are from the U.S. Department of Agriculture, “International Macroeconomics Data Set,” Jan. 10, 2022, <https://www.ers.usda.gov/data-products/international-macroeconomic-data-set/>.

[3] Kari Jahnsen and Kyle Pomerleau, “Corporate Income Tax Rates around the World, 2017,” Tax Foundation, Sept. 7, 2017, <https://taxfoundation.org/corporate-income-tax-rates-around-the-world-2017/>.

[4] The Caribbean Netherlands, Bonaire, Sint Eustatius, and Saba, are also subject to Dutch corporate income tax and therefore indirectly impacted by this tax increase.

[5] PwC, “Worldwide Tax Summaries – Austria,”

2022, <https://taxsummaries.pwc.com/austria/corporate/significant-developments>.

[6] HM Revenue and Customs, “Corporation Tax charge and rates from 1 April 2022 and Small Profits Rate and Marginal Relief from 1 April 2023,” Mar. 3,

2021, <https://www.gov.uk/government/publications/corporation-tax-charge-and-rates-from-1-april-2022-and-small-profits-rate-and-marginal-relief-from-1-april-2023/corporation-tax-charge-and-rates-from-1-april-2022-and-small-profits-rate-and-marginal-relief-from-1-april-2023>.

[7] PwC, “Worldwide Tax Summaries – Turkey,”

2022, <https://taxsummaries.pwc.com/austria/corporate/significant-developments>.

[8] OECD, “Tax Policy Reforms 2022: OECD and Selected Partner Economies,” OECD Publishing, Paris, 2022, <https://doi.org/10.1787/067c593d-en>.

[9] PwC, “Worldwide Tax Summaries – South Africa,”

2022, <https://taxsummaries.pwc.com/south-africa/corporate/taxes-on-corporate-income>.

[10] As no averages are presented in this section, it covers all 225 jurisdictions for which corporate income tax rates were found in 2022 (thus including jurisdictions for which GDP data was not available).

[11] This average is lower than the average of the 180 jurisdictions because many of the jurisdictions for which no GDP data is available are small economies with low corporate income tax rates.

[12] Where applicable, similar combinations of national and subnational rates are included in this dataset. For example, the combined German corporate tax rate is 29.83 percent which includes both the federal rate of 15 percent and accounts for municipal trade taxes which range from 14 to 17 percent.

[13] BRICS is a group of countries with major emerging economies. The members of this group are Brazil, Russia, India, China, and South Africa.

[14] As no averages are presented in this chapter, it covers all 225 jurisdictions for which 2022 corporate income tax rates were found (thus including jurisdictions for which GDP data was not available).

[15] Historical data comes from multiple sources: PwC, “Worldwide Tax Summaries – Corporate Taxes,” 2010-2019; KPMG, “Corporate Tax Rate Survey,” 1998- 2003; KPMG, “Corporate tax rates table,” 2003-2019; EY, “Worldwide Corporate Tax Guide,” 2004-2019; OECD, “Historical Table II.1 – Statutory corporate income tax rate,” 1999, http://www.oecd.org/tax/tax-policy/tax-database.htm#C_CorporateCapital; the University of Michigan – Ross School of Business, “World Tax Database,” <https://www.bus.umich.edu/otpr/otpr/default.asp>; and numerous government websites.

[16] Daniel Bunn, “Sources of Government Revenue in the OECD,” Tax Foundation, 2022, <https://taxfoundation.org/publications/sources-of-government-revenue-in-the-oecd/>

[17] OECD, “Tax revenue trends 1965-2020”, in Revenue Statistics 2021: The Initial Impact of COVID-19 on OECD Tax Revenues, OECD Publishing, Paris, 2021, https://read.oecd-ilibrary.org/taxation/revenue-statistics-2021_b5975909-en#page10.

[18] This section of the report covers all 225 jurisdictions for which 2022 corporate income tax rates were found (thus including jurisdictions for which GDP data was not available).

[19] Asa Johansson, Christopher Heady, Jens Arnold, Bert Brys, and Laura Vartia, “Tax and Economic Growth,” OECD, July 11, 2008, <https://www.oecd.org/tax/tax-policy/41000592.pdf>; see also, Alex Durante, “Reviewing Recent Evidence of the Effect of Taxes on Economic Growth,” Tax Foundation, May 21, 2021, <https://taxfoundation.org/reviewing-recent-evidence-effect-taxes-economic-growth/>.

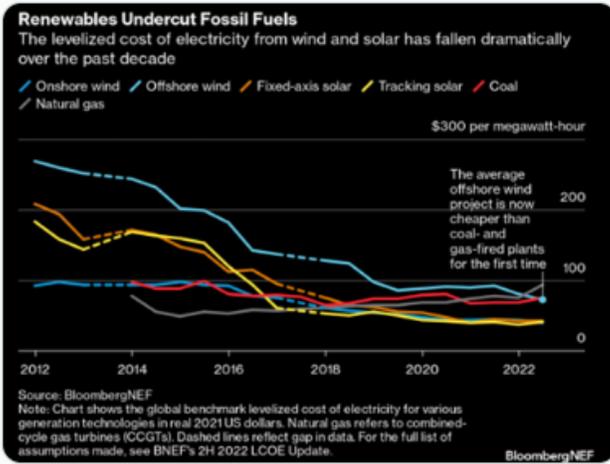
Banner image attribution: grapestock, Adobe Stock

SAF

Dan Tsubouchi @Energy_Tidbits · 14h

...

