October 23, 2023

energyresearch institute

ARC Energy Charts

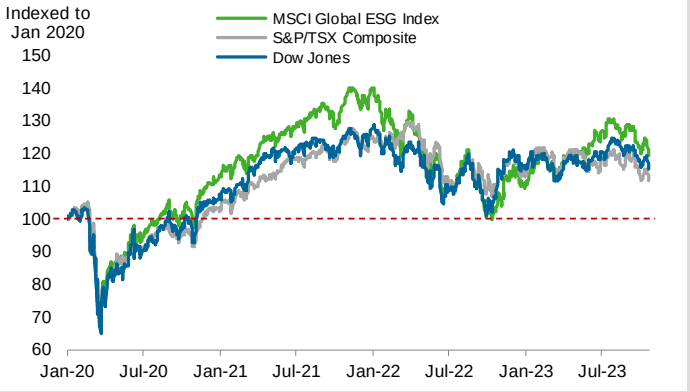
Visit www.arcenergyinstitute.com for more information on this publication and the Institute

Chart Watch

Spot WTI Crude $US/B	Spot Henry Hub $US/ MMBtu	Spot AESO Electricity $C/MWh	EUA Emissions (ICE) EUR/Tonne	Bloomberg Commodity Index	Currency $US/$Cdn
86.39 ↓	2.65 ↓	105.39 ↑	80.50 ↓	104.86 ↑	0.7305 ↓

1 Broad Equity Markets

Daily Index Values; January 2020 to Present

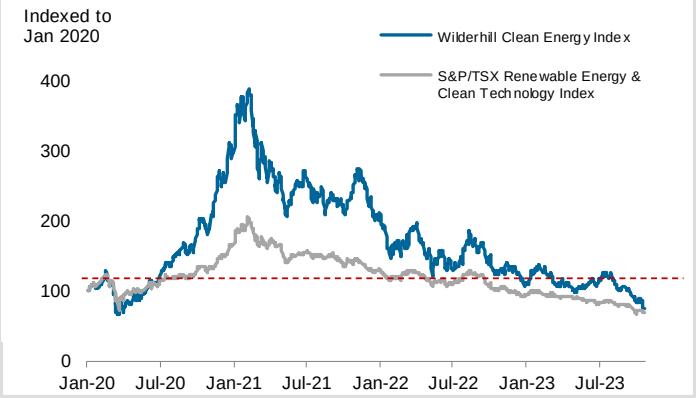


Broad market indices are one the many vital signs measuring the health of the economy. Energy demand is a function of economic health.

Source: Bloomberg, ARC Financial Corp.

2 Clean Energy Indices

Daily Index Values; January 2020 to Present

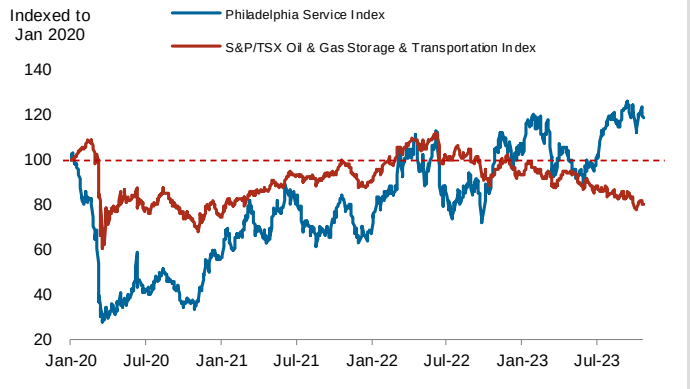


The performance of global and Canadian clean energy indices are compared against each other.

Source: Bloomberg, ARC Financial Corp.

3 Oil & Gas Service and Midstream Indices

Daily Index Values; January 2020 to Present

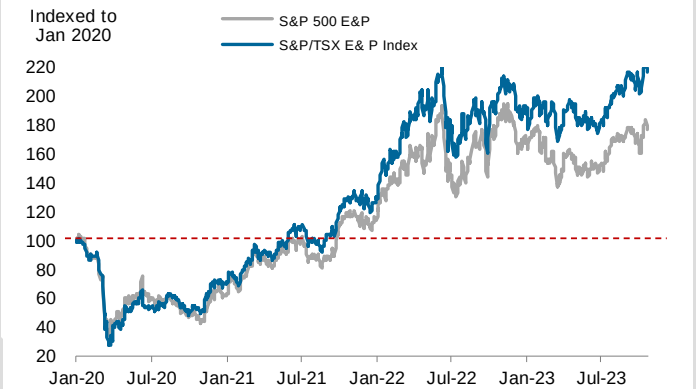


The performance of Canadian And US oilfield equities and Canadian midstream equities are compared against each other.

Source: Bloomberg, Petroleum Services Association of Canada

4 Oil and Gas E&P Indices

Daily Index Values; January 2020 to Present



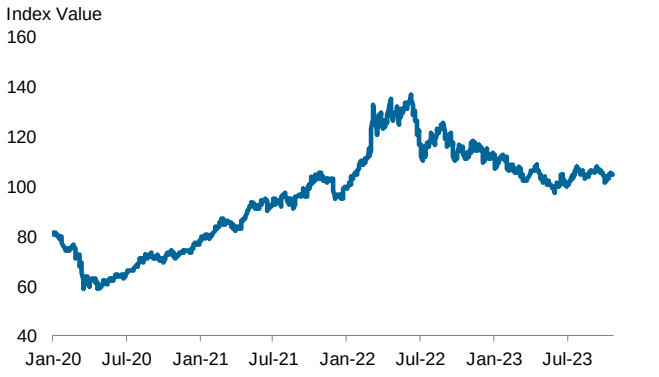
The performance of Canadian and US oil & gas equities are compared against each other.

Source: Bloomberg, ARC Financial Corp.

