

Oil Market Rollercoaster

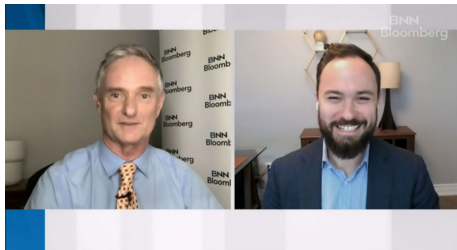
Presentation to the Ottawa Economics Association

October 20, 2022

Rory Johnston is a Canadian commodity market expert

- Founder of Commodity Context, a commodity research service
 - Join more than 14,000 on the mailing list & hundreds of premium subscribers
- Managing Director & Market Economist, Price Street Inc.
- Former Scotiabank Commodity Market Economist
- Frequent media commentator

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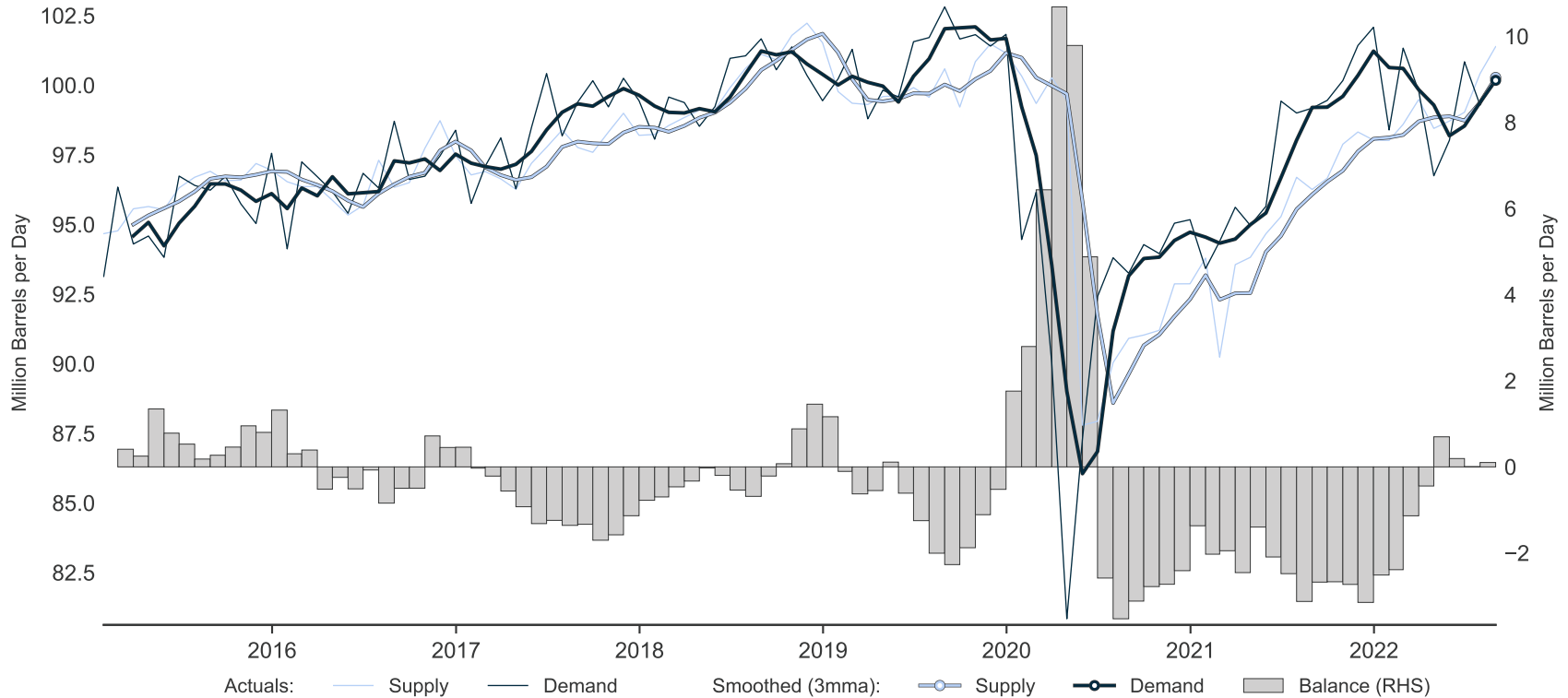


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A screenshot of the Commodity Context website. The page features a navigation bar with 'Home', 'Archive', and 'About' links. Below the navigation bar is a large featured article titled 'Global Oil Data Deck (Oct '22)' with a sub-headline 'Oil market balances tightened slightly in August, but the market remains mildly oversupplied despite a few pockets of extreme tightness (e.g., diesel)'. Below this are several smaller article cards, each with a title, a brief summary, and a date. The articles include 'Oil Context Weekly (W41)', 'US Fuel Export Retort, but Global Market Short', 'Oil Context Weekly (W40)', 'Quick Context: OPEC+ 's Deep Papercut', and 'North American Oil Data Deck (October '22)'. Each article card includes a small thumbnail image and a date.

Crude Oil Market Overview: Supply vs Demand

October 20, 2022



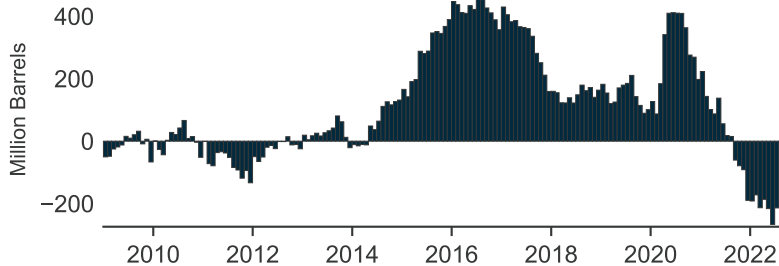
Sources: Commodity Context, EIA, JODI, OPEC, Bloomberg, National Statistical Agencies.

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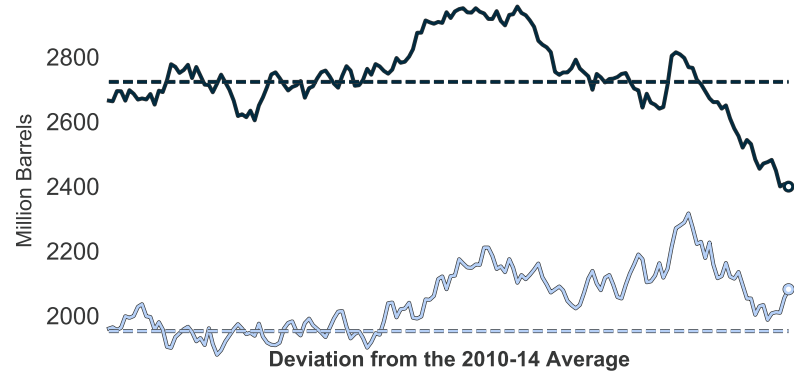
Observable Total Petroleum Inventory



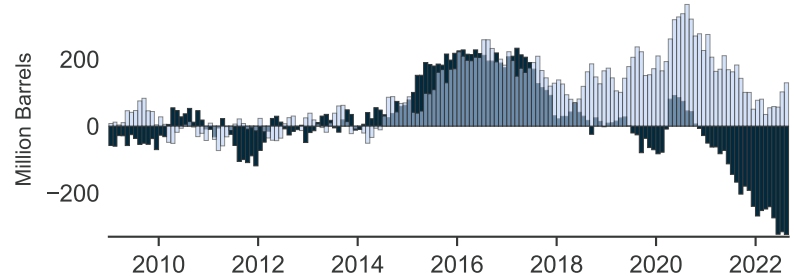
Deviation from the 2010-14 Average



Observable Crude Oil VS Refined Product Inventories



Deviation from the 2010-14 Average



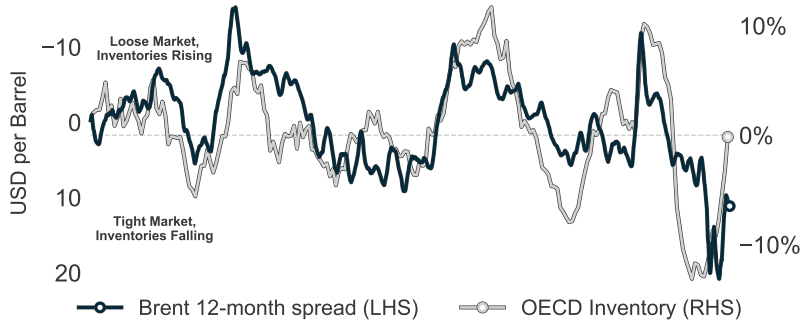
■ Crude Oil ■ Refined Products

Note: Observable sample includes 41 countries but excludes China and Russia, for which no reliable public data is available; Indian stocks adjusted for definition change breaks.

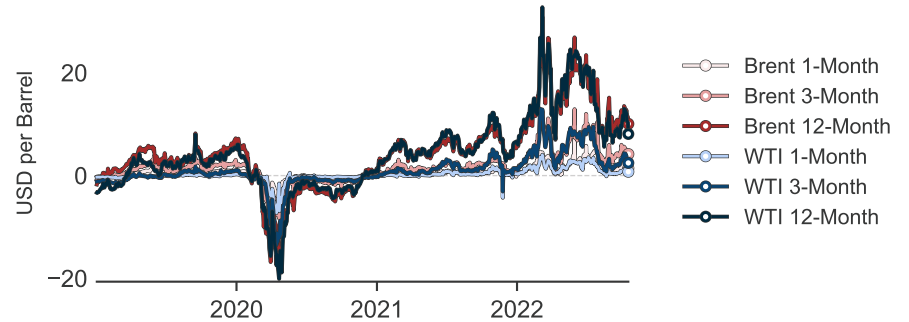
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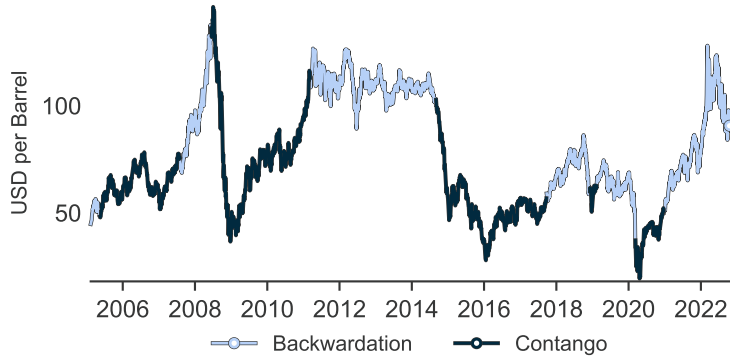
Calendar Spreads Track Inventory Position



