Energy Market Insights

December 2023

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New England

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ISO-NE's Inventoried Energy Program

2023/2024 marks the first winter for the inventoried energy program

- The program will be in place for two winter periods, 2023/24 and 2024/25. It is designed to compensate gas-fired generators in ISO-NE for securing sufficient fuel supplies to meet electricity demand during the winter months of December to February. The grid operator hopes the incentives will minimize supply-related disruptions over the next two winters, as well as reduce generator retirement risks.
- In November, ISO New England posted the amount of participating megawatt hours in the Inventoried Energy Program (IEP) for Winter 2023/24 and associated payment rates, providing an early glimpse into program's estimated retail costs for the Dec 2023 – Feb 2024 period.
- The ISO purchased 844,201 MWh of forward inventoried energy at a forward payment rate of $92.51/MWh. Based on those numbers, this would result in program costs of $78.1 million for Dec 2023 – Jan 2024. Dividing program costs by forecasted ISO-NE load of 32.6 million MWh for the Winter 23/24 period yields an estimated retail charge to New England electricity customers of $2.39/MWh (or $0.00239/kWh).
- Both the number of MWhs and the payment rate came in substantially lower than published caps, which were 1.4 million MWh and $288/MWh, respectively. Under unusual circumstances, this could have resulted in retail costs closer to $12.2/MWh.

	Inventoried Energy Program					
Winter Period (Dec-Feb)	Rate ($/MWh)	IEP Generation (MWh)	Est. Total Program Costs ($)	Dec-Feb ISONE Forecasted Load (MWh)*	Est. Retail Cost ($/MWh)	Est. Retail Cost ($/kWh)
2023/2024	$95.51	844,201	$78,097,035	32,619,000	**$2.39**	**$0.0239**
2024/2025	TBD *(Max $288)*	TBD *(Max 1,400,000)*	TBD	33,298,000	TBD	TBD

*Source: ISONE, *ISONE 2023 CELT Report, Enel X*

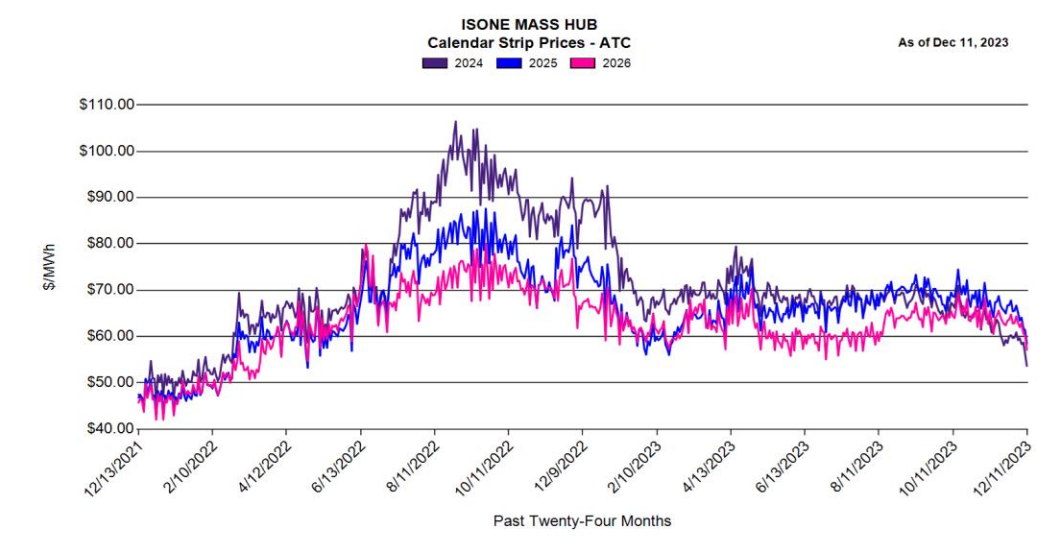
KEY TAKEAWAY: New England electricity customers with supply contracts that pass through IEP costs can expect those charges to appear on invoices from Dec-23 to Feb-24 and from Dec-24 to Feb-25. Preliminarily, IEP charges for 2023/24 winter are expected in the ballpark of $2.39/MWh.