2022 was a great year for #NatGas #Coal prices, but also means it's cheaper to add #Solar #Wind electricity capacity. Note this compares cost to add capacity and not adjusted for lower capacity utilization of renewable. Thx @BloombergNEF Nilushi Karunaratne Amar Vasdev. #OOTT



5

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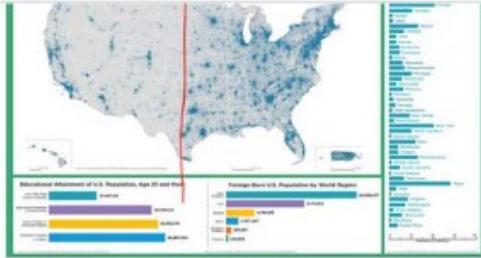
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SAF

Dan Tsubouchi @Energy_Tidbits · 18h

...

Near term support for HH #NatGas. Reminder vast majority of Americans live in east half of US, @NOAA's updated 6-10 day calls for very cold thru Xmas in east half of US. #OOTT



<https://www.cpc.ncep.noaa.gov/products/predictions/610day/>



<https://www.cpc.ncep.noaa.gov/products/predictions/814day/index.php>



↻ 5

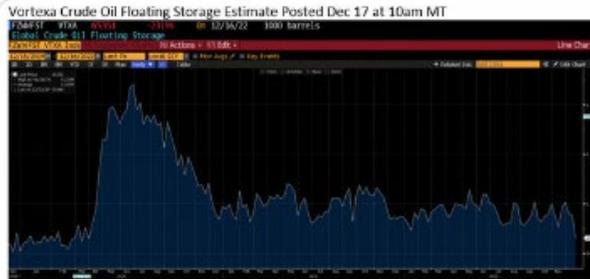
♥ 15





Dan Tsubouchi @Energy_Tidbits · 22h

#Vortexa crude #Oil floating storage at 12/16 est 65.35 mmb, -23.2 mmb WoW vs revised small 12/09 of 88.55 mmb. Lowest level since Covid hit, are more dark tankers evading Vortexa count? Wide range, but average idown to ~87 mmb for past 7 wks. Thx @Vortexa @business. #OOTT



Source: Bloomberg, Vortexa

Posted Dec 17, 10am MT						Dec 10, 10am MT						Dec 3, 10am MT					
ID	SD	IM	GI	YTD	SY	ID	SD	IM	GI	YTD	SY	ID	SD	IM	GI	YTD	SY
Fr	12/16/2022			65351		Fr	12/09/2022			89796		Fr	12/02/2022			84560	
Fr	12/09/2022			88547		Fr	12/02/2022			91676		Fr	11/25/2022			102,426k	
Fr	12/02/2022			90180		Fr	11/25/2022			103,023k		Fr	11/18/2022			99390	
Fr	11/25/2022			101,218k		Fr	11/18/2022			98439		Fr	11/11/2022			81568	
Fr	11/18/2022			96973		Fr	11/11/2022			80061		Fr	11/04/2022			90847	
Fr	11/11/2022			76573		Fr	11/04/2022			90422		Fr	10/28/2022			104,752k	
Fr	11/04/2022			88482		Fr	10/28/2022			104,324k		Fr	10/21/2022			92757	
Fr	10/29/2022			99988		Fr	10/21/2022			92182		Fr	10/14/2022			88119	
Fr	10/23/2022			89570		Fr	10/14/2022			86547		Fr	10/07/2022			82746	
Fr	10/16/2022			87538		Fr	10/07/2022			82070		Fr	09/30/2022			85376	
Fr	10/07/2022			81918		Fr	09/30/2022			84595		Fr	09/23/2022			101,147k	

Source: Bloomberg, Vortexa

2 8 35

Dan Tsubouchi Retweeted



Dan Tsubouchi @Energy_Tidbits · Dec 16



Looks like @txrrc will have to do another expedited measure given another big earthquake earlier tonight, a 5.4 that is 22 km NW of Midland. Permian water handling logistics are only going to get more complicated, expensive and add time. #OOTT

M 5.4 - 22 km NNW of Midland, Texas

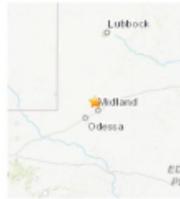
2022-12-16 23:35:27 (UTC) | 32.191°N 102.141°W | 8.2 km depth

Interactive Map



Contributed by TX,²

Regional Information



Contributed by TX,²

Felt Report - Tell Us!

0 0 1 9 7 6

Responses

Contribute to citizen science. Please [tell us](#) about your experience.

Citizen Scientist Contributions

Railroad Commission of Texas @txrrc · Dec 13



The RRC is expediting measures to help reduce earthquakes in one part of West Texas. Read more about the revised plan that's in place ow.ly/Sh1U50M2Ck3



↻ 3

♥ 4





Dan Tsubouchi @Energy_Tidbits · Dec 16

...

#Keystone

Hard not to read this @NGNews report + GAO Pipeline Safety: Information on Keystone Accidents & DOT Oversight and worry Affected Segment restart will take longer than expected & 80% limit may not be lifted. #OOT

gao.gov/assets/gao-21-...

GAO@100 Highlights

Highlights of GAO-21-588, a report to congressional requesters

Why GAO Did This Study

Since it began operating in 2010, Keystone has transported over 3 billion barrels of crude oil from Canada to refineries in Illinois, Oklahoma, and Texas, according to its operator, TC Energy. Prior to construction, TC Energy requested and obtained a special permit from PHMSA to operate certain portions of the pipeline at a higher stress level than is allowed under PHMSA's regulations. Since TC Energy was the first and remains the only hazardous liquid pipeline operator to request a waiver of this particular regulation, the Keystone special permit is unique.

