



BRAKEY ENERGY
OHIO'S ENERGY EXPERTS

Ohio's Energy Market Analysis

Managing Energy Costs in a Volatile Environment

MEC 2024

Presentation Summary

1. Oil, Gas, and Power Fundamentals
2. Energy Market Narratives
3. Macroeconomic Trends & Energy Markets
4. Analyzing Energy Futures and LMP Trends
5. Managing Energy Costs and Risk

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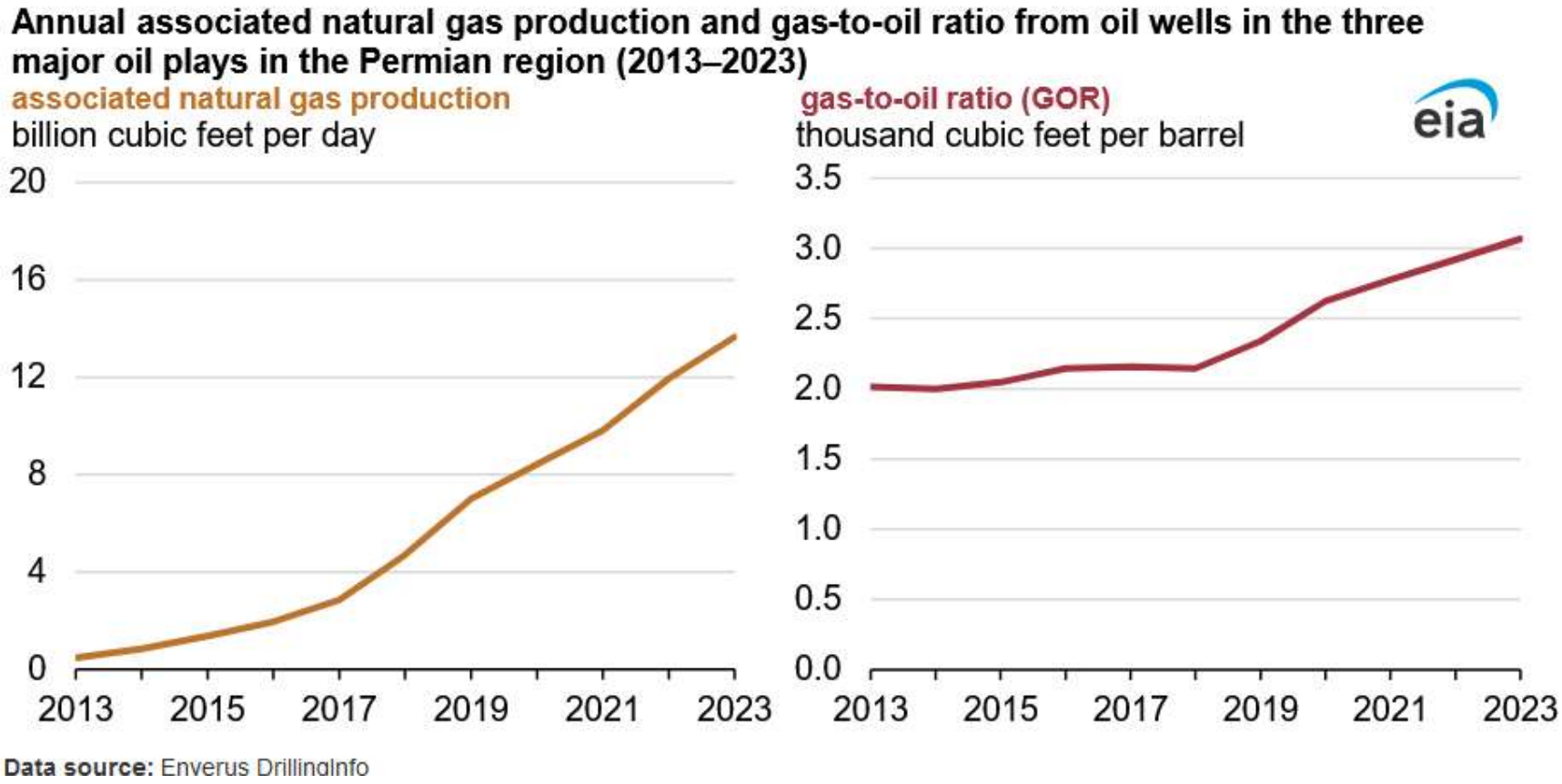
Section 1:

Oil, Gas, and Power Fundamentals

Relationship of Oil & Gas

- US oil production has increased dramatically since the early 2010s because of the Shale Revolution. As of writing, US oil production sits at an all-time high of approx. 13.7 million barrels per day.
- Natural gas is produced as a byproduct of drilling for and producing oil from shale regions, known as “associated natural gas.”
- Since 2018, the amount of associated gas produced from oil production has increased by as much as 50% in some shale regions, particularly the Permian region.
- US natural gas production also sits at all-time highs of around 105.5 billion cubic-feet (BCF) per day.



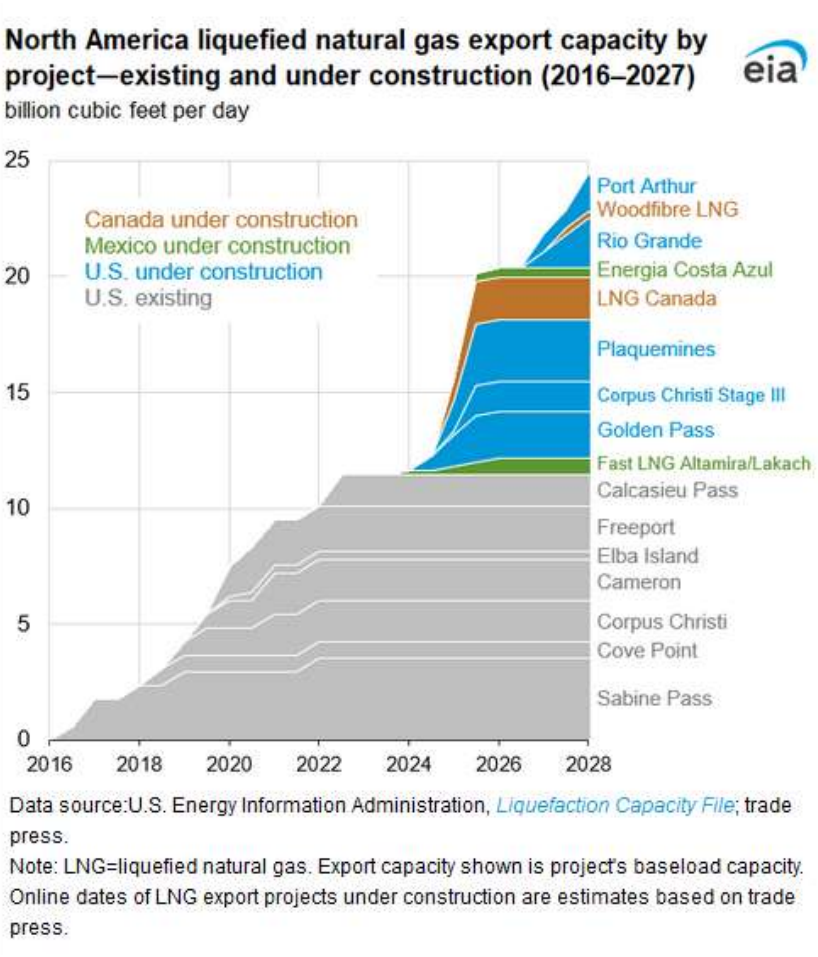
Source: https://www.eia.gov/todayinenergy/detail.php?id=61043

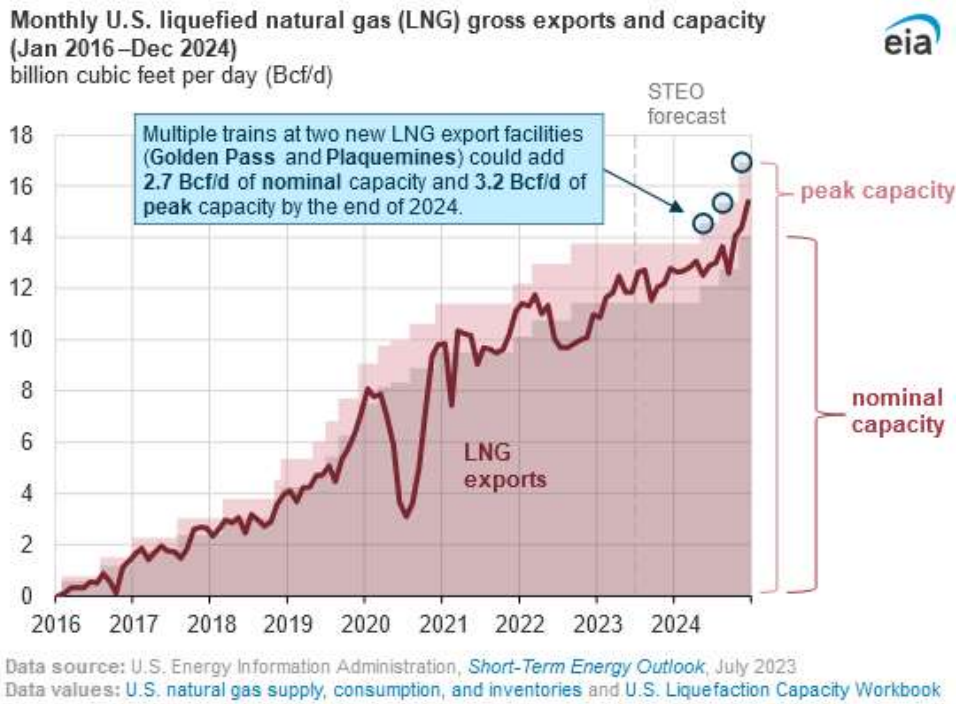
Liquefied Natural Gas (LNG)

- The US became the world's largest exporter of LNG after the Russian invasion of Ukraine in February 2022, as European nations attempt to wean themselves off Russian pipeline gas imports by accepting US LNG imports.

- The US's LNG export capacity is forecasted to grow by 20-25% by the end of 2025 from new terminal construction.

- As of November 2023, LNG export prices are approximately 250% greater than the NYMEX settlement price. This arbitrage opportunity makes it likely that LNG exports will continue at or near capacity for the foreseeable future.





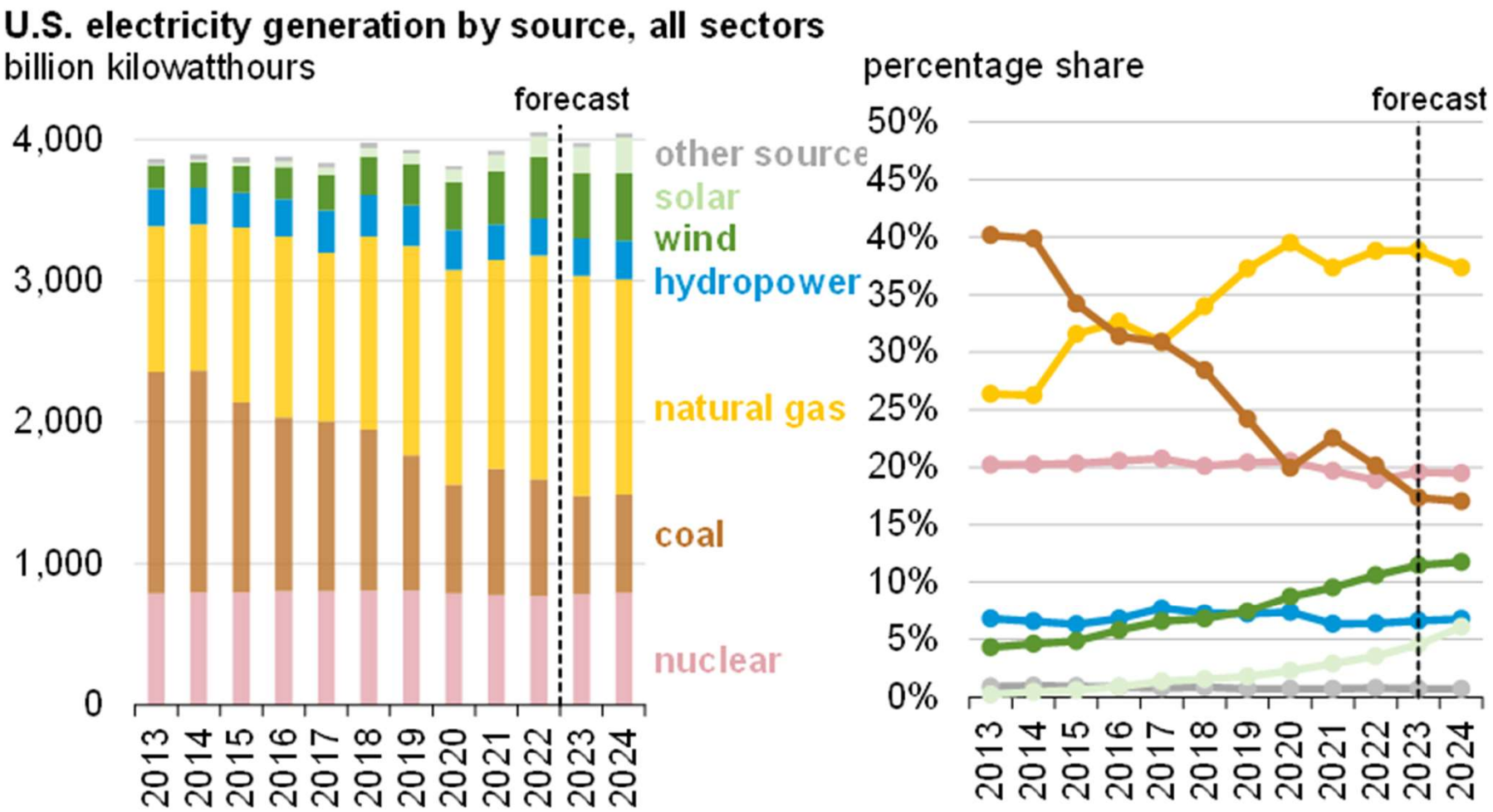
Note: ExxonMobil announced that their Golden Pass export terminal will not be operational until Q2 2025, rather than the original Q4 2024 forecast.