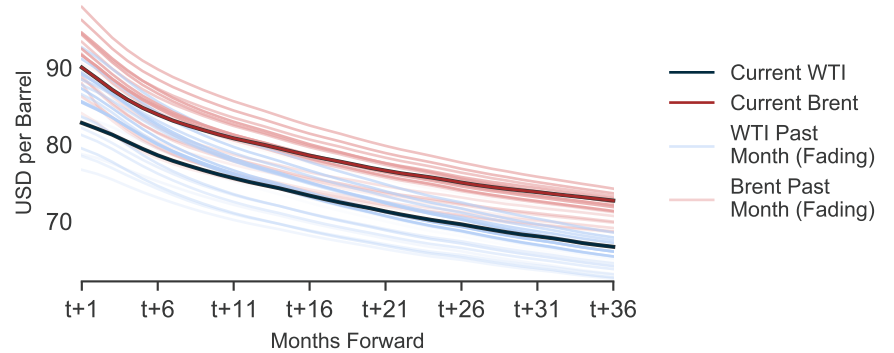
Short-Term Calendar Spreads



History of Backwardation/Contango Regimes



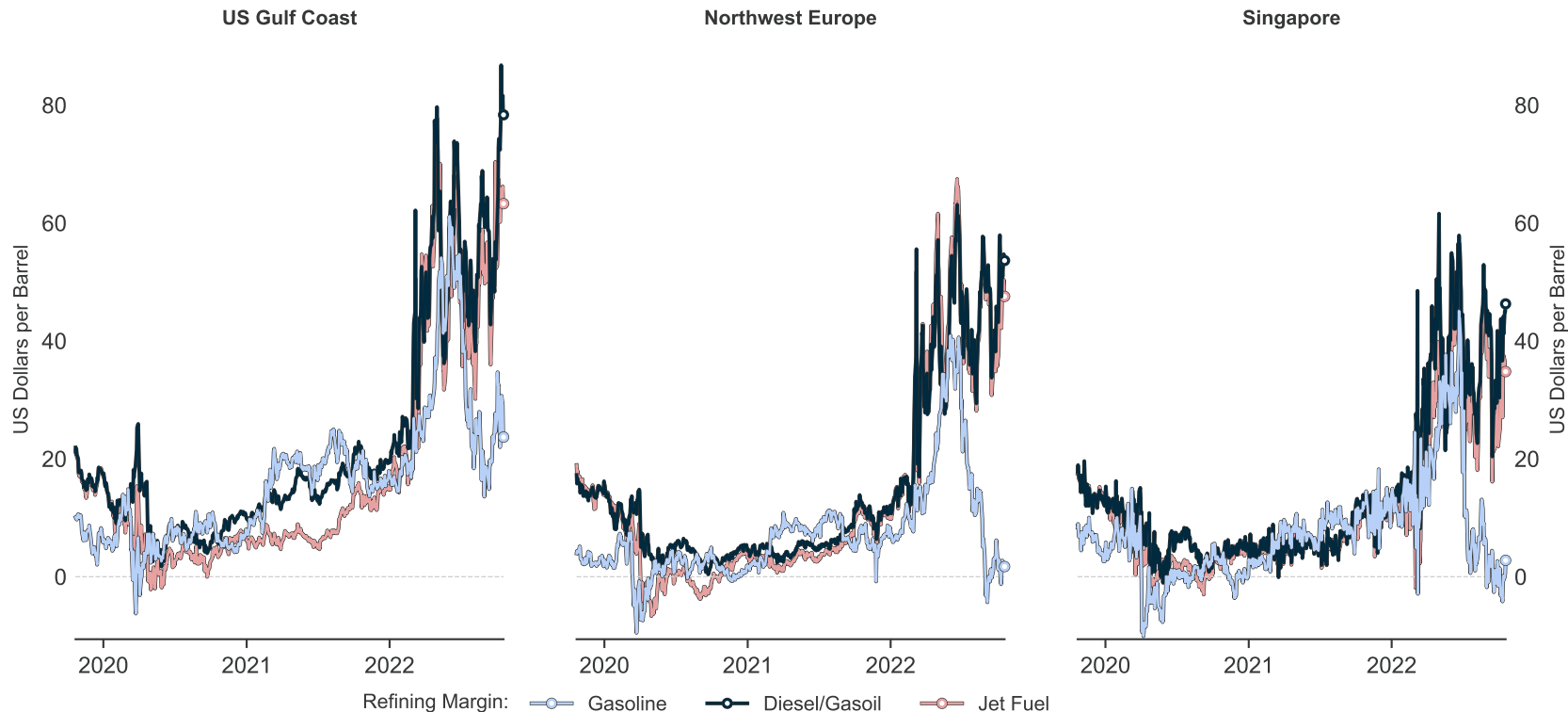
Crude Curve Past and Present



Note: Backwardation and contango regimes based on 12-month (CO1 vs CO13) calendar spread (30-day moving average).

Sources: Commodity Context, NYMEX, CME, ICE, Bloomberg.

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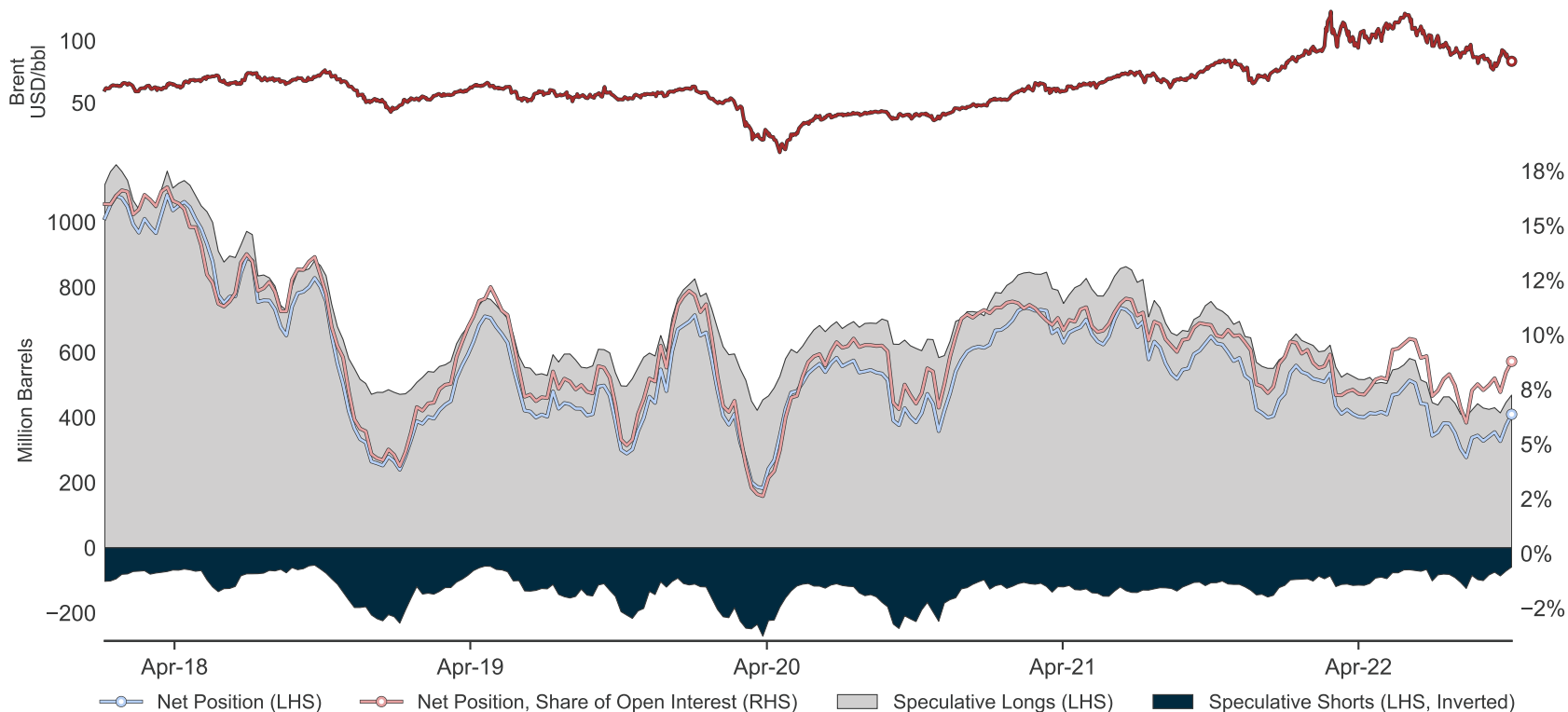
Note: Regional crack spreads are based on local product prices vs regional crude benchmark (USGC = WTI Houston, NWE = Brent, Singapore = Dubai)

Sources: Commodity Context, Bloomberg.

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Speculative Positioning In Major Crude Contracts

October 20, 2022

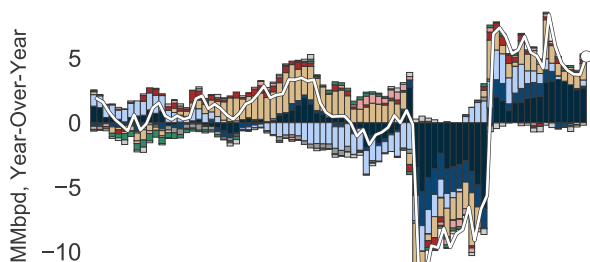


Note: Speculative refers to Managed Money Positions; Combined Futures & Options; WTI and Brent.

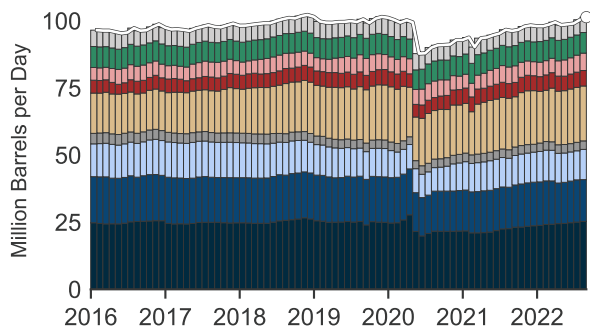
Sources: Commodity Context, CME, NYMEX, ICE, CFTC, Bloomberg.

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Production Growth

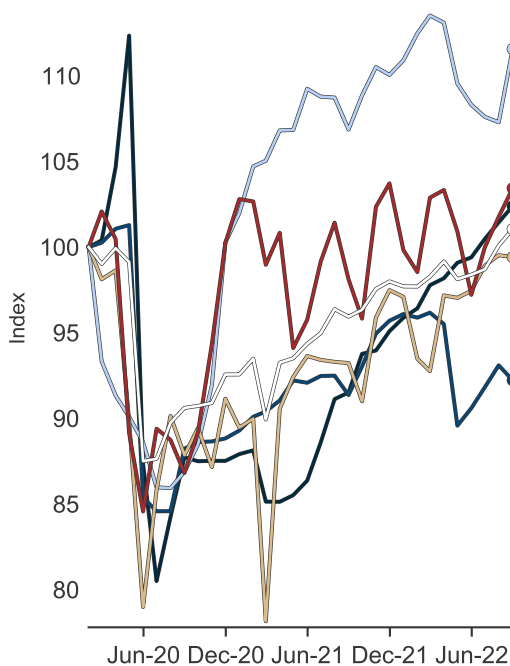


Production



○—○ Total ■ Non-OPEC Allies ■ Former OPEC ■ Canada ■ Asia
■ OPEC-10 ■ OPEC+ Excl. & NGLs ■ US ■ LatAm ■ Other

Indexed Production

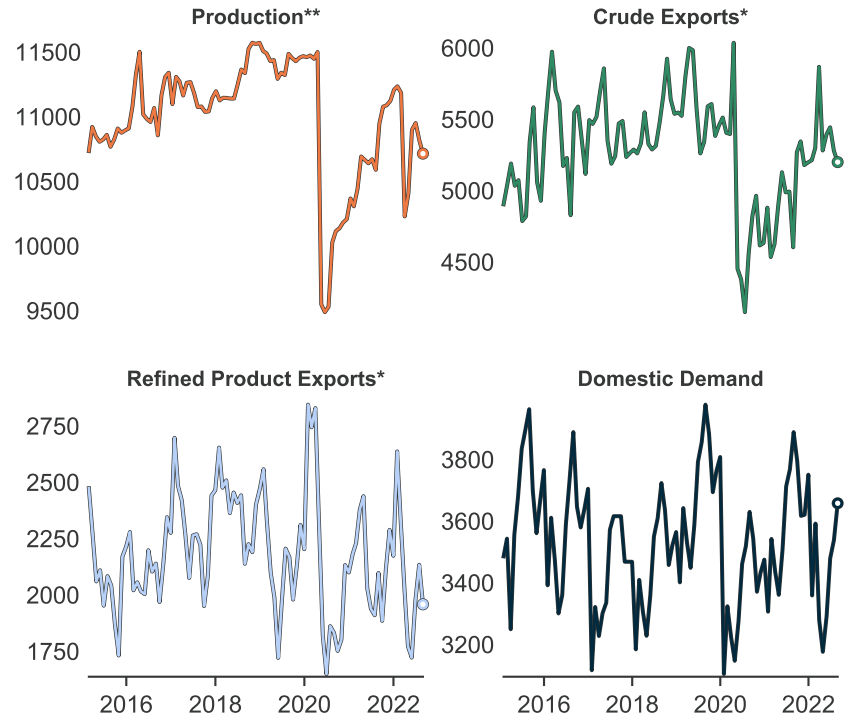
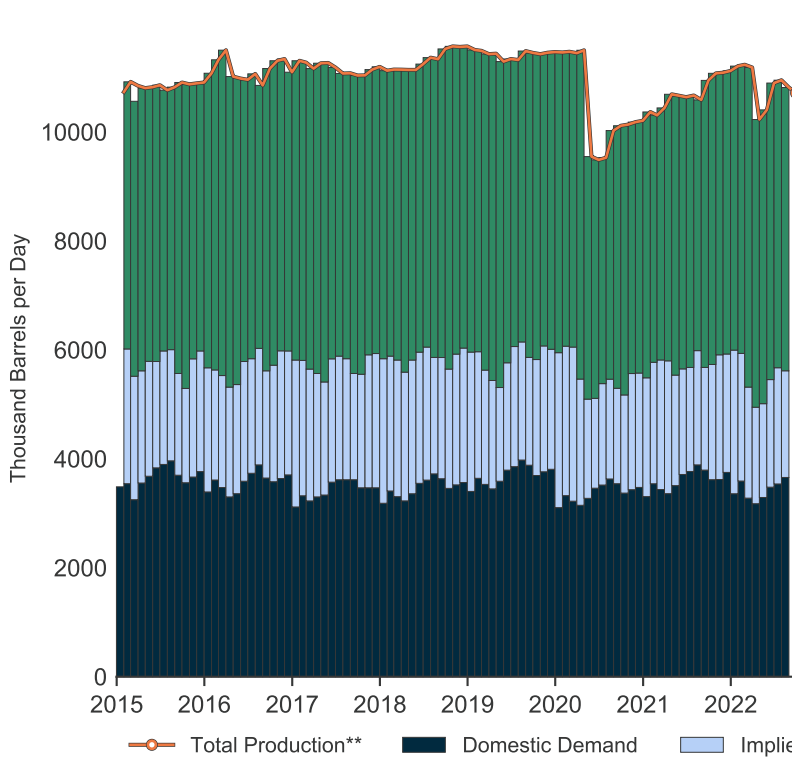