GAO was asked to review PHMSA's oversight of the Keystone Pipeline. This report discusses: (1) PHMSA's actions to approve the Keystone special permit and allow the pipeline to operate at a higher stress level; (2) how Keystone accidents compare to accidents on all U.S. crude oil pipelines since 2010; and (3) PHMSA's actions in response to Keystone safety issues.

GAO reviewed applicable statutes and regulations, the special permit, and PHMSA enforcement actions. It also analyzed PHMSA's pipeline accident data from 2010 to 2020 to describe Keystone's accidents and compare TC Energy to PHMSA's performance measures. GAO also interviewed TC Energy representatives, PHMSA officials, and 17 stakeholders selected to provide a range of perspectives representing industry associations, pipeline safety and technical stakeholders, and environmental, tribal, and state organizations.

View GAO-21-588. For more information, contact Heather Krouse at (202) 512-2834 or krouseh@gao.gov.

July 2021

PIPELINE SAFETY

Information on Keystone Accidents and DOT Oversight

What GAO Found

The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) required TC Energy to take additional safety measures specified in a special permit as conditions of allowing certain portions of the Keystone Pipeline (Keystone) to operate at a higher stress level than allowed by regulation. PHMSA reviewed technical information and drew on its experience granting similar permits to natural gas pipelines to develop 51 conditions with which TC Energy must comply. Most pipeline safety and technical stakeholders GAO interviewed agreed the conditions offset the risks of operating at a higher stress level. However, PHMSA did not allow TC Energy to fully operate Keystone at this higher stress level until 2017, after TC Energy replaced pipe affected by industry-wide pipeline quality issues.

Keystone's accident history has been similar to other crude oil pipelines since 2010, but the severity of spills has worsened in recent years. Similar to crude oil pipelines nationwide, most of Keystone's 22 accidents from 2010 through 2020 released fewer than 50 barrels of oil and were contained on operator-controlled property such as a pump station. The two largest spills in Keystone's history in 2017 and 2019 were among the six accidents that met PHMSA's criteria for accidents "impacting people or the environment." According to PHMSA's measures for these more severe types of accidents, from 2010 to 2020 TC Energy performed better than nationwide averages, but worse in the past five years due to the 2017 and 2019 spills.

Keystone Accidents Impacting People or the Environment, 2010-2020



Source: PHMSA data and the Resources. | GAO 21-588

In response to each of Keystone's four largest spills, PHMSA issued Corrective Action Orders requiring TC Energy to investigate the accidents' root causes and take necessary corrective actions. These investigations found that the four accidents were caused by issues related to the original design, manufacturing of the pipe, or construction of the pipeline. PHMSA also issued other enforcement actions and assessed civil penalties to TC Energy for deficiencies found during inspections, such as inadequate corrosion prevention and missing pipeline markers. Based in part on its experience overseeing Keystone, PHMSA officials said they have increased resources to conduct inspections during construction of other pipelines and are establishing a more formal process to document and track the compliance of all special permits, including Keystone's permit.

United States Government Accountability Office

NGI Natural Gas Intel @NGNews · Dec 16

Corrosion Left Keystone Pipeline 'Less than Half the Thickness of a Dime,' Says U.S. Government Accountability Office dldr.it/SfTHIC #NatGas #ONGT



SAF Dan Tsubouchi @Energy_Tidbits · Dec 16
first winter wedding we have ever noticed. congrats to the brave couple.



SAF Dan Tsubouchi @Energy_Tidbits · Dec 16
bravest bride of the year. It's -8 celsius and they just finished taking their wedding pictures on the old coal mine field besides the Bow River in Canmore.



🗨️ 🔄 ❤️ 3 📤

SAF **Dan Tsubouchi** @Energy_Tidbits · Dec 16 ...
bravest bride of the year. It's -8 celsius and they just finished taking their wedding pictures on the old coal mine field besides the Bow River in Canmore.



2 2 12

Dan Tsubouchi @Energy_Tidbits · Dec 16

Rapid Covid spread in China winning right now VS removal of travel restrictions.

Fits 📌 12/15 tweet re @vitolnews @michaelwmuller China moving to herd immunity ie. set up for J shaped recovery in China transportation fuels demand as soon as Q2.

Thx @BloombergNEF.

#OOTT #Oil



Dan Tsubouchi @Energy_Tidbits · Dec 15



Nike swoosh or J shaped recovery in China demand transportation fuels. See 📌 Vitol @michaelwmuller inbound international air travel to China as soon as Q2. Freedom of travel + population less scared of Virus = China move faster to herd immunity. @sean_evers ...

1 4 5

Dan Tsubouchi @Energy_Tidbits · Dec 16

SAF

Dan Tsubouchi @Energy_Tidbits · Dec 16
#Goldman's Currie a super cycle is not this big upward trend in prices that we have envisioned in our heads, it's a sequence of spikes...

See 09/14 tweet, #Trafigura @saadrahim series of spikes, each subsequent low is actually higher..."

@adsteel @GuyJohnsonTV. #OOTT #Oil



OLYMPIA SEES COMMODITIES SURGE IN 2022

related transcript of comments by Jeff Currie (Goldman Sachs Global Head of Commodities Research) with Bloomberg's Ailsa Steel and Guy Johnson on Bloomberg Markets: Europe 2022

www.bloomberg.com/news/videos/2022-12-15/goldmans-sachs-sees-commodities-will-surge-in-2023

SAF Group created transcript

Currie "Bottom line, when we think about what a super cycle really is, it's not this big upward trend in prices that we have envisioned in our heads, it's a sequence of spikes. And as prices provide an economic function, they stop to subside supply and demand, bring them back in line when they get out of line like they did in 2022 and early part of this year. Subsidized right now today, why? Because China is being locked down, so demand comes back down on top of supply, prices collapse, back down. But we have not been investing fully in oil again. So I have to just simply ask what happens when China, the largest commodity consumer in the world, the largest oil importer in the world begins to rebound again? I'd say year it's going to tighten all of these markets tremendously and put a lot of upward pressure on prices. And I think the key point is you actually have the largest commodity market essentially liberating over the course of the last year and that's been hiding a bit of this underinvestment. Really the core point here - underinvestment, weak demand, initial growth in 2022 begins to tighten these markets."