Source: EIA Natural Gas Weekly Update, 10/26/23 and EIA STEO, 10/11/23

Relationship of Gas & Power

- In 2023, gas-fired power generation accounted for an all-time high of 42% of all US power generation, up from 39% in 2022.
- Coal-fired power generation accounted for 17% of all US power generation in 2023, down from 20% in 2022.
- Coal-fired plants are slated to retire through the rest of the decade and beyond, leaving natural gas as not only the largest source of power generation, but increasingly as the sole dispatchable source of power generation.
- Going forward, generation growth is expected to largely come from renewable sources, such as solar and wind.

Source: EIA Short Term Energy Outlook – January 9, 2024



Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, March 2023

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Section 2:

Energy Market Narratives

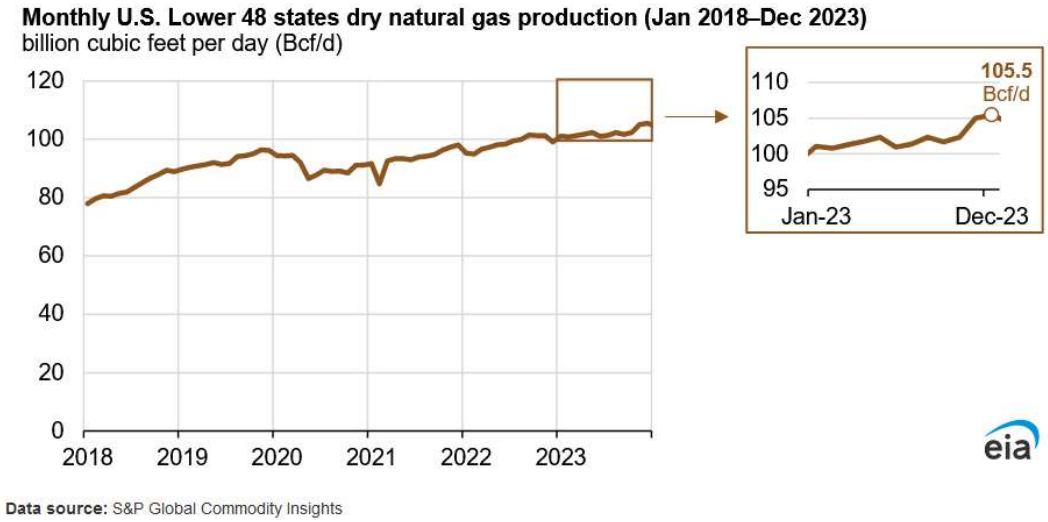
Oil & Gas Production

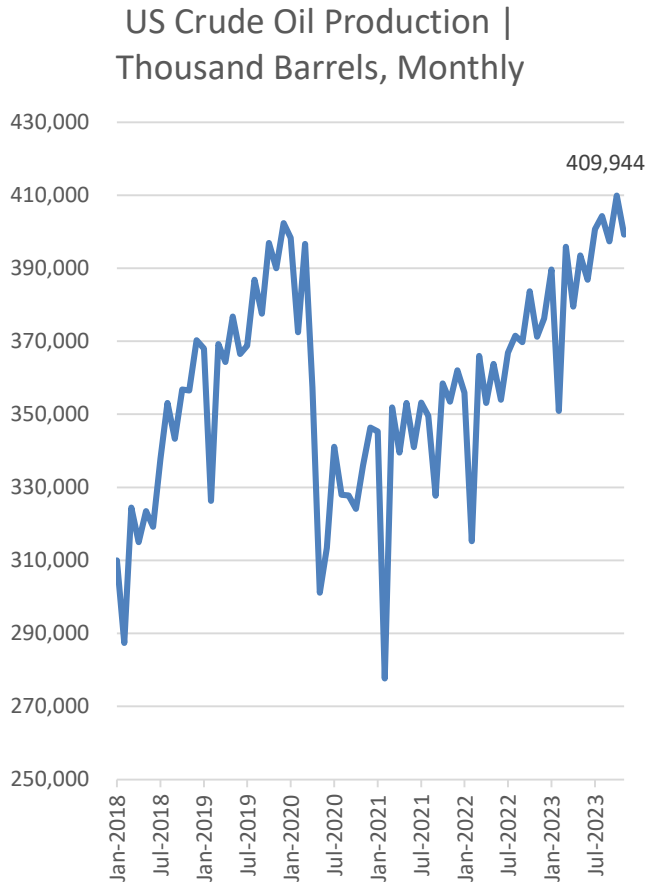
- US Oil and Gas production are both at or near all-time highs. With oil prices stable and above producer break-even prices, it is likely that oil production will continue at or above these levels in 2024 and 2025.

- With the improved efficiency of capturing associated natural gas, and the large premium offered by exporting gas as LNG, it is likely that gas production will also remain at or near these levels in 2024 and 2025.

- This narrative of historically high and increasing production could help to keep downward pressure on gas and thus electricity prices in the short to medium term.

Oil & Gas Production





Source: https://www.eia.gov/todayinenergy/detail.php?id=61263, EIA Data Navigator

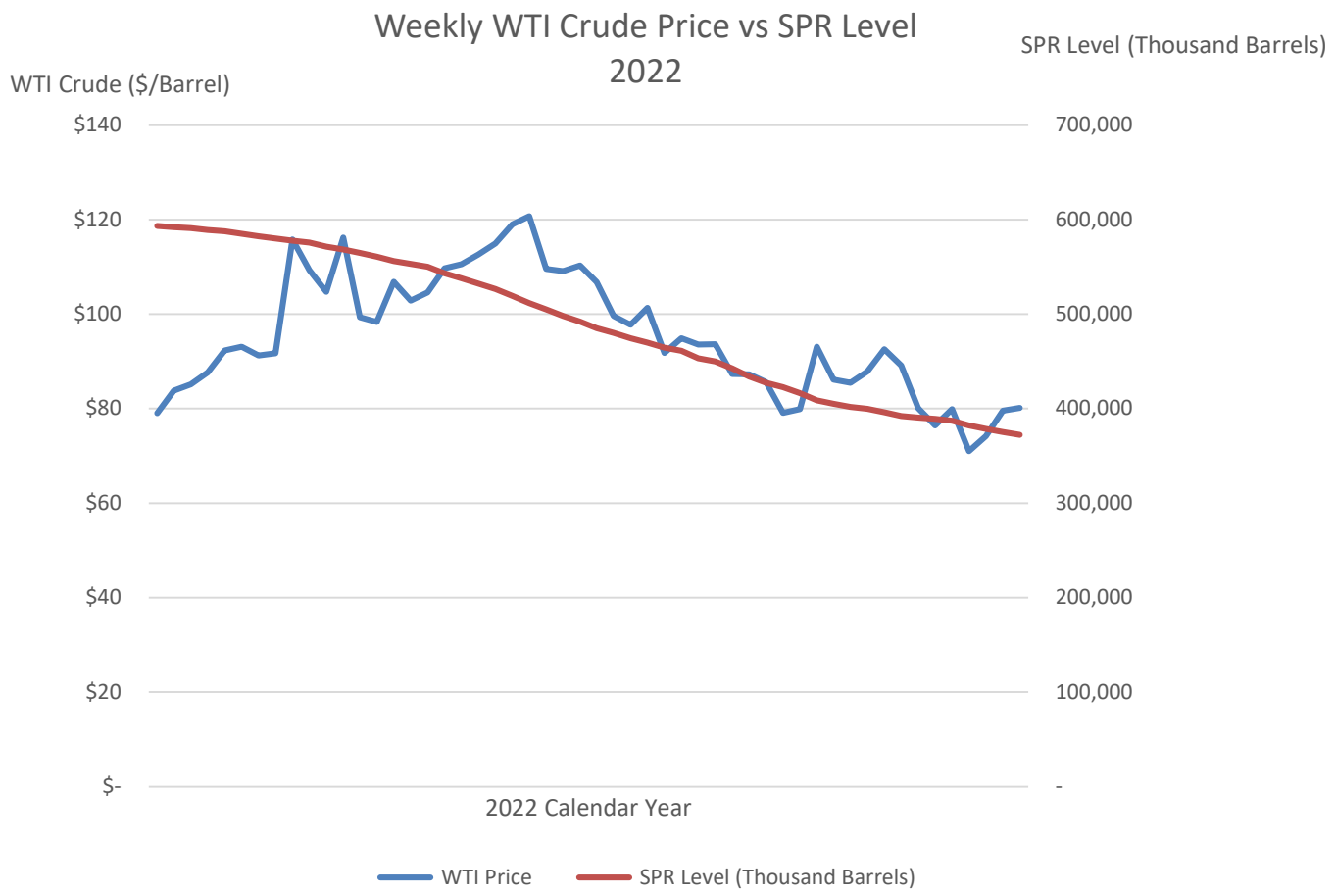
The Strategic Petroleum Reserve (SPR)

- Shortly after the Russian invasion of Ukraine, the Biden administration pursued a policy of liquidating the SPR into the global oil market to help reduce the impact of the rising cost of oil.

- The millions of barrels of additional supply likely helped to soften oil prices, however, the SPR was roughly halved by this policy over the course of 2022.

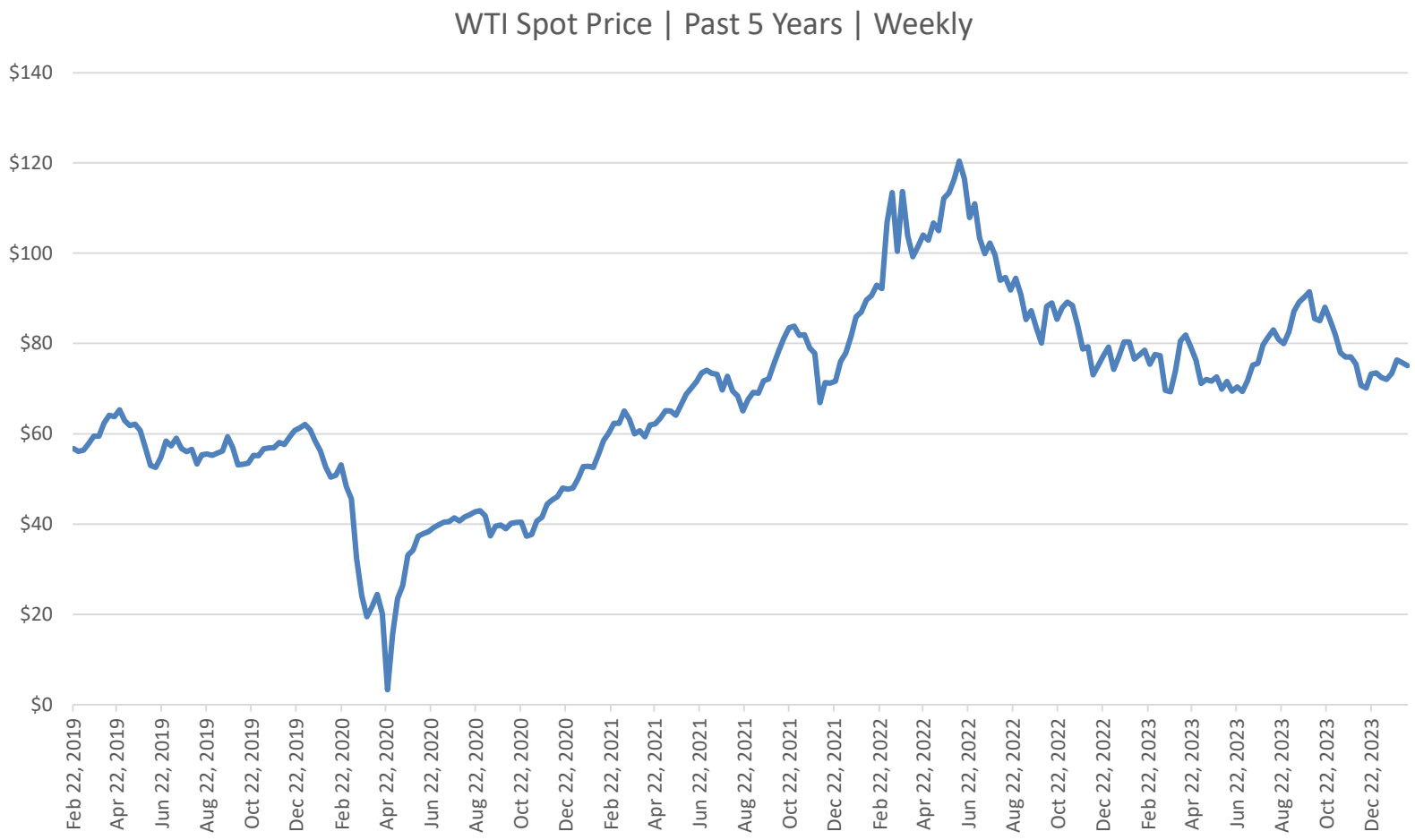
- The Biden administration has announced that they will now pursue a policy of resupplying the SPR when WTI oil prices are between $67-$72 per barrel. This may help to keep a floor underneath the market and provide stability so long as the policy is maintained.