(MMbpd)	2022			Avg.		Chg.
	Jun	Jul	Aug	2021	YTD	YTD
Global Supply	99.0	100.4	101.4	95.4	99.3	5.0
OPEC+	51.2	51.6	52.1	48.8	51.4	3.5
OPEC-10	24.8	25.0	25.3	22.2	24.5	2.9
Saudi Arabia	10.6	10.7	10.9	9.1	10.4	1.7
Non-OPEC	15.5	15.7	15.6	15.7	15.7	0.3
Russia	10.0	10.0	10.0	9.8	9.9	0.3
Excluded Members	3.9	3.9	4.4	4.1	4.1	0.1
Iran	2.6	2.6	2.6	2.4	2.6	0.2
Other Liquids	6.9	7.0	6.9	6.8	7.0	0.2
Former OPEC	3.1	3.2	3.2	3.2	3.2	-0.0
Non-OPEC+	44.8	45.7	46.1	43.5	44.7	1.5
North America	25.9	26.1	26.2	24.5	25.6	1.4
US	20.3	20.5	20.4	19.0	19.9	1.3
Canada	5.6	5.7	5.8	5.5	5.6	0.1
Latin America	6.1	6.3	6.5	5.6	5.8	0.2
Brazil	3.9	4.2	4.3	3.7	3.7	-0.0
Europe	3.5	4.0	4.0	4.1	3.9	-0.2
Norway	1.5	1.9	2.0	2.0	1.9	-0.1
Asia Pacific	7.7	7.5	7.7	7.5	7.6	0.1
China	5.2	5.1	5.2	5.0	5.2	0.1
Eurasia	0.4	0.4	0.4	0.4	0.4	0.0
Middle East	0.2	0.1	0.1	0.2	0.2	-0.0
Africa	1.1	1.2	1.2	1.2	1.2	-0.0

Note: Table values are independently rounded and thus may not accurately add up to aggregate regional/global levels.

Sources: Commodity Context, EIA, OPEC, JODI, Bloomberg, National Statistical Agencies.

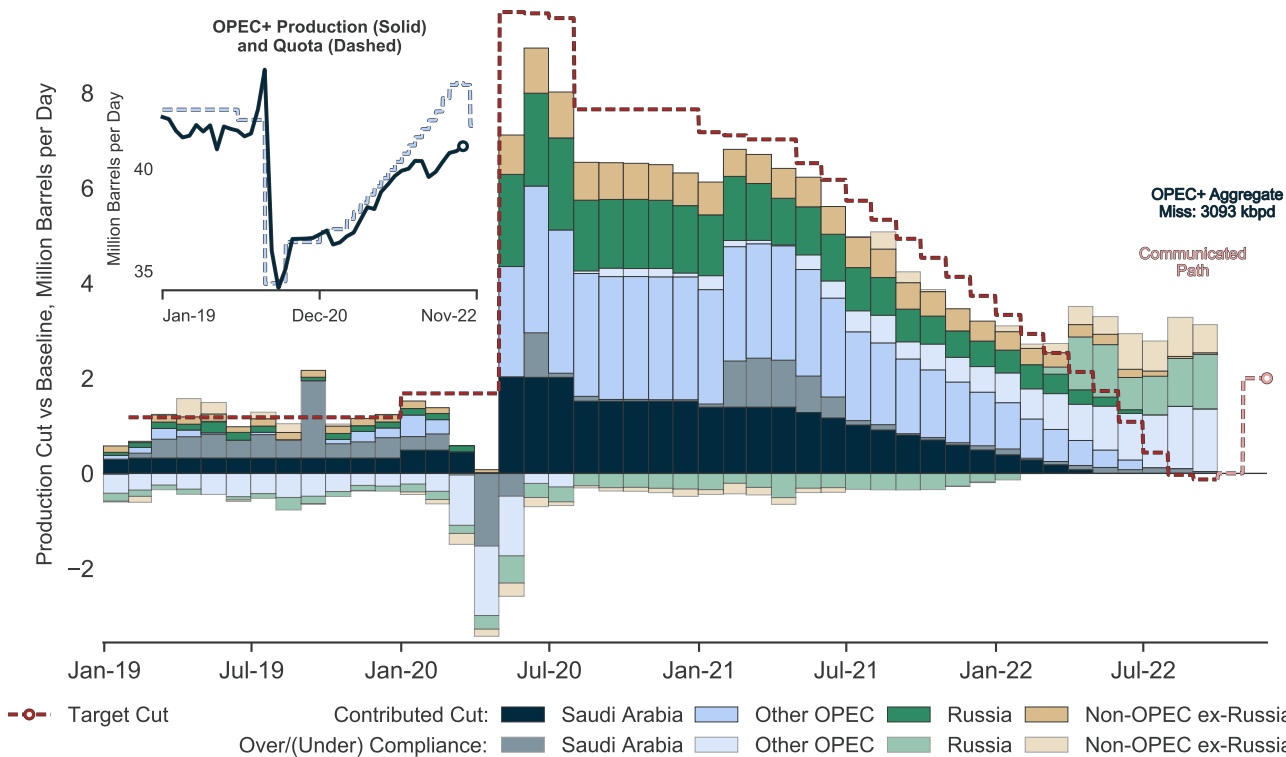
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Note: *Export availability defined as difference between observed production and observed domestic demand; **Production data is one month more current.

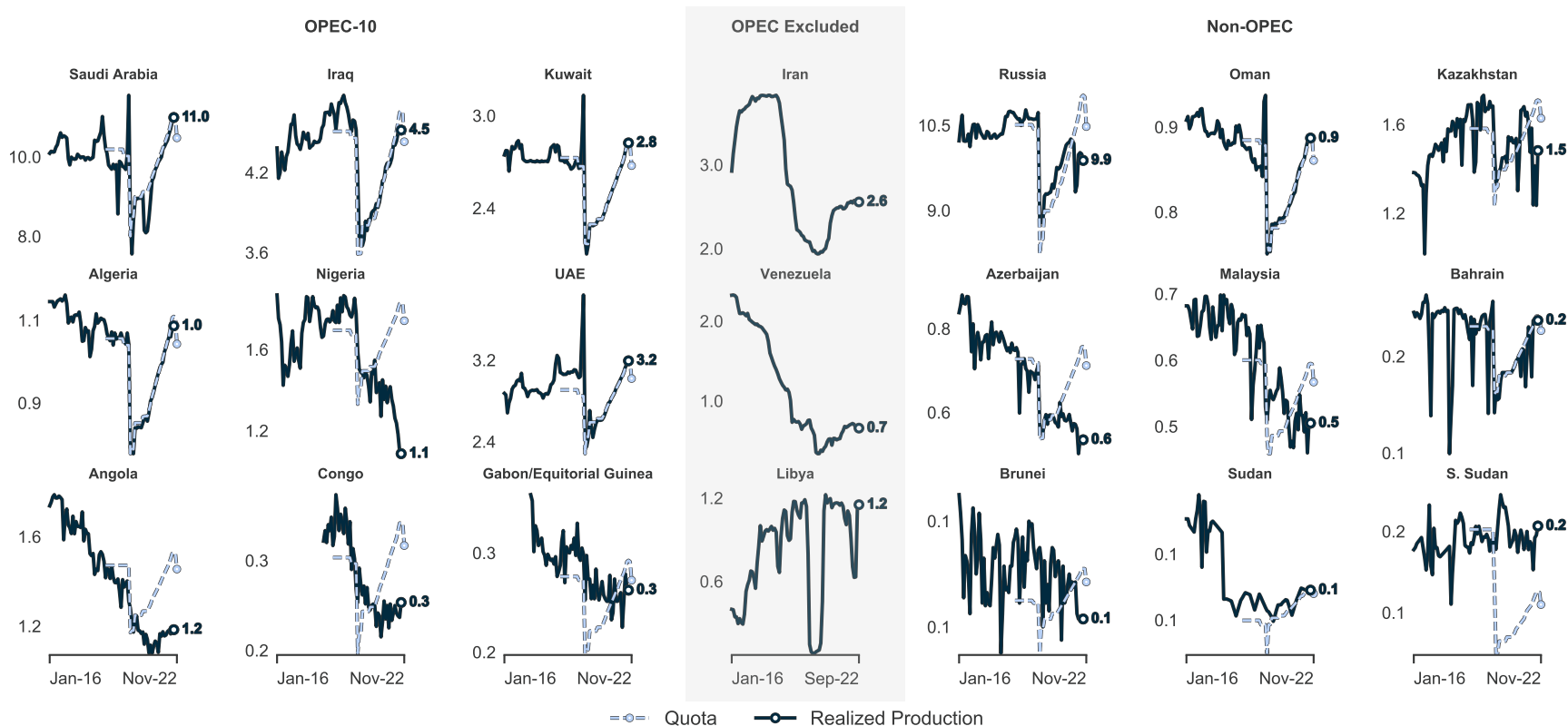
Sources: Commodity Context, JODI, Rosstat, EIA.

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(MMbpd)	Aug	Sep	Quota	Miss
OPEC+ Total	40.86	41.11	44.2	-3.09
OPEC-10	25.28	25.4	26.75	-1.35
Saudi Arabia	10.9	10.99	11.03	-0.04
Iraq	4.53	4.52	4.66	-0.15
UAE	3.16	3.19	3.19	0.01
Kuwait	2.81	2.82	2.82	0.0
Nigeria	1.1	1.09	1.83	-0.74
Angola	1.19	1.18	1.53	-0.34
Algeria	1.04	1.04	1.06	-0.02
Gabon	0.2	0.2	0.19	0.01
Congo	0.26	0.27	0.32	-0.05
Equ. Guinea	0.09	0.09	0.13	-0.04
Non-OPEC	15.58	15.71	17.45	-1.74
Russia	10.0	9.88	11.03	-1.15
Oman	0.88	0.88	0.88	-0.0
Kazakhstan	1.23	1.48	1.71	-0.23
Azerbaijan	0.55	0.55	0.72	-0.17
Malaysia	0.51	0.51	0.6	-0.09
Bahrain	0.2	0.2	0.2	-0.0
Brunei	0.08	0.08	0.1	-0.02
Sudan	0.07	0.07	0.08	-0.0
S. Sudan	0.16	0.16	0.13	0.03

Note: Baseline is Oct 2018, KSA/RUS adjusted to 11 MMbpd in May 2021; recent Russian production estimates use media reports given lack of reliable data.
 Sources: Commodity Context, EIA, OPEC, JODI, Bloomberg, National Statistical Agencies.
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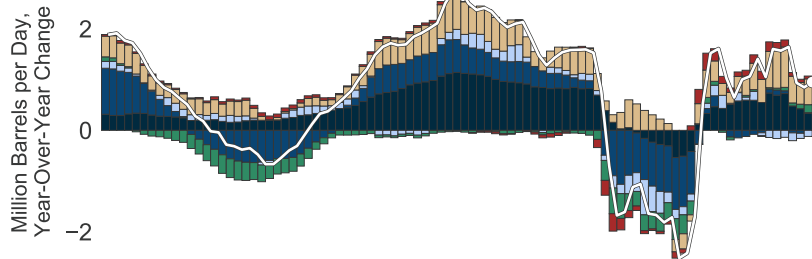


Note: OPEC MOMR secondary source basis for traditional OPEC members; realized production displayed through August while quotas continue through November.