SAF Group <https://www.safgroup.com/en/insights>

Dan Tsubouchi @Energy_Tidbits · Sep 14



#Trafigura case for a serious upcycle in #Oil. Prices spike to where causes demand destruction, but because haven't had enough time to catch up on investment, each subsequent low is actually higher. See SAF Group transcript. Thx @saadrahim ...

4 18

SAF

Dan Tsubouchi @Energy_Tidbits · Dec 15
US #LNG exports Oct/22 were 9.98 bcf/d, +3.9% YoY, +1.5% MoM

Continued impact of #FreeportLNG 2.2 bcf/d June 8 shut.

Oct/22 top 5 export countries: France, UK, Dutch, Korea, China

Oct/21 top 5 export countries: China, Brazil, Japan, Spain, Korea.

@ENERGY data.

#OOTT

Summary

Overview of Activity for October 2022

- Top five countries of destination, representing 82.8% of total U.S. LNG exports in October 2022
 - France (2.8 bcf/d), United Kingdom (2.0 bcf/d), Netherlands (1.0 bcf/d), South Korea (1.1 bcf/d), and China (2.9 bcf/d)
- 384.4 bcf of exports in October 2022
 - + 6.9% increase from September 2022
 - + 3.9% increase from October 2021
- 47 cargoes shipped in October 2022
 - 10 cargoes from U.S., 10 cargoes from U.K., 10 cargoes from U.S., 10 cargoes from U.S., and 7 cargoes from U.S.
 - 10 cargoes in September 2022
 - 14 cargoes in October 2021

1a. Table of Exports of Domestically-Produced LNG Delivered by Region (Cumulative from February 2018 through October 2022)

Region	Number of Deliveries	Volume Delivered (Bcf)	Percentage Receipts of Total Volume Delivered (%)	Number of Cargoes
East Asia and Pacific	8	4,341.9	33.3%	175
Europe and Central Asia	13	5,312.8	41.6%	469
Latin America and the Caribbean ¹	13	2,124.2	16.4%	164
Middle East and North Africa	5	275.5	2.1%	110
South Asia	3	759.2	5.7%	231
Sub-Saharan Africa	0	0.0	0.0%	0
Total LNG Exports	42	12,867.6	100.0%	4,801

Overview of Activity for October 2021

- Top five countries of destination, representing 81.8% of total U.S. LNG exports in October 2021
 - China (1.2 bcf/d), United Kingdom (1.0 bcf/d), Japan (1.0 bcf/d), South Korea (1.0 bcf/d), and France (1.0 bcf/d)
- 327.8 bcf of exports in October 2021
 - + 0.7% increase from September 2021
 - + 10.9% increase from October 2020
- 31 cargoes shipped in October 2021
 - 10 cargoes from U.S., 10 cargoes from U.S., 10 cargoes from U.S., 10 cargoes from U.S., and 10 cargoes from U.S.
 - 10 cargoes in September 2021
 - 10 cargoes in October 2020

1a. Table of Exports of Domestically-Produced LNG Delivered by Region (Cumulative from February 2018 through October 2021)

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South Asia	3	759.2	5.7%	231
Sub-Saharan Africa	0	0.0	0.0%	0
Total LNG Exports	42	12,867.6	100.0%	4,801

2 1

SAF

Dan Tsubouchi @Energy_Tidbits · Dec 15

looks like the ducks are about to launch an attack on the geese for the primo water spot on the Elbow River in #Calgary. looks like it will be a great sunny day here



1 7

SAF

Dan Tsubouchi @Energy_Tidbits · Dec 15

Nike swoosh or J shaped recovery in China demand transportation fuels. See Vitol @michaelwmuller inbound international air travel to China as soon as Q2. Freedom of travel + population less scared of Virus = China move faster to herd immunity. @sean_evers @CrystalEnergy. #OOTT



SAF Energy created a meeting of comments by Mike Muller, Head of Asia, with Susan Burns, Managing Partner, Global Intelligence and Chemical Risk Review News in Tokyo, center on Global Energy Policy 2020-2030 presented at Global Energy Policy 2020 by Mike Muller - Head of Asia - Global Energy Policy 2020-2030

1:08:00 - Mike Muller, Head of Asia, with Susan Burns, Managing Partner, Global Intelligence and Chemical Risk Review News in Tokyo, center on Global Energy Policy 2020-2030

1:08:00 - Mike Muller, Head of Asia, with Susan Burns, Managing Partner, Global Intelligence and Chemical Risk Review News in Tokyo, center on Global Energy Policy 2020-2030

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1:08:00 - Mike Muller, Head of Asia, with Susan Burns, Managing Partner, Global Intelligence and Chemical Risk Review News in Tokyo, center on Global Energy Policy 2020-2030

7 12



Dan Tsubouchi @Energy_Tidbits · Dec 14



. @TCEnergy restarts unaffected portion of #Keystone pipeline, east leg from Steele City to Patoka.

@robertttuttle reporting #Genscape data indicating flows are between 150k b/d and 170k b/d.

No update as to est restart date for Keystone south leg to Cushing & Gulf Coast. #OOTT

Updates

TC Energy restarts Keystone section unaffected by incident

7:40 p.m. CT — December 14, 2022

TC Energy has communicated with its regulators and customers about today's restart of the Keystone Pipeline System section unaffected by the Milepost 14 incident. This restart facilitates safe transportation of the energy that Canadians and North Americans rely on. This section extends from Hardisty, Alberta, to Wood River/Woods, Illinois.