The Strategic Petroleum Reserve (SPR)



Source: EIA and St Louis Federal Reserve Economic Data (FRED) – Taken 8/3/23

WTI Oil Spot Price – Past 5 Years



Source: EIA Data Navigator – Taken 2/21/2024

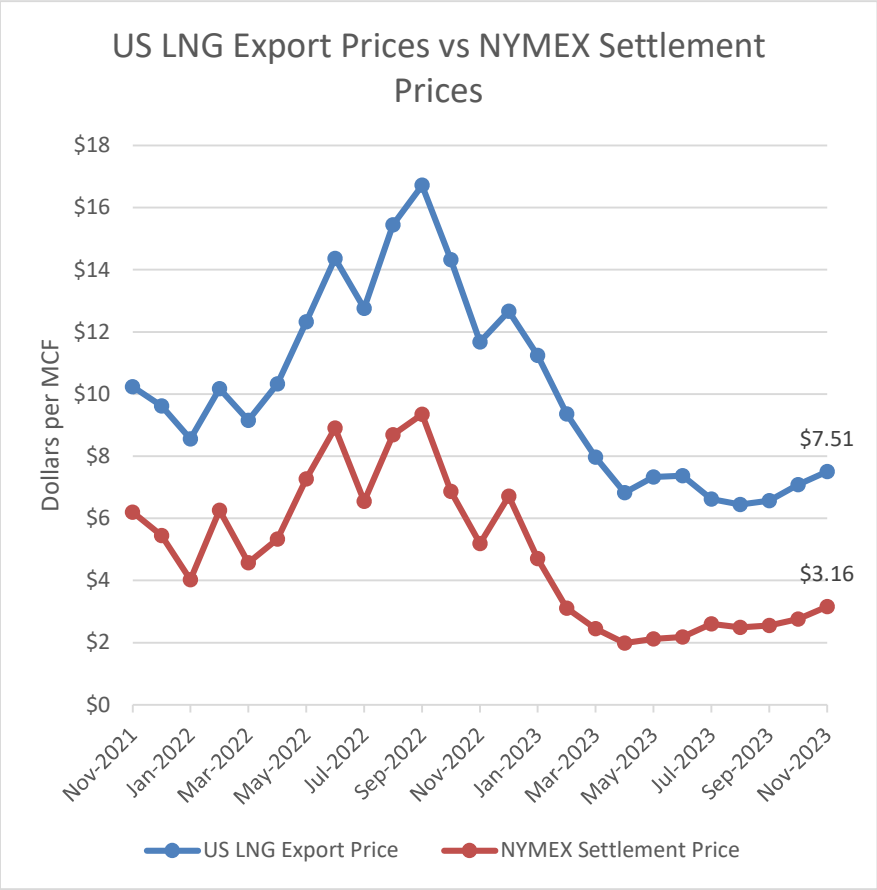
LNG Price & Export Trends

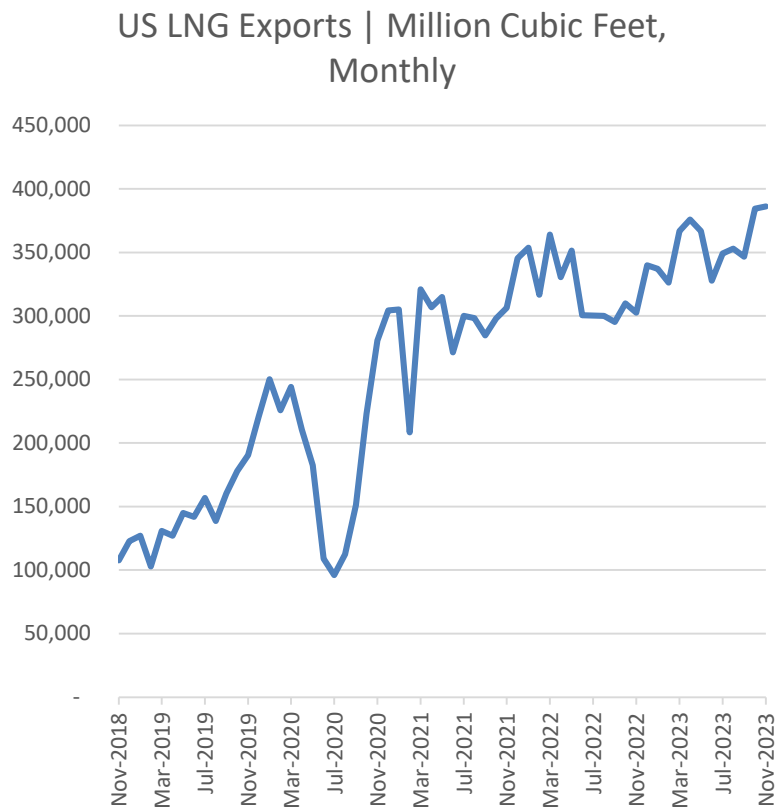
- Despite the Biden administration's recent announcement of suspending the approval of future LNG Export Terminal construction, there are several terminals that are already under construction and slated to be operational from 2025-2028 that will materially increase US export capacity.

- The European and Asian demand for imported LNG is likely to continue for the foreseeable future, keeping the premium of exported LNG over domestic gas prices intact.

- This pulling effect of gas from the domestic market while power burn demand is at all-time highs could put upward pressure on gas and power prices when weather conditions and temperatures are forecasted to be abnormal, in both Europe and the US.

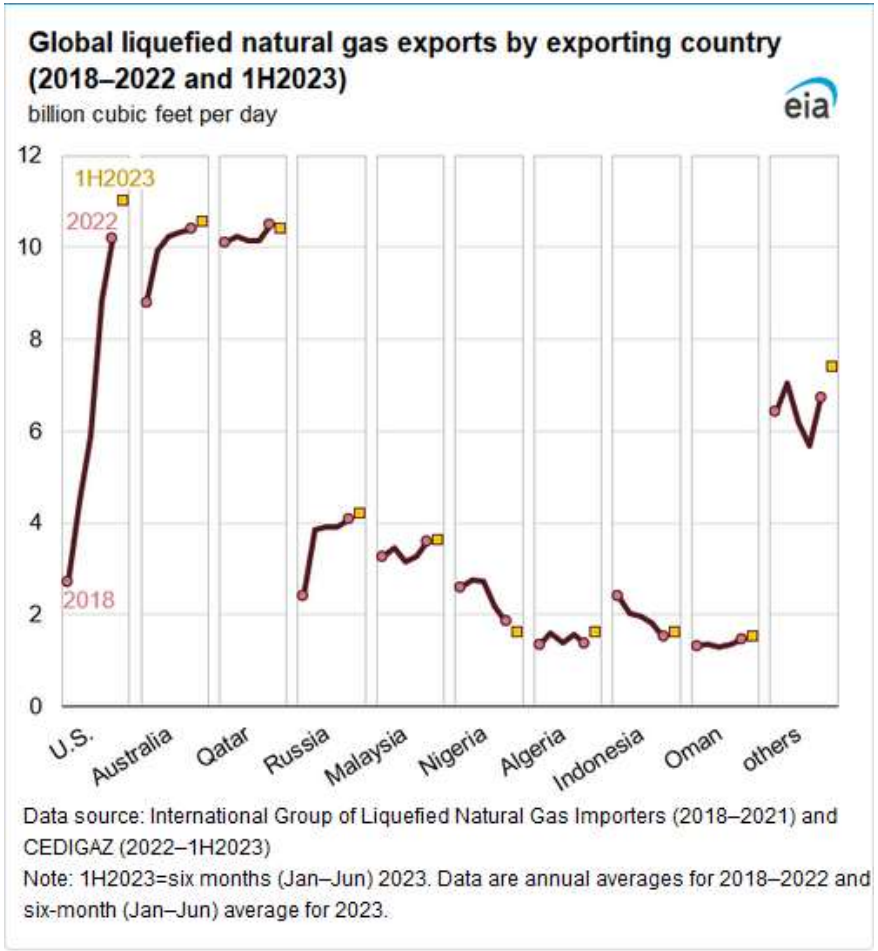
LNG Price & Export Trends





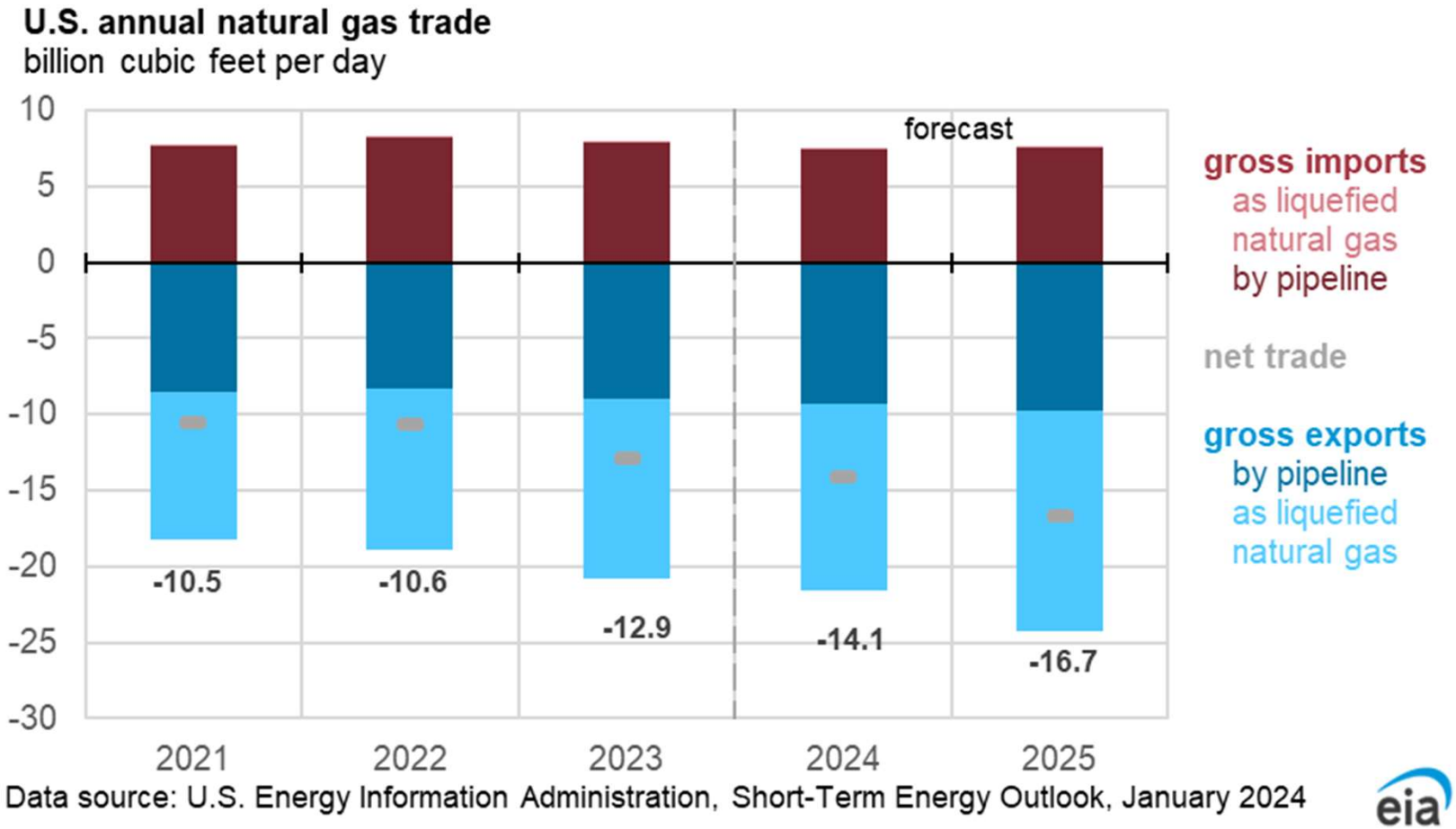
Source: EIA Data Navigator – Taken 2/4/24

