

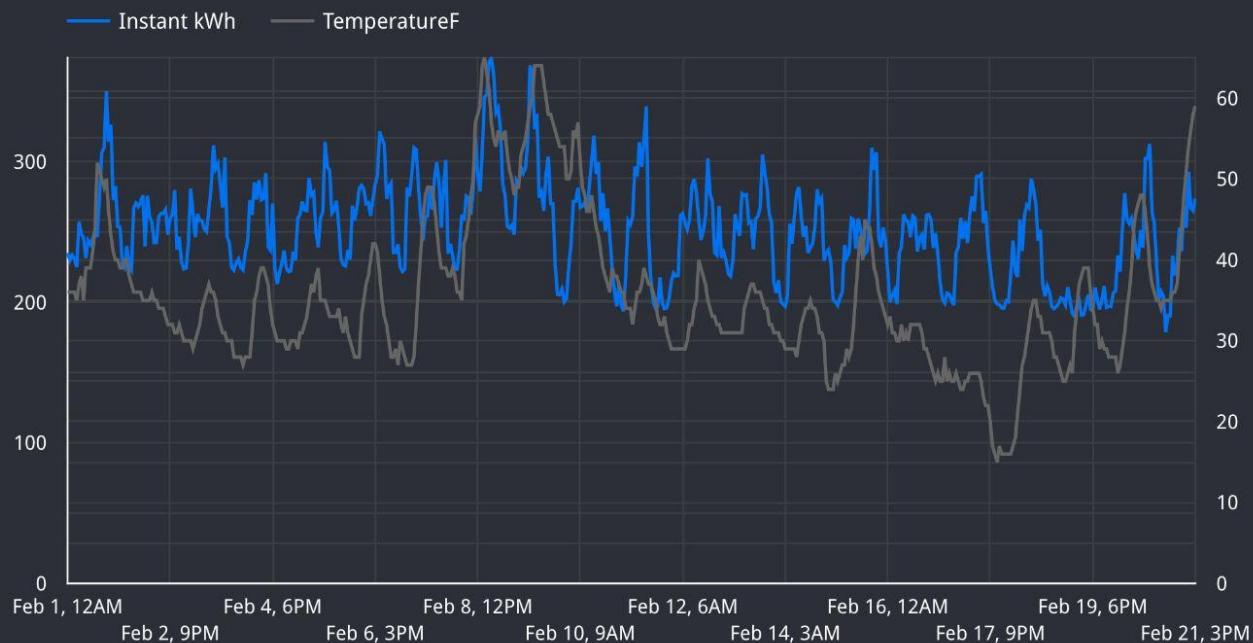


Energy Markets

AEE Northern Ohio Chapter
February 22, 2024



Sample Services - Real Time Cost



Date ▾	kWh	Demand	TempF
Feb 21, 2024	3,763	301	43
Feb 20, 2024	5,838	325	36
Feb 19, 2024	4,782	225	31
Feb 18, 2024	5,557	295	25
Feb 17, 2024	5,762	302	24
Feb 16, 2024	5,740	280	30
Feb 15, 2024	5,861	315	34
Feb 14, 2024	5,823	307	30
Feb 13, 2024	6,087	315	33
Feb 12, 2024	6,052	324	33
Feb 11, 2024	5,720	342	35
Feb 10, 2024	6,200	325	47
Feb 9, 2024	6,000	305	57
Grand total	124,840	395	36

Service Period
Forecast

Period Cost Forecast
\$18,016

Period kWh Forecast
201,931

Period Demand Forecast
437

Period-to-Date
Forecast

Current Cost Forecast
\$11,012

Current kWh Forecast
132,136

Period-to-Date
Actual

Actual Cost
\$10,091

Actual kWh
124,840

Actual Demand
395

Cost Over/Under
-\$921

kWh Over/Under
-7,295

Demand Over/Under
-42

Date ▾	Forecast Cost	Actual Cost	Cost Over/Under
Feb 21, 2024	\$343	\$317	-\$27
Feb 20, 2024	\$497	\$485	-\$12
Feb 19, 2024	\$513	\$429	-\$84
Feb 18, 2024	\$493	\$470	-\$23
Feb 17, 2024	\$535	\$481	-\$54
Feb 16, 2024	\$531	\$480	-\$51
Feb 15, 2024	\$558	\$486	-\$72
Feb 14, 2024	\$549	\$484	-\$65
Feb 13, 2024	\$539	\$498	-\$41
Feb 12, 2024	\$529	\$496	-\$32
Grand total	\$11,012	\$10,091	-\$921

Sample Services - Voltage Variance

Voltage Variance

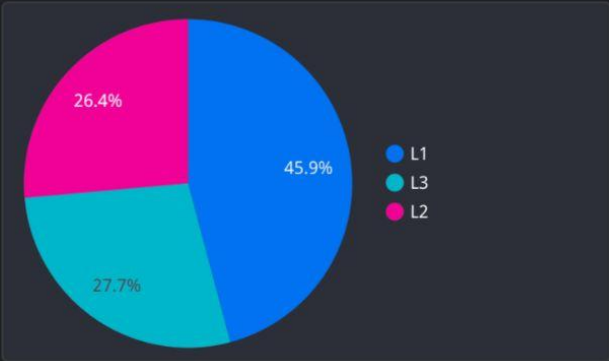
location

Month	L1 Volt Variance Seconds	L2 Volt Variance Seconds	L3 Volt Variance Seconds
Feb 2024	70,164	24,363	32,219
Jan 2024	46,887	19,122	18,903
Dec 2023	98,086	57,670	64,741
Nov 2023	387,227	242,852	248,216
Oct 2023	611,848	421,118	436,478
Sep 2023	539,518	388,329	394,095
Aug 2023	821,282	565,187	573,506
Jul 2023	663,617	488,302	513,360
Jun 2023	459,333	355,877	352,997
May 2023	419,954	289,567	269,547
Apr 2023	292,784	146,953	172,489
Mar 2023	91,264	35,771	51,097
Feb 2023	9,697	544	708
Jan 2023	1,578	589	670
Dec 2022	2,973	515	600
Nov 2022	3,878	480	533
Oct 2022	23,498	1,395	2,227

1 - 26 / 26

sort	location	voltage_bin	Variance Leg Seconds
1	Cleveland	<= -10%	6,817
1	Avon	<= -10%	2,587
2	Cleveland	-7.5% to -10%	86,451
2	Avon	-7.5% to -10%	136
3	Cleveland	-5% to -7.5%	12,533,747

1 - 9 / 9



TimeStampLocal	L1_Volts	L1_Amps	L2_Volts	L2_Amps	L3_Volts	L3_Amps
Feb 21, 2024, 3:43:52 PM	262	1,037	null	null	null	null
Feb 21, 2024, 3:37:33 PM	256	1,085	258	1,084	258	1,049
Feb 21, 2024, 3:37:32 PM	255	1,133	256	1,129	257	1,095
Feb 21, 2024, 3:37:31 PM	258	1,058	259	1,051	259	1,024
Feb 21, 2024, 3:36:25 PM	255	1,170	256	1,191	255	1,155
Feb 21, 2024, 3:36:24 PM	255	1,227	256	1,241	256	1,205
Feb 21, 2024, 3:32:42 PM	261	893	261	908	261	881
Feb 21, 2024, 3:32:41 PM	260	930	260	947	260	918
Feb 21, 2024, 3:00:59 PM	263	1,114	null	null	null	null
Feb 21, 2024, 3:00:58 PM	262	1,140	null	null	null	null

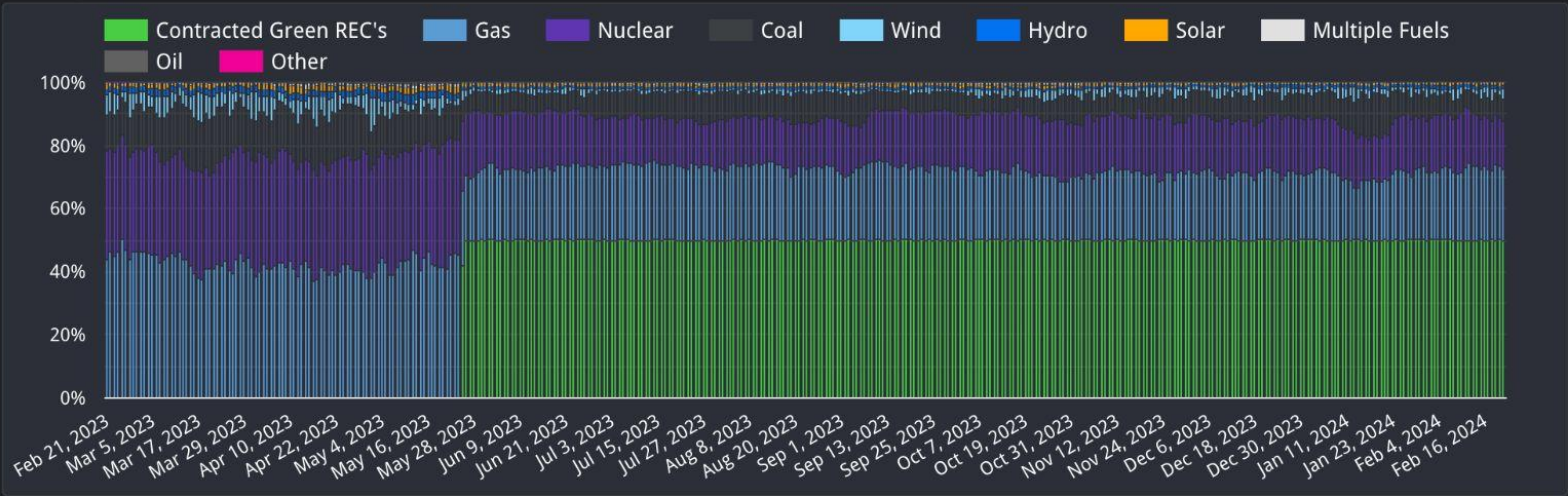
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Sample Services - CO2 Reporting

Environmental Impact

Feb 21, 2023 - Feb 21, 2024

kWh by Fuel Source:

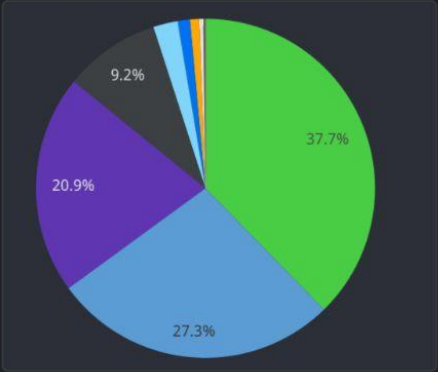


kWh
1,515,722

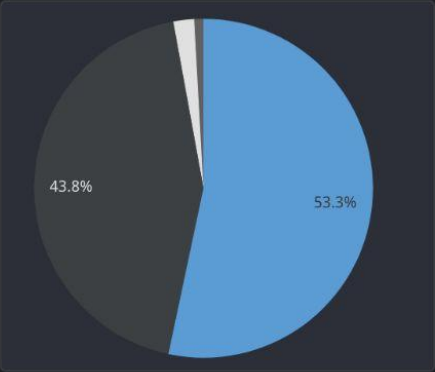
Metric Tons CO2
436.17

Metric Tons CO2 Reduced
186.13

kWh by Fuel Source:



CO2 by Fuel Source:



CO2 by Month:

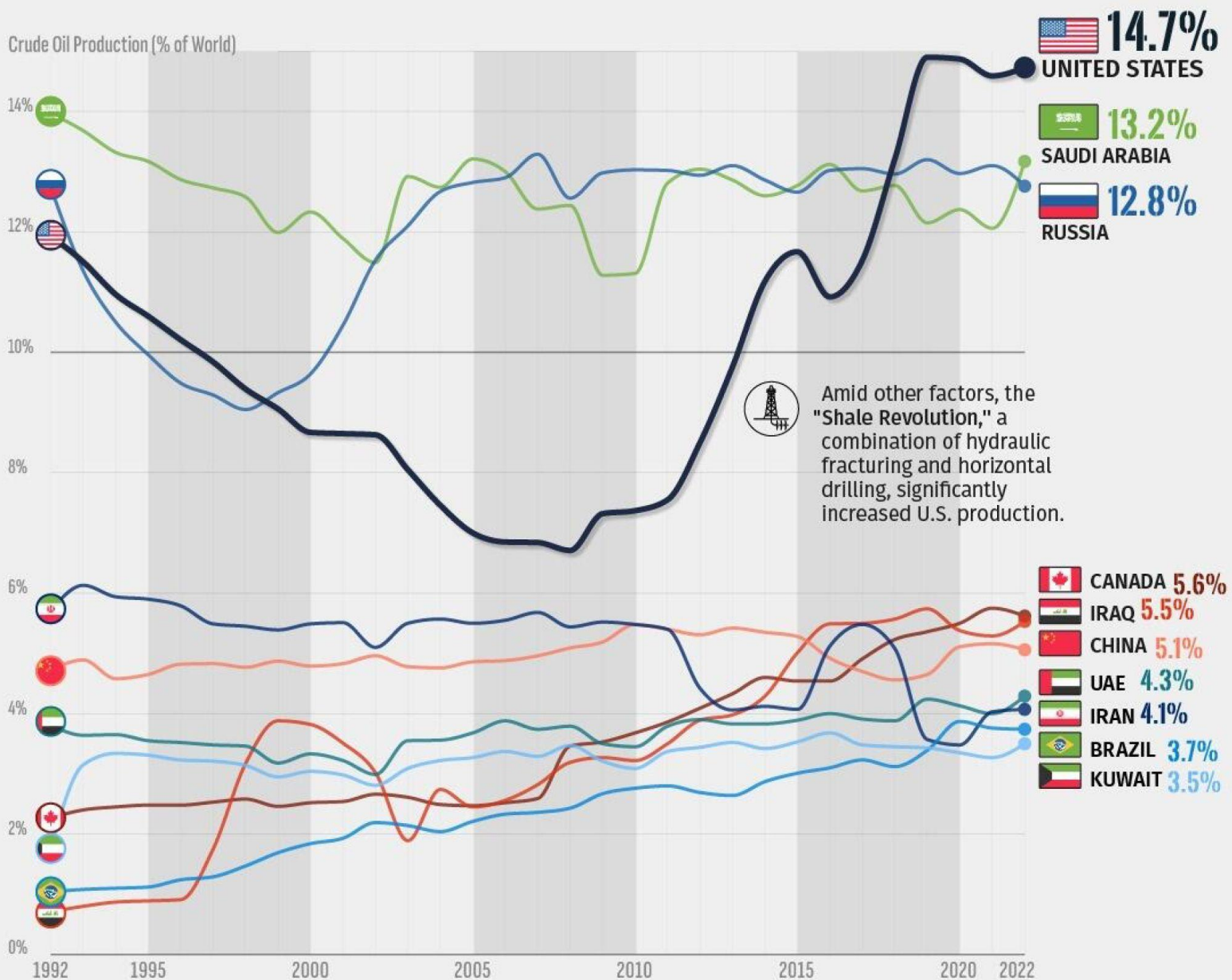
Month	kWh	Metric Tons CO2	Metric Tons CO2 Reduced
Feb 2024	85,480	13.56	13.56
Jan 2024	132,651	20.79	20.79
Dec 2023	120,834	19.64	19.64
Nov 2023	114,622	20.53	20.53
Oct 2023	115,270	22.05	22.05
Sep 2023	112,712	20.40	20.40
1 - 13 / 13			



Natural Gas Market

Largest Oil Producing Nations

Over the last decade, **the United States** has established itself as the world's biggest producer of crude oil, leaving behind Saudi Arabia and Russia.

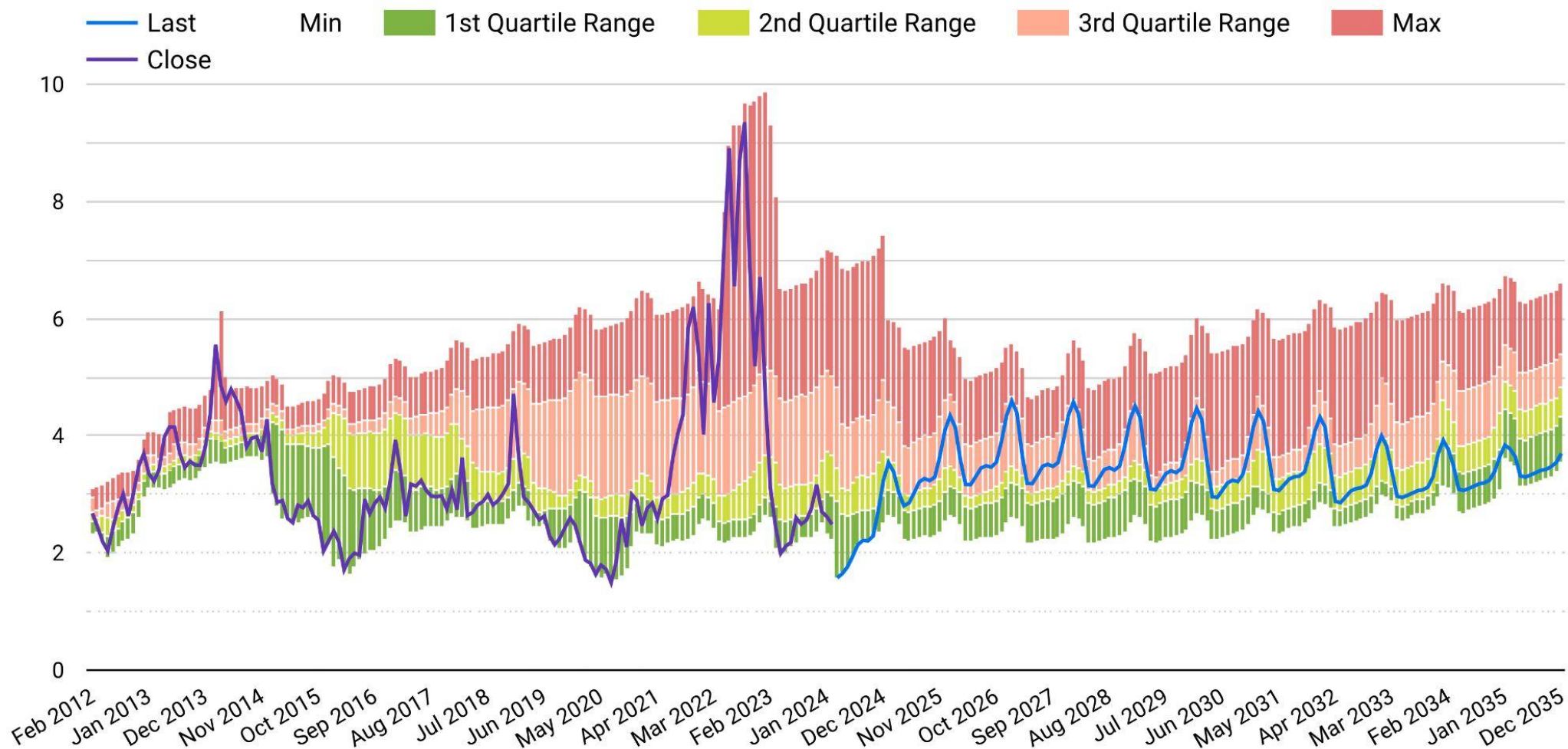


Natural Gas - Monthly Contract Closing & Future Prices

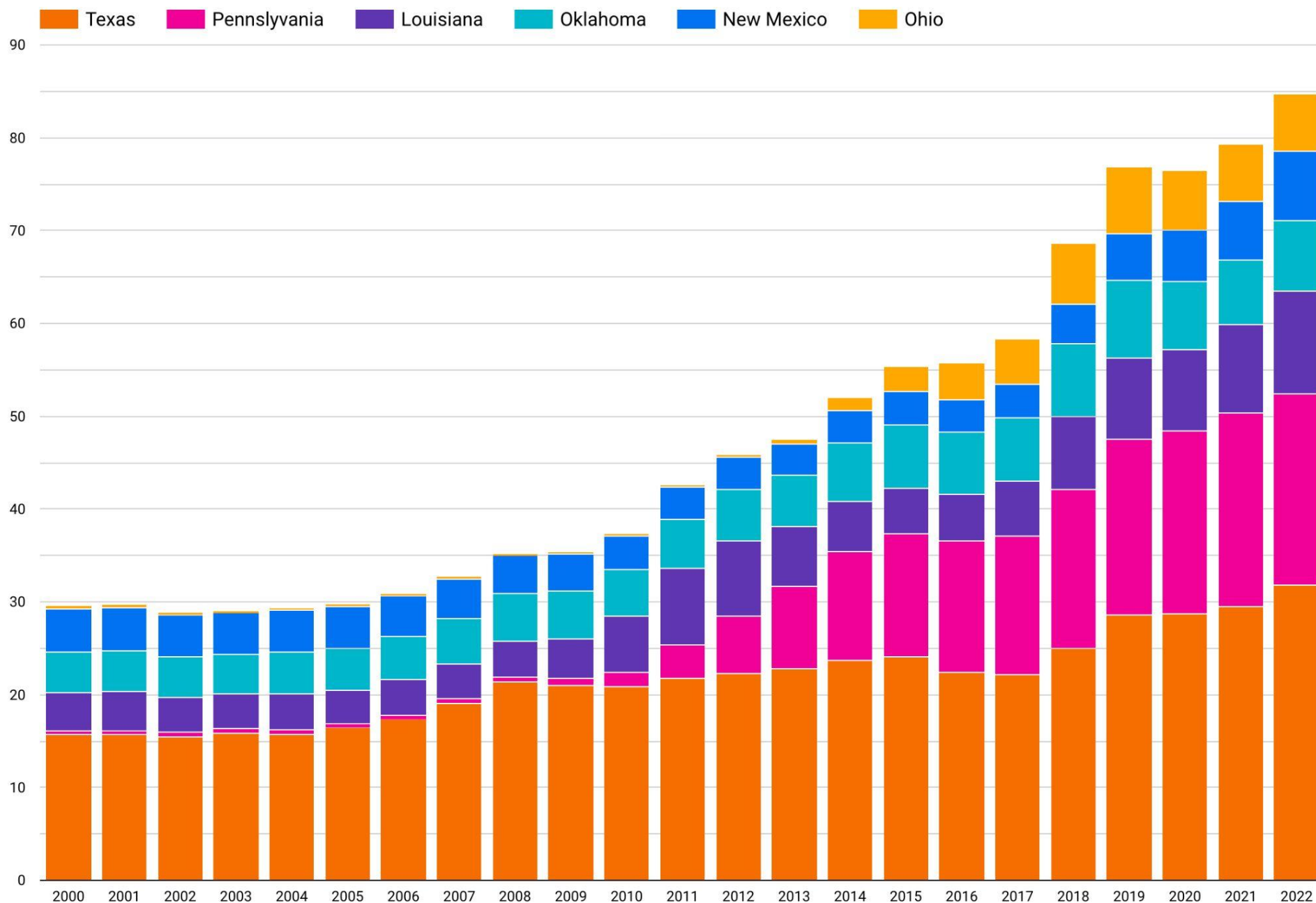
Market Closing Prices from: Feb 20, 2024

Contract: Henry LD1 Fixed Price Future


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Natural Gas Production (BCF/Day)