New England power prices

Mass Hub CY2024 forwards down 42% YTD

Where are forwards trending?

- Mass Hub power forwards for CY2024 were last seen trading at $53.69/MWh, which is 16% lower than a month ago and 42% lower since the start of 2023
- CY2025 and CY2026 strip prices are trading at similar levels; last seen trading at $58.59/MWh and $57.4/MWh, respectively.
- Calendar year strips for 2024 through 2026 are trading below or near 22-months



Where are index prices trending?

- Day ahead MassHub LMPs averaged $39.64/MWh in November, an increase of 50% month-over-month in line with seasonal trends
- Seasonal trends aside, November marked the 11th consecutive calendar month that LMPs fell year-over-year, with prices declining 36% in November compared to the same period a year ago.

Average Monthly Day Ahead LMP - MaHub

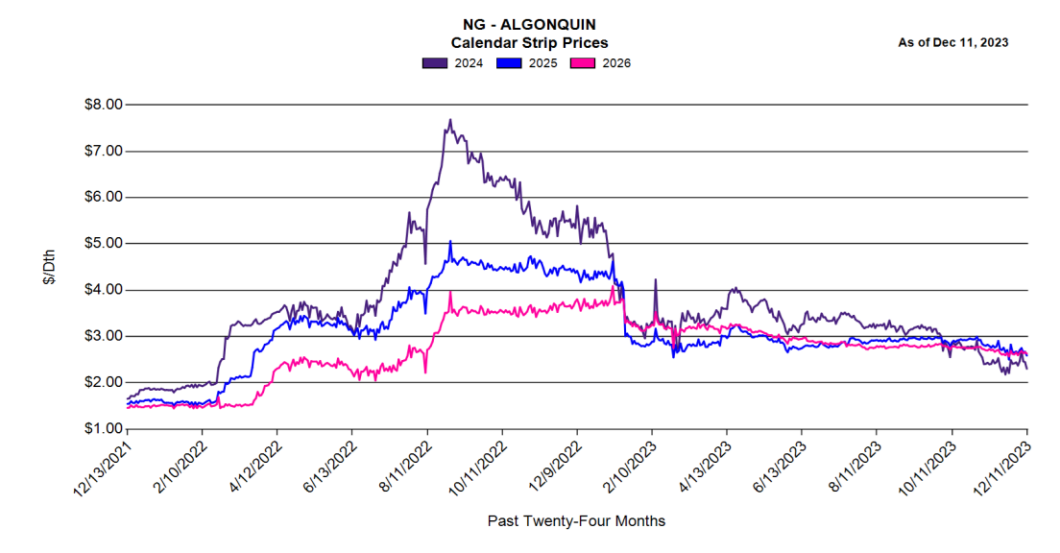
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$168.81	$71.14	$38.60	$40.30	$108.75	$56.76	$26.45	$42.73	$149.46	$49.14
Feb	$156.02	$122.77	$29.90	$30.02	$39.58	$35.62	$23.06	$73.12	$117.08	$69.35
Mar	$111.16	$64.25	$20.63	$35.75	$35.38	$38.07	$17.18	$34.88	$66.18	$35.02
Apr	$44.98	$28.43	$28.36	$29.23	$45.00	$26.97	$18.36	$26.14	$62.37	$28.79
May	$36.95	$24.92	$21.24	$27.31	$24.04	$24.21	$16.48	$24.98	$76.71	$25.03
Jun	$37.92	$21.16	$22.61	$25.48	$26.82	$22.09	$19.84	$37.10	$68.43	$33.52
Jul	$37.50	$26.44	$31.12	$27.60	$32.89	$29.78	$23.78	$37.16	$89.85	$42.34
Aug	$30.35	$30.06	$35.54	$24.90	$39.16	$25.69	$23.79	$49.47	$99.55	$26.94
Sep	$34.10	$30.82	$28.62	$23.57	$33.89	$21.14	$20.46	$48.01	$67.23	$30.28
Oct	$32.19	$37.01	$21.98	$29.74	$38.46	$20.75	$24.78	$57.71	$52.97	$26.33
Nov	$47.71	$29.42	$24.98	$33.98	$57.43	$32.29	$25.12	$56.69	$61.72	$39.64
Dec	$43.00	$22.42	$53.28	$71.31	$47.31	$40.98	$40.15	$65.14	$115.50	
Avg.	$65.06	$42.40	$29.74	$33.27	$44.06	$31.20	$23.29	$46.09	$85.59	$36.94

New England gas prices

Algonquin Basis CY2024 forwards down 58% YTD

Where are forwards trending?