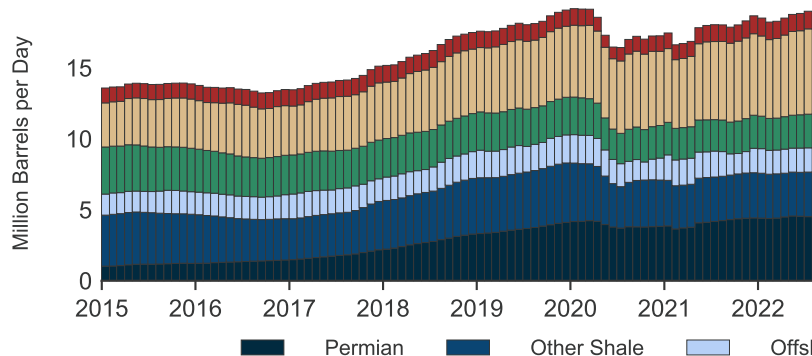
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Production Growth



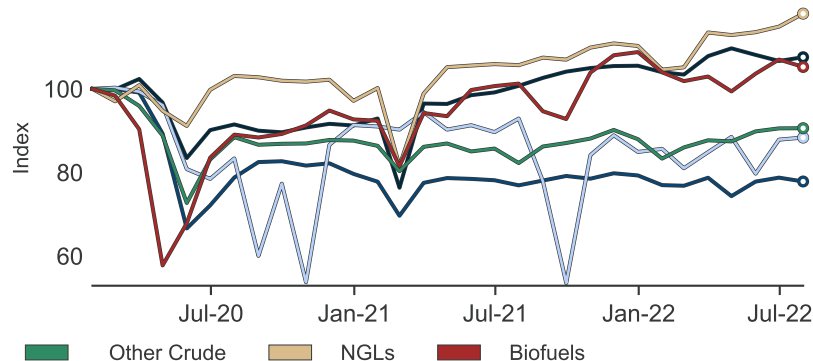
Production



Permian
 Other Shale
 Offshore
 Other Crude
 NGLs
 Biofuels

(MMbpd)	2021			2022							Annual Avg.				Growth		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	2019	2020	2021	YTD	2020	2021	YTD
Total Liquids	18.5	18.8	18.7	18.0	18.0	18.8	18.7	18.8	19.0	19.2	18.3	17.5	17.8	18.7	-0.8	0.3	1.2
Crude	11.6	11.8	11.6	11.4	11.3	11.7	11.7	11.6	11.8	11.8	12.3	11.3	11.2	11.6	-1.0	-0.1	0.5
Permian	4.4	4.4	4.4	4.4	4.3	4.5	4.6	4.5	4.5	4.5	3.7	3.9	4.1	4.5	0.2	0.2	0.5
Other Shale	3.2	3.2	3.2	3.1	3.1	3.2	3.0	3.1	3.2	3.1	4.0	3.4	3.1	3.1	-0.6	-0.3	0.0
Offshore	1.7	1.8	1.7	1.7	1.6	1.7	1.8	1.6	1.8	1.8	1.9	1.7	1.7	1.7	-0.2	0.0	-0.1
Other Crude	2.3	2.4	2.3	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.6	2.3	2.3	2.3	-0.3	-0.1	0.1
NGLs	5.7	5.8	5.7	5.4	5.5	5.9	5.9	5.9	6.0	6.1	4.8	5.2	5.4	5.8	0.3	0.2	0.6
Biofuels	1.2	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.0	1.2	1.2	-0.1	0.1	0.1

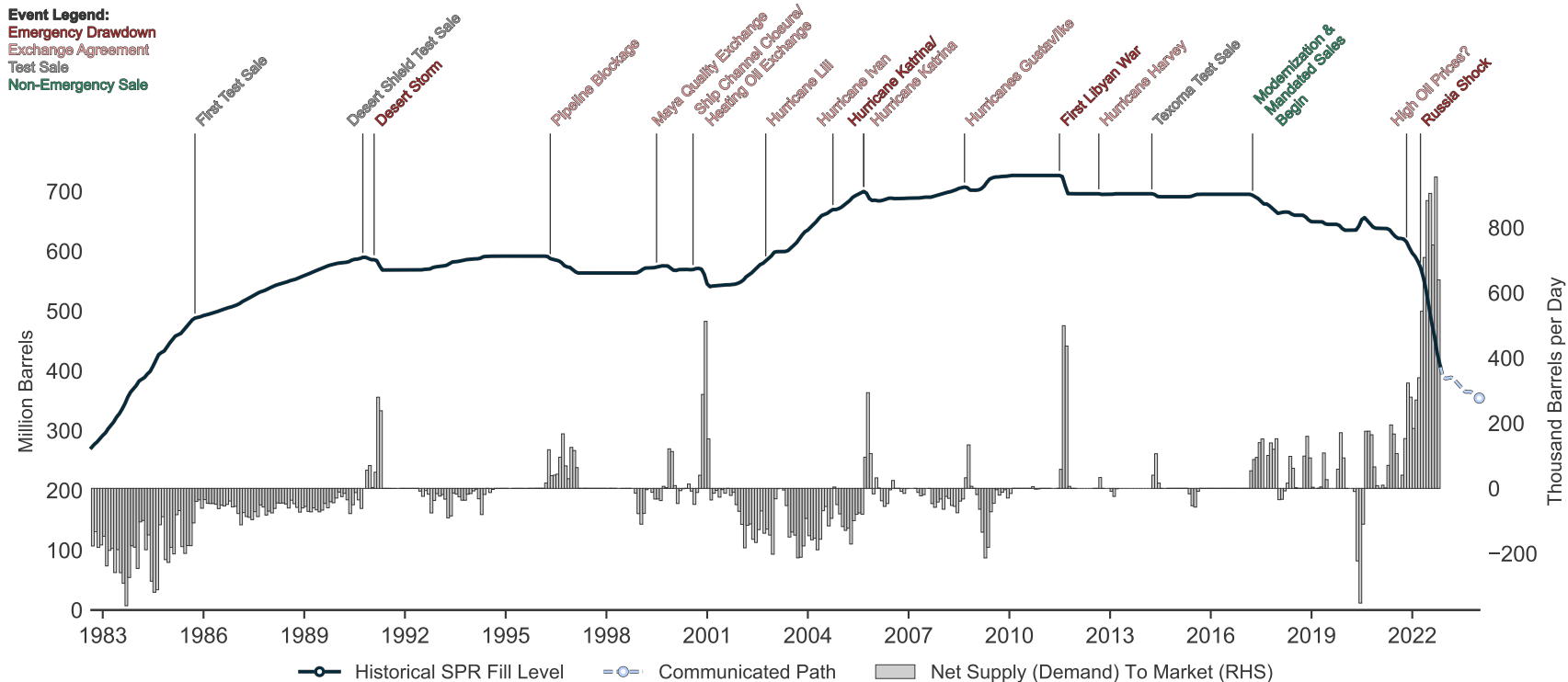
Indexed Source Production



Note: Data is displayed as 3-month moving averages.

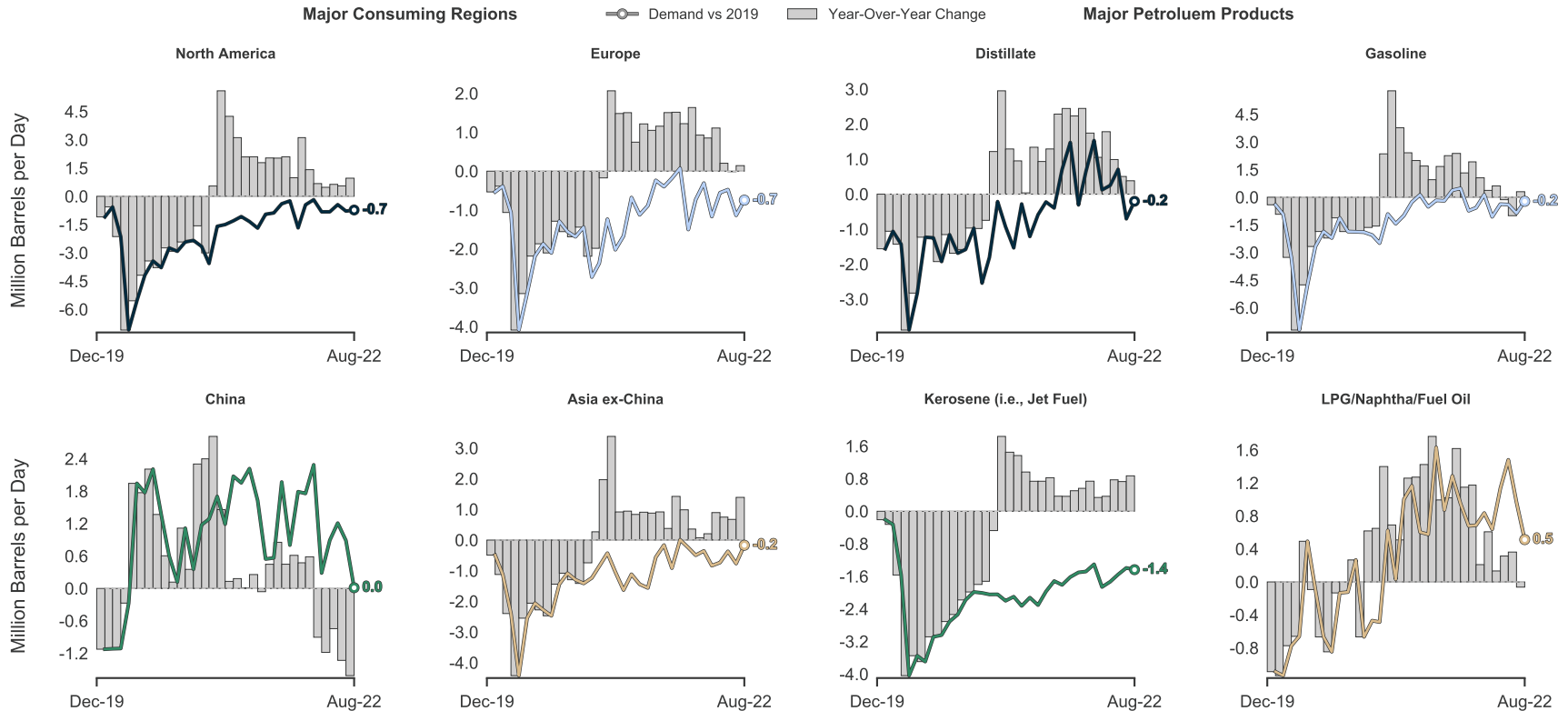
Sources: Commodity Context, Energy Information Administration, BOEM.

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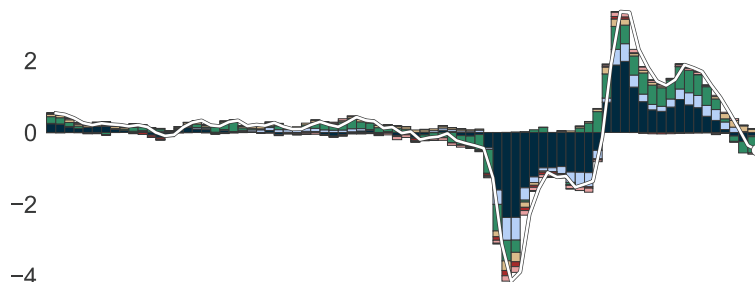
Note: *Global(ish) sample includes 45 countries representing roughly three-quarters of global demand.