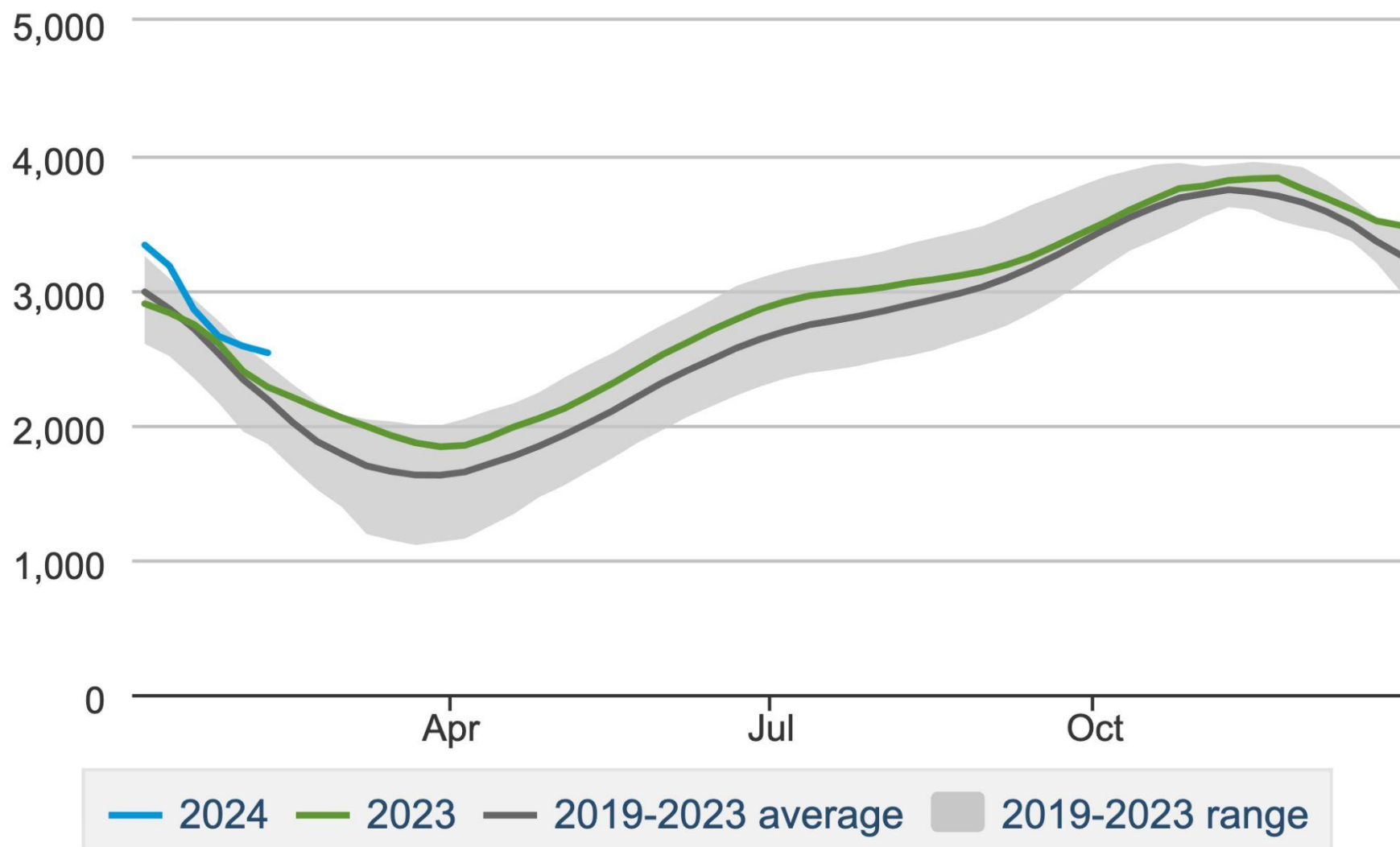
U.S. Natural Gas Supply & Demand

DATE Updated 15-Feb	U.S. Supply* (billion cubic feet/day) *excludes storage	U.S. Demand (billion cubic feet/day)			
		Power burn	Industrial	All other (res-comm, exports, pipe loss)	Total
09-Feb	110.4	29.5	23.3	56.7	109.5
10-Feb	111.0	29.1	23.6	58.4	111.1
11-Feb	111.0	30.3	24.0	62.8	117.1
12-Feb	111.3	34.6	24.1	64.2	122.9
13-Feb	110.8	33.9	24.4	68.2	126.5
14-Feb 	110.5	32.2	24.5	68.8	125.5
15-Feb	110.7	32.4	24.5	65.5	122.4

Lower 48 weekly working gas in underground storage



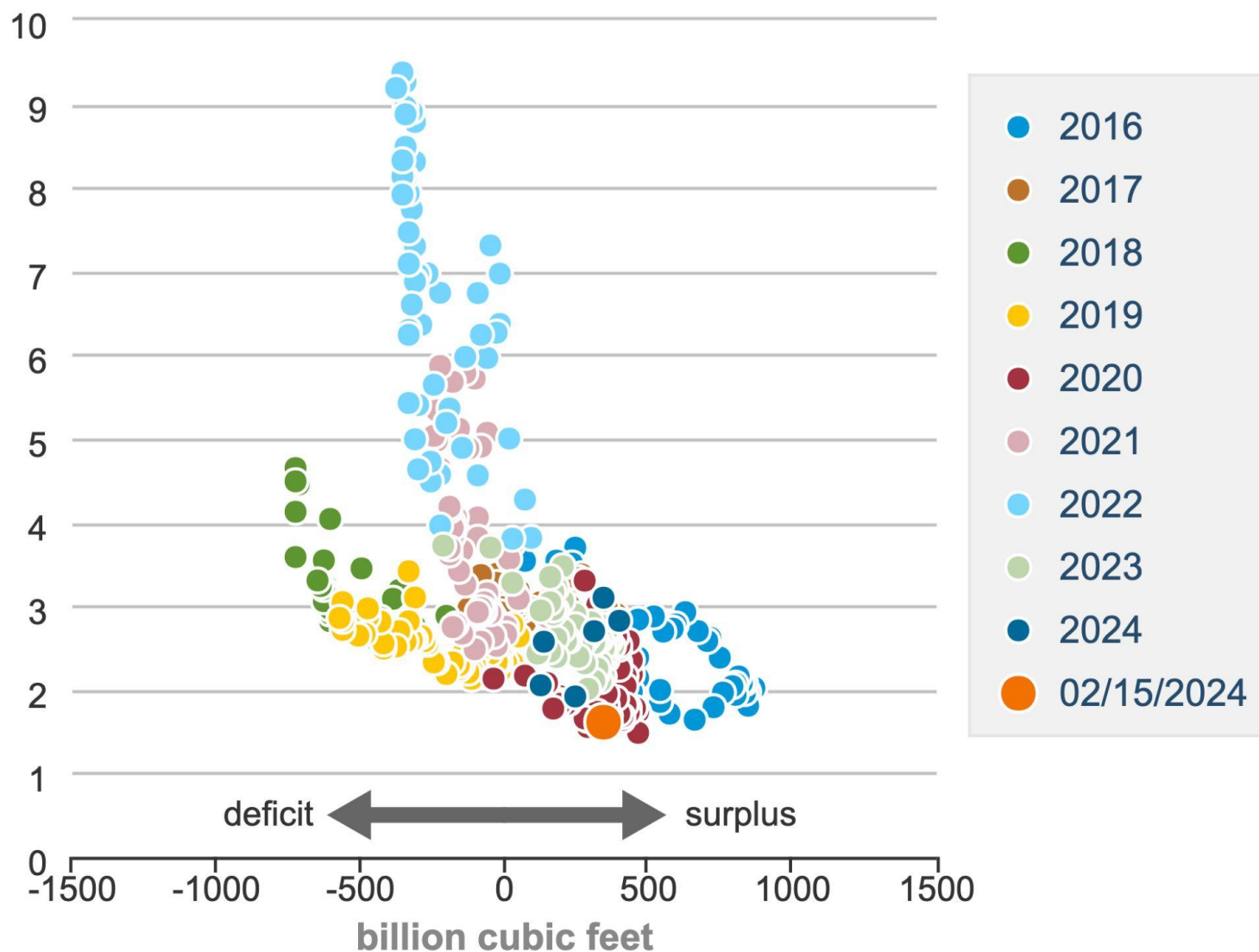
billion cubic feet



Lower 48 weekly working gas stocks, minus five-year average, and near-month futures prices