- Algonquin Basis Only forward prices for CY2024 stabilized in the first two weeks of December, and were last seen trading at $2.30/Dth, a modest 10 cents higher than late-Nov 2023 lows
- CY2024 forwards have dropped 58% since the beginning of 2023, while CY2025 and CY2026 forwards are down 40% and 30%, respectively over the same period
- CY2025-26 trade at a modest 30 cent premium compared to 2024



Where are index prices trending?

- Daily prices at Algonquin City-Gates (including Henry Hub) averaged $3.46/Dth in November, up 144% month-over-month
- Similar to regional power prices, Algonquin City-Gates gas remains weak compared to a year ago, with monthly average prices falling year-over-year for the eleventh consecutive month
- Year-to-date, spot prices have settled 66% lower than a year ago

Average of Daily Prices - Algonquin, City-Gates Full Price w/ HH

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$24.69	$9.34	$4.54	$5.09	$15.62	$6.95	$2.83	$4.92	$20.00	$4.72
Feb	$21.05	$17.50	$3.46	$3.73	$4.40	$4.20	$2.27	$8.37	$14.56	$8.01
Mar	$15.19	$7.99	$1.87	$4.52	$3.97	$4.04	$1.58	$3.40	$6.54	$2.94
Apr	$4.80	$3.16	$2.93	$3.11	$4.98	$2.56	$1.63	$2.33	$6.49	$1.90
May	$3.85	$1.87	$2.12	$3.08	$6.78	$2.32	$1.39	$2.31	$7.79	$1.58
Jun	$4.05	$1.69	$2.28	$2.45	$2.62	$2.12	$1.52	$2.84	$7.26	$2.60
Jul	$3.10	$1.99	$2.75	$2.50	$2.83	$2.28	$1.63	$3.22	$7.53	$2.77
Aug	$2.71	$2.34	$3.11	$2.36	$3.17	$2.02	$1.49	$3.93	$8.37	$1.42
Sep	$3.16	$2.80	$2.59	$1.90	$2.94	$1.95	$1.42	$4.44	$6.79	$1.59
Oct	$2.83	$3.69	$2.26	$2.78	$3.23	$1.66	$2.00	$4.78	$4.96	$1.42
Nov	$6.18	$3.29	$2.54	$3.27	$6.08	$3.31	$1.95	$5.63	$5.71	$3.46
Dec	$6.01	$2.19	$6.74	$9.35	$5.77	$4.61	$4.24	$8.27	$13.96	
Avg	$8.07	$4.74	$3.10	$3.69	$5.22	$3.17	$2.00	$4.51	$9.15	$2.95

**This is a generic wholesale curve to New England. Pricing does not reflect locational adjustments, utility tariff designations or rate class adjustments specific to your facility. For more detailed pricing please contact your Enel representative.*

New York

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NYISO decides to retain peaker plants for reliability

Generators previously slated for early retirement will remain online

The 2019 “peaker rule,” put in place by the Department of Environmental Conservation, applies a much stricter set of emissions standards to generators classified as peaking units.

This legislation was seen as a major win for environmental goals, but introduced reliability concerns in future years. In the 4 years since it’s enactment, over 1,000 MW of peaking capacity has retired, essentially narrowing the capacity margin in instances of high demand. The initial estimate was that up to 3,300 MW of peaking capacity could be impacted by the rule. While that estimate has proven high to date, it will still definitively result in the retirement of another 590 MW, reducing NYC local capacity by 1,600 MW in only 4-5 years.

2025 is seen as the critical year, with NYISO estimating that the NYC area could see a deficit of 446 MW during the summer. Because of this, and due to the fact that no viable solution has been found, NYISO has triggered the reliability clause of the peaker rule, allowing 4 plants to remain online to prevent electricity shortage during increasingly hot, volatile summer months. As a result, 565 MW of gas capacity will continue operating until a better solution is identified.