Please see **Advisories and Disclaimers** at the end of the publication for important cautionary advisory and disclaimer language

5 Bloomberg Commodity Index

Daily Index Values; January 2020 to Present

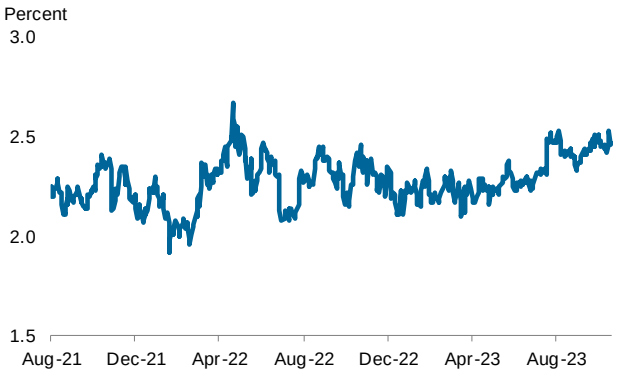


BCOM is a widely tracked benchmark for the commodities market. It is composed of 23 exchange-traded contracts on physical commodities.

Source: Bloomberg

6 5-Yr, 5-Yr Forward Inflation Expectation Rate

Daily; Rolling 24 Month History

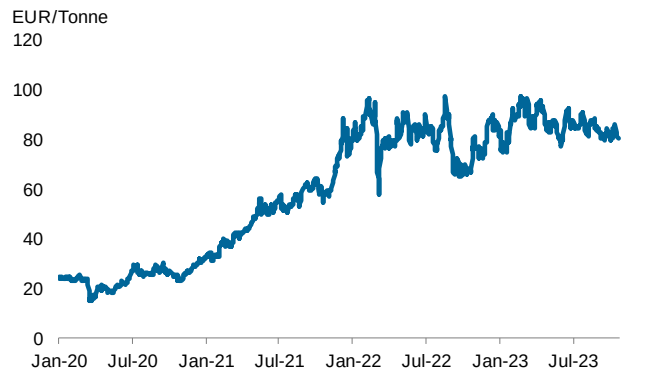


This series is a measure of expected inflation (on average) over the five-year period that begins five years from today.

Source: Federal Reserve Bank of St. Louis, (FRED) Economic Data

7 CO2e Emissions: ICE EUA Futures Contract

Daily; January 2020 to Present

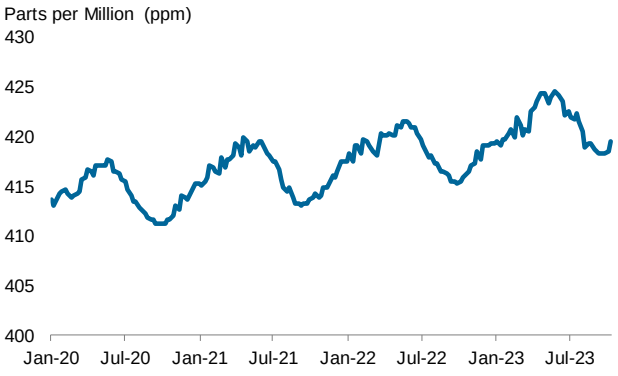


EU Allowances (EUA) are carbon credits equivalent to one tonne of CO2 used in the European Union Emissions Trading Scheme (EU ETS).

Source: Bloomberg

8 Trends in Atmospheric CO2

Mauna Loa Weekly Average: January 2020 to Present

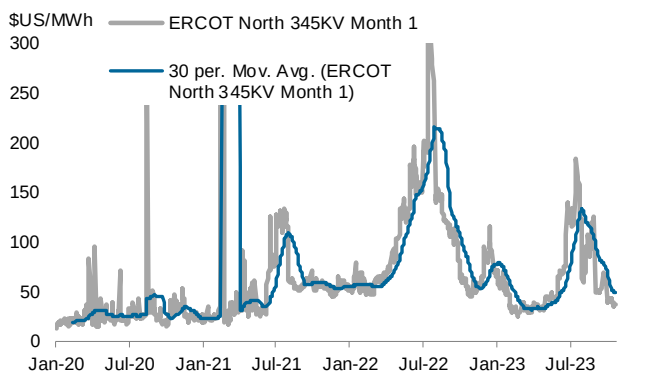


The carbon dioxide data on Mauna Loa constitutes the longest record of direct measurements of CO2 in the atmosphere.

Source: NOAA

9 Texas Electricity: ERCOT North Hub Price

Daily and 30-Day Average; January 2020 to Present

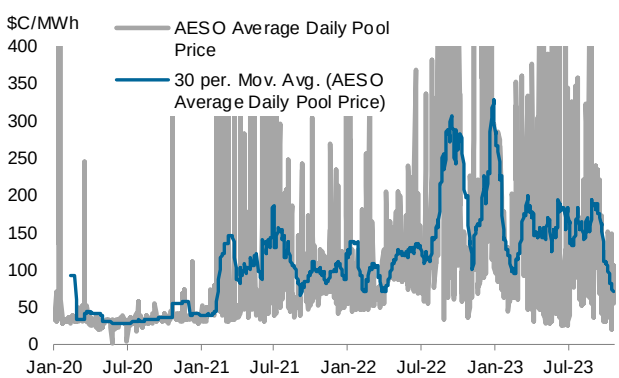


ERCOT is the grid operator for 90% of the electricity sold in Texas. The price shown is for the North Hub and is the wholesale price.

Source: Bloomberg

10 Alberta Electricity: AESO Average Pool Price

Daily and 30-Day Average; January 2020 to Present

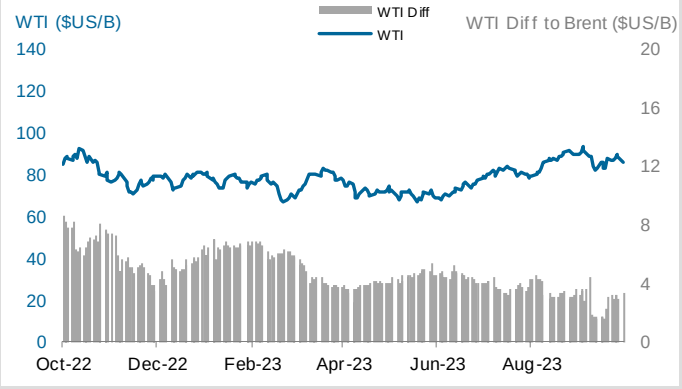


The Alberta Electric System Operator (AESO) manages and operates the provincial power grid.