LNG Price & Export Trends



Source: EIA Natural Gas Weekly Update – August 24, 2023

LNG Price & Export Trends



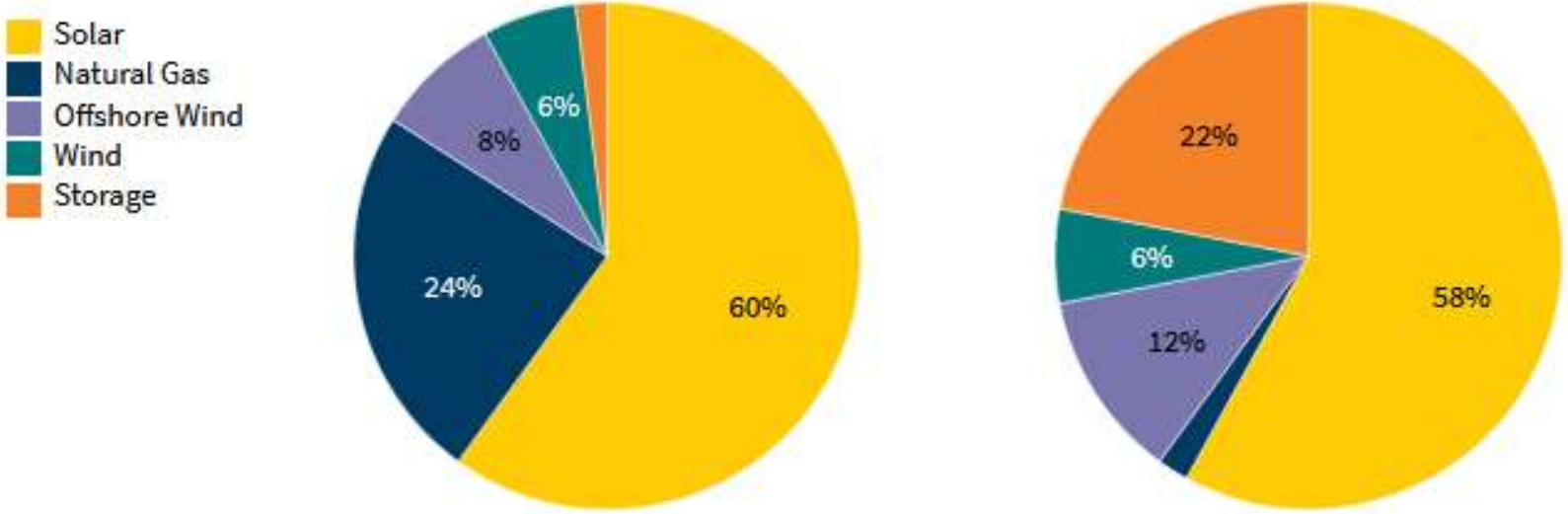
PJM Interconnection – "The Green Transition"

- Most new generation plants in the queue for approval to build and connect to PJM are renewable sources.
- These renewable generation plants will be expected to replace retiring coal and gas-fired plants over the next decade.
- Declining dispatchable capacity could lead to increased volatility of both forward and spot power prices, as it could become increasingly plausible that demand outstrips supply.
- This could happen at times that presently and historically would not be considered a time of excess demand on the grid, because even if the thermal generation capacity is replaced 1:1 in GW with renewable generation, renewable generation can only run at nameplate (e.g., "peak") capacity when weather conditions are optimal.

PJM Interconnection – "The Green Transition"

Exhibit 1: PJM Queue Capacity by Type of Generation and Status

Percent breakdown of nameplate capacity in PJM's queue with a signed ISA (left) and active in queue (awaiting signed ISA, right). Total capacity in each category is displayed in parentheses.



Data downloaded on June 20, 2023

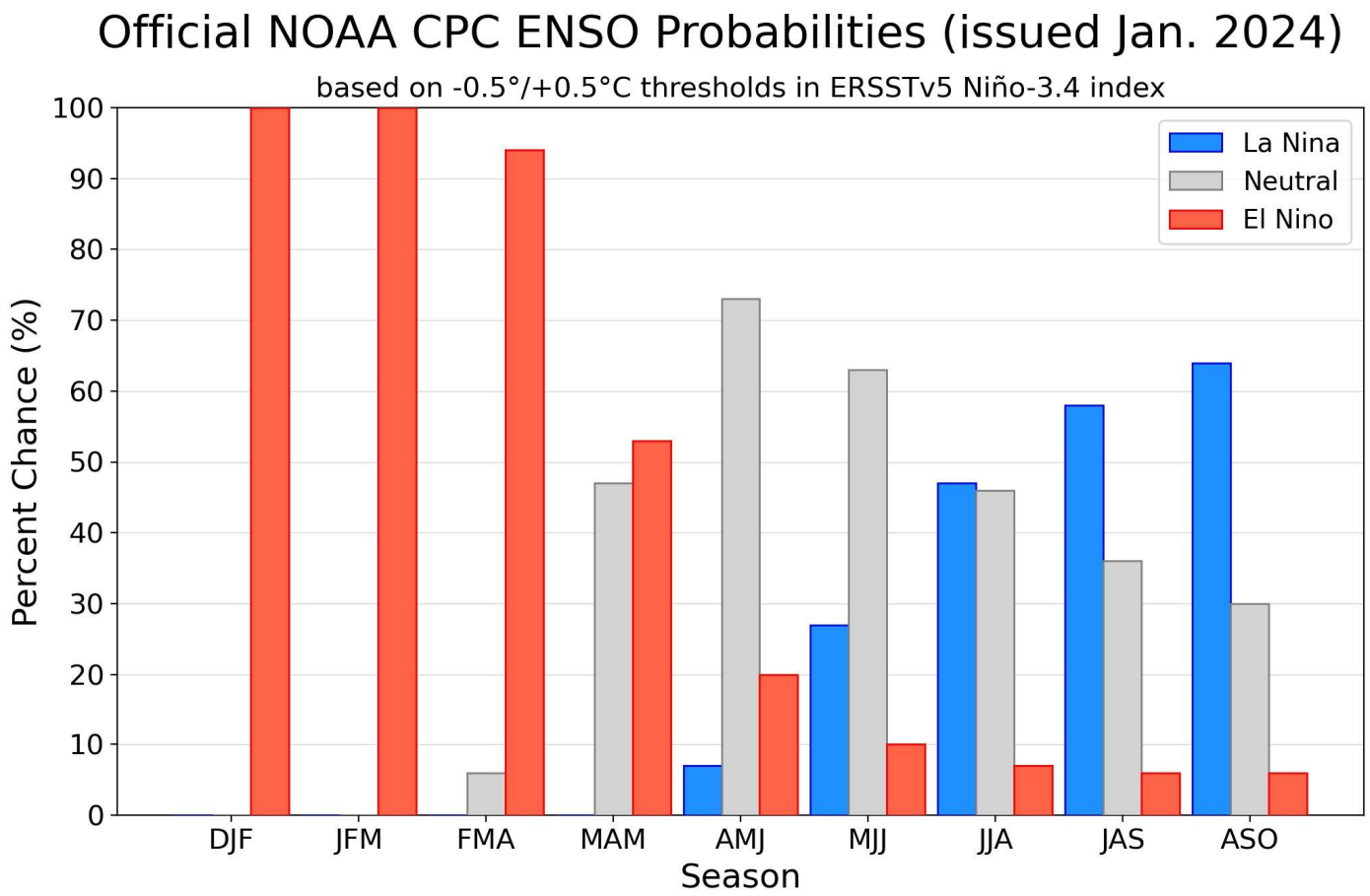
Chart: Claire Wayner • **Source:** PJM

Source: https://rmi.org/ongoing-struggle-to-join-pjms-grid/ - Taken 2/4/24

Climate & Weather Patterns

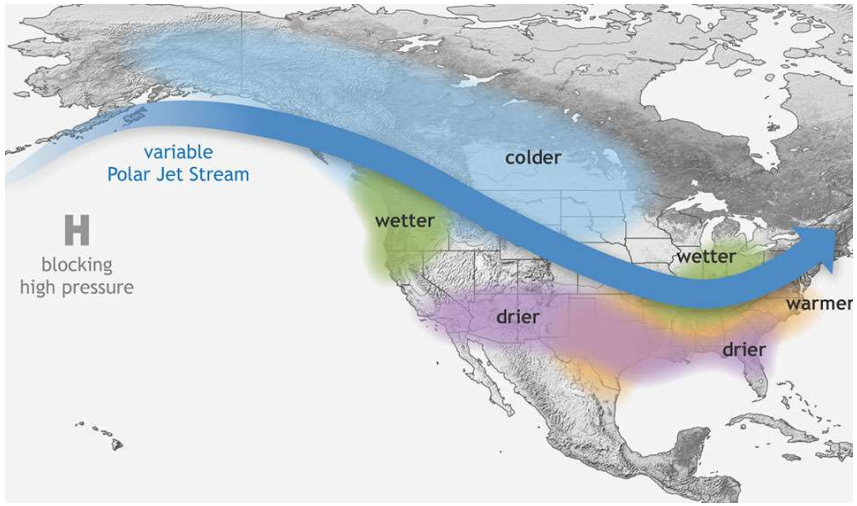
- Winter 2022/2023 was extraordinarily mild for much of the country, followed by the also extraordinarily mild Summer 2023 in the Midwest and Northeast.
- Historically low coincident peaks observed on the PJM RTO grid, as well as regional zones such as the ATSI zone, provide additional context to how mild the summer was.
- Beginning in Summer 2023, a strong El Nino event began to develop in the central Pacific Ocean and peaked in mid-December 2023. Strong El Nino events tend to correlate with milder and drier than average winter conditions in the Midwest and Northeast.
- Meteorologists are forecasting that the El Nino event will dissipate, and that conditions in the Pacific will return to “ENSO Neutral” by the early summer, with a possibility of a La Nina event developing in the late summer or early autumn.

Climate & Weather Patterns



Source: Emily Becker, University of Miami, CIMAS - https://www.climate.gov/news-features/blogs/enso/january-2024-el-nino-update-birds

Climate & Weather Patterns



- Cooler Pacific waters push the jet stream northward and tend to lead to drought in the southern U.S. and heavy rains and flooding in the Pacific Northwest and Canada.
- During a La Niña year, winter temperatures are warmer than normal in the South and cooler than normal in the North.
- La Nina can also lead to a more severe hurricane season.

Source: National Ocean Service, NOAA - https://oceanservice.noaa.gov/facts/ninonina.html

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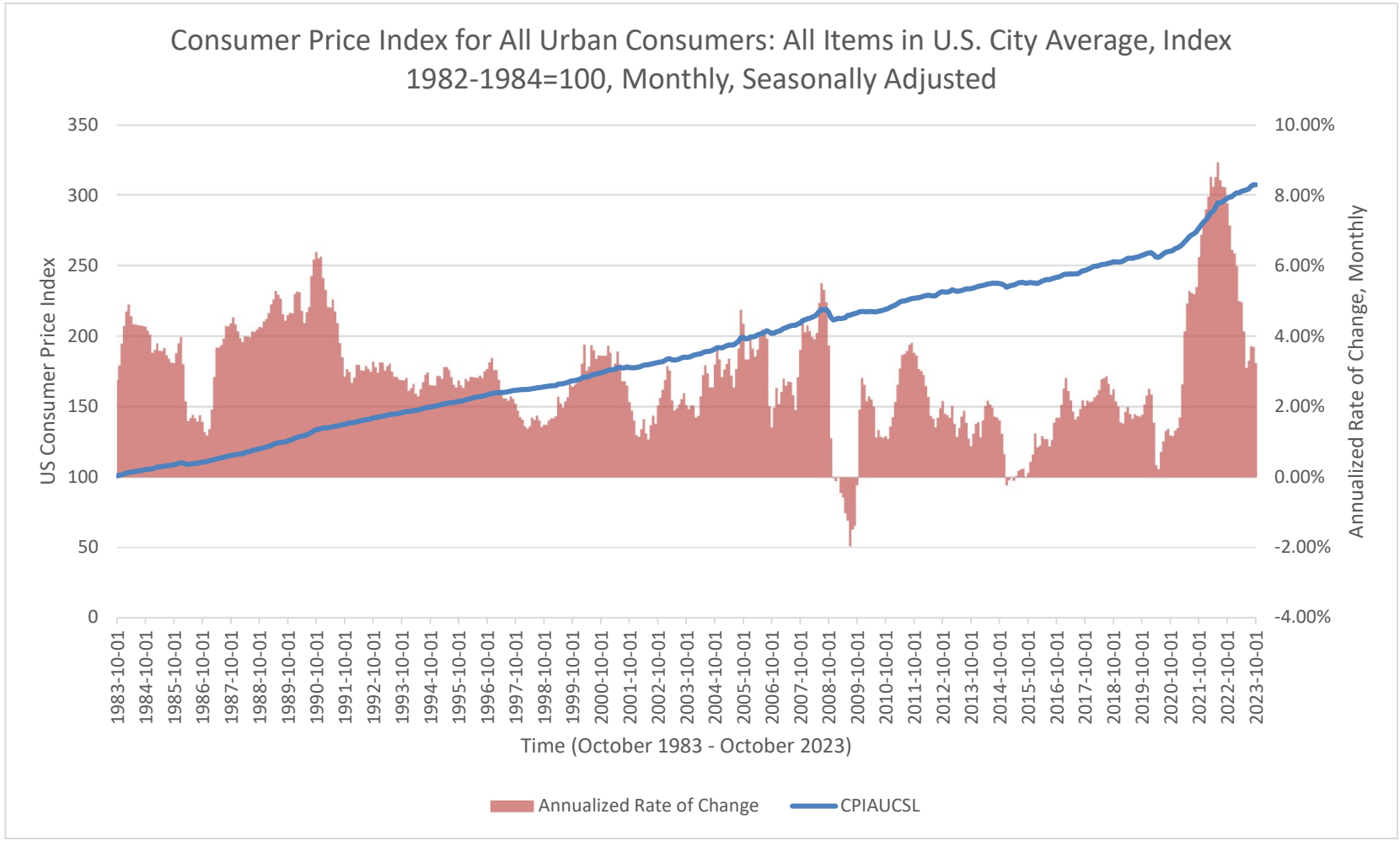
Section 3:

Macroeconomic Trends & Energy Markets

Inflation – Weak Dollar's Impact

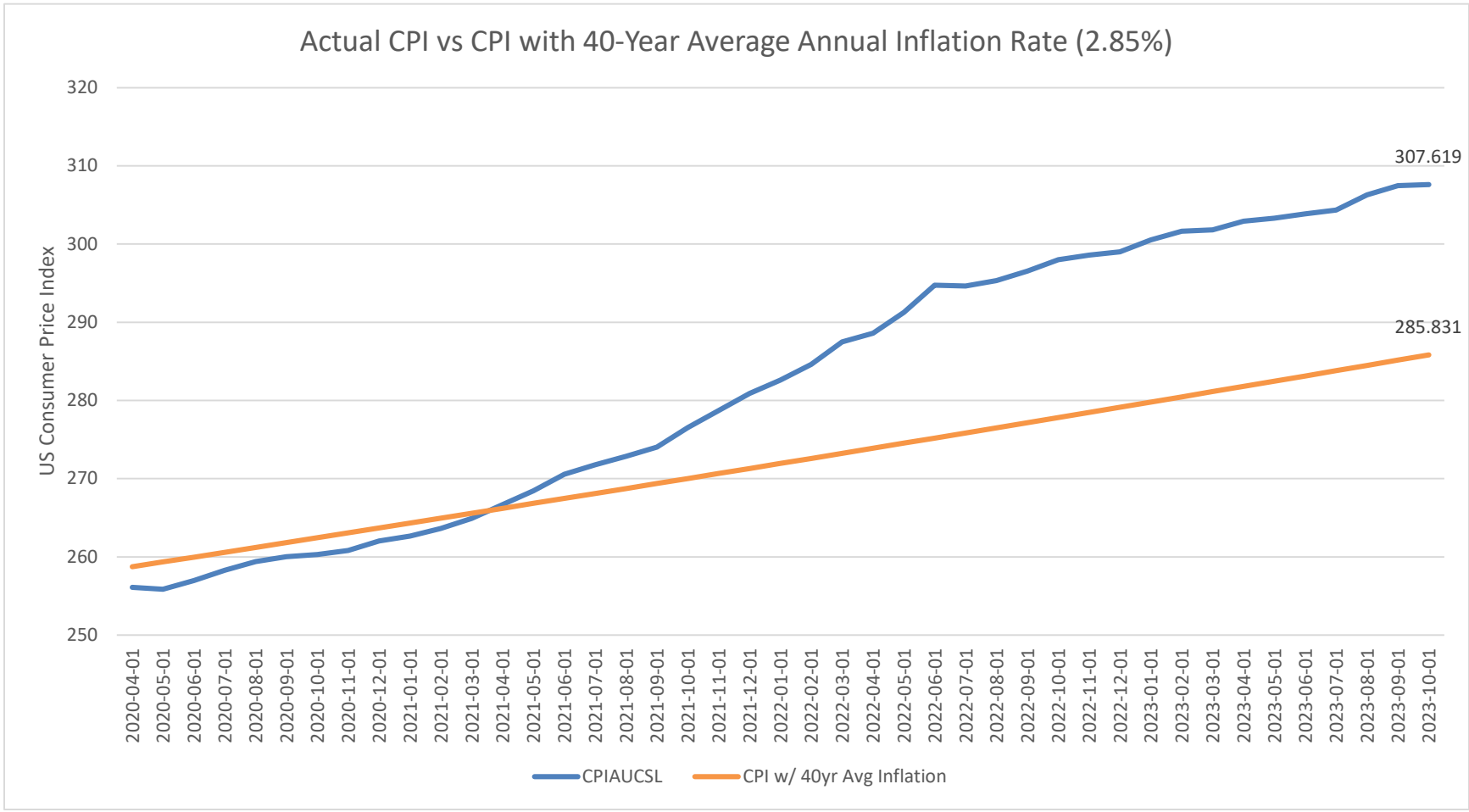
- In the wake of the global lockdowns during the COVID-19 Pandemic, the Federal Reserve ("the Fed") pursued an ultra loose monetary policy of dropping their key interest rate to 0% and eliminating the reserve requirement on bank deposits to 0%.
- Simultaneously, the Trump and subsequent Biden administration implemented several massive and direct fiscal stimulus programs, including "Covid Relief Payments" and the Payment Protection Plan.
- An enormous increase in the money supply resulted, weakening the US Dollar and eventually translating to high inflation beginning in 2021 and that persists today.
- Most commodities are priced in US Dollars and rise in price in times of high inflation, all else being equal.

Just How Much Inflation?



Source: St Louis Federal Reserve FRED – Taken 12/11/23

Just How Much Inflation?



Source: St Louis Federal Reserve FRED - Taken 12/11/23

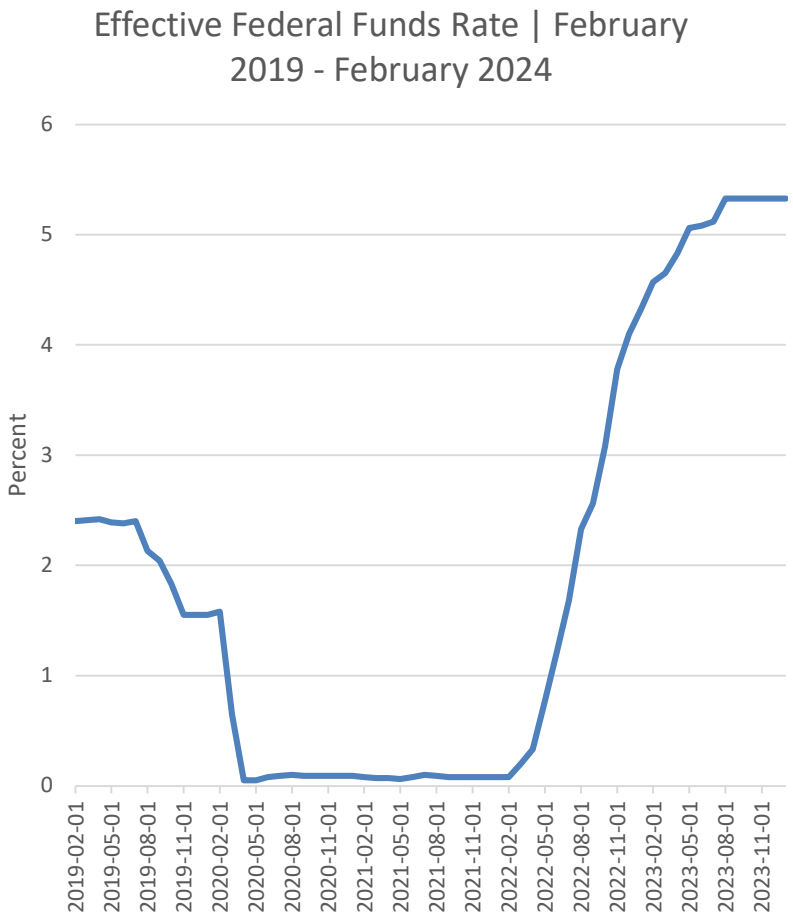
Current Monetary Policy

- The Y/Y Core Inflation rate (top), the preferred metric of the Fed, remains just under 4%. This metric excludes volatile food and energy prices. The Fed's target rate is 2%

- The Y/Y Inflation rate (bottom), which does not exclude food and energy prices, remains in the 3% range after softening substantially in the first half of 2023. The Fed's target rate is 2%

Source: Tradingeconomics.com, US Bureau of Labor Statistics, CME Fedwatch Tool – Taken 1/30/24

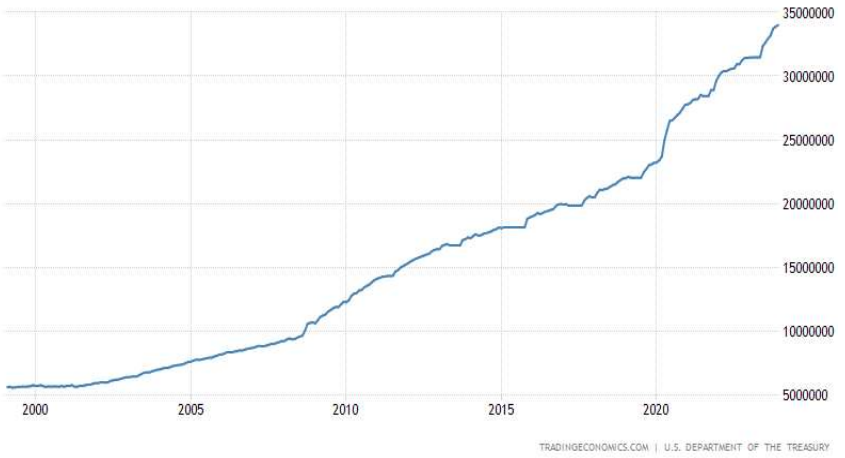
Current Monetary Policy

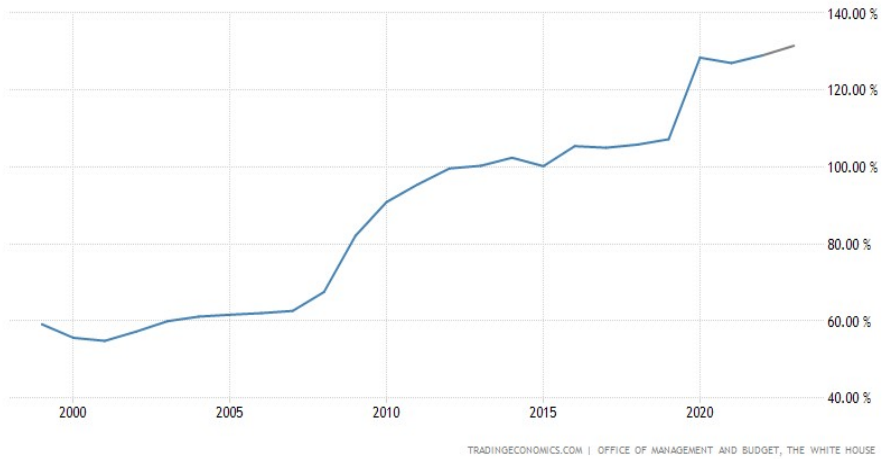


Source: St. Louis Federal Reserve FRED, CME FedWatch Tool – 2/4/24

- After increasing their key interest rate (Federal Funds rate) to combat rising inflation, the Fed anticipates that they will be able to cut this rate multiple times in 2024.
- The median projection based on the Fed Governors' "Dot Plot" is a Federal Funds rate of 4.5% in 2024 and 3.75% in 2025.

Current Fiscal Policy





- US Government Debt is approaching $35 Trillion (top), and the US Debt/GDP ratio has eclipsed 120% (bottom), increasingly sharply as expenditures increased in response to the COVID-19 Pandemic.
- Escalating geopolitical tensions around the world may lead to increased military and foreign aid expenditures, putting upward pressure on US Treasury bond yields and affecting the wider domestic economy.