Gowanus floating generating station. Source: RTO Insider

Peaking Unit: A generation unit that only produces electricity during times of extremely high demand. These plants are “called on” by the ISO and typically consist of older fossil fuel technology.

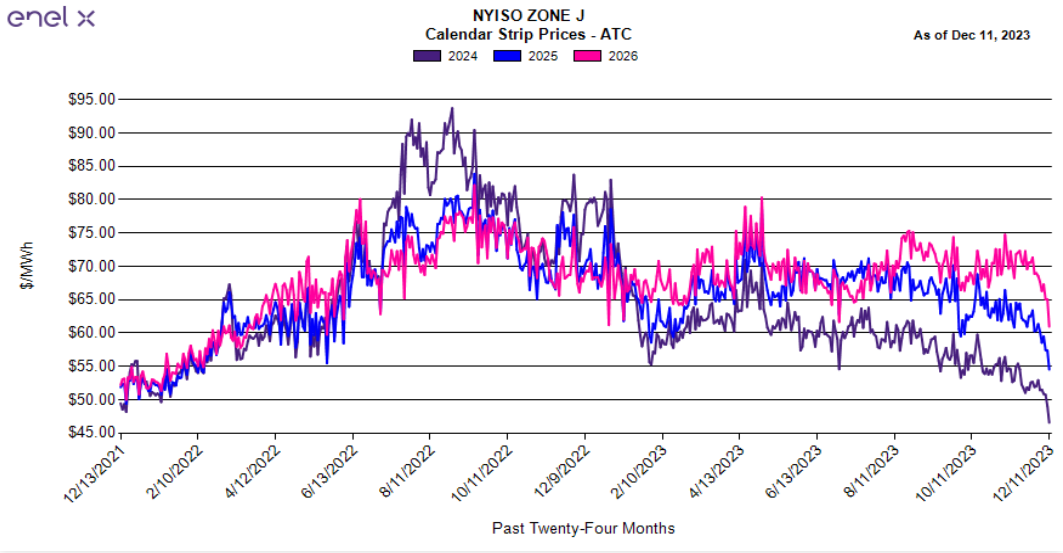
KEY TAKEAWAY: Reliability continues to be the main concern for our ever-evolving electricity grid as we move towards a fossil-fuel dominated fleet, to one that is renewable. The key is to find the right pace to limit the impact to reliability as well as consumer prices. This NYISO announcement caused electricity prices to decline as risk was reduced in 2025.

NYC power prices

Forward prices present advantageous buying opportunity

Where are forwards trending?

- 2025 and 2026 strips remain several dollars apart in anticipation of natural gas supply concerns in late 2025, but have seen prices come off sharply in the last week
- 2024 remains well below outer year strips, and took a sharp downturn as LNG facilities have announced delays



Where are index prices trending?

- November index prices traded higher than October due to planned generation outages causing supply constraints, as well as some colder periods during the month.
- December prices have remained close to November, but a mild late-December forecast could help temper any price spikes similar to what occurred in 2022.