The affected segment of the Keystone Pipeline System remains safely isolated as investigations, recovery, repair and remediation continues to advance. This segment will not be restarted until it is safe to do so and when we have regulatory approval from PHUSA.

We will continue to provide updates as information becomes available.

Media inquiries can be sent to TC Energy media relations at media@tcenergy.com.

Community related input can be sent to public_affairs@tcenergy.com or 1-855-623-4027.



1 4 12



Dan Tsubouchi @Energy_Tidbits · Dec 14



WOW!

@SecGranholm is latest to come out of closet on the need for a managed #EnergyTransition to have energy, economic, climate security. Fits 12/09/21 #2022Predictions tweet. A return to #EnergySecurity = #Oil #NatGas #LNG strong thru 2030. #OOTT 1/4.

— Dan Tsubouchi @Energy_Tidbits · Dec 9, 2021

Time for #2022Predictions. My #1 is more #EnergyTransition #NetZero leaders come out of closet, have a #MacronMoment ie. have "transition" not self inflicted shortage so 2021 energy crisis isn't every year. A return to #EnergySecurity = #Oil #NatGas #LNG strong thru 2030. #OOTT twitter.com/Energy_Tidbits...

2 7 16

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Renewables don't replace #FossilFuels, rather expand the energy supply pie.

@SecGranholm "there is a moment for diversification at hand right now. Our energy security, and when I say diversification I'm talking about expanding and growing the pie on this..." 3/4 #OOTT

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"... our energy security, our climate security, our economic security, I think all compel us to meet our needs today but then expand, invest in a widening array of energy sources." See 🗣️ SAF Group transcript 4/4. #OOTT



SAF Group created transcript of Energy Secretary Granholm at 132nd Meeting of the National Petroleum Council on Dec 14, 2022 https://www.youtube.com/watch?v=d0_sUd0Pvts

Items in "Italics" are SAF Group created transcript

At 2:12:45, Granholm "In that spirit, I want to be open and frank in this meeting as well. I want to say, *first of all*, that the Biden-Harris Administration's commitment to a "managed" transition is as strong as ever. And I want to underscore the managed part because as you have noted in your reports and in your statements that moving too fast could end up creating unintended consequences that will hurt people, cause backlash. This has got to be done in a smart, and thoughtful way in partnership. The first part of this managed transition means meeting our energy needs right now. And that means today and, as we have talked about with many of you, increasing investment in production to unburden Americans and really around the world we have a unique position in the world as *major* energy supplier. And so, the world is really looking at *America for* assistance with that, with managing that transition. And really to, as we look at this sort of geopolitical *reliance* of the world around energy supply, the role here in this room, the oil and gas sector is just enormous. It's enormous. So it means increasing production to meet that demand. It means finding, for example as we have spoken with a number of you, the right approach for, in the United States, increasing *dis*state storage where we need it ..." at 2:09:30 Granholm "... this managed transition obviously means as well keeping refineries operating safely. Safety I know is your first priority, it's our first priority as well..." At 2:08:40 Granholm "...we understand that this transition puts a sector, for example like *refining*, in a challenging position. We're going to continue to work with refiners as you work with you as you manage capacity as you think about creative options to reduce emissions in the future. That's the now, *but* further ahead, this transition hinges, I think you all agree, on making sure it's done well, making sure we acknowledge that fossil fuel is not going to go away anytime soon, but that there is a moment for diversification at hand right now. Our energy security, and when I say *diversification* I'm talking about expanding and growing the pie on this, our energy security, our economic security, our climate security, I think all compel us to meet our needs today but then expand, invest in a widening array of energy sources. We need this industry to play a lead role developing, deploying these additional resources."

At 2:03:40, Granholm "... this managed transition that we are pursuing is I have been saying is not going to eliminate the use of *fossil* fuels by 2050, as we have been having that 2050 Net Zero goal. That's the reason it's call Net. IPCC, any credible climate analysis all acknowledge that fact so we've got to do all that we can to decarbonize. And work together on that decarbonization strategy even as we expand the pie and add renewables to this plate, that growing opportunity. But, it does point to lower use I think of fossil and the question is how the industry adapts to that, as well. As we've long said, we're ready, we're eager to work with you on the answer to that question. And we know that question *will* lead to responsibly meeting our energy security needs to rapidly decarbonizing, especially the natural gas value chain, there is such a huge uptake to protecting American families and communities, and to maintaining American competitiveness."

Prepared by SAF Group <https://safgroup.ca/news-insights/>

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Big stock build!

For those not near their laptop, @EIAgov just released #Oil #Gasoline #Distillates inventory as of Dec 9. Table below compares EIA data vs @business expectations and vs @APIenergy yesterday. Prior to release, WTI was \$76.60. #OOTT

ir.eia.gov/wpsr/overview...