Sources: Commodity Context, JODI, EIA, BEIS, METI, PPAC, Eurostat, Statcan, NBS, China Customs, Bloomberg.

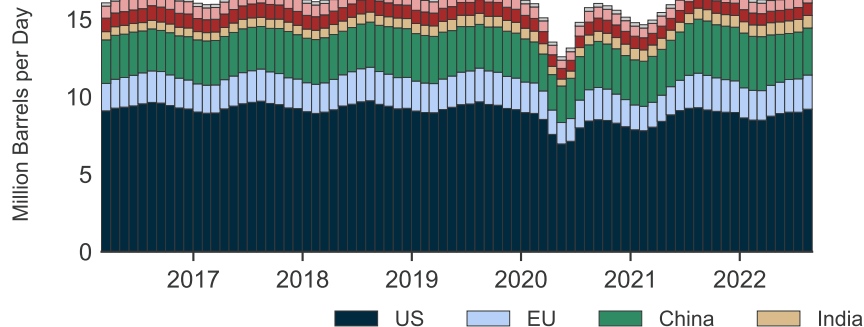
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Consumption Growth

Million Barrels per Day,
Year-Over-Year Change



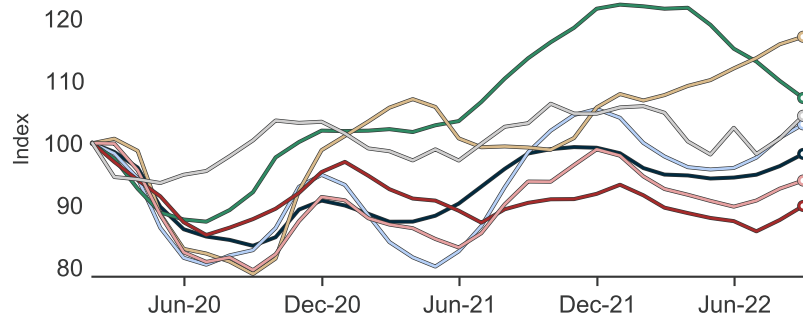
Consumption



US EU China India Japan Canada Korea

	2021		2022					Annual Avg.				Growth					
(MMbpd)	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	2019	2020	2021	YTD	2020	2021	YTD
Gasoline Sample	17.2	17.0	15.6	16.5	16.8	16.1	16.7	17.0	16.6	17.6	16.8	14.9	16.4	16.6	-1.9	1.6	0.5
US	9.0	8.9	8.0	8.6	8.9	8.8	9.1	9.1	8.8	9.7	9.3	8.1	8.8	8.9	-1.2	0.7	0.1
EU	2.1	2.0	1.8	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.0	1.8	2.0	2.1	-0.3	0.2	0.2
China	3.6	3.5	3.5	3.5	3.4	2.9	3.0	3.1	3.0	3.0	2.9	2.7	3.3	3.2	-0.2	0.6	0.0
India	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.7	0.8	-0.1	0.1	0.1
Japan	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.9	0.8	0.8	0.8	-0.1	-0.0	-0.0
Canada	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.7	0.7	0.7	-0.1	0.0	0.0
Korea	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.0	0.0	0.0

Indexed Product Consumption

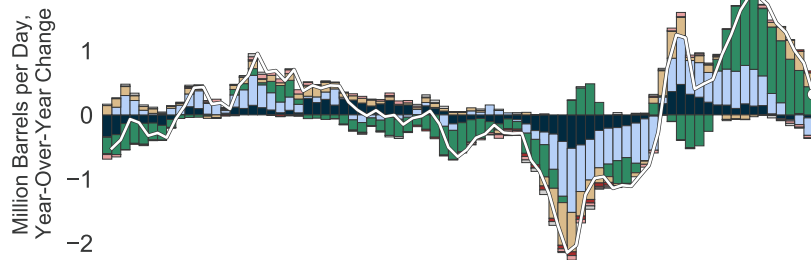


Note: *Country sample is equivalent to roughly half of global liquids demand; Data is displayed as 3-month moving averages.

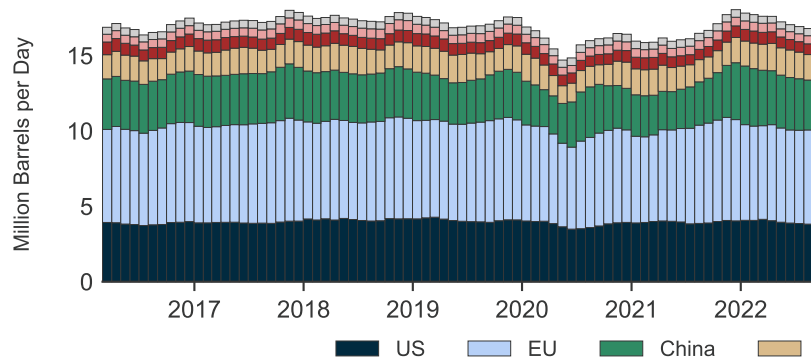
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Consumption Growth

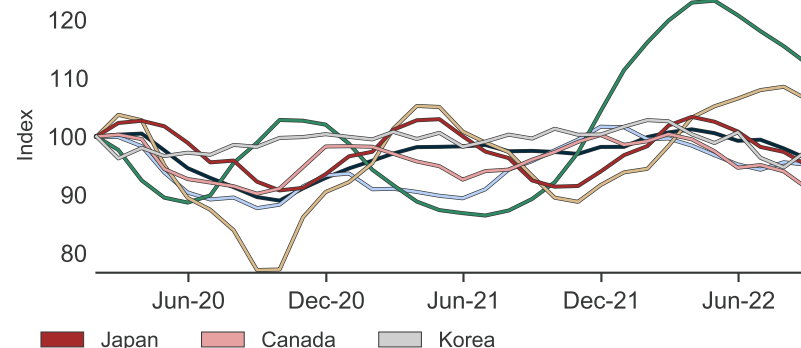


Consumption



(MMbpd)	2021		2022		Annual Avg.								Growth				
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	2019	2020	2021	YTD	2020	2021	YTD
Distillate Sample	18.3	18.3	16.9	18.1	18.0	16.8	17.0	17.2	16.4	16.5	17.2	15.9	16.7	17.1	-1.4	0.8	1.0
US	4.2	4.0	4.1	4.2	4.2	3.8	3.9	4.0	3.7	3.8	4.1	3.8	4.0	4.0	-0.3	0.2	0.0
EU	6.7	6.6	5.7	6.5	6.5	6.2	6.1	6.2	6.2	6.3	6.6	6.0	6.3	6.2	-0.6	0.3	0.1
China	4.0	4.0	3.7	3.7	3.6	3.4	3.5	3.5	3.2	3.2	3.0	2.9	3.0	3.5	-0.1	0.1	0.8
India	1.6	1.8	1.6	1.8	1.9	1.8	1.8	1.9	1.6	1.5	1.7	1.5	1.6	1.7	-0.3	0.1	0.1
Japan	0.7	0.8	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	-0.0	-0.0	0.0
Canada	0.6	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.5	-0.0	0.0	-0.0
Korea	0.5	0.6	0.5	0.5	0.4	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	-0.0	0.0	-0.0

Indexed Product Consumption

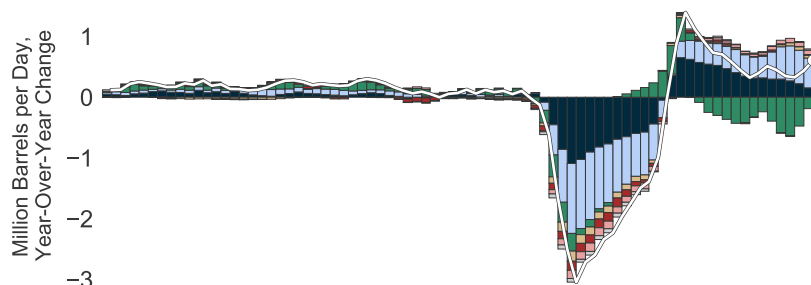


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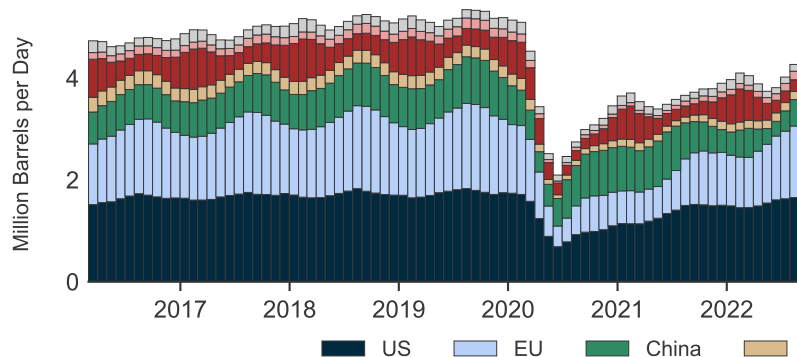
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Consumption Growth

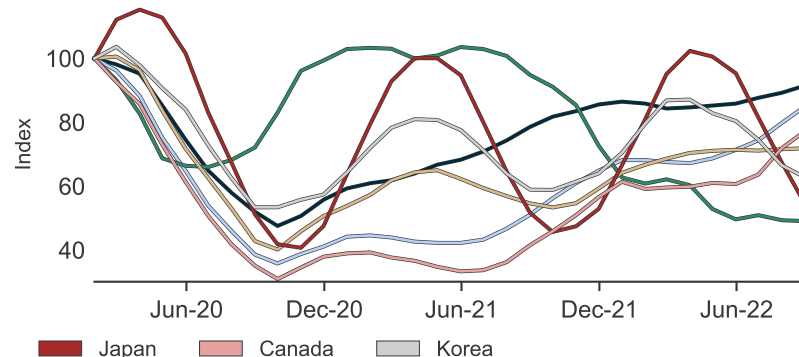


Consumption



(MMbpd)	2021		2022										Annual Avg.				Growth		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	2019	2020	2021	YTD	2020	2021	YTD		
Jet Fuel Sample	3.7	4.1	4.1	4.1	3.9	3.6	3.6	4.2	4.3	4.4	5.2	3.3	3.7	4.0	-1.9	0.4	0.5		
US	1.5	1.5	1.4	1.4	1.5	1.5	1.6	1.7	1.6	1.6	1.7	1.1	1.4	1.6	-0.7	0.3	0.2		
EU	1.0	1.1	0.9	1.0	1.0	1.2	1.2	1.3	1.4	1.5	1.5	0.7	0.8	1.2	-0.8	0.1	0.5		
China	0.4	0.4	0.6	0.6	0.5	0.2	0.2	0.4	0.6	0.6	0.8	0.7	0.7	0.5	-0.1	-0.0	-0.3		
India	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	-0.1	0.0	0.0		
Japan	0.4	0.6	0.7	0.6	0.5	0.3	0.2	0.2	0.2	0.2	0.5	0.4	0.4	0.4	-0.1	-0.0	0.0		
Canada	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	-0.1	0.0	0.1		
Korea	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	-0.1	0.0	0.0		

Indexed Product Consumption

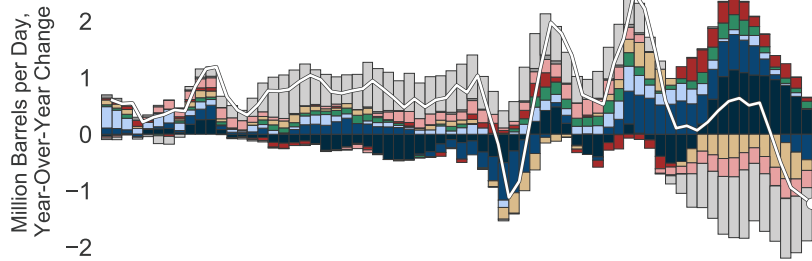


Note: *Country sample is equivalent to roughly half of global liquids demand; Data is displayed as 6-month moving averages.