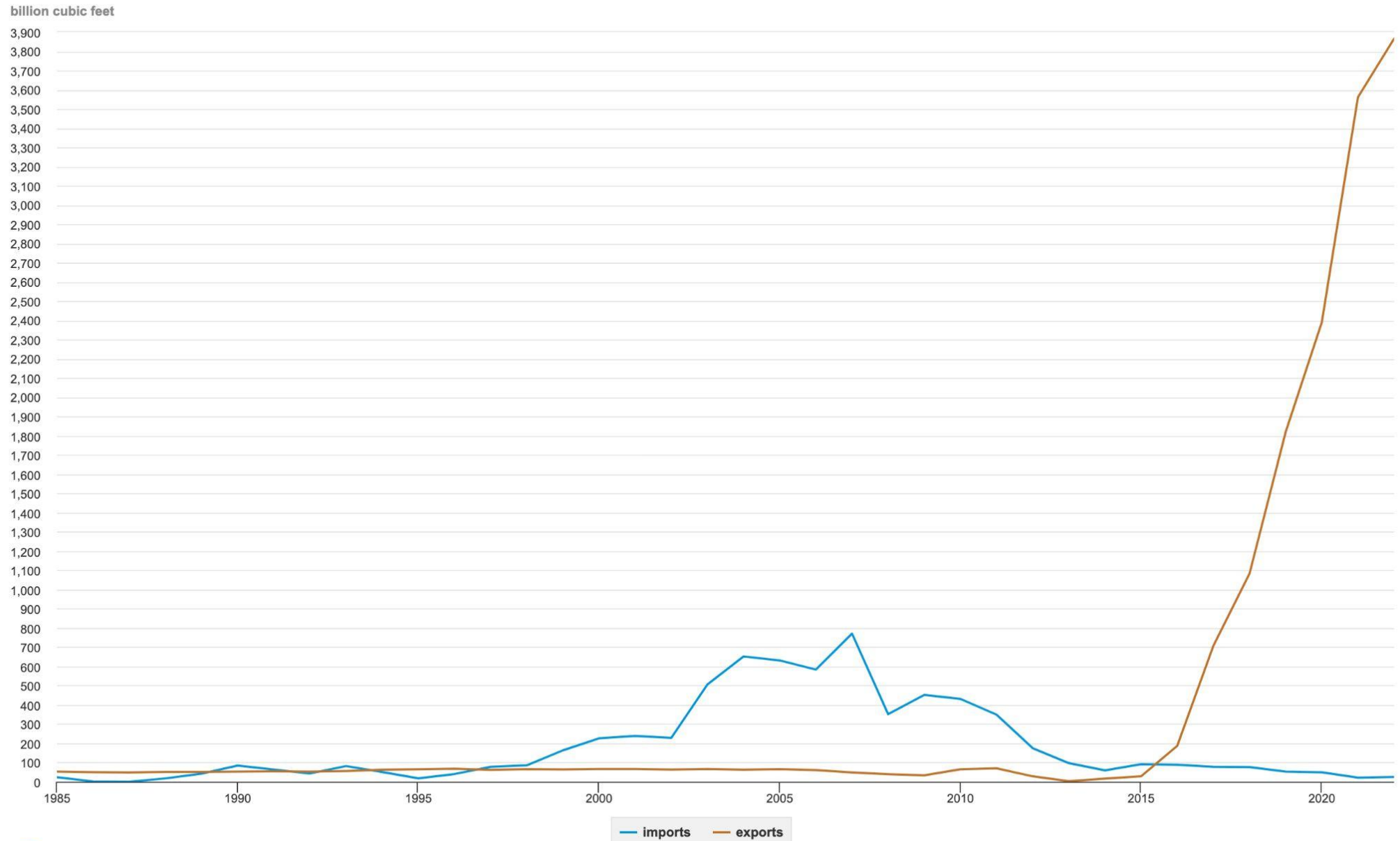


price of gas at the Henry Hub in dollars per million British thermal units



LNG Imports & Exports

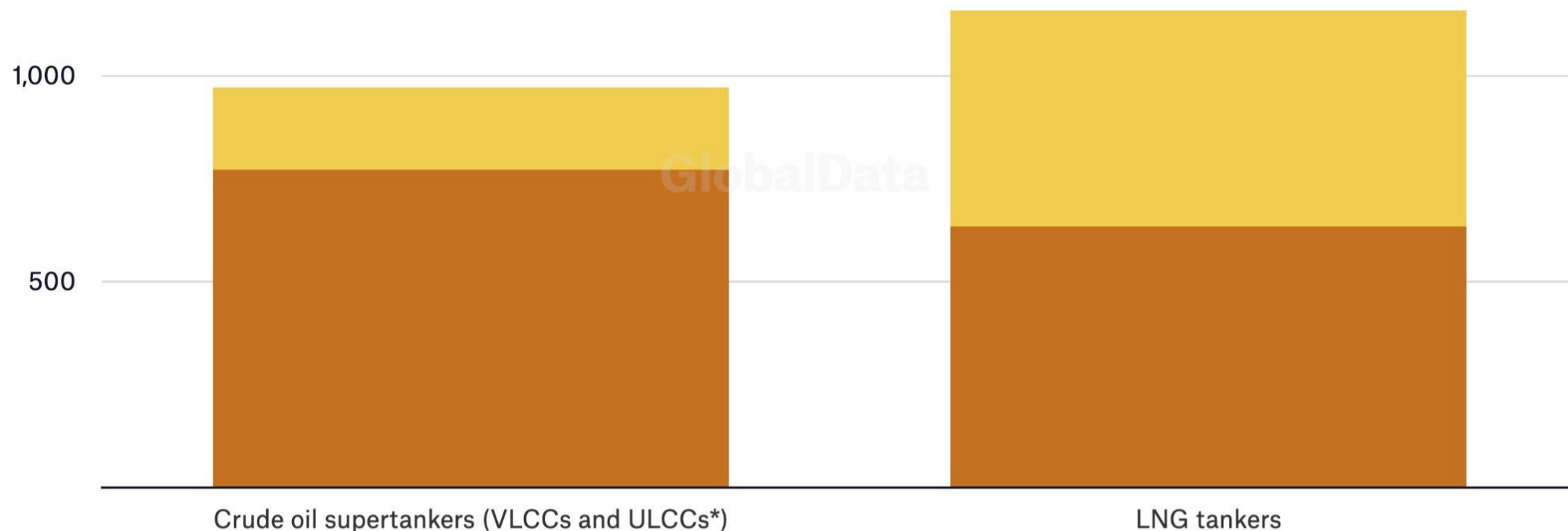
U.S. liquefied natural gas (LNG) imports and exports, 1985-2022



There will be more LNG tankers than crude oil supertankers by 2028

Total number of existing and planned LNG and crude oil supertankers worldwide

Existing in 2023 Set to be completed by 2028 under current plans



*Very large crude carriers and ultra-large crude carriers.

Chart: Nick Ferris • Source: GlobalData

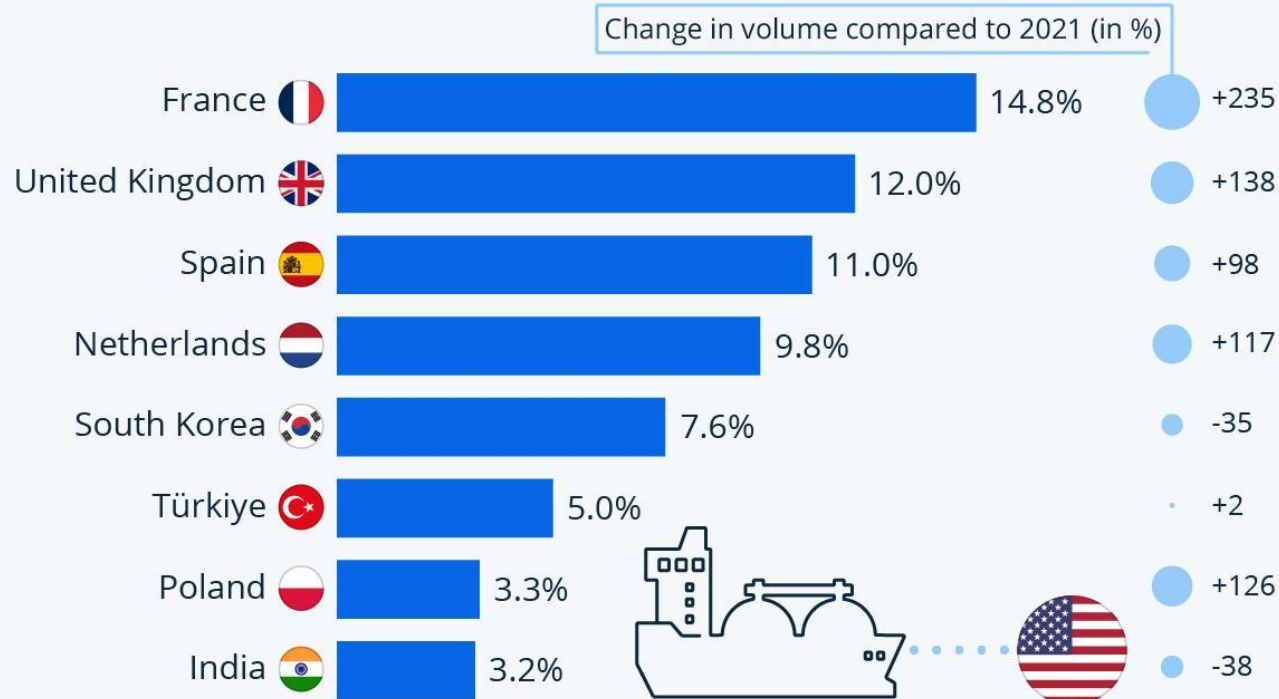
LNG Marine Traffic



Graphic: Global picture – Tankers enable international movement of LNG. Source: MarineTraffic

France Is the Biggest Importer of U.S. LNG

Countries receiving the highest shares of LNG* exported from the United States in 2022



Source: U.S. Department of Energy

THE WHITE HOUSE



JANUARY 26, 2024

Statement from President Joe Biden on Decision to Pause Pending Approvals of Liquefied Natural Gas Exports

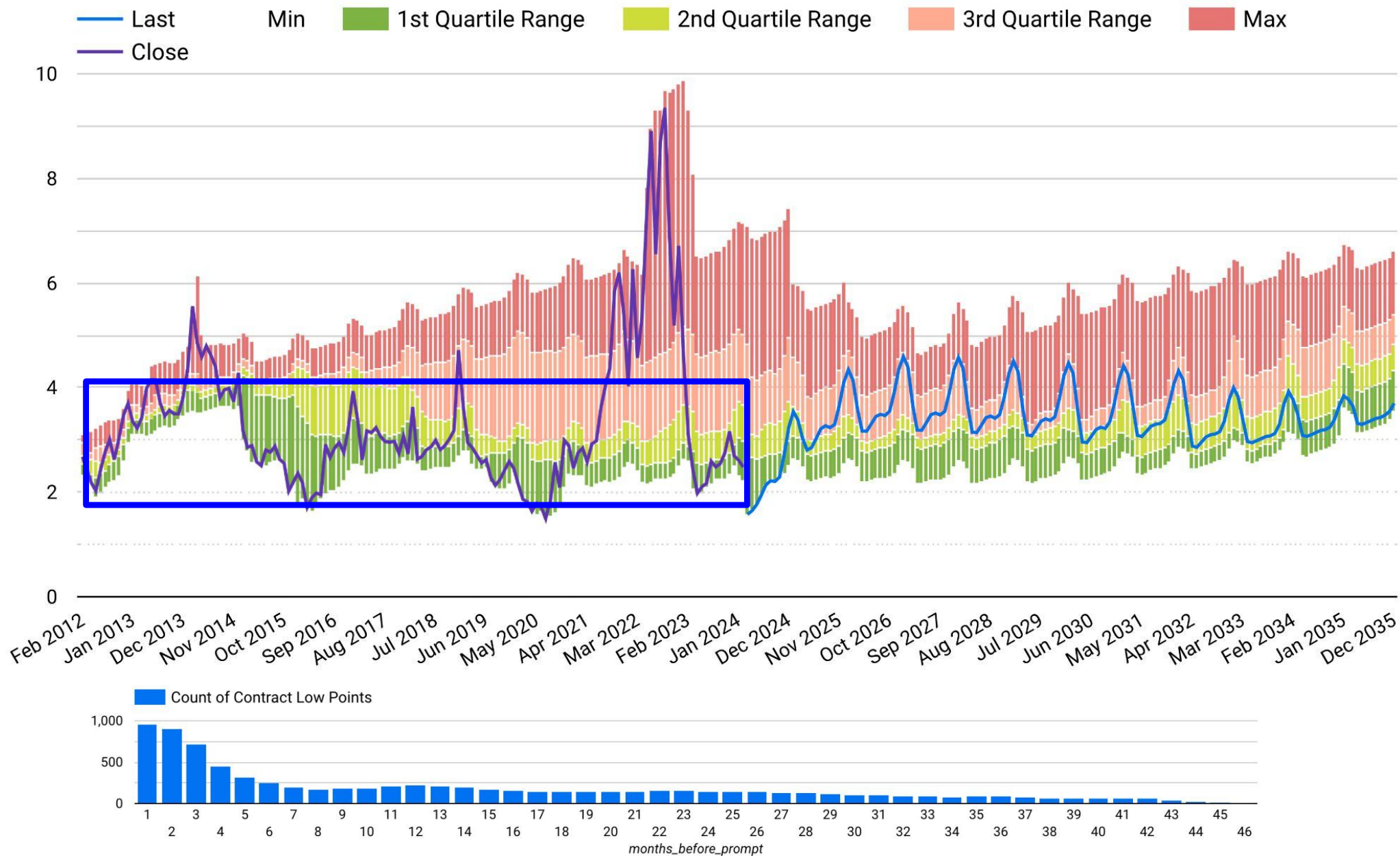
“Today, the Biden-Harris Administration is announcing a **temporary pause on pending decisions** on exports of Liquefied Natural Gas (LNG) to **non-FTA countries** until the Department of Energy can update the underlying analyses for authorizations”