(bls)	EIA	Expectations
	10.23	-3.50
	4.50	2.50
	1.36	2.50
	16.09	1.50

Commercial so builds in impact of 4.7 mmb draw from SPR for Dec 9. Cushing had a build of 0.43 mmb for Dec 9 vs Bloomberg

SAF Group <https://safgroup.ca/news-insights/>

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SAF Dan Tsubouchi @Energy_Tidbits · Dec 14
Buckle up! @Delta CEO on why see bullish air travel outlook. "relationship of air travel demand to GDP in this country, it's at 1.3% and has been per year for the last 40 yrs", look at last 3 yrs what demand should have been, the gap is \$300b. thx @SquawkCNBC. #OOTT

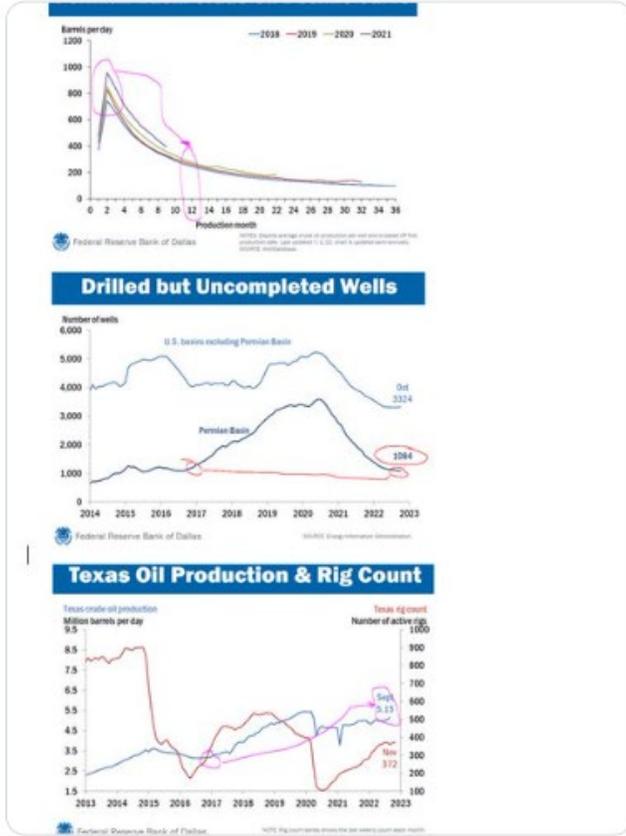


🗨️ 2 🔄 9 ❤️ 31 🔄

Overlooked @DallasFed: new high IP #Permian wells are down to same prod 12 mths out as lower IP wells ie. steeper decline/faster treadmill.

How can #Permian sustainably grow unless rigs crank up big as DUCs/rigs are ~5 yrs ago levels when oil prod was ~1/2 today.

#OOTT



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Dan Tsubouchi @Energy_Tidbits - Dec 13

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Scoop!

Good news for Cdn #Oil producers.

No confirmation, but @business reports @TCEnergy Still Planning Full #Keystone Restart By Dec. 20.

Didn't say but assume will be at 80% for Affected Segment from @PHMSA_DOT CAO.

Thx @vtobben @jendlouhyhc Lucia Kassai.

#OTT

The company initially expected to begin a partial restart Dec. 10, but bad weather and the rupture's proximity to a waterway have delayed efforts to excavate the pipeline, said the people, who asked not to be identified discussing confidential matters.

Keystone, which delivers up to 600,000 barrels a day of heavy Canadian crude into the US Midwest, was shut Wednesday night after a spill that is poised to be the largest in the pipeline's history, and one of the worst in the US since 2010. Including the latest rupture, Keystone has leaked almost 26,000 barrels of crude since it was built 12 years ago, the most of any US pipeline during that timeframe, PHMSA data show. TC Energy can't resume operations on the ruptured segment until federal regulators approve its restart plan. As of Monday, the company had not submitted one, said the Pipeline and Hazardous Materials Safety Administration. If the line resumes service as planned by Dec. 20, this would be one of the longest outages in the pipeline's history.

TC didn't immediately return request for comment.

So far, the shutdown has limited supplies of Canadian crude to the US Gulf Coast. The Marketlink pipeline, which transport supplies from Keystone to the Gulf, has already informed customers about cuts in flows for December and January, according to people familiar with the matter.

The spill hasn't contaminated any drinking water wells, according to the Environmental Protection Agency. Although the pipeline has spewed oil into Mill Creek, which connects to the Little Blue River, the latter wasn't impacted because of containment efforts, said Kellen Ashford, the agency spokesperson for region 7.

So far, fewer than 2,600 barrels of oil have been recovered — including 2,163 barrels of an oil-water mixture from Mill Creek and 435 of crude directly from the pipeline, the EPA said in a statement. Currently, there is no timeline for clean-up to be completed.

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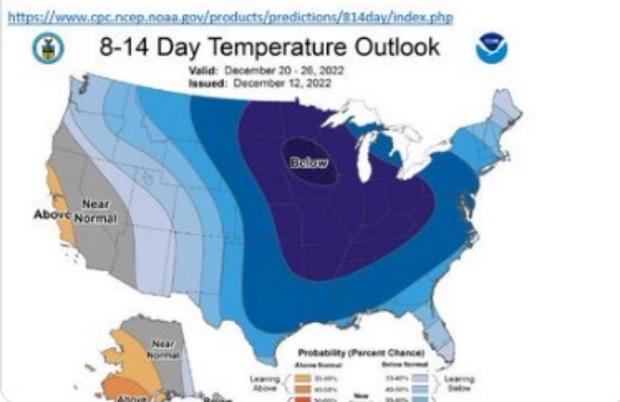
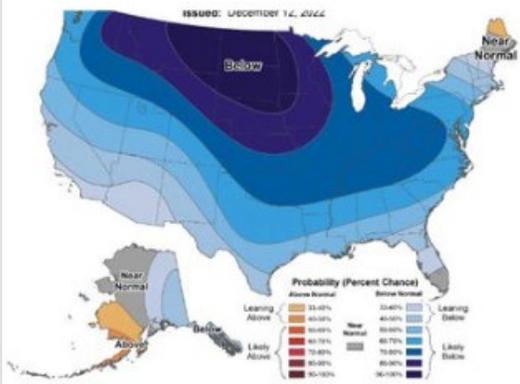
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SAF **Dan Tsubouchi @Energy_Tidbits** · Dec 13
#NatGas up today on cold weather ❄️ across the US for xmas. #OOTT

👁️ **Dan Tsubouchi @Energy_Tidbits** · Dec 12
Looking even colder now across all of the US thru Xmas! Much more important to be colder than normal in Dec (especially in Great Lakes/Eastern US) than in Nov. Below are today's @NOAA 6-10 and 8-14 day outlooks. #OOTT #NatGas [twitter.com/Energy_Tidbits...](https://twitter.com/Energy_Tidbits)



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Dan Tsubouchi @Energy_Tidbits - Dec 13

Great reminder on how much Covid has hit China and road/air travel.