Average Monthly Day Ahead LMP - NYISO Zone J

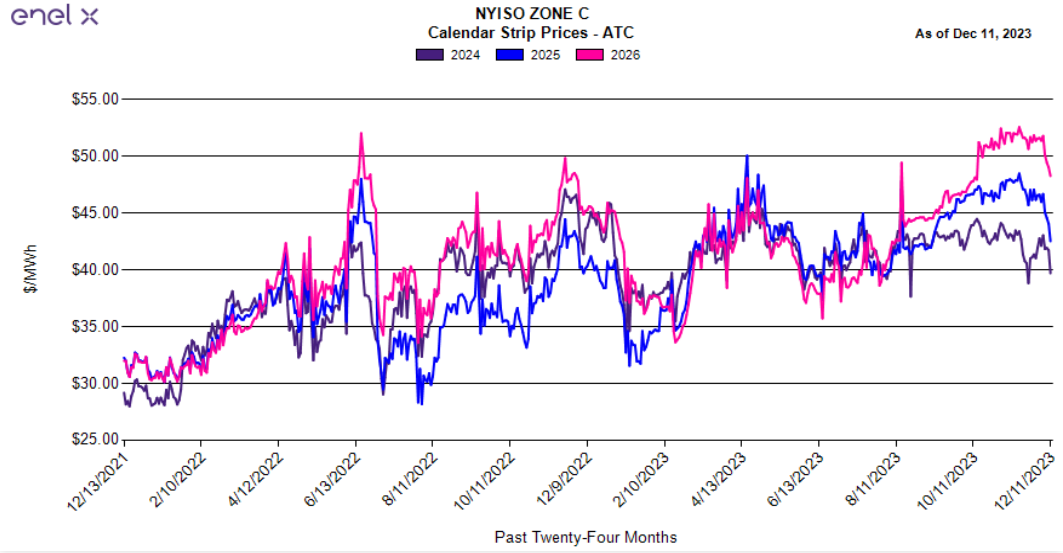
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$81.20	$175.92	$57.34	$35.04	$40.64	$96.58	$49.20	$25.12	$36.35	$138.44	$42.77
Feb	$90.67	$122.84	$112.33	$29.61	$30.55	$34.05	$33.07	$21.26	$64.78	$94.62	$51.84
Mar	$48.82	$102.52	$51.26	$20.75	$36.04	$31.98	$35.00	$16.81	$29.40	$59.23	$33.98
Apr	$43.94	$46.49	$27.53	$28.62	$32.27	$34.77	$28.82	$15.53	$24.55	$64.88	$30.30
May	$45.25	$37.31	$30.35	$23.45	$31.61	$26.96	$23.39	$14.95	$26.11	$78.58	$24.67
Jun	$43.65	$39.95	$24.95	$25.47	$30.17	$29.79	$23.41	$19.78	$34.84	$75.72	$27.98
Jul	$60.14	$39.79	$30.01	$35.43	$33.57	$36.94	$31.23	$25.50	$42.00	$93.59	$41.72
Aug	$40.12	$32.10	$31.10	$35.64	$28.66	$39.36	$26.59	$23.45	$46.90	$104.10	$27.98
Sep	$39.89	$32.91	$32.45	$27.01	$26.26	$35.52	$21.49	$19.33	$48.41	$79.96	$30.50
Oct	$37.55	$32.09	$27.68	$20.84	$27.88	$34.70	$19.86	$19.59	$54.47	$56.76	$28.43
Nov	$40.82	$41.29	$23.34	$25.62	$29.97	$38.60	$26.55	$22.04	$57.10	$57.92	$35.57
Dec	$61.14	$36.23	$20.24	$46.06	$49.54	$38.63	$28.53	$33.09	$47.29	$108.57	$37.35
Avg	$52.77	$61.62	$39.05	$29.46	$33.10	$39.82	$28.93	$21.37	$42.68	$84.36	$34.43

Upstate NY power prices

Forward prices cease upward march, fall due to the plummet of natural gas

Where are forwards trending?

- Upstate NY forward power prices are slightly less affected by natural gas, as there is an abundance of Nuclear and hydro generation driving prices.
- A step separation between 2024 vs 2025/26 emphasizes the upcoming shutdown of several gas generation plants throughout the state.



Where are index prices trending?

- November and MTD December prices have increased since the shoulder month low of $23.79 in October; the result of planned generation outages and increased heating load.
- December forecasts point to above average temperatures, likely preventing a cold-related price spike late in the month.