Source: https://tradingeconomics.com/united-states/government-debt-to-gdp - Taken 2/4/24

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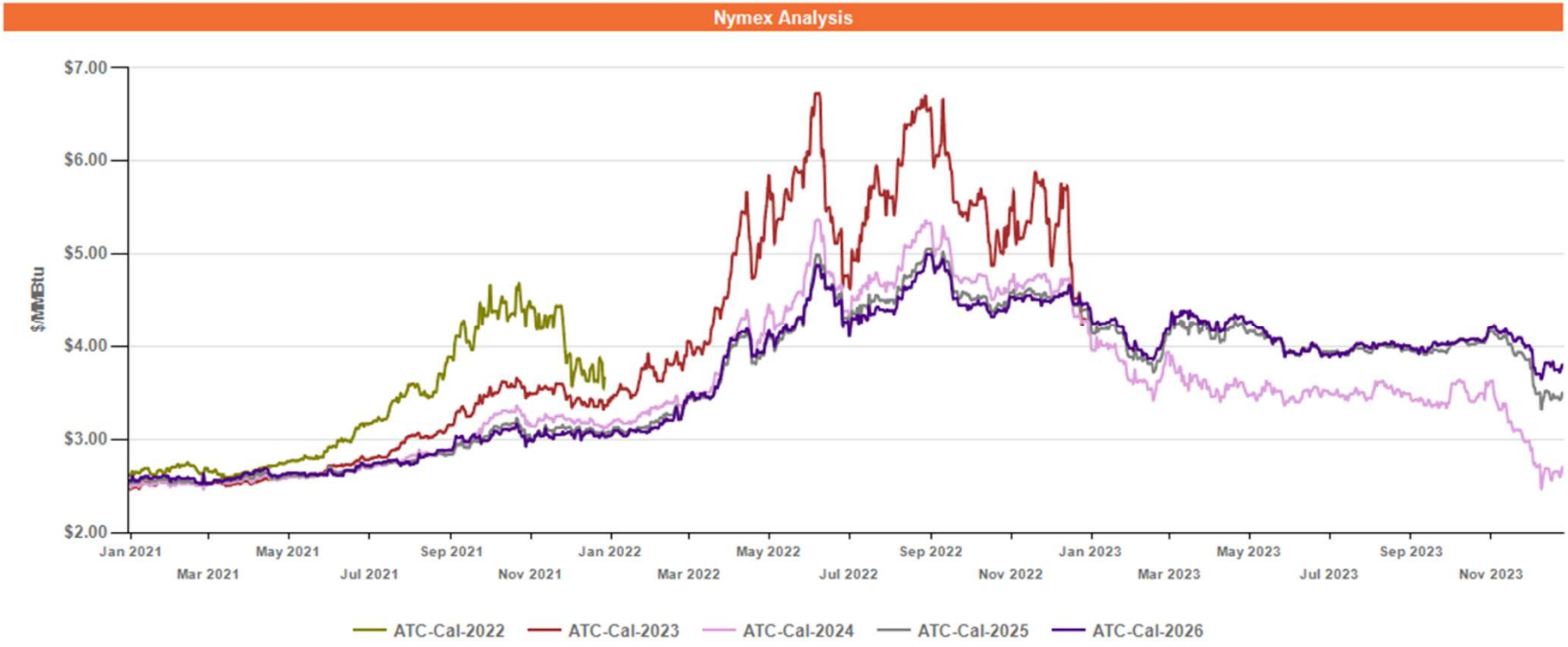
Section 4:

Analyzing Energy Futures & LMP Trends

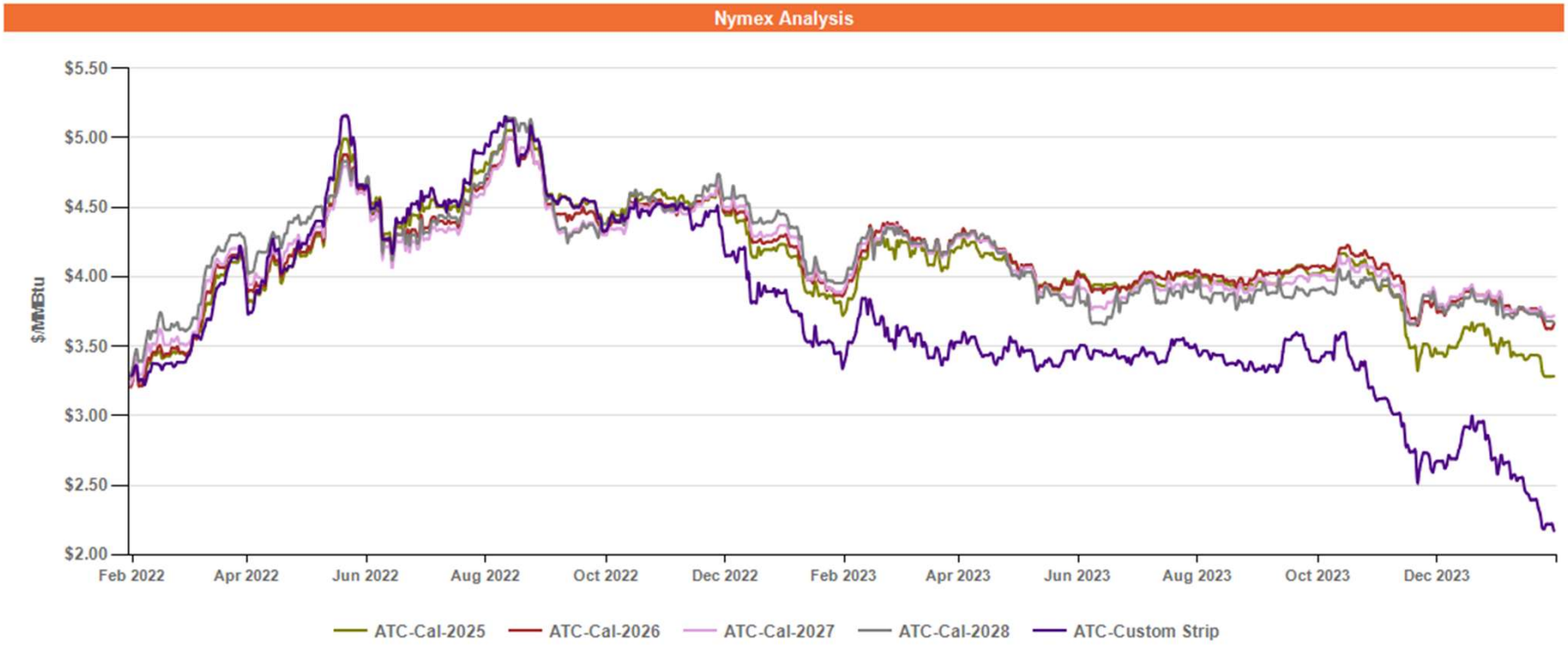
NYMEX Gas Forwards



- The graph above shows NYMEX forward gas prices from 1/4/21 through 12/29/23, taken on 12/29/23, for calendar years 2022-2026

Source: Forward Gas & Power Curves provided courtesy of Direct Energy

NYMEX Gas Forwards



- The graph above shows NYMEX forward gas prices as of 2/21/24 for the balance of 2024, March through December (labeled as “custom strip”), as well as calendar years 2025-2028.

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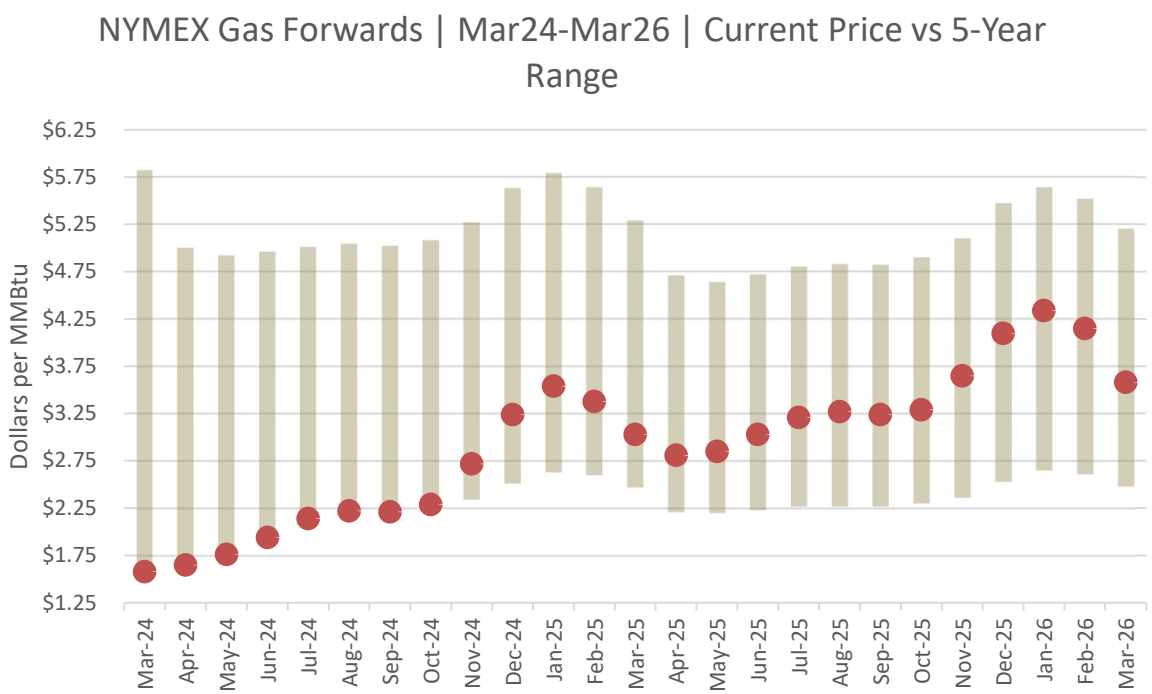


	Maximum Price ($/MMBtu)	*Current Price ($/MMBtu)*	*Minimum Price ($/MMBtu)*
Mar-24	$5.82	$1.58	$1.58
Apr-24	$5.00	$1.65	$1.65
May-24	$4.92	$1.76	$1.76
Jun-24	$4.96	$1.94	$1.94
Jul-24	$5.01	$2.14	$2.14
Aug-24	$5.04	$2.22	$2.22
Sep-24	$5.02	$2.21	$2.21
Oct-24	$5.08	$2.29	$2.28
Nov-24	$5.27	$2.72	$2.34
Dec-24	$5.63	$3.24	$2.51
Jan-25	$5.79	$3.54	$2.63
Feb-25	$5.64	$3.38	$2.60
Mar-25	$5.29	$3.03	$2.47
Apr-25	$4.71	$2.81	$2.21
May-25	$4.64	$2.85	$2.20
Jun-25	$4.72	$3.03	$2.23
Jul-25	$4.80	$3.21	$2.27
Aug-25	$4.83	$3.27	$2.27
Sep-25	$4.82	$3.24	$2.27
Oct-25	$4.90	$3.29	$2.30
Nov-25	$5.10	$3.65	$2.36
Dec-25	$5.47	$4.10	$2.53
Jan-26	$5.64	$4.34	$2.65
Feb-26	$5.52	$4.15	$2.61
Mar-26	$5.20	$3.58	$2.48

Source: Forward Power prices provided courtesy of Direct Energy – Taken 2/20/24

NYMEX Mar-24 Contract Trading History

Source: tradingview.com – Taken 2/21/24

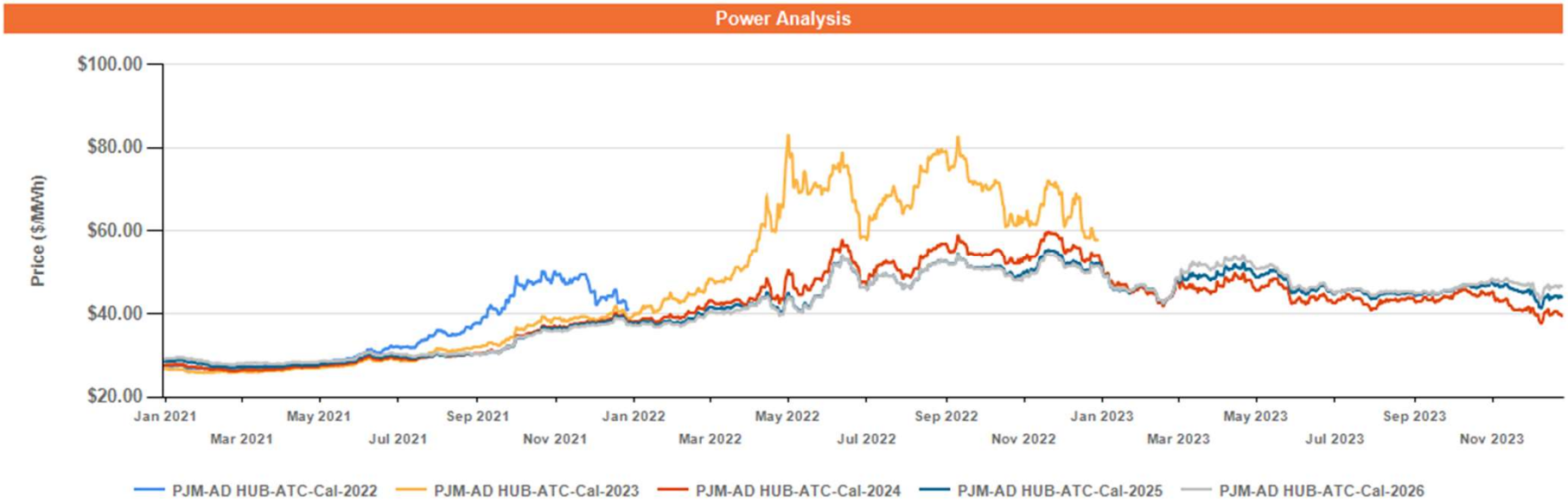
Power Generation Markets

- Electricity is a unique commodity in that it cannot be cost-effectively stored in large quantities, and therefore must be produced and consumed simultaneously.
- Power is traded mainly in two markets: forward markets and hourly spot/index markets.
- Suppliers offer various products to remove yourself from the variability of the spot market, access the potentially lower costs of the spot market, or a combination of both.