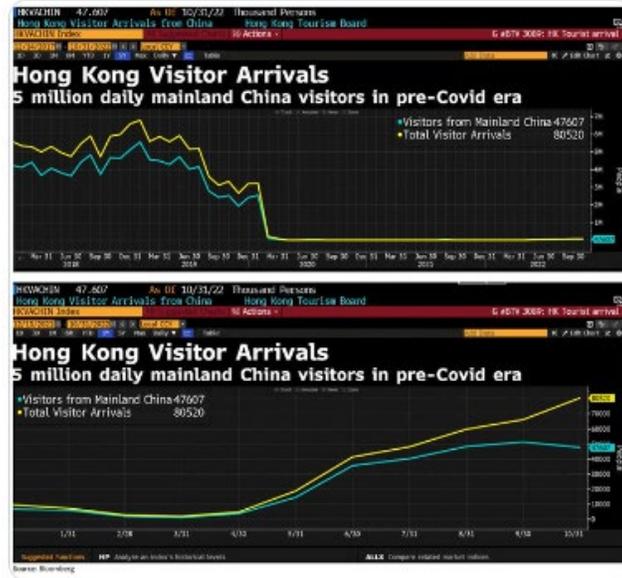
DAILY arrivals to Hong Kong:

Pre-Covid: 5.6 mm Mainland China + 1.3 mm Other = Total 6.9 Million.

Now: Total 80,520!

Thx @DavidInglesTV @business

#OOTT #JetFuel #Gasoline



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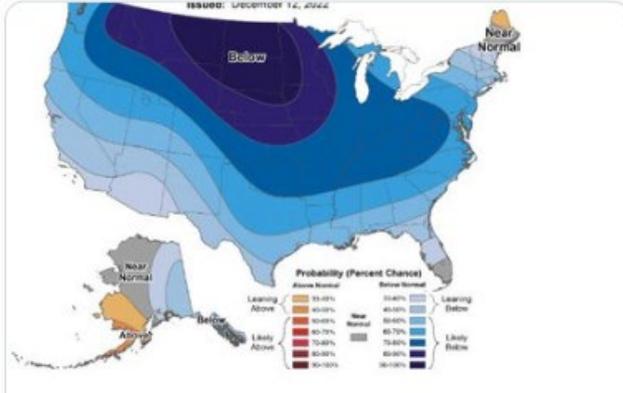
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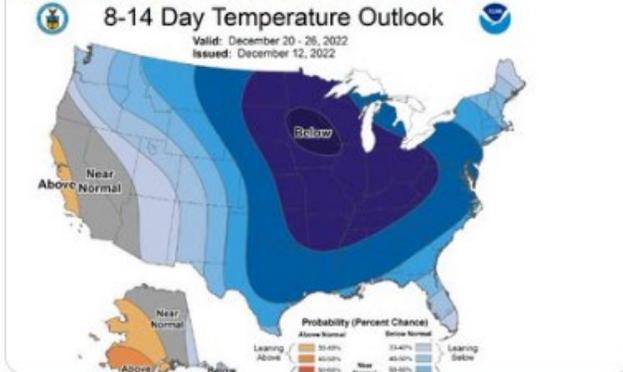
Dan Tsubouchi @Energy_Tidbits - Dec 12

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Looking even colder now across all of the US thru Xmas! Much more important to be colder than normal in Dec (especially in Great Lakes/Eastern US) than in Nov. Below are today's @NOAA 6-10 and 8-14 day outlooks. #OOTT #NatGas



<https://www.cpc.ncep.noaa.gov/products/predictions/814day/index.php>



Dan Tsubouchi @Energy_Tidbits - Dec 10



Finally, some cold weather expected across all of the US in the lead up to Xmas. Below are today's @NOAA updated 6-10 and 8-14 day outlooks. #OOTT #NatGas

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#LNG Game Changer.

No Baker Hughes big turbines = Lower RUS LNG capacity.

TASS: under construction Novatek Arctic LNG 2 to add 0.87 bcfd in 2023-26, 33% of pre-BKR RUS exit capacity of 2.6 bcfd.

See 🗨️ 06/16 thread

Key reason why #LNG is supply short thru 2026.

#OOTT #NatGas

<https://tass.com/economy/1549513>

12 DEC, 08:37

Launch of first line of Arctic LNG 2 set for December 2023

According to Russian Ambassador to Tokyo Mikhail Galutin, around 2 mln tonnes of LNG will be added to gas supplies to Japan with the full-scale launch of Arctic LNG 2.

SARAJEVO, December 12. /TASS/. The launch of Novatek's first line of the Arctic LNG 2 plant is still scheduled for December 2023, and the second and third lines - for 2024 and 2026, respectively, Deputy General Director for capital construction of Arctic LNG 2 Timofey Sazonov told reporters.

The goal is to launch... in December 2023. [Second and third stages] - in 2024 and 2026. We are not reconsidering [deadlines] to set.