Natural Gas - Monthly Contract Closing & Future Prices

Market Closing Prices from: Feb 20, 2024

Contract: Henry LD1 Fixed Price Future

(1) ▾

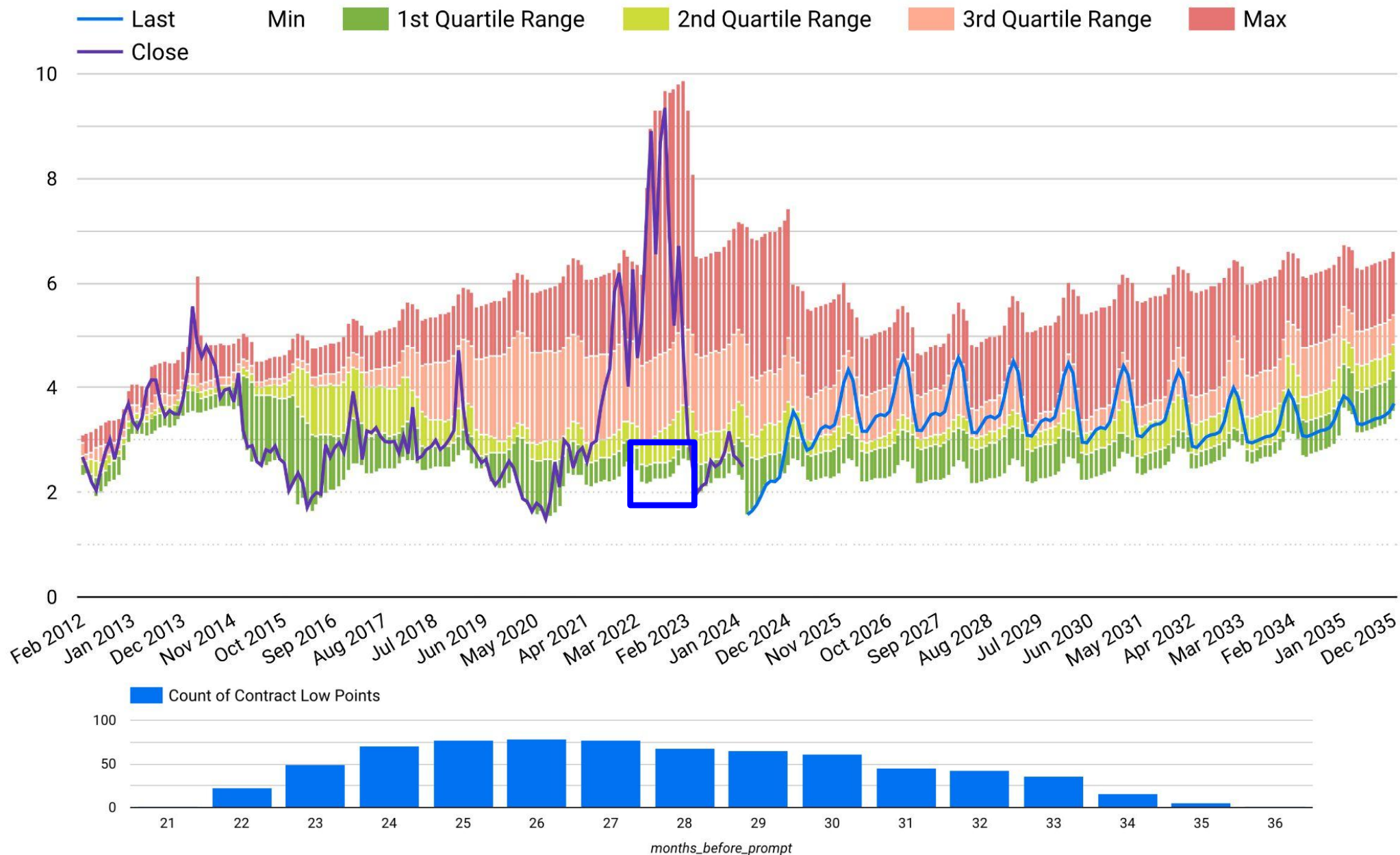


Natural Gas - Monthly Contract Closing & Future Prices

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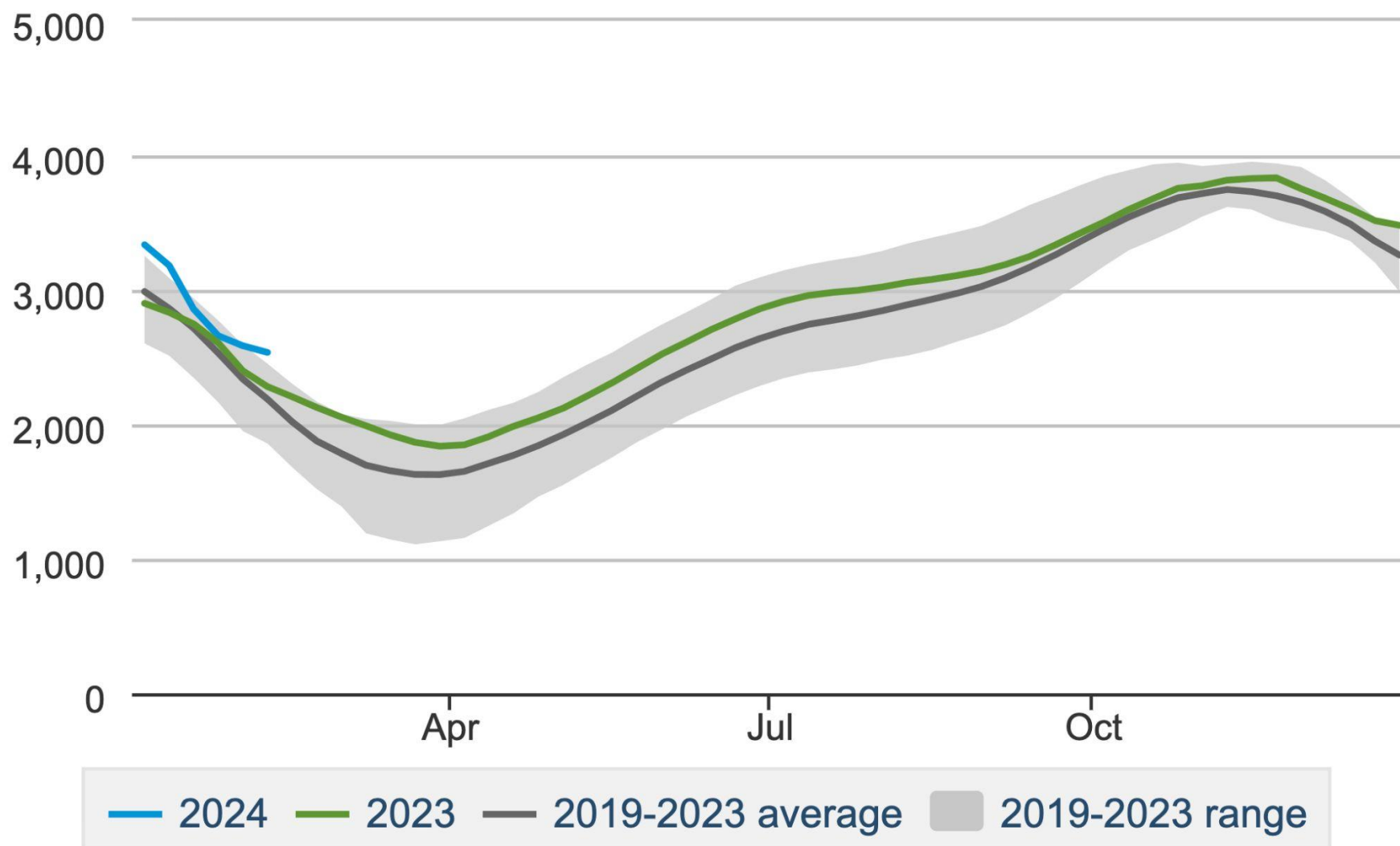
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Lower 48 weekly working gas in underground storage