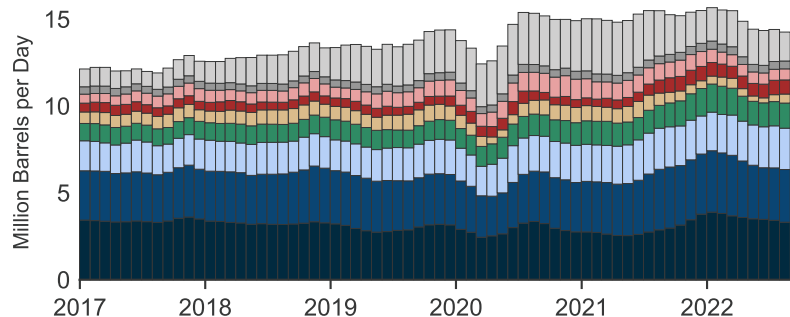
Sources: Commodity Context, Bloomberg, Statcan, EIA, NBS, China Customs, PPAC, BEIS, METI, Eurostat.

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Consumption Growth

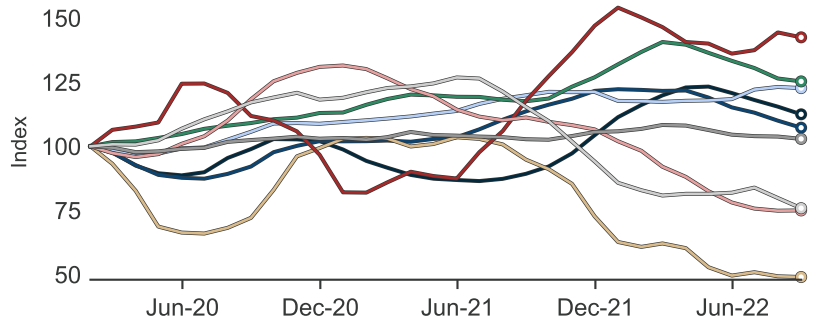


Consumption



(MMbpd)	2021		2022		Annual Avg.								Growth				
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	2019	2020	2021	YTD	2020	2021	YTD
Total	16.0	15.4	15.6	15.6	15.2	13.8	14.2	15.0	14.0	13.8	13.8	14.3	15.2	14.7	0.5	0.9	-0.5
Distillate	4.0	4.0	3.7	3.7	3.6	3.4	3.5	3.5	3.2	3.2	3.0	2.9	3.0	3.5	-0.1	0.1	0.8
Gasoline	3.6	3.5	3.5	3.5	3.4	2.9	3.0	3.1	3.0	3.0	2.9	2.7	3.3	3.2	-0.2	0.6	-0.0
LPG	2.3	2.1	2.3	2.3	2.4	2.2	2.4	2.5	2.4	2.2	1.9	2.0	2.2	2.3	0.1	0.2	0.1
Napthha	1.6	1.6	1.6	1.6	1.4	1.3	1.4	1.5	1.4	1.5	1.1	1.2	1.4	1.5	0.1	0.2	0.1
Kerosene	0.4	0.4	0.6	0.6	0.5	0.2	0.2	0.4	0.6	0.6	0.8	0.7	0.7	0.5	-0.1	-0.0	-0.3
Fuel Oil	0.9	0.8	0.6	0.8	0.7	0.7	0.8	0.9	0.8	0.7	0.5	0.6	0.7	0.7	0.0	0.1	0.2
Asphalt	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.8	1.0	0.9	0.7	0.2	-0.1	-0.3
Pet Coke	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.0	0.0	0.0
Other	1.9	1.8	2.1	2.0	2.1	2.0	2.0	2.1	1.5	1.5	2.3	2.8	2.6	1.9	0.5	-0.2	-1.0

Indexed Product Consumption



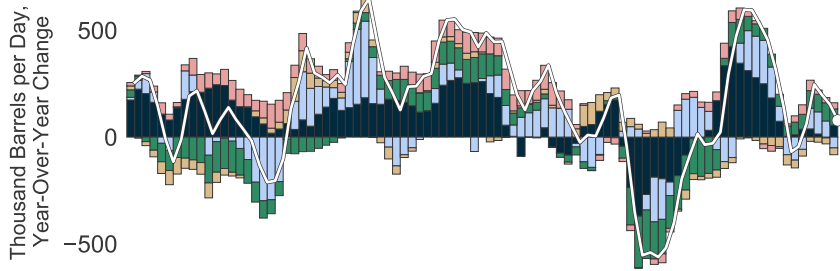
Note: Data is displayed as 3-month moving averages.

Sources: Commodity Context, National Bureau of Statistics, China Customs, Bloomberg.

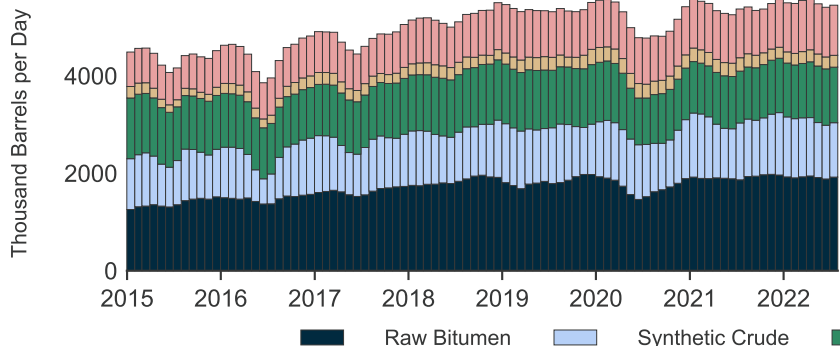
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Production Growth

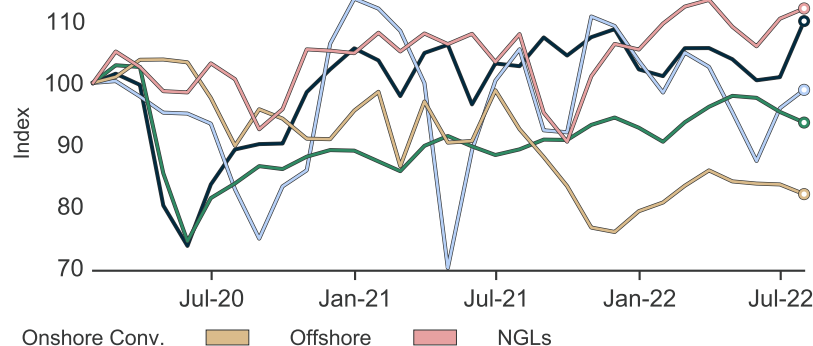


Production



(kbpd)	2021 2022							Annual Avg.			Growth		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	2020	2021	YTD	2021	YTD
Total Liquids	5,450	5,385	5,618	5,638	5,493	5,300	5,426	5,620	5,131	5,411	5,497	280	109
Raw Bitumen	1,891	1,871	1,955	1,955	1,922	1,858	1,868	2,036	1,718	1,920	1,924	202	34
Synthetic Crude	1,230	1,169	1,246	1,218	1,131	1,037	1,139	1,174	1,116	1,181	1,159	64	-3
Onshore Conv.	1,107	1,080	1,118	1,148	1,169	1,165	1,138	1,117	1,063	1,078	1,133	14	74
Offshore	232	236	244	251	246	245	244	240	284	258	243	-27	-30
NGLs	990	1,030	1,056	1,066	1,025	995	1,037	1,053	949	975	1,038	26	35

Indexed Source Production



Note: Data is displayed as 3-month moving averages; latest month national liquids production may be inferred from AB/SK/NL data; condensate in conventional, pentates in NGLs.

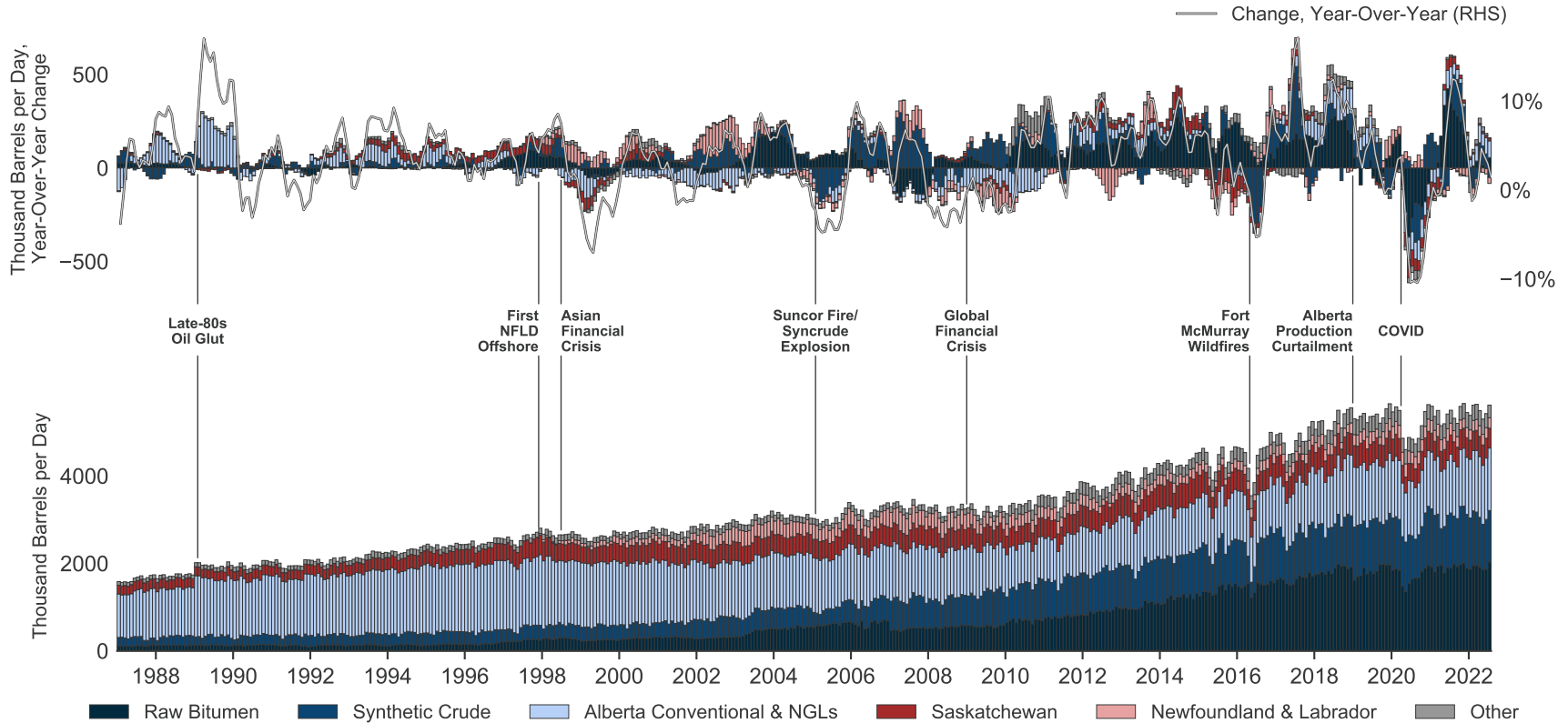
Sources: Commodity Context, Statistics Canada, Alberta Energy Regulator, Canadian Energy Regulator, NLOPB.

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Canadian Oil & Other Liquids Production: Historical Growth & Decomposition

October 20, 2022

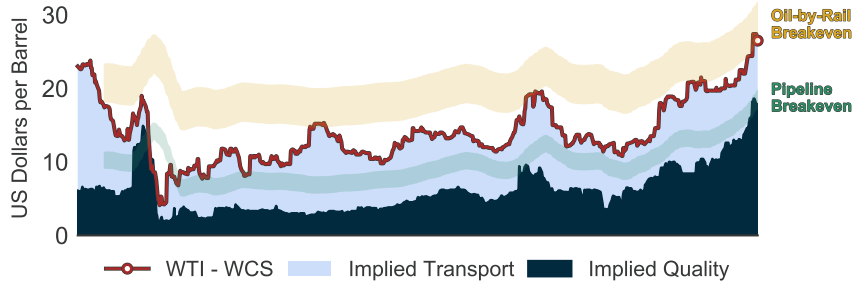


Sources: Commodity Context, StatCan, CER, NRCAN, AER, NLOPB.