It was reported back in November that Russia may start deliveries of liquefied natural gas (LNG) to Japan from the Arctic LNG-2 project in 2023, which can reach 2 mln tonnes per year in the future.

"This project [Arctic LNG-2] is developing successfully. We hope that next year Japan will receive additional volumes of Russian LNG, in addition to what is already supplied from Sakhalin-2," Russian Ambassador to Tokyo Mikhail Galutin said, drawing attention to the fact that Russia and Japan have areas "for mutually beneficial cooperation", among which he mentioned energy.

According to Galutin, around 2 mln tonnes of LNG will be added to gas supplies to Japan with the full-scale launch of Arctic LNG 2. He noted that now the volume of Japanese imports of Russian LNG reaches roughly 5-6 mln tonnes, which means that, taking into account fuel from the Arctic LNG-2 project, the share of Russian gas in the structure of Japanese imports may increase.

Arctic LNG-2 is Novatek's second LNG project. It includes the construction of three lines for the production of liquefied natural gas with a capacity of 6.0 mln metric tons per year each and stable gas condensate up to 1.6 mln metric tons per year. The launch of the first line is planned for December 2023, the launch of the second and third lines is expected in 2024 and 2026, respectively.

SAF Dan Tsubouchi @Energy_Tidbits · Jun 16



1/2. Game Changer for #LNG. 6.2 bcfd RUS LNG is now at risk incl operating 1.3 bcfd Sakhalin-2 LNG & 2.3 bcfd Yamal LNG, and under construction 2.6 bcfd Arctic LNG-2 w/ phase 1 0.87 planned 2023 in service.

#OOTT #NatGas

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Dan Tsubouchi @Energy_Tidbits - Dec 12

#Oil watch: China reopening vs Covid spreading fast

China's top epidemiologist - Omicron variant developing, evolving, mutating rapidly, highly transmissible and "spreading fast, and under such circumstances, it is very difficult to entirely cut off the transmission"

#OOT

PEOPLE'S DAILY ONLINE
<http://en.people.cn/3/2022/12/12/c90000-10182824.html>
Top epidemiologist urges intensified COVID-19 vaccine booster drive
 (Xinhua) 08:24, December 12, 2022
 GUANGZHOU, Dec. 11 (Xinhua) -- China's leading epidemiologist Zhong Nanshan has urged a scale-up in vaccination efforts to inoculate more people with COVID-19 vaccine booster shots, especially with the Spring Festival travel rush coming soon.

A significant portion of people in China have already been vaccinated against COVID-19, and getting boosted is the best protection during the new phase of the anti-virus fight, Zhong told Xinhua in an exclusive interview on Friday.

"Preparations need to be beefed up. I suggest those planning to travel back home get a booster shot so that, even with COVID-19 infection, they don't become seriously ill," he said.

It usually takes two weeks for a booster to take effect, according to Zhong. "This would be of great help in preventing large-scale transmission during the mass migration of people in the Spring Festival travel rush," the epidemiologist said. The 2023 Spring Festival falls on Jan. 22.

There is a pressing need to step up vaccination efforts across the nation, he noted, asking seniors and people with underlying health conditions in particular to get vaccinated. "If you have received two doses of inactivated vaccines, you will need another dose to be boosted."

Zhong called for the full vaccination of children to protect schools and students, saying this is essential for resuming in-person schooling.

Asked about the recent spike in infections, Zhong explained that the Omicron variant has been developing, evolving and mutating rapidly, and is highly transmissible.

The Omicron subvariants that are now predominant in China are spreading fast, and under such circumstances, it is very difficult to entirely cut off the transmission, Zhong said.

But on the other hand, he said, Omicron has become significantly less pathogenic, with the mortality rate recently falling to around 0.1 percent, about the same as that of influenza.

Zhong noted that Omicron is still far more transmissible than flu.

In most cases, patients do not need to go to a hospital and can stay at home, according to Zhong. "However, they need to keep watching their symptoms and see a doctor if the high fever does not subside in a couple of days," he said.

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Dan Tsubouchi @Energy_Tidbits - Dec 11

#Keystone. @TCEnergy "We have not confirmed a timeline for re-start and will only resume service when it is safe to do so, and with the approval of the regulator"

Are they just talking Affected Segment? or including unaffected line to Steele City & eastern leg to Patoka?

#OOT



Milepost 14 Incident

TC Energy actively responding to oil incident

Update: 10:05am CT - December 11, 2022

TC Energy continues to progress our response efforts in Washington County, Kansas. We have entered under Contract with the U.S. Environmental Protection Agency (EPA) and continue to work in collaboration with the Kansas and Missouri Statewide Safety Oversight (SSISO) and the Kansas Department of Health and Environment (KDHE).

The release has resulted in the following response and recovery activities, including:

- A dedicated incident response team, including two party environmental specialists.
- The project teams conduct and manage recovery efforts, and address concerns and issues as we continue the recovery process.
- Issue mitigation and response at all discovery locations.
- Completion of quality monitoring has been reported and this line has no evidence of adverse health or environmental impacts.

Additionally, crews are beginning preparations for remediation beginning Monday. We continue to work closely with landowners, the community, and local, state and federal regulators. Additionally, we are in discussion with the state regulators and will continue to take appropriate steps to resolve the program.

As always, the health and safety of our crew and personnel, our community neighbors, and mitigating risk to the environment remain our primary focus. We are working with local and state environmental agencies to develop incident specific Spill Response Plans, including procedures to track the issue for safety.

We appreciate the patience and collaboration of the surrounding community and public agencies for their support in responding to this incident. We recognize this is concerning to the community and we will continue our response until we have fully responded to the incident.

Our teams continue to monitor the situation and we will continue to provide updates as we learn more.

We will continue to provide updates as we learn more.

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