Average Monthly Day Ahead LMP - NYISO Zone C

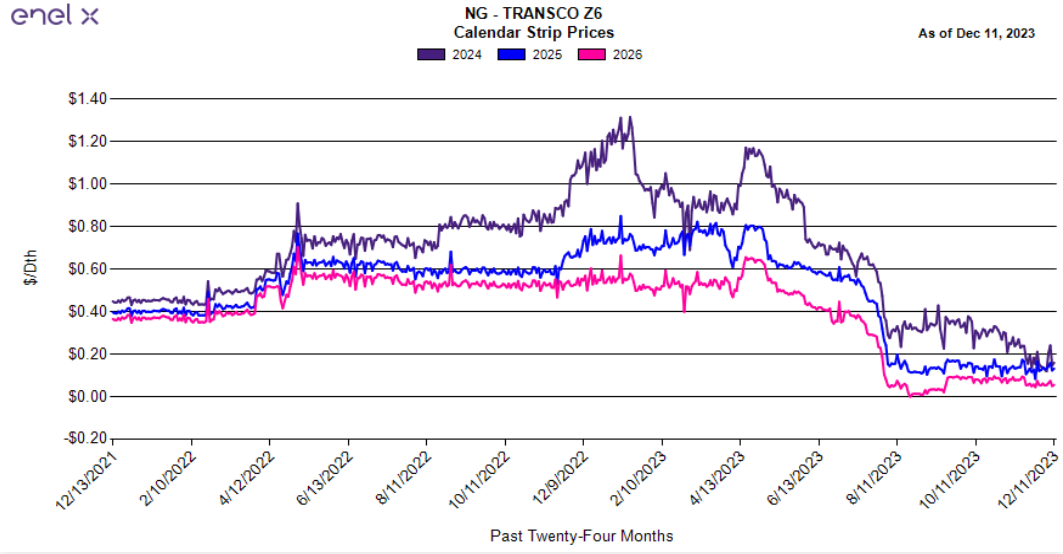
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$49.86	$121.65	$37.81	$21.50	$29.68	$62.19	$35.02	$16.57	$23.96	$96.30	$34.05
Feb	$42.80	$80.31	$75.58	$17.63	$24.98	$23.91	$25.74	$16.36	$38.58	$66.26	$35.62
Mar	$39.23	$85.79	$37.35	$12.58	$24.47	$22.14	$27.67	$13.99	$14.43	$35.21	$20.65
Apr	$37.20	$40.38	$22.80	$22.01	$20.86	$28.14	$21.82	$11.87	$10.15	$34.31	$20.82
May	$38.06	$32.23	$25.66	$16.11	$20.28	$22.94	$15.11	$13.08	$15.97	$32.52	$17.06
Jun	$34.09	$35.71	$20.24	$21.06	$20.86	$25.51	$15.67	$16.46	$28.27	$60.38	$24.74
Jul	$44.94	$34.52	$24.94	$29.31	$25.74	$31.54	$25.27	$22.18	$32.81	$73.04	$36.54
Aug	$32.75	$29.40	$25.43	$30.40	$22.71	$32.87	$22.40	$19.94	$40.97	$88.47	$24.51
Sep	$34.30	$28.79	$25.14	$22.75	$21.72	$29.40	$16.90	$16.36	$35.01	$63.13	$27.58
Oct	$33.65	$29.30	$24.02	$18.27	$20.67	$29.50	$16.49	$16.10	$43.23	$42.23	$23.79
Nov	$33.80	$34.18	$16.32	$21.58	$23.18	$31.86	$19.75	$13.45	$41.57	$25.56	$28.00
Dec	$46.29	$31.50	$13.65	$25.79	$33.62	$31.12	$19.76	$19.69	$34.51	$74.25	$33.37
Avg	$38.91	$48.65	$29.08	$21.58	$24.06	$30.93	$21.80	$16.34	$29.95	$57.64	$27.23

New York gas prices

Forward prices remain quiet; index prices see normal seasonal uptick

Where are forwards trending?

- Basis prices remain relatively unaffected despite the natural gas commodity free-fall seen in recent weeks.
- 2024 basis strip has converged on 2025 and 2026 strips, all trading between $.00- $.20/ dth



Where are index prices trending?

- Transco Zone 6 index prices are averaging extremely low as milder weather, combined with the cooldown of the market have limited volatility
- December is likely to remain slightly higher as the normal increase in heating demand provides upward pressure on regional gas prices.