Source: Bloomberg

11 WTI Crude Oil Price and Differential to Brent

Near-Month WTI and Brent Differential; Rolling 12-Month History

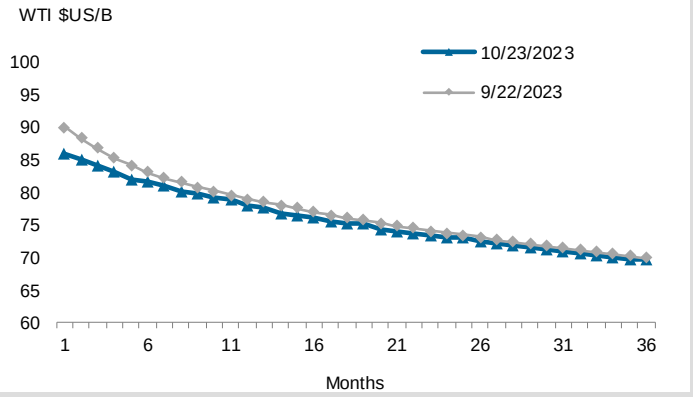


North American crude oil prices can sometimes disconnect from global prices depending on regional supply and demand dynamics.

Source: Bloomberg

12 US Crude Oil Futures

West Texas Intermediate (WTI), Next 36 Months

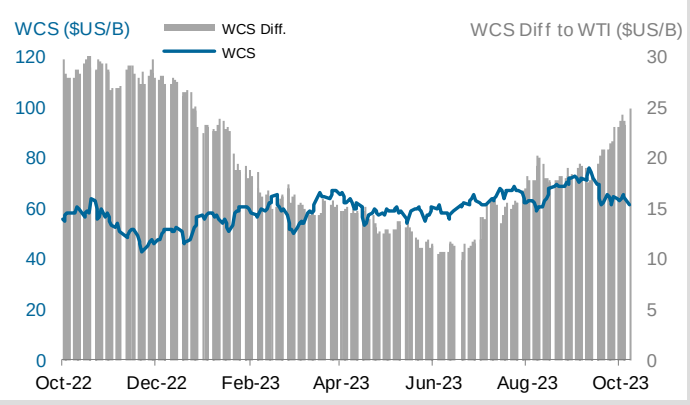


Forward prices for WTI are plotted for the next 36 contracts, and compared against the same contracts one month prior.

Source: Bloomberg

13 CDN Heavy Oil Price Differential to WTI

Western Canadian Select (WCS) Differential; Rolling 12-Month History

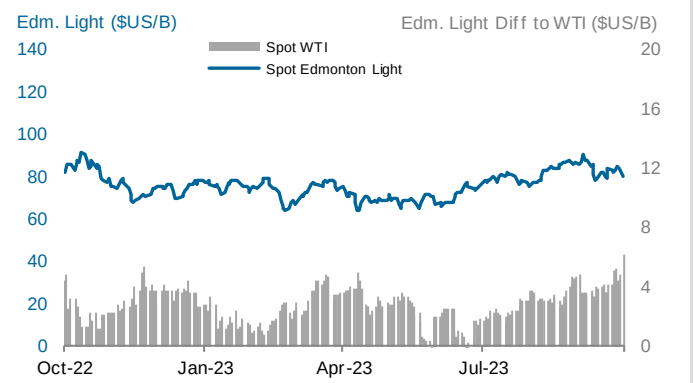


The differential should reflect quality differences and transportation costs. Greater discounts can result from infrastructure or refinery outages.

Source: Bloomberg

14 CDN Light Crude Oil Price Differential to WTI

WTI and Edmonton Light differential; Rolling 12-Month History

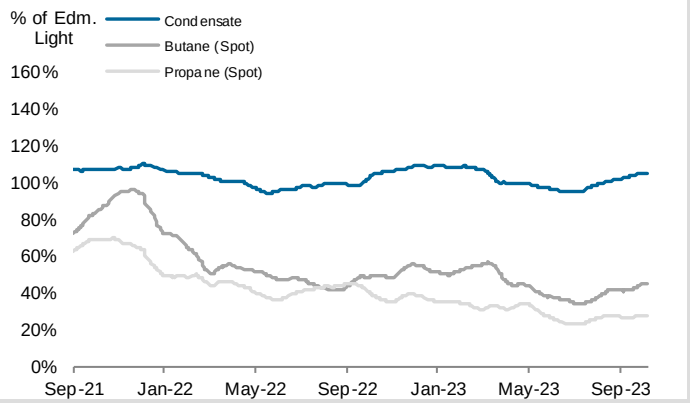


The differential should reflect the transportation cost from Alberta to Cushing. Greater discounts can result from infrastructure or refinery outages.

Source: Bloomberg

15 Daily NGL Prices as a % of Edmonton Light

NGL Prices at Edmonton, AB, 10 Day Rolling Average Shown

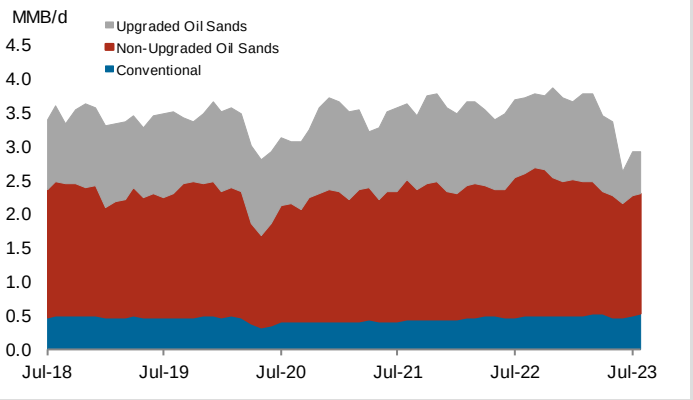


Natural gas liquids have become critical contributors to producer's cash flow. Prices are influenced by the price of oil as well as local supply and demand.

Source: Bloomberg, ARC Financial Corp.

16 Alberta Oil Production

Monthly; Conventional and Oil Sands

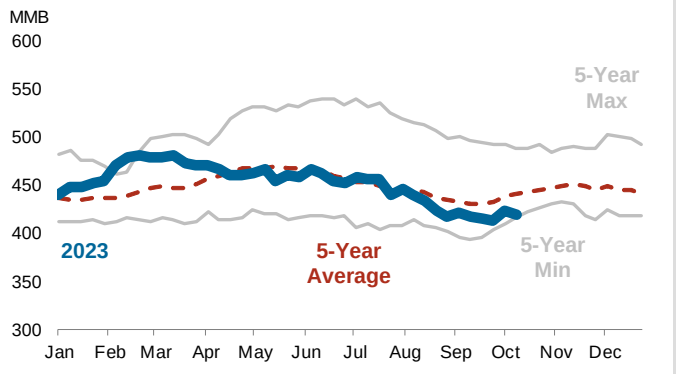


Most of Canada's oil production comes from Alberta; split between oil sands and conventional production.