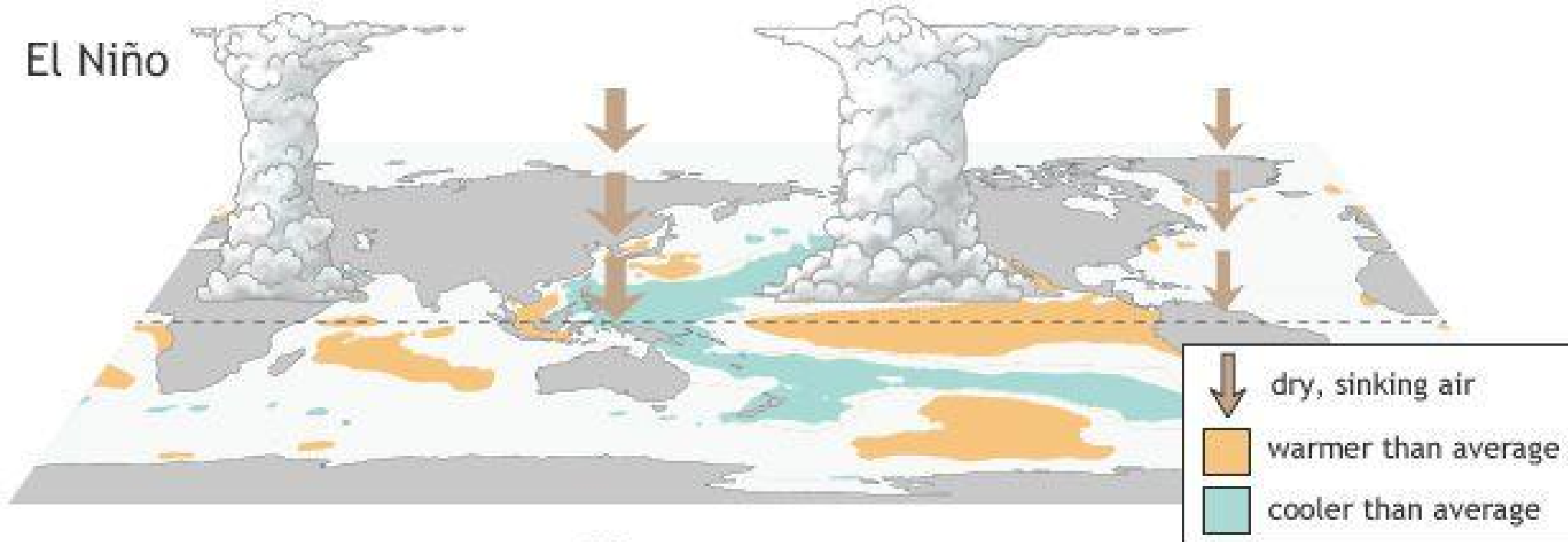


billion cubic feet

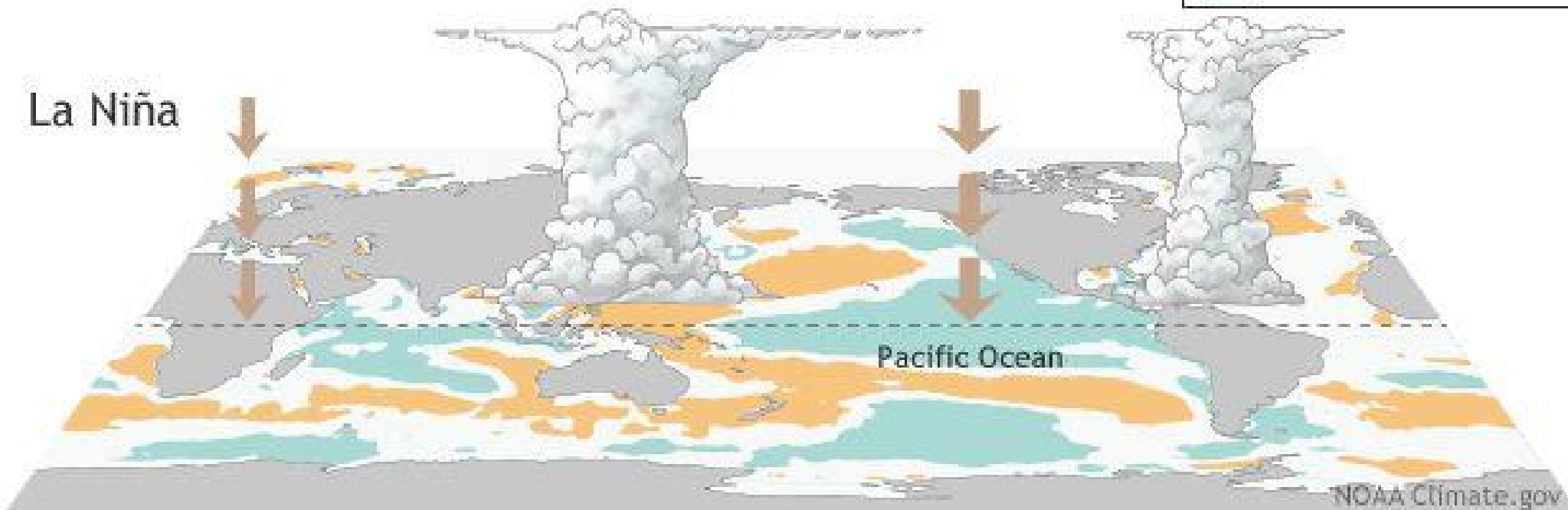


ENSO - Weather Drives Price

El Niño



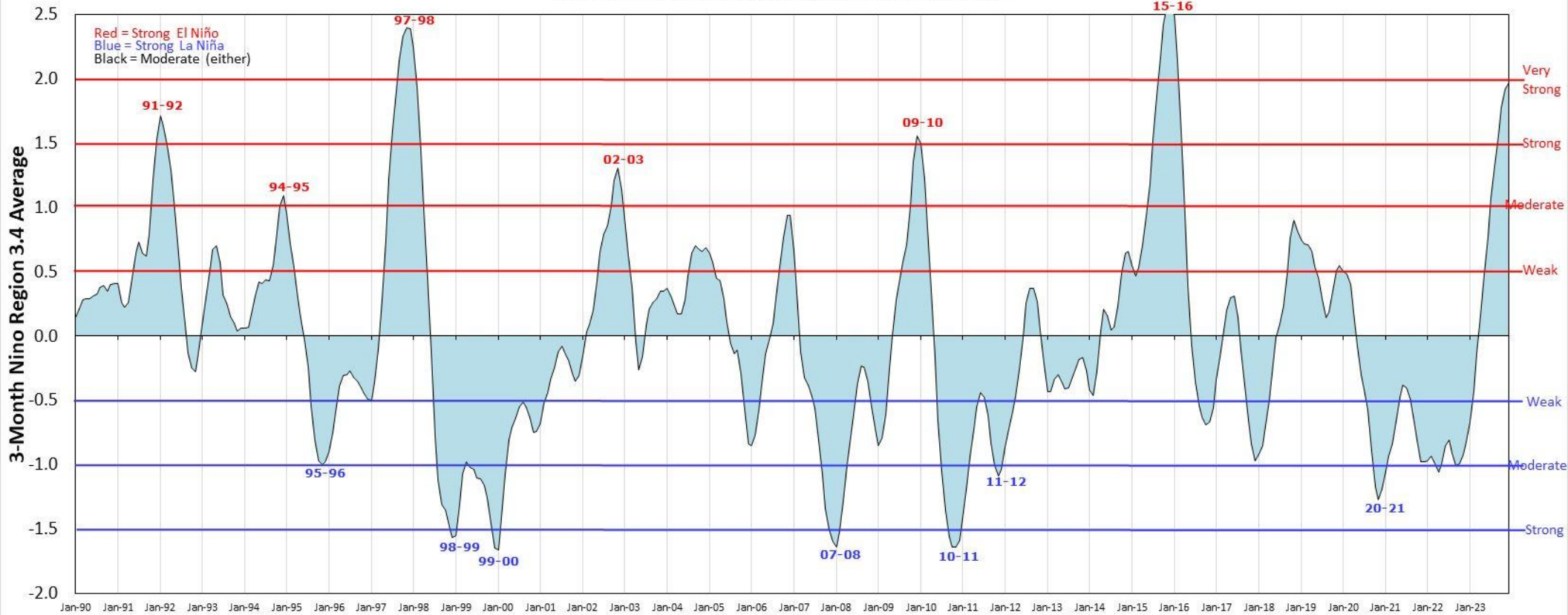
La Niña



ENSO - Weather Drives Price

Oceanic Niño Index (ONI) - 1990-present

https://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php

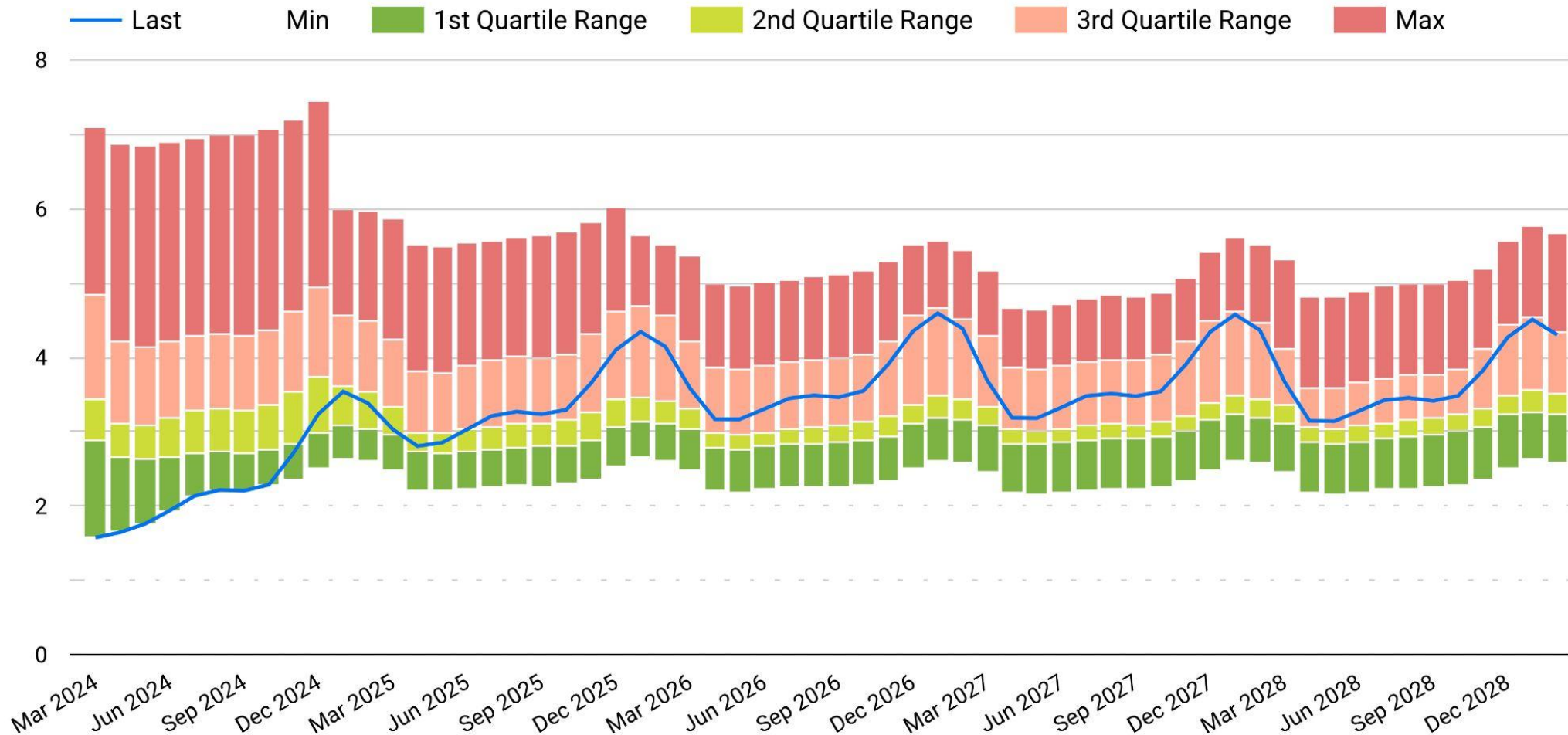


Natural Gas - Monthly Contract Prices

Market Closing Prices from: Feb 20, 2024

Contract: Henry LD1 Fixed Price Future

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Power Market

U.S. Avg. Cost of Generation (\$/MWh)

Year	Fuel				Total			
	Nuclear	Fossil Steam	Hydro-electric	Gas Turbine and Small Scale	Nuclear	Fossil Steam	Hydro-electric	Gas Turbine and Small Scale
2012	7.61	28.34	--	30.45	27.42	37.20	11.34	35.67
2013	8.14	28.94	--	32.56	27.29	37.92	10.88	37.92
2014	7.71	29.39	--	37.06	26.79	39.04	11.90	42.60
2015	7.48	26.70	--	28.22	25.71	37.26	13.42	33.24
2016	7.45	25.50	--	24.97	25.36	36.08	10.98	30.19
2017	7.47	25.27	--	26.48	24.38	35.41	10.29	31.76
2018	7.15	25.40	--	27.35	23.86	35.86	10.65	32.43
2019	6.81	24.28	--	23.11	23.73	36.66	10.80	28.33
2020	6.10	22.87	--	19.65	21.92	34.86	12.71	24.55
2021	6.31	24.64	--	25.78	22.74	35.66	12.30	30.18
2022	6.12	32.04	--	38.72	22.73	43.88	12.44	43.28

Hydroelectric category consists of both conventional hydroelectric and pumped storage.

Gas Turbine and Small Scale category consists of gas turbine, internal combustion, photovoltaic, and wind plants.

Notes: Expenses are average expenses weighted by net generation. A mill is a monetary cost and billing unit equal to 1/1000 of the U.S. dollar (equivalent to 1/10 of one cent).

Total may not equal sum of components due to independent rounding.

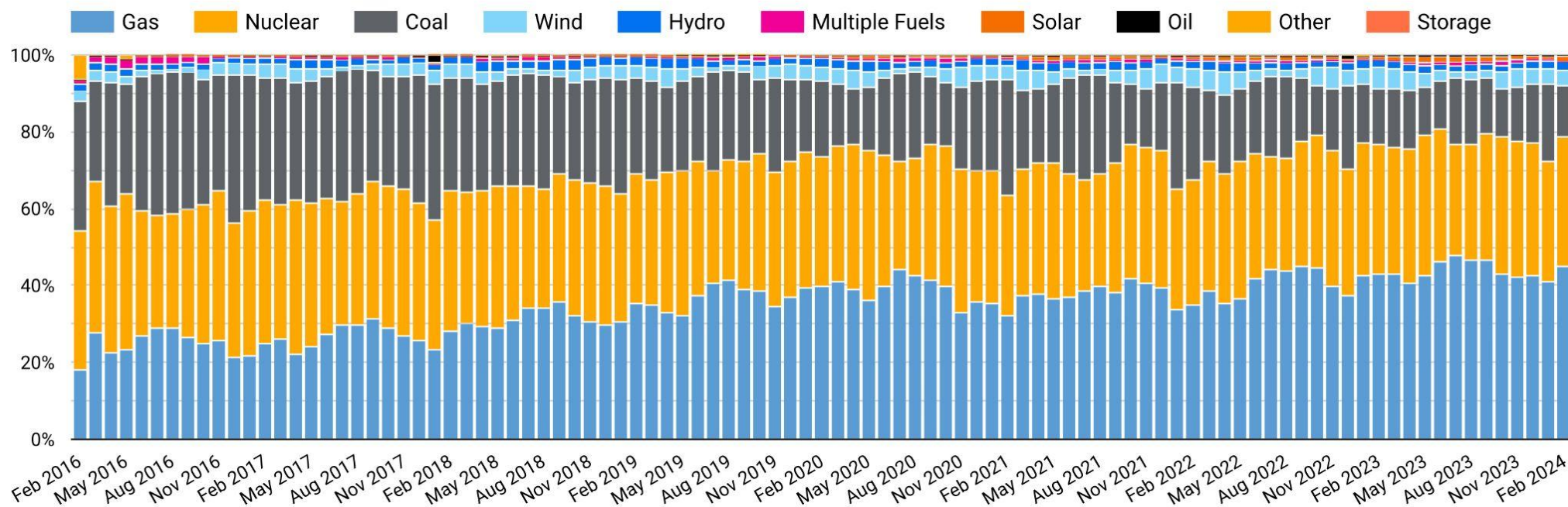
Sources: Federal Energy Regulatory Commission, FERC Form 1, "Annual Report of Major Electric Utilities, Licensees and Others via Ventyx Global Energy Velocity Suite.

How much coal, natural gas, or petroleum is used to generate a kilowatthour of electricity?