FE SSO Auction Results

Auction Date	Term in Months	Weight	6/1/2016 to 5/31/2017	6/1/2017 to 5/31/2018	6/1/2018 to 5/31/2019	6/1/2019 to 5/31/2020	6/1/2020 to 5/31/2021	6/1/2021 to 5/31/2022	6/1/2022 to 5/31/2023	6/1/2023 to 5/31/2024	6/1/2024 to 5/31/2025	6/1/2025 to 5/31/2026
1/29/18	24	16%			$0.04931	$0.04931	N/A					
1/29/18	36	17%			$0.04935	$0.04935	$0.04935					
10/22/18	12	17%				$0.04712	N/A					
1/28/19	12	17%				$0.04792	N/A					
10/7/19	12	16%					$0.04166					
10/7/19	24	25%					$0.04539	$0.04539				
1/28/20	12	17%					$0.03865					
1/28/20	24	25%					$0.04295	$0.04295				
10/5/20	12	25%						$0.04847				
1/26/21	12	25%						$0.04680				
8/23/21	12	33%							$0.04210			
10/6/21	12	33%							$0.05021			
3/7/22	24	33%							$0.06811			
10/4/22	12	33%								0.1223		
1/10/23	12	33%								0.0977		
3/20/23	12	34%								0.08375		
2/19/24	12	50%										
3/19/24												
Weighted average price			**$0.05005**	**$0.05062**	**$0.04915**	**$0.04798**	**$0.04406**	**$0.04590**	**$0.05347**	**$0.101250**		
				1.1%	-2.9%	-2.4%	-8.2%	4.2%	16.5%	89.3%		
% of Supply			100%	100%	100%	100%	117.0%	100.0%	100%	100%		

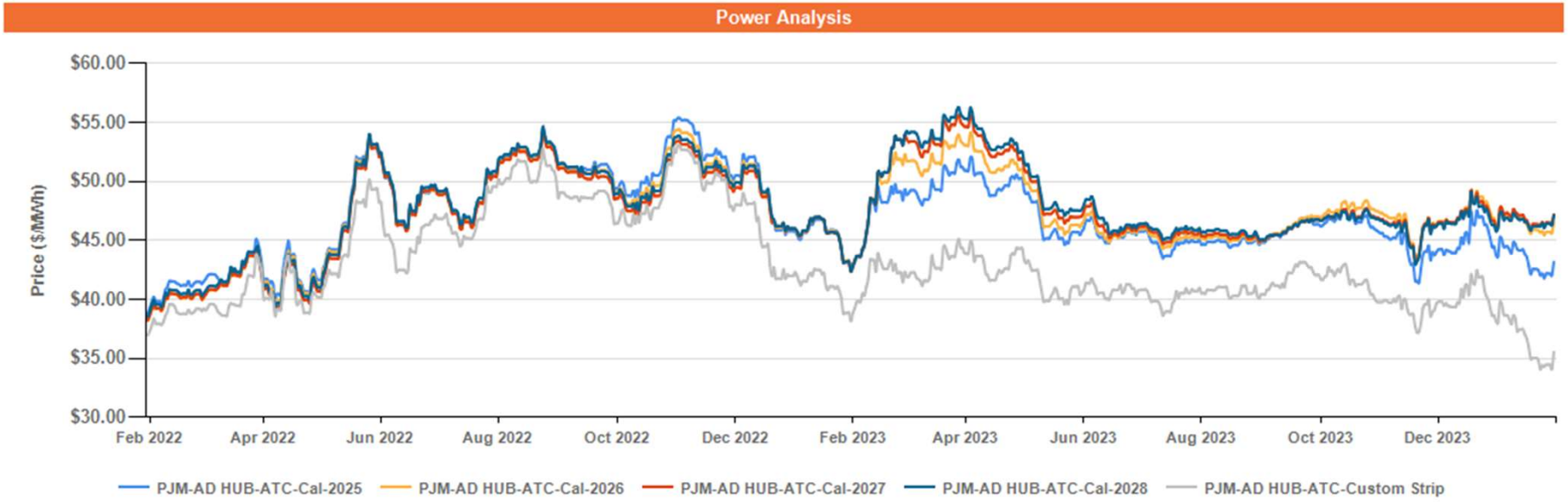
AD Hub Power Forwards



- The chart above shows AD Hub forward ATC power futures from 1/4/21 to 12/29/24, taken 12/29/24, for calendar years 2022-2026

Source: Forward Gas & Power Curves provided courtesy of Direct Energy

AD Hub Power Forwards



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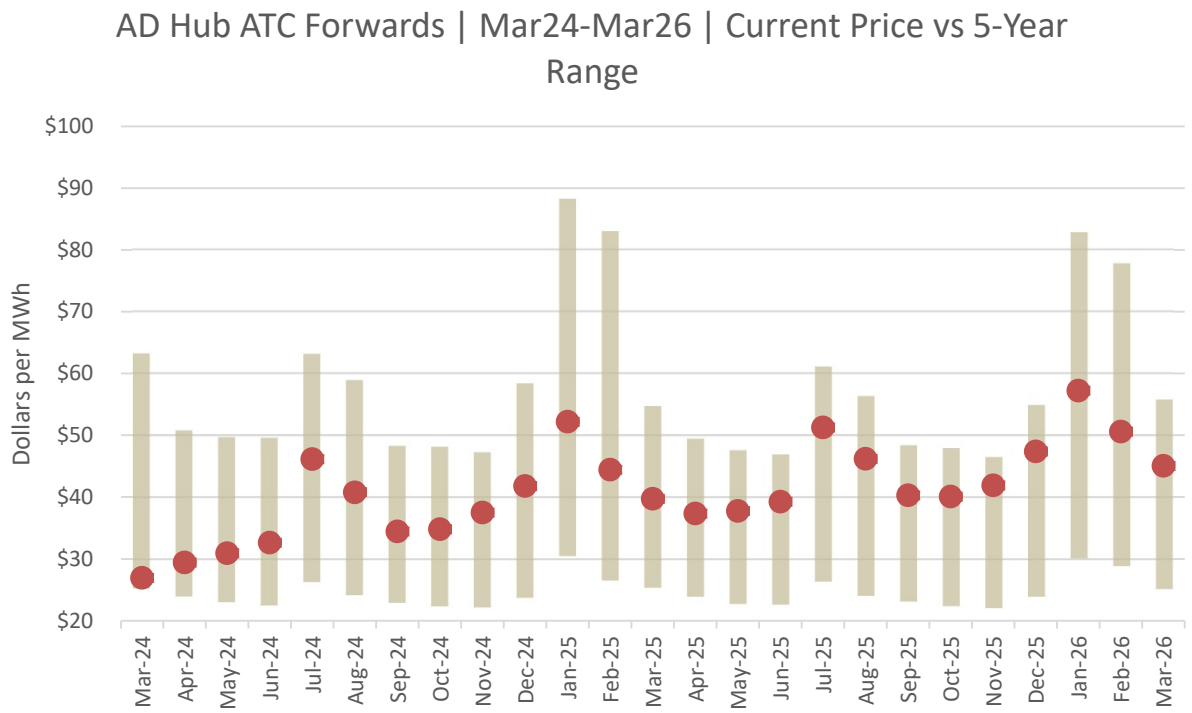
AD Hub Power Forwards



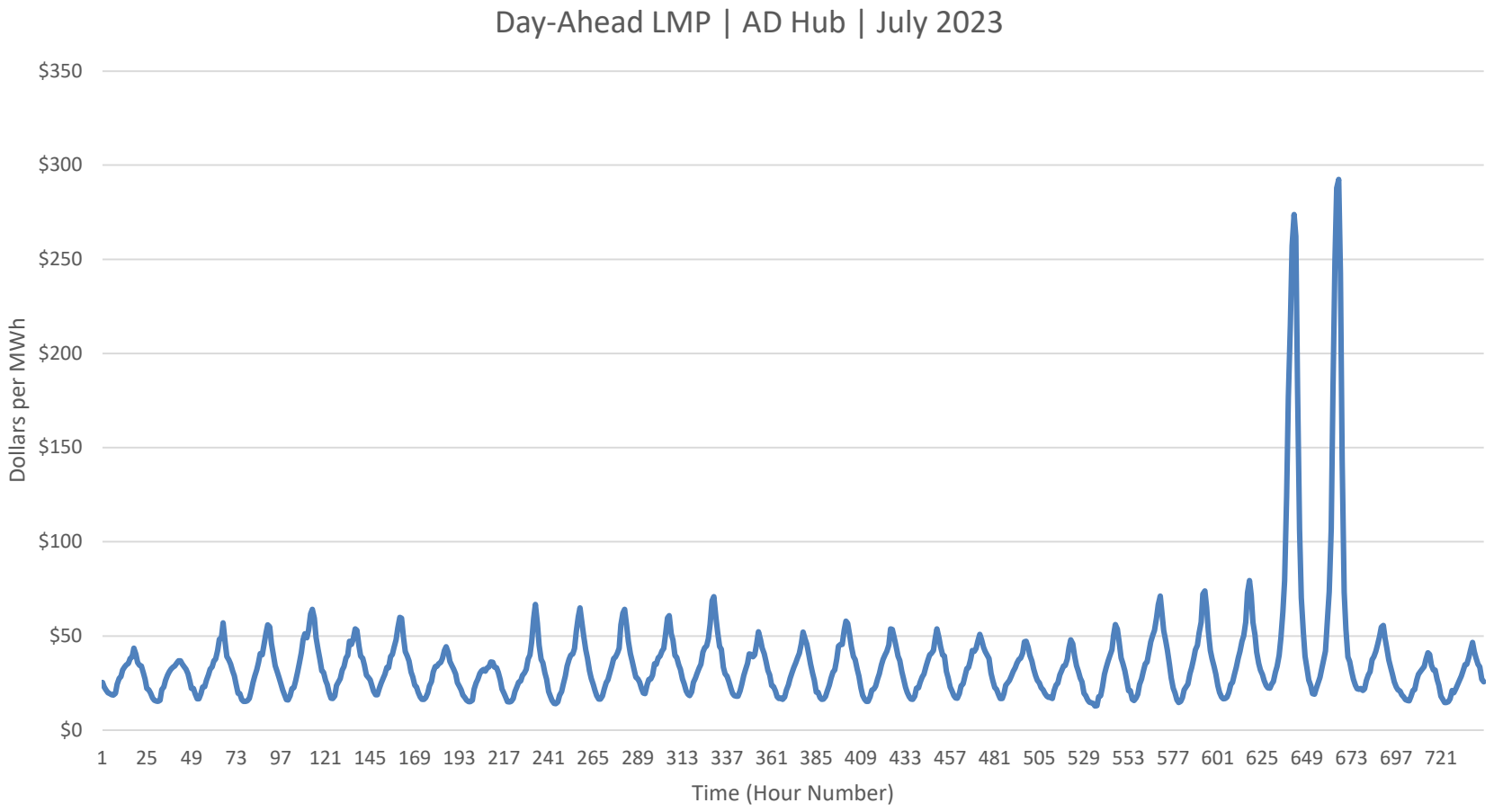
	Maximum Price ($/MWh)	*Current Price ($/MWh)*	*Minimum Price ($/MWh)*
Mar-24	$63.22	$26.94	$25.26
Apr-24	$50.81	$29.44	$23.99
May-24	$49.68	$30.93	$23.05
Jun-24	$49.58	$32.62	$22.52
Jul-24	$63.19	$46.13	$26.29
Aug-24	$58.92	$40.77	$24.18
Sep-24	$48.30	$34.43	$22.94
Oct-24	$48.13	$34.84	$22.36
Nov-24	$47.27	$37.52	$22.19
Dec-24	$58.38	$41.83	$23.75
Jan-25	$88.25	$52.19	$30.48
Feb-25	$82.94	$44.45	$26.54
Mar-25	$54.73	$39.73	$25.35
Apr-25	$49.43	$37.36	$23.94
May-25	$47.60	$37.77	$22.78
Jun-25	$46.90	$39.25	$22.70
Jul-25	$61.10	$51.28	$26.36
Aug-25	$56.34	$46.22	$24.06
Sep-25	$48.40	$40.33	$23.16
Oct-25	$47.96	$40.10	$22.40
Nov-25	$46.49	$41.89	$22.10
Dec-25	$54.89	$47.39	$23.93
Jan-26	$82.80	$57.24	$30.13
Feb-26	$77.76	$50.62	$28.89
Mar-26	$55.78	$45.05	$25.15

Source: Forward Power prices provided courtesy of Direct Energy – Taken 2/20/24

Day Ahead LMP Trends (DA-LMP)