Source: Alberta Energy Regulator

17 US Crude Oil Stocks

Historical Range and Current Year Levels

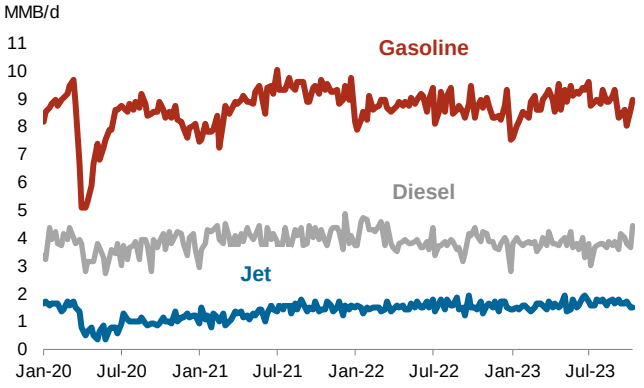


US crude oil stock levels can affect crude oil prices. Stock levels for the current year are represented by the blue line.

Source: U.S. Energy Information Administration

18 US Petroleum Product Consumption

Top Three Product Categories; Jan 2020 to Present

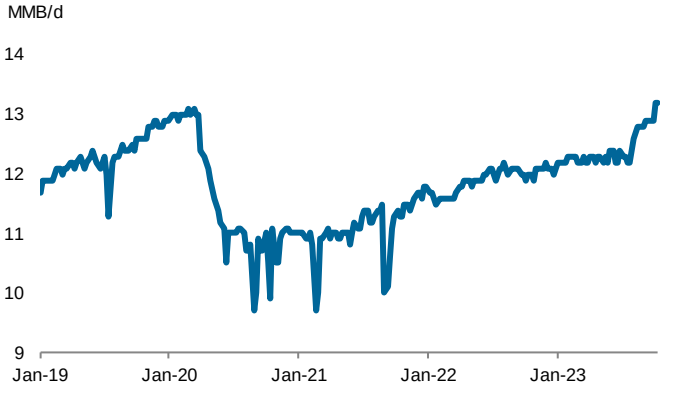


Gasoline, diesel and jet fuel consumption represent the majority of oil use in the US.

Source: U.S. Energy Information Administration

19 US Weekly Crude Oil Production

US Field Production of Crude Oil; 2019 to Present

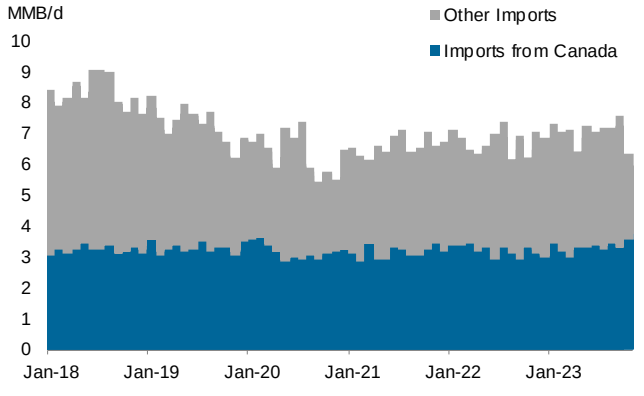


Weekly production is modelled by the EIA. It is less accurate then monthly reported numbers, but is instructive of up to date changes.

Source: U.S. Energy Information Administration

20 US Crude Oil Imports

Weekly Data; 2018 to Present

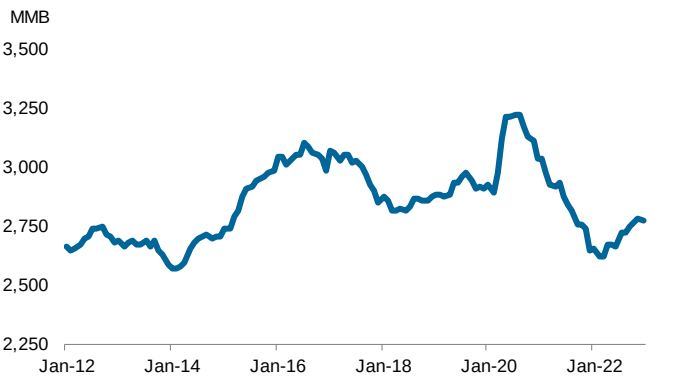


Crude oil imports from Canada are taking market share from overseas imports.

Source: U.S. Energy Information Administration

21 OECD Total Industry Oil Stocks

Monthly; 2012 to Present

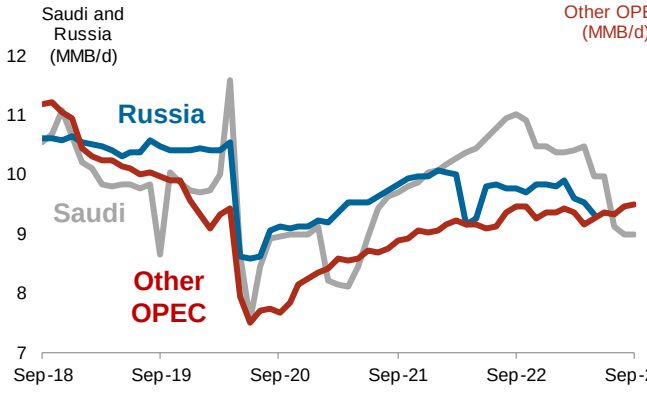


OECD stock levels can affect crude oil prices.