The annual average amounts of coal, natural gas, and petroleum fuels used to generate a kilowatthour (kWh) of electricity by U.S. electric utilities and independent power producers in 2022 were:¹

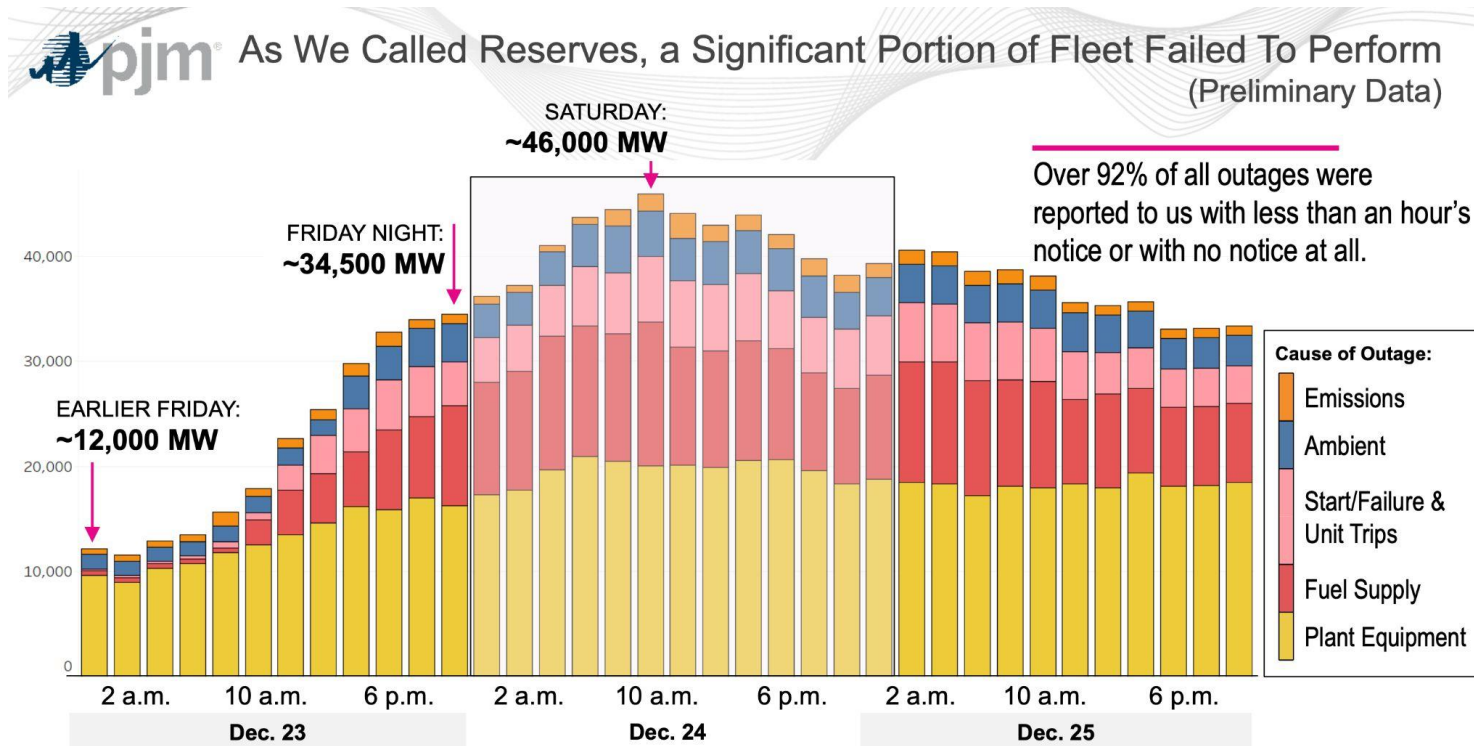
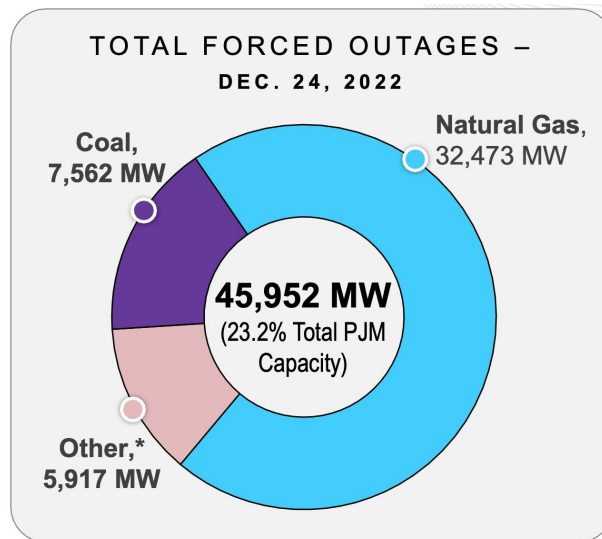
- Coal—1.14 pounds/kWh
- Natural gas—7.42 cubic feet/kWh
- Petroleum liquids—0.08 gallons/kWh
- Petroleum coke—0.85 pounds/kWh

PJM Generation % by Fuel

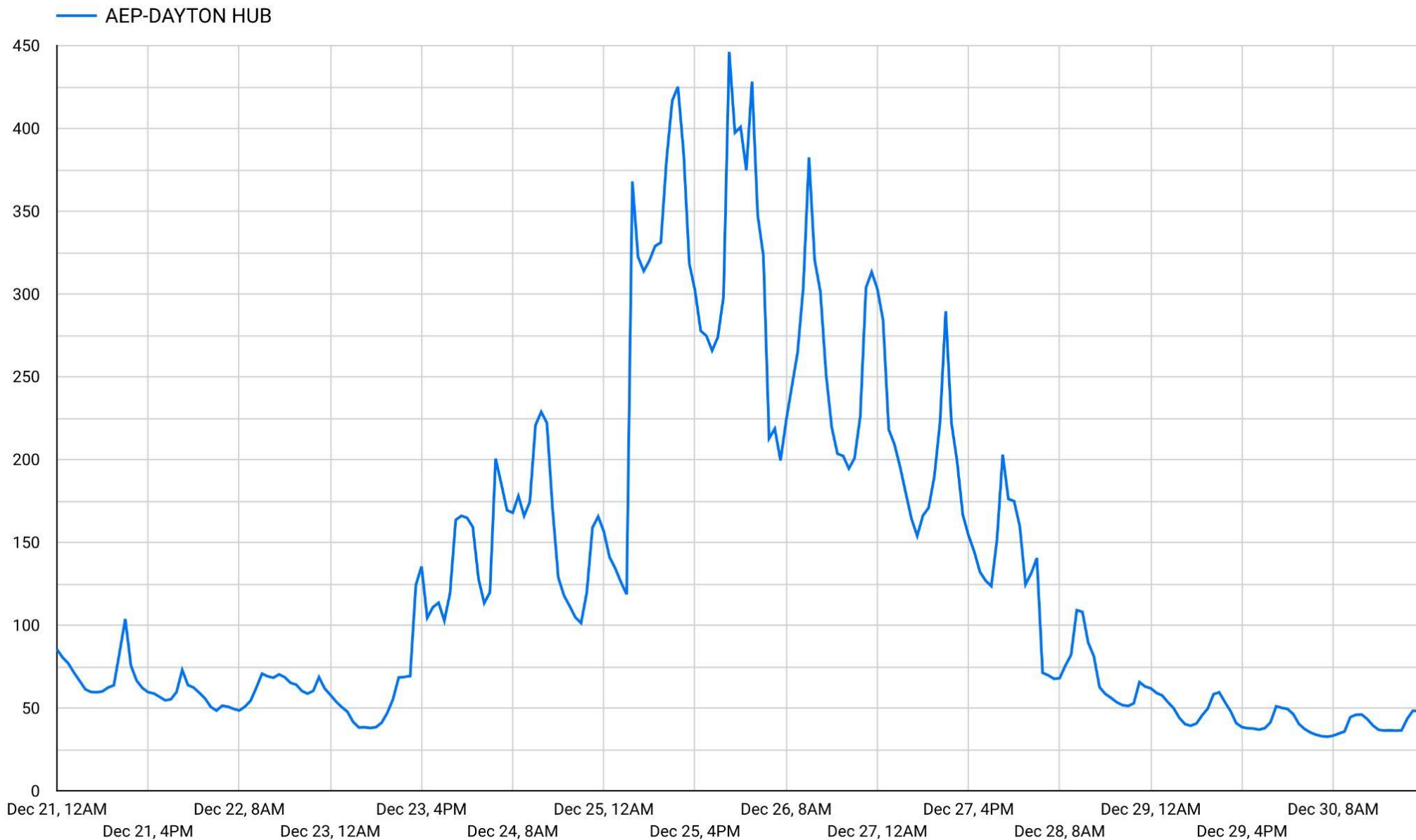


Year / Fuel % of Total								
Fuel	2016	2017	2018	2019	2020	2021	2022	2023
Gas	25%	26%	30%	36%	39%	38%	39%	44%
Nuclear	36%	37%	35%	35%	35%	34%	33%	34%
Coal	33%	31%	28%	23%	19%	22%	20%	15%
Wind	2%	3%	3%	3%	3%	4%	4%	4%
Hydro	2%	2%	2%	2%	2%	2%	2%	2%
Multiple Fuels	2%	0%	0%	0%	1%	0%	0%	1%
Solar	0%	0%	0%	0%	0%	1%	1%	1%
Oil	0%	0%	0%	0%	0%	0%	0%	0%
Other	1%	0%	0%	0%	0%	0%	0%	0%
Storage	0%	-	0%	0%	-	-	-	-