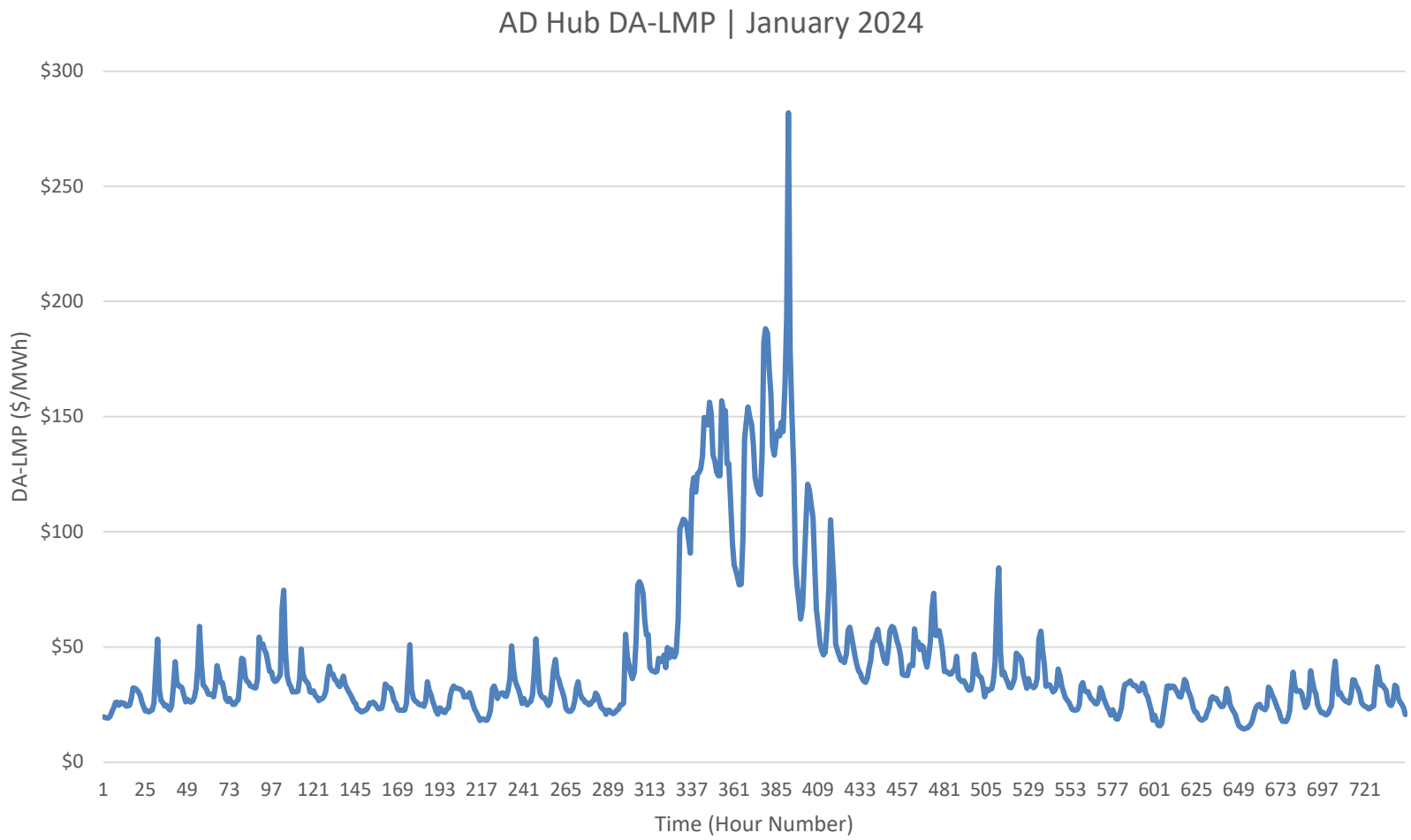
- Day Ahead Locational Marginal Prices (DA-LMP), or the index/spot market price, follow two distinct daily trends that are very highly correlated with forecasted demand on the grid.
- In Summer, a general sine wave is observed, with a clear peak in the late afternoon around Hour Ending (HE) 17:00 (i.e., 5:00pm), and a clear trough overnight.
- In Winter, a “double-peak” is observed, with peaks typically at HE 08:00 and HE 18:00.
- Spot prices can spike to multiples of the prevailing average when greater than average demand is forecasted on the grid.

DA-LMP | Summer



Source: PJM Data Miner – Taken 2/5/24

DA-LMP | Winter



Source: PJM Data Miner – Taken 2/5/24

AD Hub Forward Prices vs LMP Prices

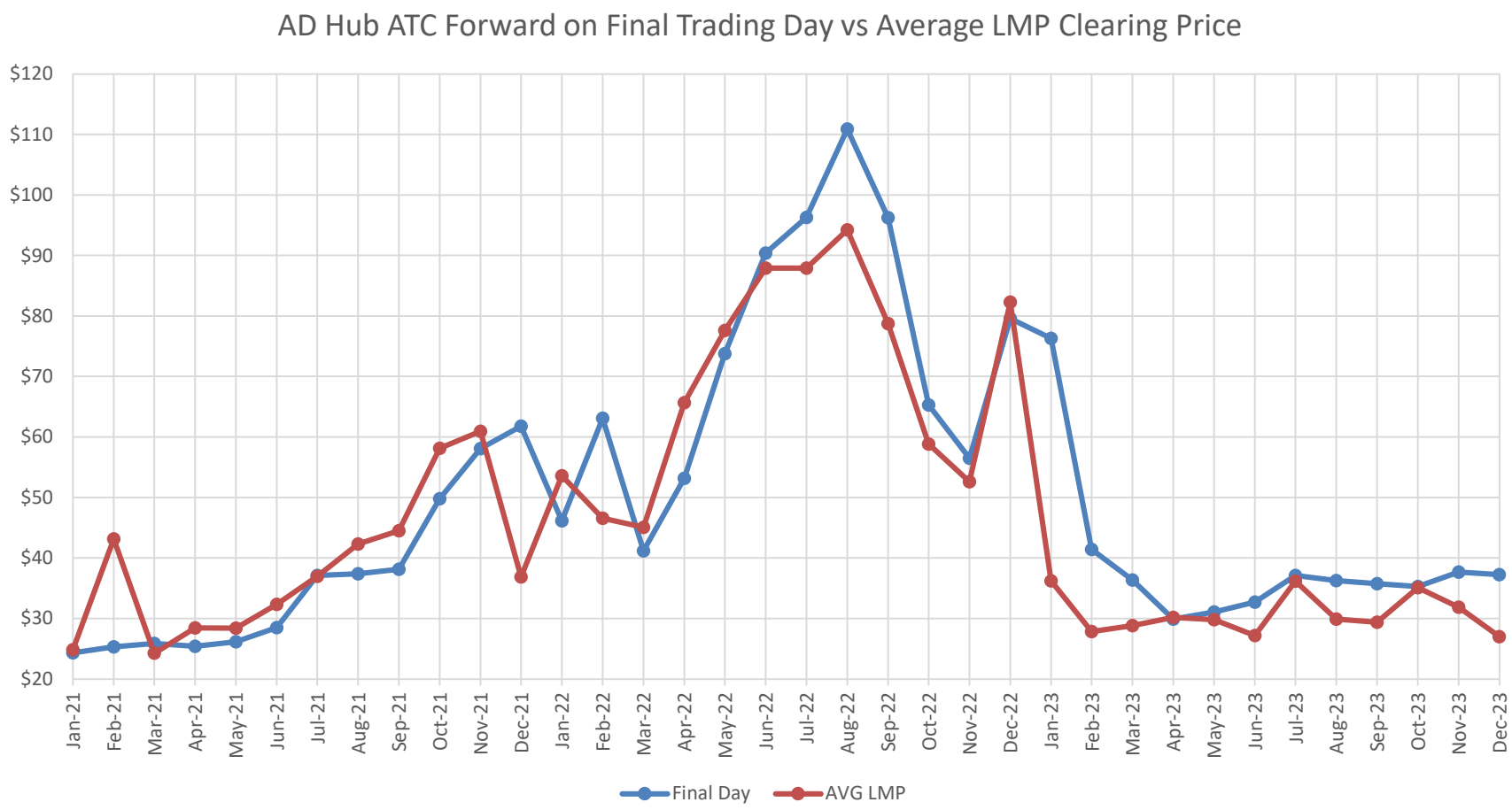
- The average monthly LMP from January 2021 through December 2023 cleared below the ATC forward price on the final trading day 58.33% of the time.

- The average monthly LMP from Jan21-Dec23 cleared at least $5/MWh or 0.5¢/kWh below the ATC forward price on the final trading day 38.89% of the time.

- The average monthly LMP from Jan21-Dec23 cleared at least $5/MWh or 0.5¢/kWh above the ATC forward price on the final trading day 13.89% of the time.

Source: PJM Data Miner – Taken 2/5/24

AD Hub Forward Prices vs LMP Prices



Source: PJM Data Miner – Taken 2/5/24

BRAKEY ENERGY
OHIO'S ENERGY EXPERTS

Section 5:

Managing Energy Costs & Risk

Why Pass-Through Capacity?

- Base Residual Auctions (BRAs) have been repeatedly delayed in recent years, making future capacity rates a relative unknown, although the trend has largely been down since 2018/2019.

- When fixing the cost of capacity, suppliers must estimate what future capacity rates will be. There could be contractual stipulations that allow for changes in the contracted rate if these estimates turn out to be incorrect.

- Electing to pass-through capacity charges at cost eliminates this risk and allows for the customer to manage their capacity costs by shifting their load during Capacity Coincident Peaks on the PJM RTO grid.

Traditional Fixed Rate

- 100% of your load is supplied at the fixed rate for the duration of the term. Retail rates offered by suppliers are derived from your load profile and forward power prices.
- Carries the most supplier risk premium; based on your load profile, the retail rate offered can be as much as 0.5¢ per kWh over equivalent wholesale ATC forward prices.
- Best fits customers who desire fixed costs or have inflexible load profiles.
- Customers who are able to shift their load to use power when demand on the grid is lower, or who have a higher risk tolerance, could benefit from products with spot market exposure.

Layered Load-Following Products

- Ability to fix up to 100% of your load in one or several tranches; load that is not fixed is subject to spot market pricing.
- Carries less supplier risk premium than 100% fixed products compared to equivalent wholesale forward prices. All power consumed is subject to an adder rate per kWh, unlike 100% fixed products.
- Can be a good fit for customers with flexible and inflexible load profiles; you can choose to fix 100% of your load or to “float” a portion of your load at spot prices.
- Ability to layer-in tranches can allow for more flexibility to take opportunities as they present themselves in the forward market, while the ability to float part of your load allows you to take advantage of times when spot pricing is favorable.

Block-and-Index (B&I)

- Subjects you to 100% spot market pricing but grants you the right, not the obligation, to execute fixed “blocks” of power to act as a hedge against spot market volatility.
- Unlike load-following products, these blocks of power are not a fixed portion of your load, but rather fixed blocks of power (e.g., 1 MW ATC, or 0.5 MW for On-Peak hours only).
- Fixed block pricing is derived from the forward power market and carries the least supplier premium.
- All power consumed is subject to an adder rate per kWh, however, this is typically a lower rate than a load-following product.
- Customers with large or flexible loads can benefit the most from this product.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Biographical Information

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Matt Brakey is an Ohio energy professional who directs all services Brakey Energy provides to clients and leads the company's operations. He is an expert on Ohio energy rates and markets, securing and negotiating third-party commercial and industrial energy contracts, and navigating Ohio's energy regulatory environment. Matt joined Brakey Energy in 2004 and become President in 2010.

In addition to his client responsibilities, Matt has been retained as an expert witness in high-profile energy litigation. One such case, Schwebel Baking Company, et al. v. FirstEnergy Solutions Corp, reached a $12 million settlement. This class action lawsuit resulted from surcharges assessed to commercial and industrial customer electric bills relating to the 2014 polar vortex. Matt was the sole subject matter expert for plaintiffs.

Under Matt's leadership, Brakey Energy was honored with the prestigious Weatherhead 100 Upstart award in 2015, 2017, and 2019, which is given to companies that achieve outsized five-year growth. In addition, Matt is a past Crain's Cleveland Business Forty under 40 award winner for his professional success and civic contributions.

Matt served two terms as Chairman of the Ohio Energy Leadership Council (OELC), where he helped the organization in its pursuit of reliable energy at reasonable prices for Ohio businesses. He is currently the Secretary Treasurer of the organization. Brakey Energy is also retained by OELC for its energy expertise.

Matt is a frequent speaker, seminar presenter, and published author on Ohio energy issues. He has been featured and cited in many publications, including the New York Times, Forbes, the Cleveland Plain Dealer, the Columbus Dispatch, Crain's Cleveland Business, the Dayton Daily Journal, and the National Journal.

Matt holds a J.D. from the Cleveland-Marshall College of Law, where he graduated cum laude, and a B.A. from Miami University.

Matt lives in Russell Township, Ohio with Carolyn, his wife, and their seven-year-old twins. In his spare time, Matt enjoys being involved with his church, running road races with his son, and coaching the Unicorn Sprinkles, his daughter's basketball team.

Biographical Information

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Brandon Powers coordinates the electricity and natural gas quote solicitation process for Brakey Energy clients, ensuring they contract for the best product for their organization's unique needs in a timely manner. In addition, Brandon evaluates demand response opportunities and initiatives for clients. He collaborates with Matt Brakey on developments in the energy markets, and also oversees the Coincident Peak Alerts and Watch systems for participating clients. Brandon holds a B.A. in Economics from The Ohio State University and has a background in banking, financial markets, and derivatives. Before joining Brakey Energy, he worked in banking, focusing on mortgages and consumer loans.

Brandon is a car enthusiast and enjoys spending his free time at car meets, playing bass guitar, bowling, learning foreign languages, and rooting on THE Ohio State Buckeyes.