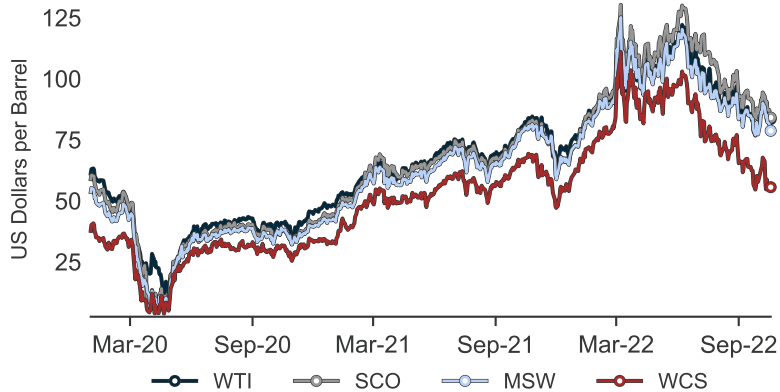
Disclaimer: These materials incorporate third-party data, are provided for informational purposes only, and do not constitute advice or opinion of any kind. Commodity Context does not warrant or guarantee the accuracy or completeness of these materials.



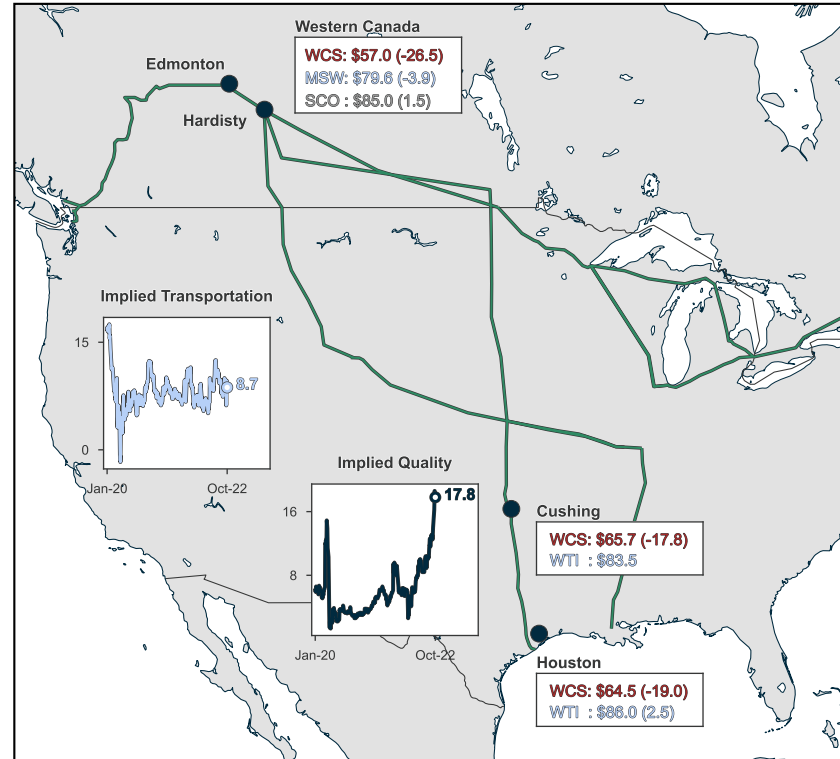
WCS Differential Decomposition



Crude Benchmark Performance



Canadian Crude Pricing Context Map



Note: Implied Quality = WCS-WTI differential at Cushing, OK; Implied Transportation = WCS Hardisty vs WCS Cushing; green pipelines are major Canadian crude carriers.

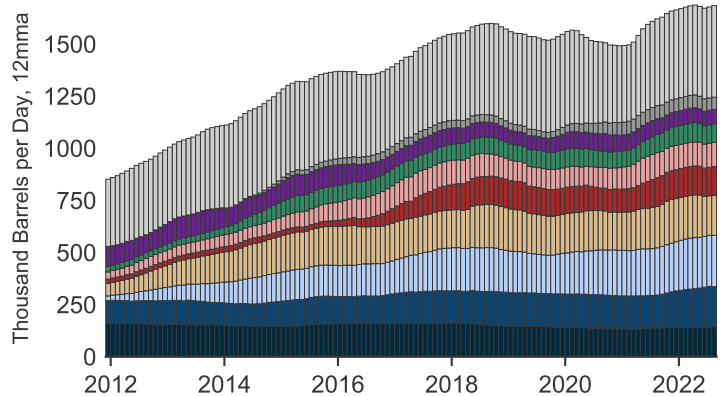
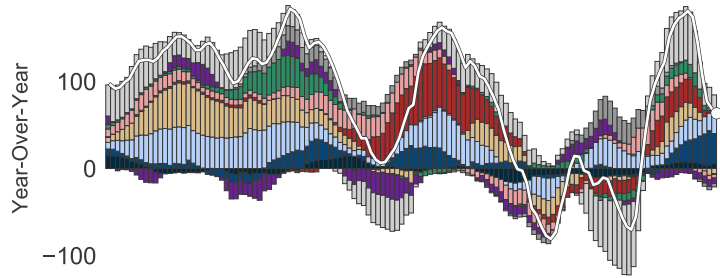
Sources: Commodity Context, Energy Information Administration, CME, NYMEX, NE2, ICE, Argus, Bloomberg.

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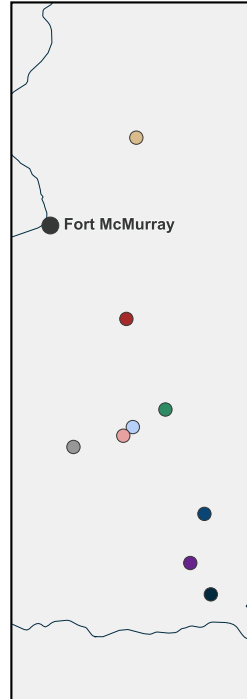
Canadian Oil Sands Thermal In-Situ Bitumen Production

October 20, 2022

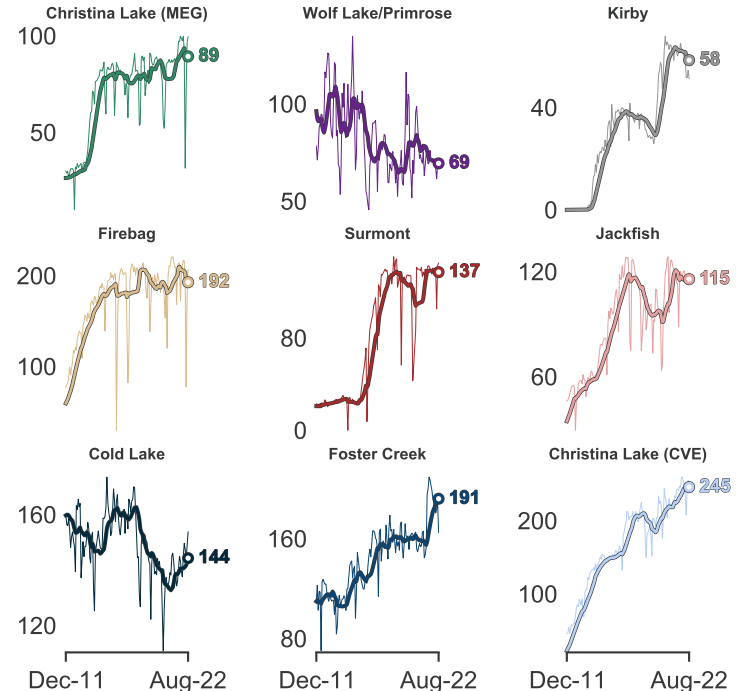


Cold Lake
 Foster Creek
 C. Lake (CVE)
 Firebag
 Surmont
 Jackfish
 C. Lake (MEG)
 Wolf Lake/Primrose
 Kirby
 Other

Thermal In-Situ Context Map



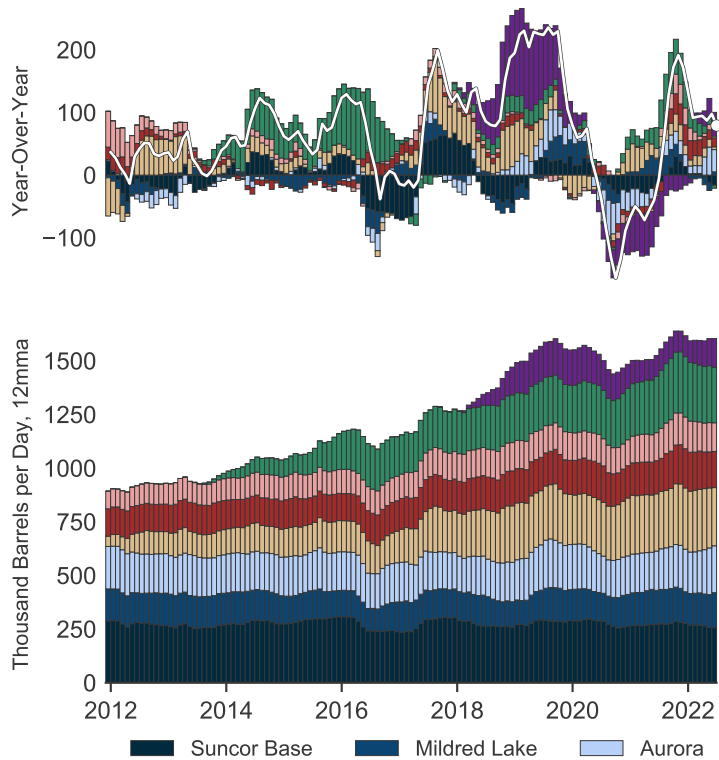
Select Major Thermal In-Situ Project Performance (thousand barrels per day)



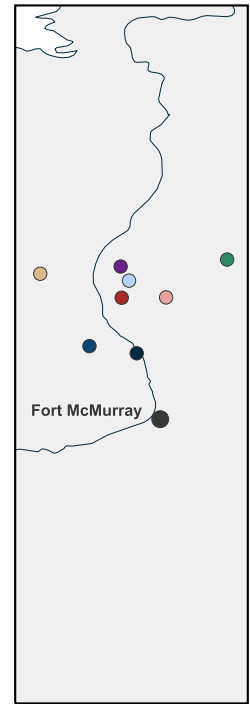
Note: project-level line charts on right show monthly actuals in light line, 12mma in dark.

Sources: Commodity Context, Alberta Energy Regulator, Statistics Canada.

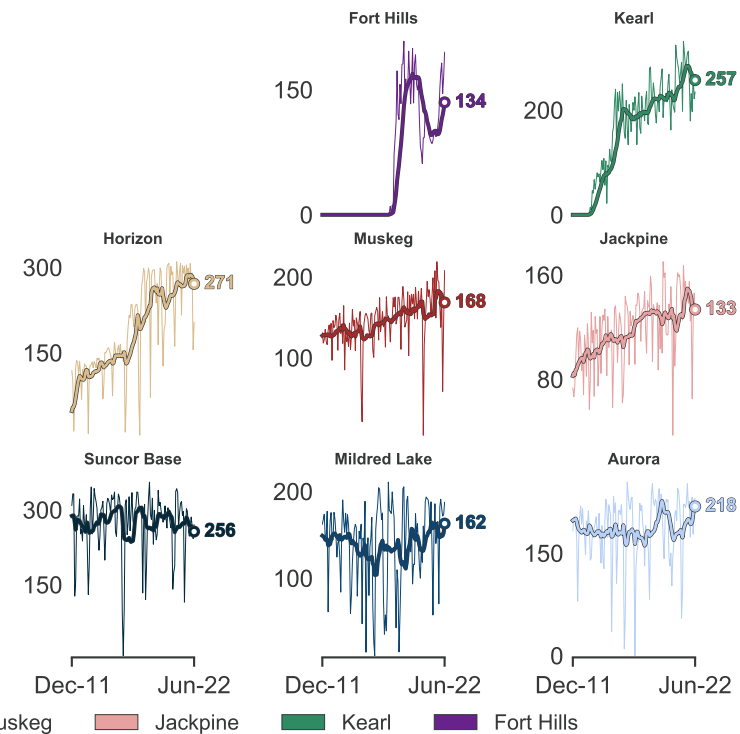
Disclaimer: These materials incorporate third-party data, are provided for informational purposes only, and do not constitute advice or opinion of any kind. Commodity Context does not warrant or guarantee the accuracy or completeness of these materials.



Bitumen Mine Context Map



Bitumen Mine Level Project Performance (thousand barrels per day)



Note: project-level line charts on right show monthly actuals in light line, 12mma in dark.