Gas Fired Power Plants Underperform



Gas Fired Power Plants Underperform



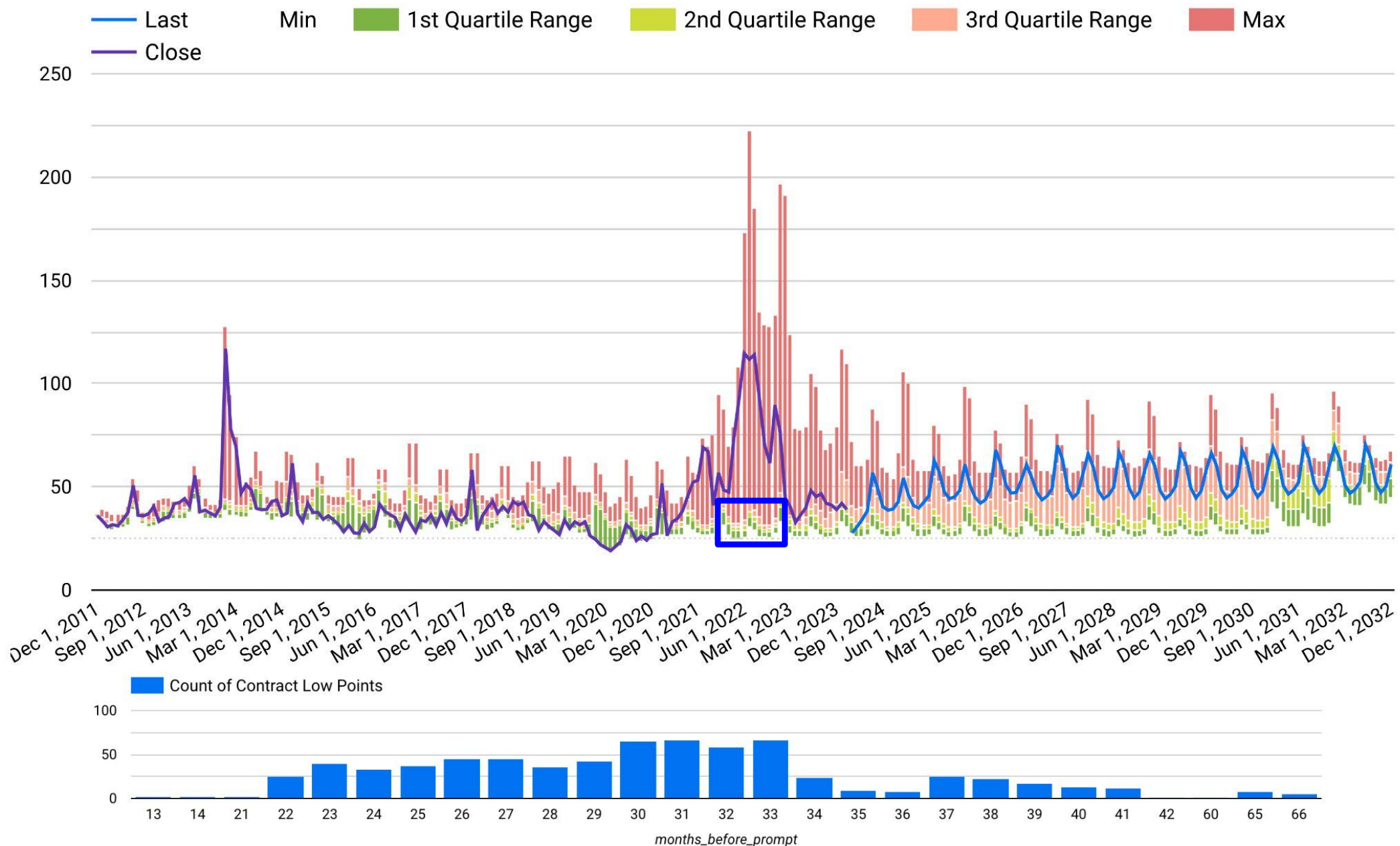


AD Hub - Monthly Contract Closing & Future Prices

Market Closing Prices from: Feb 20, 2024

Contract: PJM AEP Dayton Hub Day-Ahead Peak Fixed Price Future

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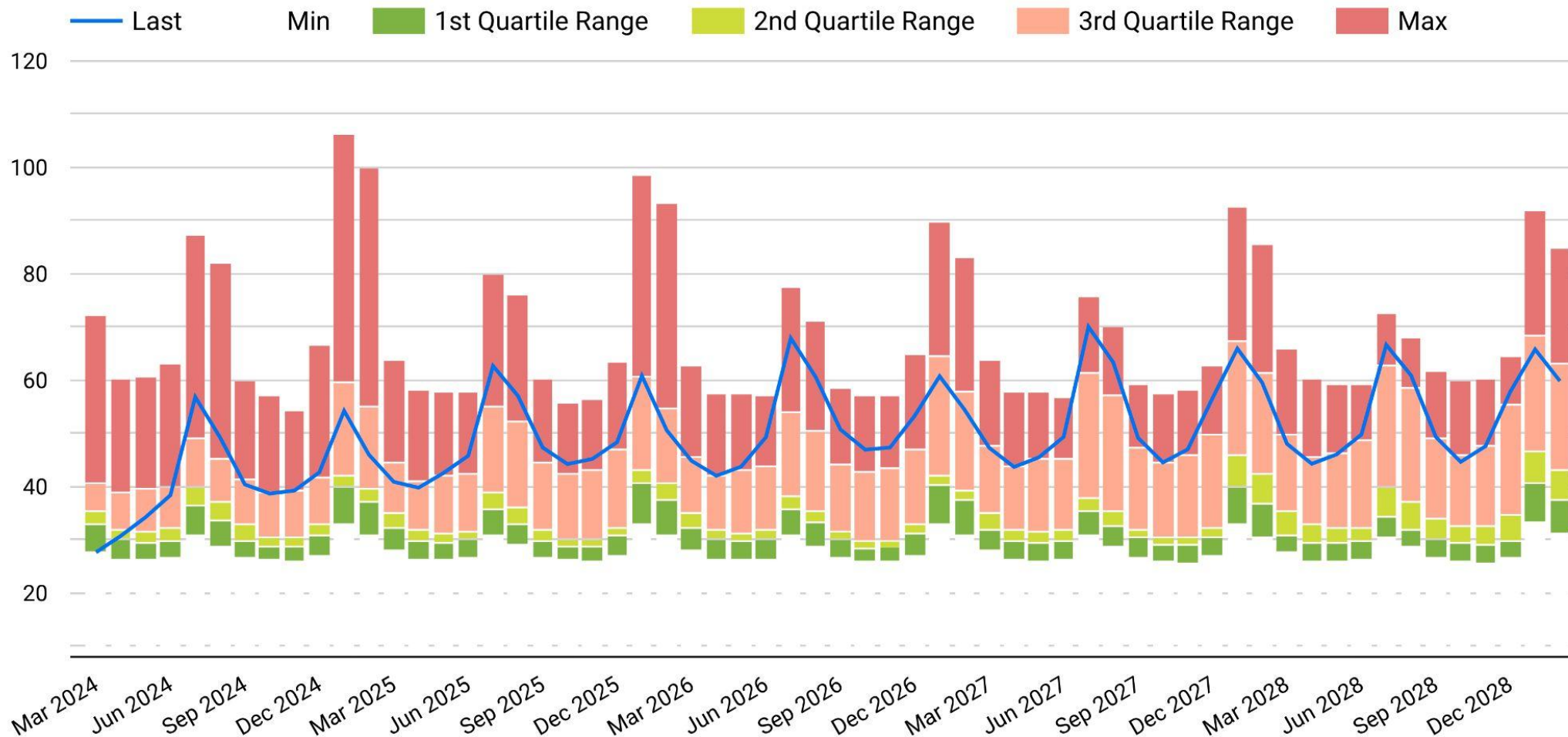


AD Hub Monthly Contract Prices

Market Closing Prices from: Feb 20, 2024

Contract: PJM AEP Dayton Hub Day-Ahead Peak Fixed Price Future

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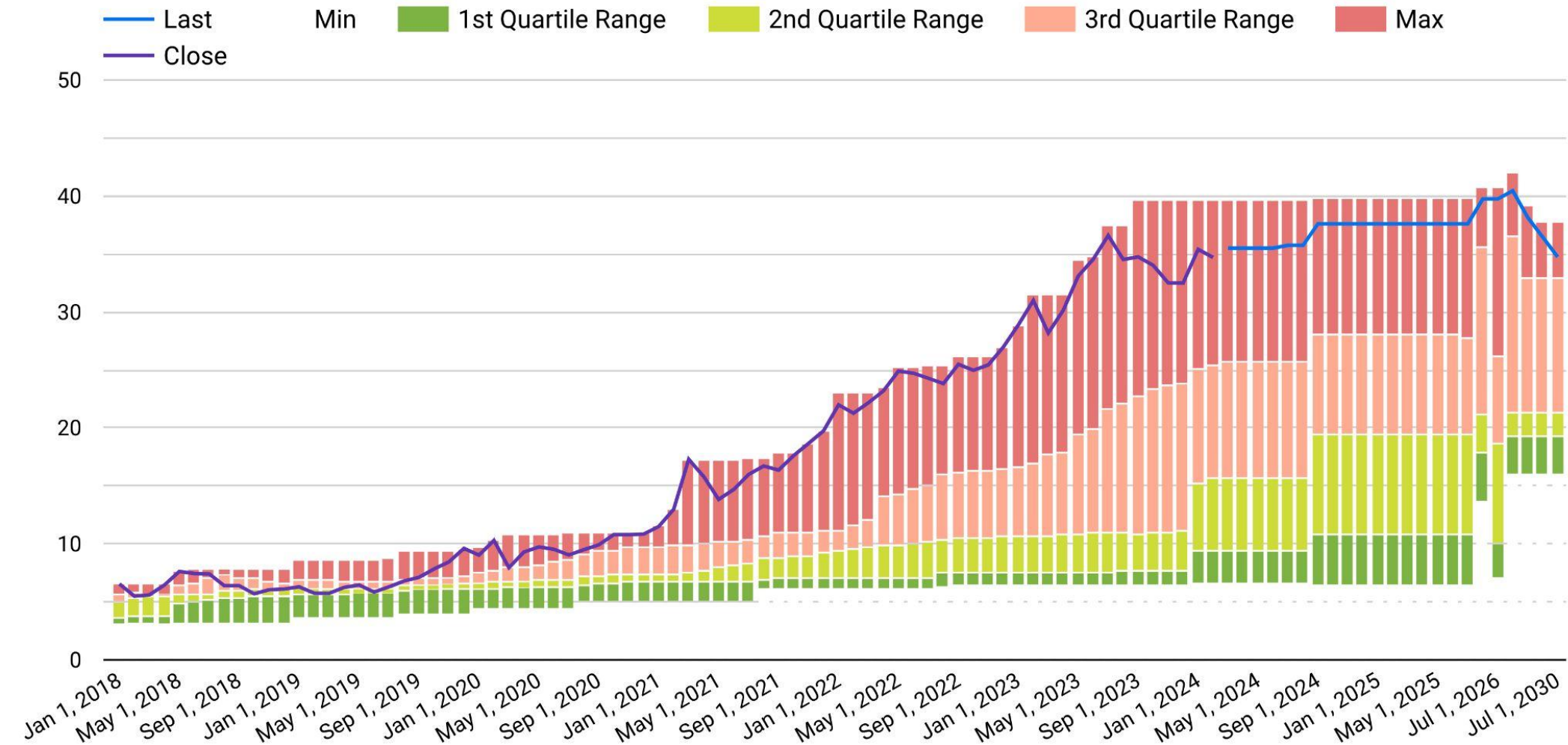


Green Energy & Carbon Offset - Monthly Contract Closing & Future Prices

Market Closing Prices from: Feb 20, 2024

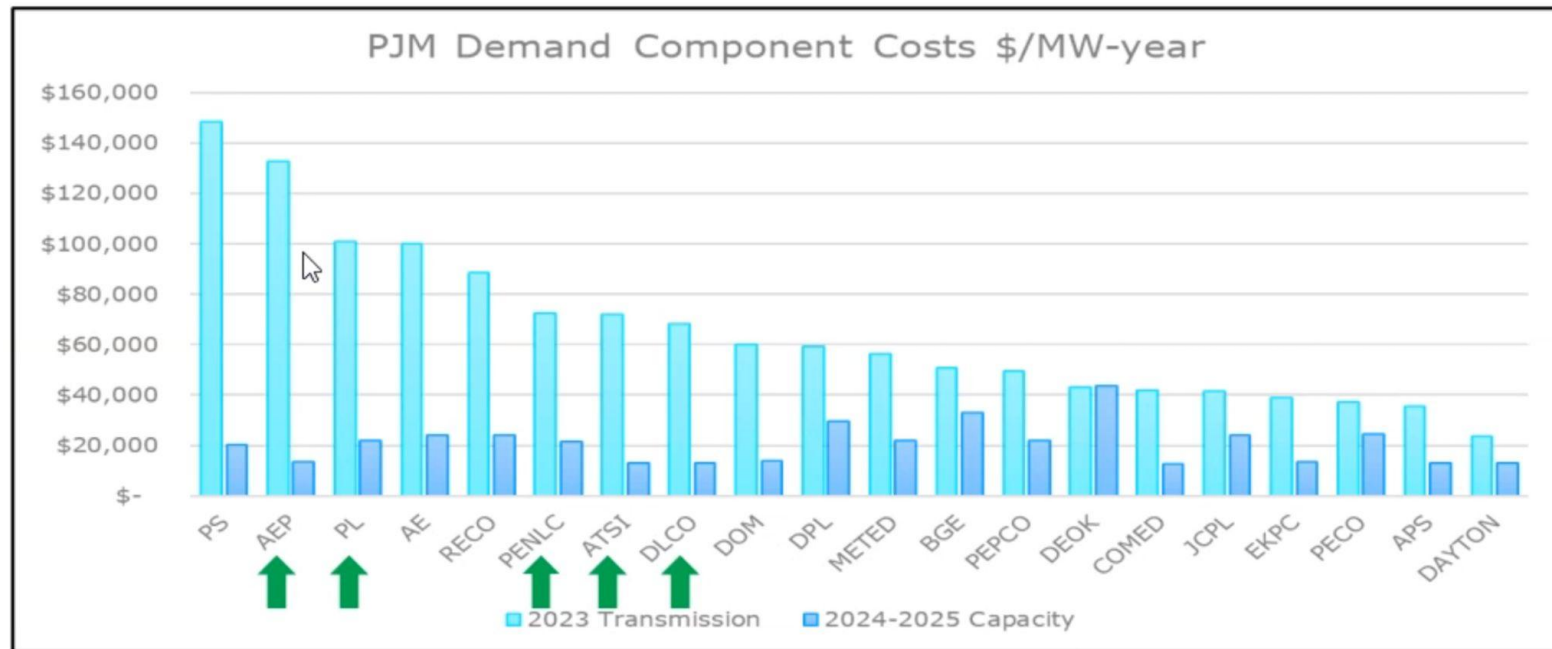
Contract: PJM Tri Qualified Renewable Energy Certificate Class I Future

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FirstEnergy Ohio Budget Impacts

- FirstEnergy Electric Security Plan effective June 1, 2024
 - Updated distribution rates
 - Transmission cost will likely be individualized to customer - BIG \$ SAVINGS FOR CP AVOIDANCE



- PJM Capacity Auction - resumes this summer setting prices beyond May '25



Thank You

Chris Greulich
President

(330) 524-7559
chris@northshoreenergy.com