Source: International Energy Agency

22 OPEC and Russian Oil Production

Monthly; Rolling 60-Month History

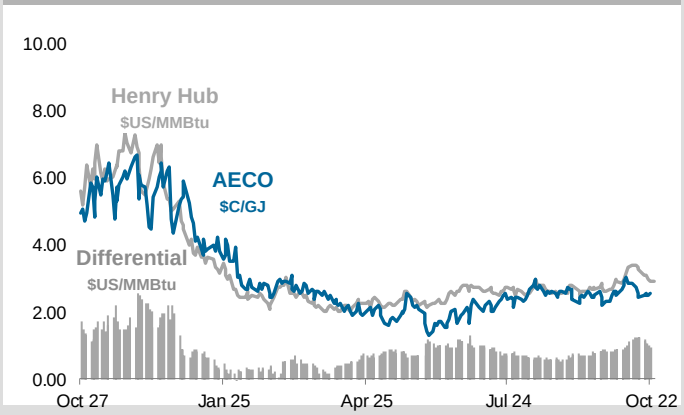


OPEC's production levels relative to its sustainable and spare capacity influences global crude prices. Note: scale has been expanded.

Source: Bloomberg, OPEC, US Department of Energy

23 Near-Month North American Natural Gas Prices

Daily Prices; Rolling 12-Month History

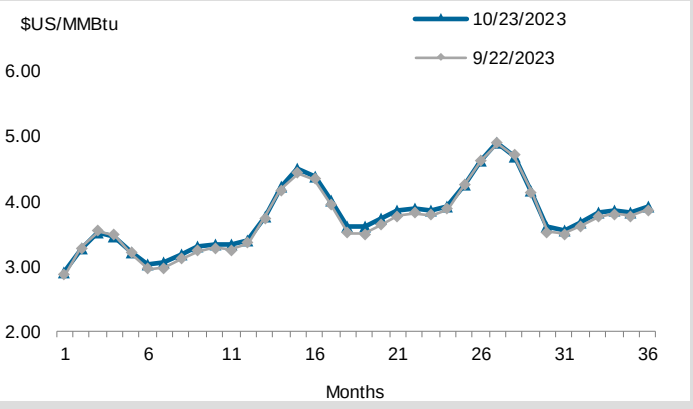


Near-month prices at AECO track Henry Hub prices, the exchange rate and the cost of transportation. Local factors can also affect price.

Source: Bloomberg

24 US Natural Gas Futures

Nymex (Henry Hub) Next 36 Months

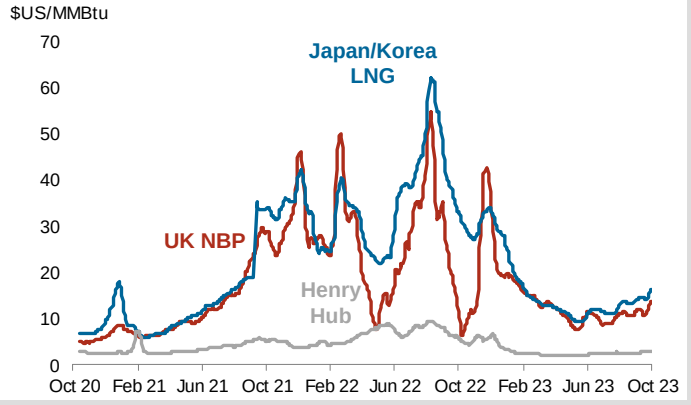


Forward contract prices are plotted for the next 36 months, and compared against the curve one month prior.

Source: Bloomberg

25 Global Natural Gas Prices

Japan/Korea, UK NBP, Henry Hub; 10-Day Moving Average Price

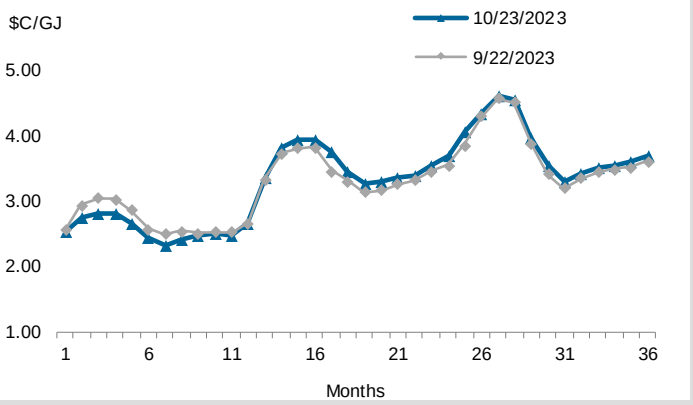


International natural gas prices strongly impact the economics of proposed LNG projects.

Source: Bloomberg

26 CDN Natural Gas Futures

AECO Hub (Bloomberg Estimate) Next 36 Months

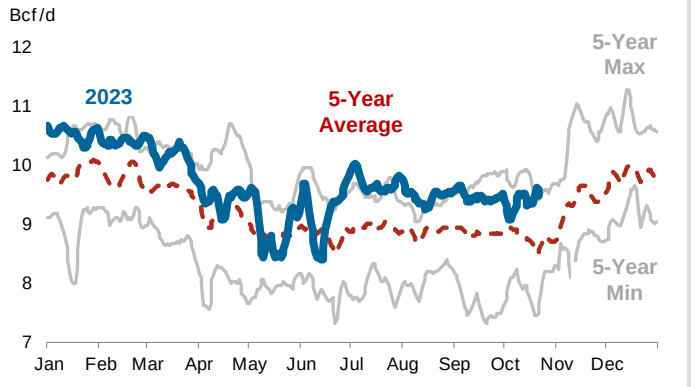


AECO forward prices mimic Henry Hub futures minus a differential.

Source: Bloomberg

27 Pipeline Flows Out of Western Canada

Daily; Historical Tracks and Current Year Levels

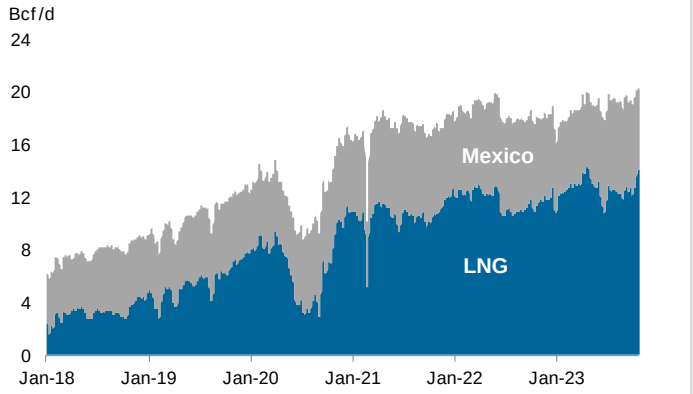


The ability of gas producers to move gas out of the WCSB to eastern markets and the US is a major factor in local natural gas prices.