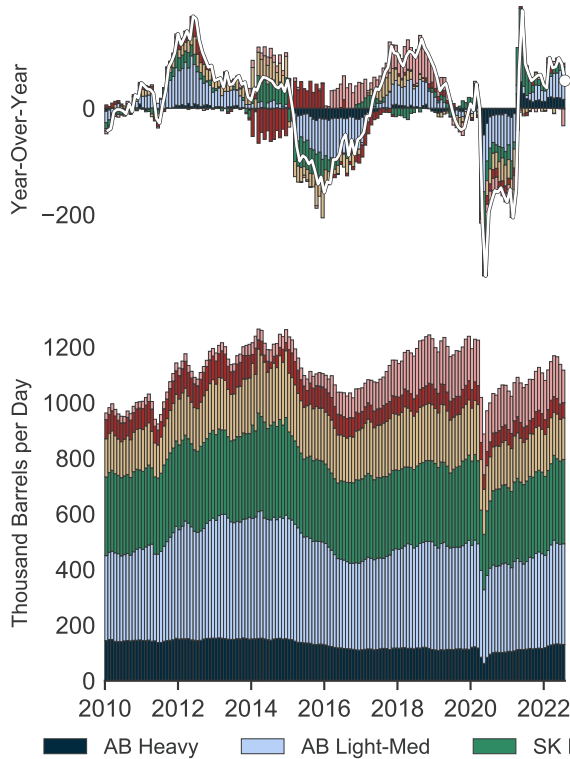
Sources: Commodity Context, Alberta Energy Regulator, Statistics Canada.

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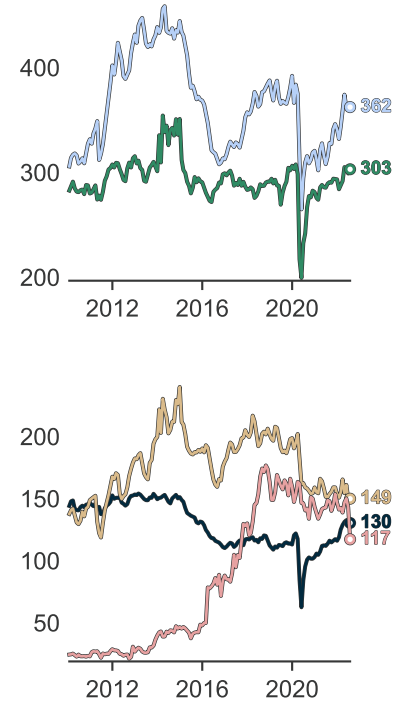
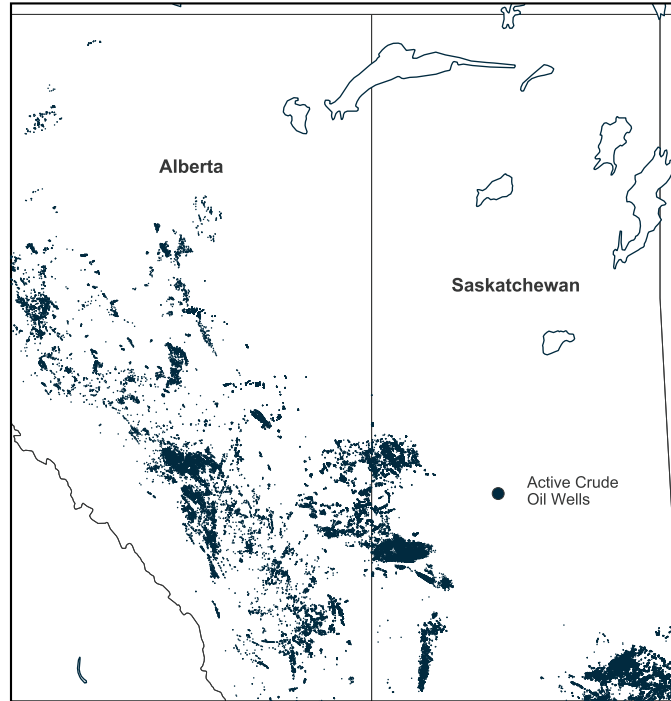


Canadian Conventional Crude and Equivalent Production

October 20, 2022



Conventional Oil Well Context Map (AB/SK Focus)

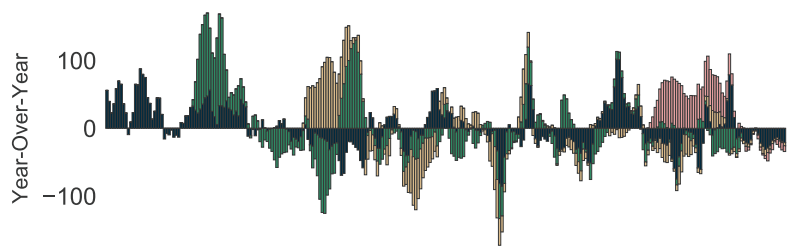


Sources: Commodity Context, Alberta Energy Regulator, Statistics Canada, Government of Saskatchewan.

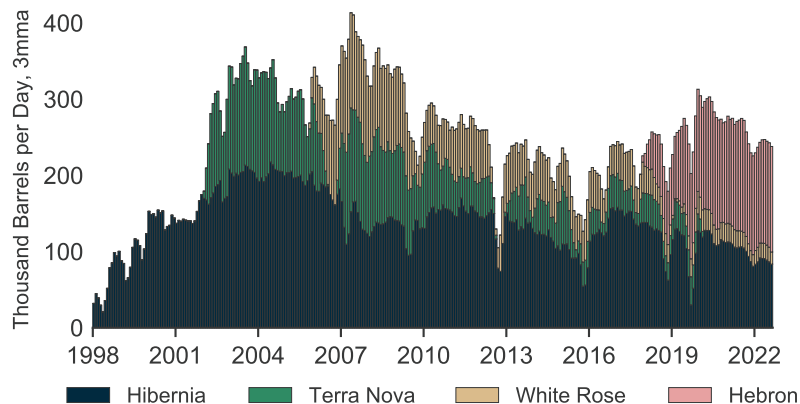
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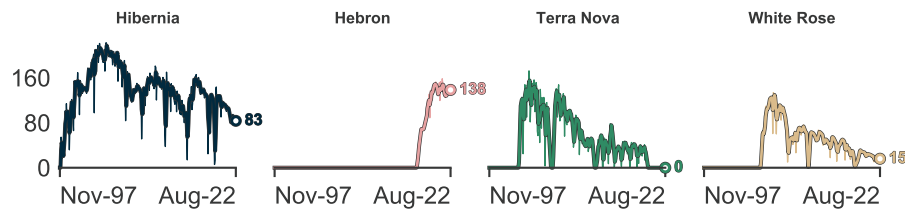
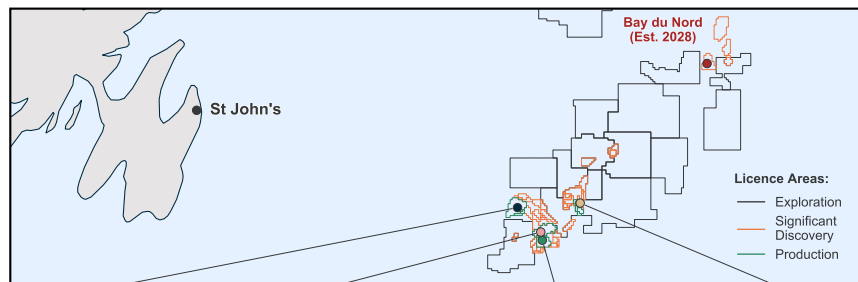
Production Growth



Production



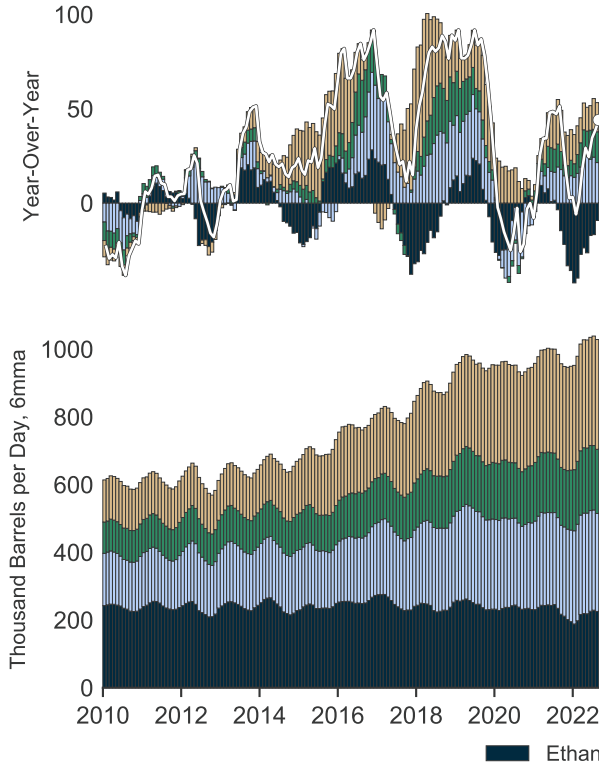
(kbpd)	2021												2022			Annual Avg.			Growth	
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	2020	2021	YTD	2021	YTD			
Total Production	243	224	222	232	236	244	251	246	245	244	240	230	284	258	242	-27	-29			
Hebron	129	131	125	133	127	134	136	137	136	136	139	140	141	138	136	-3	-7			
Hibernia	98	82	81	79	90	90	95	88	89	89	81	80	118	99	88	-19	-19			
White Rose	17	10	16	19	19	20	20	20	20	19	19	10	25	20	18	-5	-4			
Terra Nova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-0	0			



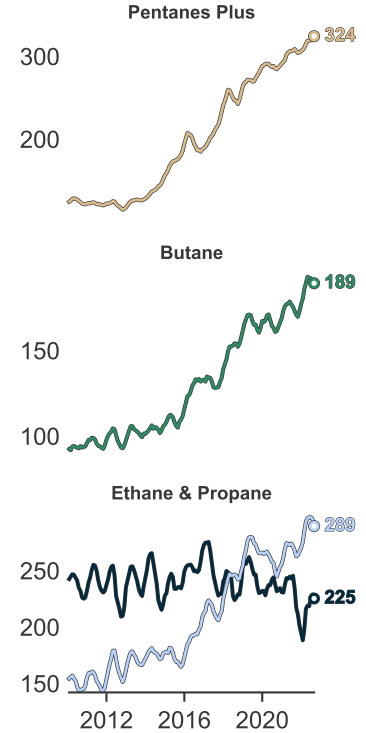
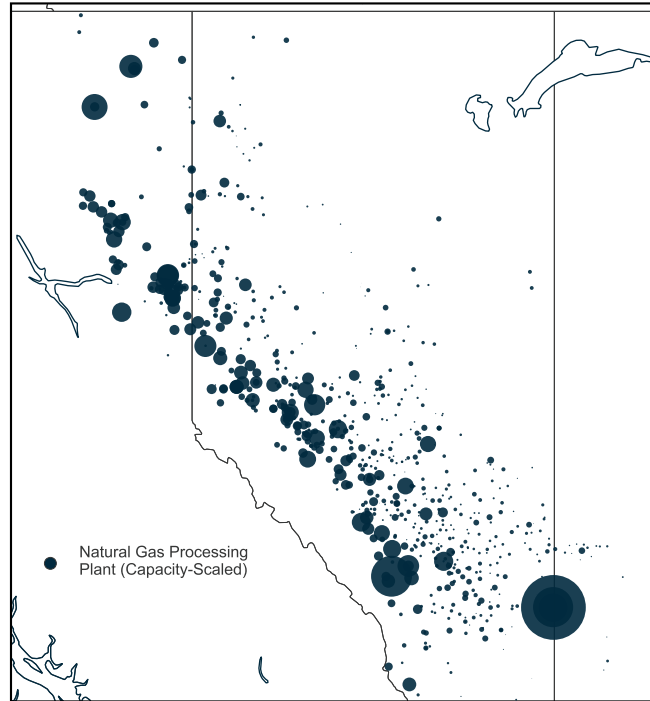
Note: North Amethyst output included in White Rose.

Sources: Commodity Context, Statcan, NRCAN BASIN, NLOPB.

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Natural Gas Processing Plant Context Map



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