Source: Various Pipeline Companies

28 US Natural Gas Exports – Excluding Canada

Daily; Jan 2018 to Present

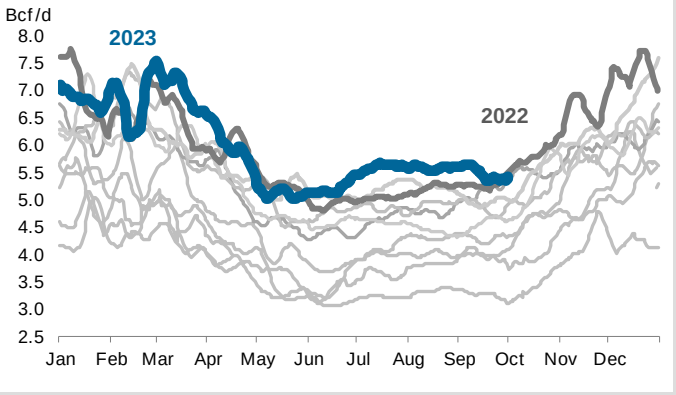


Between exports to Mexico and LNG shipments, the US is growing as a natural gas exporter. Robust US supply growth has driven this trend.

Source: Bloomberg

29 Alberta Natural Gas Demand

TransCanada Intra-AB Deliveries; Current Year and Historical Tracks

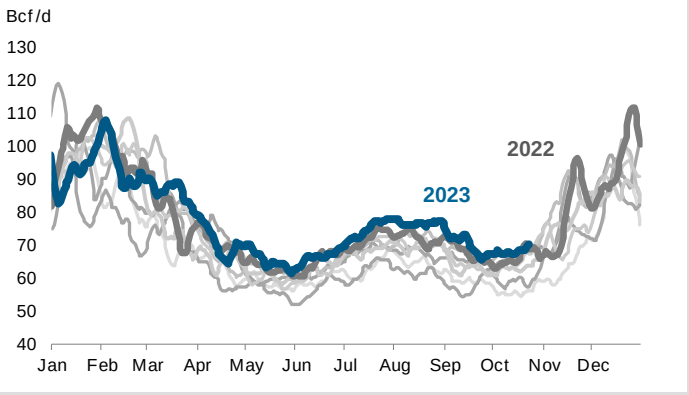


Alberta natural gas demand has grown steadily in recent years, largely driven by new oil sands demand and power generation projects.

Source: TransCanada Pipelines

30 US Domestic Natural Gas Demand

Daily; Historical Tracks and Current Year Levels

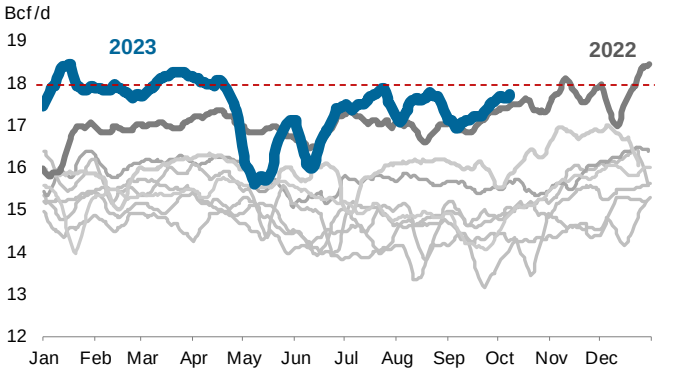


Domestic US demand fluctuates in the summer and during the winter as weather is an important driver of consumption.

Source: Bloomberg

31 Daily Western CDN Production

Estimated Using Major Pipeline Receipts

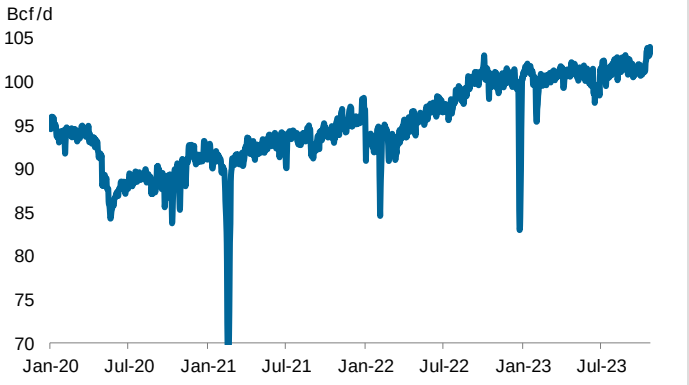


This includes receipts on the TCPL, Alliance, WestCoast and TransGas pipelines.

Source: Various Pipeline Companies

32 Total US Dry Natural Gas Production

Daily; Jan 2020 to Present

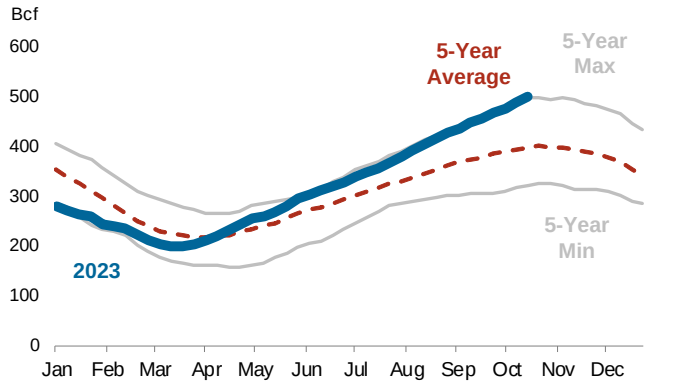


US production started ramping up in late 2007 and continues to grow year over year.

Source: Bloomberg

33 Western CDN Natural Gas Storage Levels

Weekly; Current Year and Historic Tracks

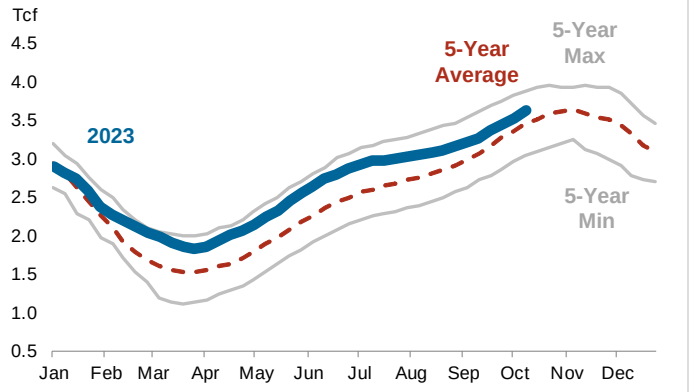


Canada's natural gas storage level provides a good metric if the country is well stocked. Abnormally high or low storage can affect the basis.

Source: Bloomberg

34 Total Working Natural Gas in US Storage

Historical Range and Current Year Levels

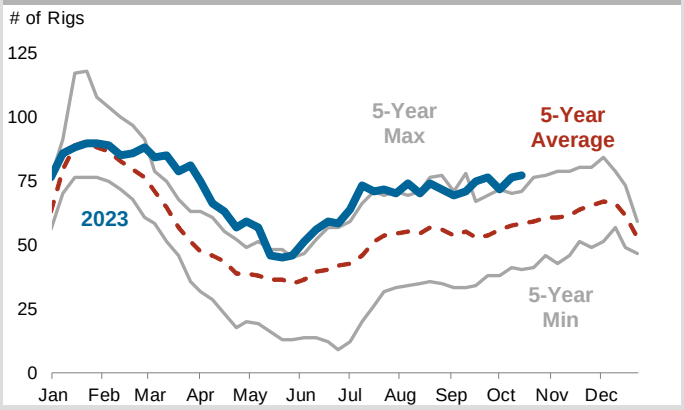


The EIA reports changes in US natural gas inventories held in underground storage facilities on a weekly basis.

Source: U.S. Energy Information Administration

35 Canada: Weekly Gas Drilling Activity

Baker Hughes Drilling Rig Count; Current Year and Historical Range

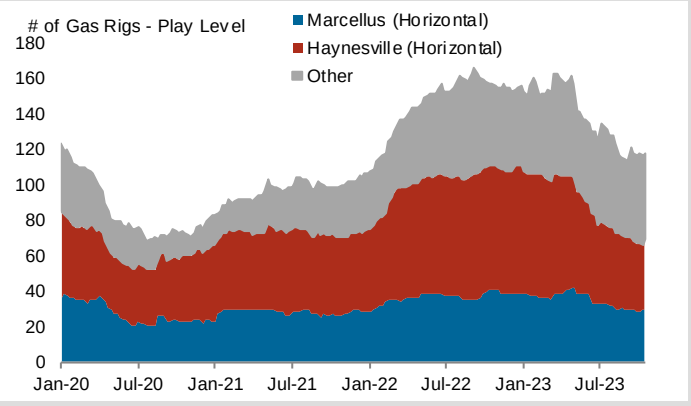


Unlike US drilling activity, Canadian rigs are dispatched seasonally. Capital allocation by operators is driven by views of future oil and gas prices.

Source: Baker Hughes

36 United States: Weekly Gas Drilling Activity

Baker Hughes Gas Rig Counts; 2020 to Present

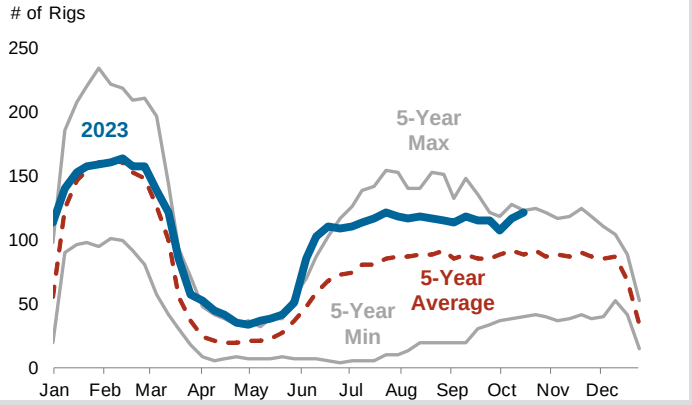


Tracking US gas drilling by major play provides insight into the composition of US gas supply and growth trends.

Source: Baker Hughes

37 Canada: Weekly Oil Drilling Activity

Baker Hughes Drilling Rig Count; Current Year and Historical Range

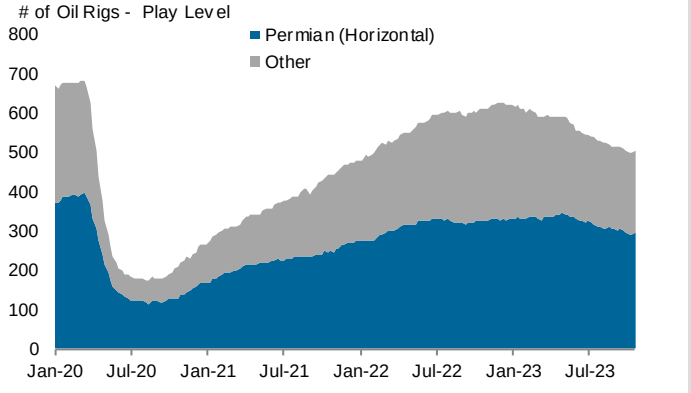


Unlike US drilling activity, Canadian rigs are dispatched seasonally. Capital allocation by operators is driven by views of future oil and gas prices.

Source: Baker Hughes

38 United States: Oil Drilling Activity

Baker Hughes Oil Rig Counts; 2020 to Present

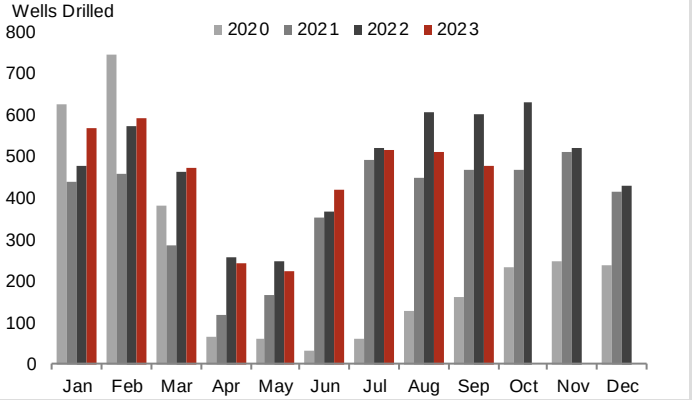


Tracking US oil drilling by major play provides insight into the composition of US oil supply and growth trends.

Source: Baker Hughes

39 Canada: Monthly Wells Drilled

Current Year *vs* Years Prior

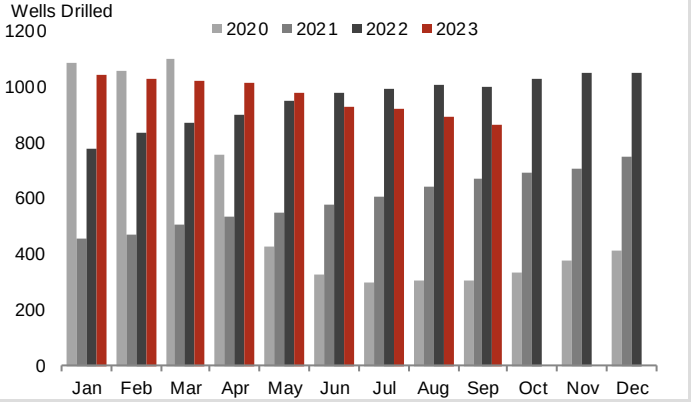


Total rig-releases for exploratory and development wells are highlighted in this chart. Rig releases for the current year are shown in red.

Source: Daily Oil Bulletin/JWN

40 United States: Monthly Wells Drilled

Current Year *vs* Years Prior

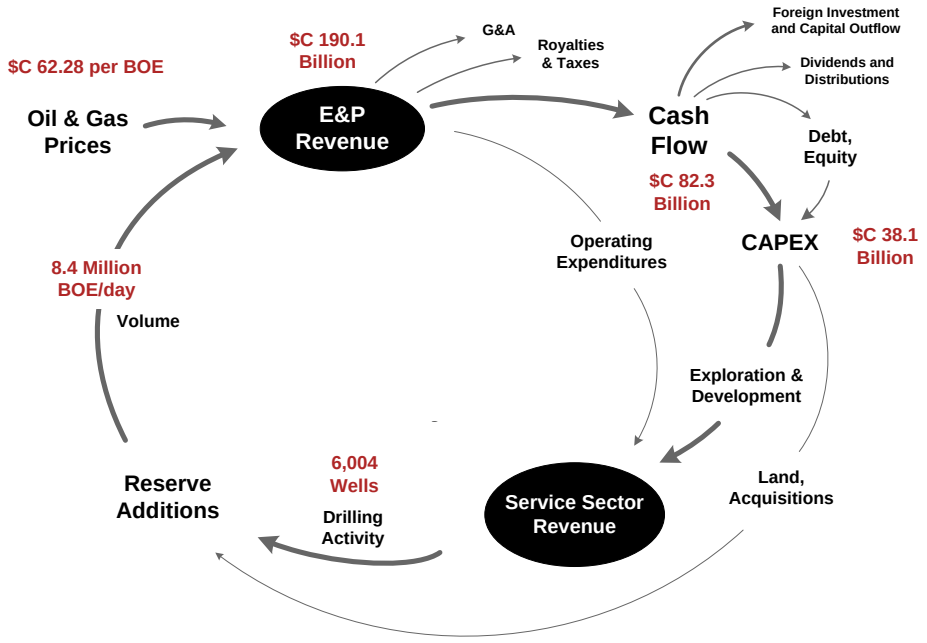


Total wells drilled in US Drilling Productivity Report regions are shown. These are the most active onshore US plays.

Source: EIA

Estimated Capital Flow in the Canadian Oil and Gas Economy for 2023

Industry Revenue, Cash Flow, Reinvestment, Drilling Activity and Production



41

Canadian Industry Statistics: Historical Data and Forecast

Canadian Industry Metrics

	Price			Production Volume				Capital Inflow		Reinvestment			Drilling		Well Split	
	Average Price	Edmonton Par	AECO	Conv. Liquids	Bitumen + Synthetic	Natural Gas	Total Volume	Total Revenue	After-tax Cash Flow	Conv. Oil and Gas	Oilsands	Reinvest Ratio	Wells Rig Releas.	Avg Rig Utiliz.	Oil Wells	Gas Wells
	$/BOE	$C/B	$C/GJ	Average MBOE/d	Average MBOE/d	MBOE/d (@ 6:1)	MBOE/d (@ 6:1)	$C millions	$C millions	$C millions	$C millions	x:1	# / Year	%	%	%
2014	60.69	95.07	4.23	2,085	1,964	2,480	6,530	144,660	66,972	46,872	33,868	1.21	11,222	45%	78%	22%
2015	37.34	57.63	2.56	1,995	2,381	2,531	6,907	94,127	29,985	31,609	22,929	1.82	5,382	24%	69%	31%
2016	32.61	53.09	2.06	2,013	2,421	2,564	6,998	83,298	23,701	23,040	15,426	1.62	4,060	17%	73%	27%
2017	39.18	62.42	2.10	2,119	2,674	2,605	7,398	105,788	45,031	28,712	13,803	0.94	7,076	30%	73%	27%
2018	39.57	69.24	1.46	2,292	2,913	2,737	7,942	114,705	49,708	27,374	11,661	0.79	6,927	32%	79%	21%
2019	42.34	69.02	1.70	2,409	2,950	2,673	8,032	124,115	55,343	25,847	9,306	0.64	4,886	26%	81%	19%
2020	30.29	46.10	2.12	2,248	2,843	2,566	7,657	84,647	29,807	14,158	7,254	0.72	2,970	18%	65%	35%
2021	51.76	80.83	3.45	2,239	3,103	2,662	8,004	151,222	71,041	16,819	8,957	0.36	4,638	24%	71%	29%
2022e	77.29	119.95	5.09	2,169	3,176	2,701	8,046	227,006	120,526	23,378	10,749	0.28	5,723	24%	70%	30%
2023e	62.28	103.93	2.78	2,145	3,449	2,768	8,361	190,071	82,287	25,748	12,361	0.46	6,004	24%	70%	30%