Average of Daily Prices - Transco Zone 6 Full Price w/ HH											
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$10.00	$27.66	$7.24	$3.82	$3.82	$18.73	$6.02	$2.20	$3.13	$11.15	$3.19
Feb	$10.69	$11.27	$16.01	$3.09	$2.85	$3.21	$2.85	$1.87	$5.21	$6.17	$3.42
Mar	$4.20	$8.24	$3.67	$1.29	$3.44	$2.83	$2.91	$1.49	$2.24	$4.48	$2.25
Apr	$4.64	$4.13	$2.22	$1.57	$2.81	$2.79	$2.37	$1.51	$2.13	$6.11	$1.70
May	$4.18	$3.49	$2.60	$1.56	$2.80	$2.56	$2.28	$1.35	$2.36	$7.39	$1.43
Jun	$3.92	$3.22	$2.35	$1.83	$2.34	$2.78	$2.11	$1.43	$2.61	$6.91	$1.39
Jul	$3.98	$2.72	$1.98	$2.14	$2.44	$2.88	$2.17	$1.69	$3.32	$6.73	$1.64
Aug	$3.45	$2.38	$2.37	$2.03	$2.17	$3.00	$1.87	$1.47	$3.75	$8.13	$1.24
Sep	$3.71	$2.25	$2.09	$1.34	$2.29	$2.74	$1.75	$1.25	$4.27	$6.61	$1.41
Oct	$3.65	$2.09	$2.22	$1.12	$2.32	$2.89	$1.53	$1.22	$4.56	$4.70	$1.30
Nov	$3.83	$3.88	$1.77	$2.10	$2.91	$4.18	$2.62	$1.47	$4.92	$4.81	$2.19
Dec	$5.25	$3.25	$1.58	$4.37	$5.67	$4.12	$2.56	$2.78	$3.44	$11.64	$2.30
Avg	$5.13	$6.21	$3.84	$2.19	$2.99	$4.39	$2.59	$1.64	$3.49	$7.07	$1.95

Mid-Atlantic

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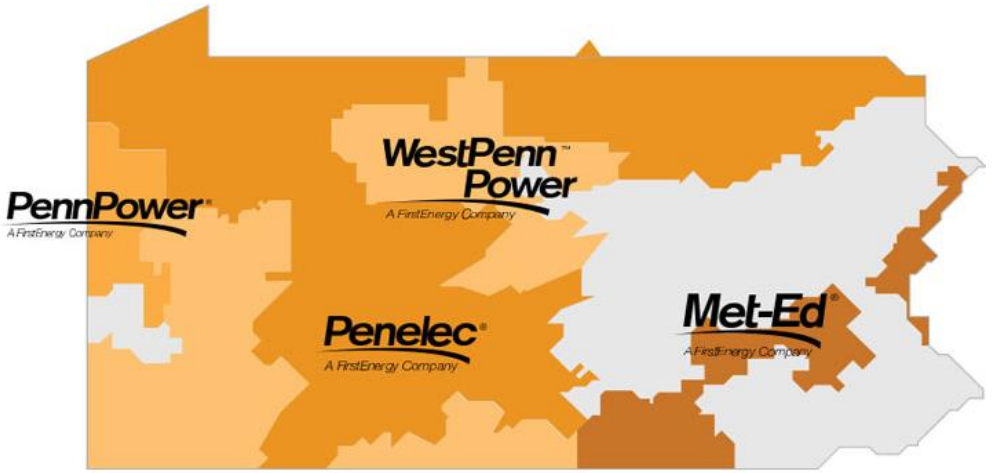
FirstEnergy to consolidate PA utilities

Move attempts to streamline and reduce utility costs in PA

- FirstEnergy acquired Penelec and Met-Ed in 2001, to add to their existing Pennsylvania utilities; Penn Power and West Penn. As part of an effort to centralize and streamline the company, which also includes utilities in Ohio, West Virginia, New Jersey and Maryland, they are opting to create a single entity in Pennsylvania, with the eventual goal of a single tariff and rate structure.
- Their initial March 6 filing was unanimously approved on December 7 and will become effective on January 1, 2024. All 4 utilities will become a new corporation; FirstEnergy Pennsylvania Electric Co. They will initially be operated similar to current methods, with separate rate schedules in regional utility "districts" until all rates can be aligned via the normal rate case process. This could take up to 10 years depending on upcoming individual rate case filings.
- Any savings that are realized as part of the consolidation will be calculated and returned to customers via the next rate case filing. Also, as part of the agreement, FirstEnergy will maintain all call centers and customer service standards for 5 years after the effective date, at which time they may attempt to consolidate operations.

Penelec
Met-Ed
Penn Power
West Penn

→ **FirstEnergy Pennsylvania Electric Co.**



Source: FirstEnergy.com

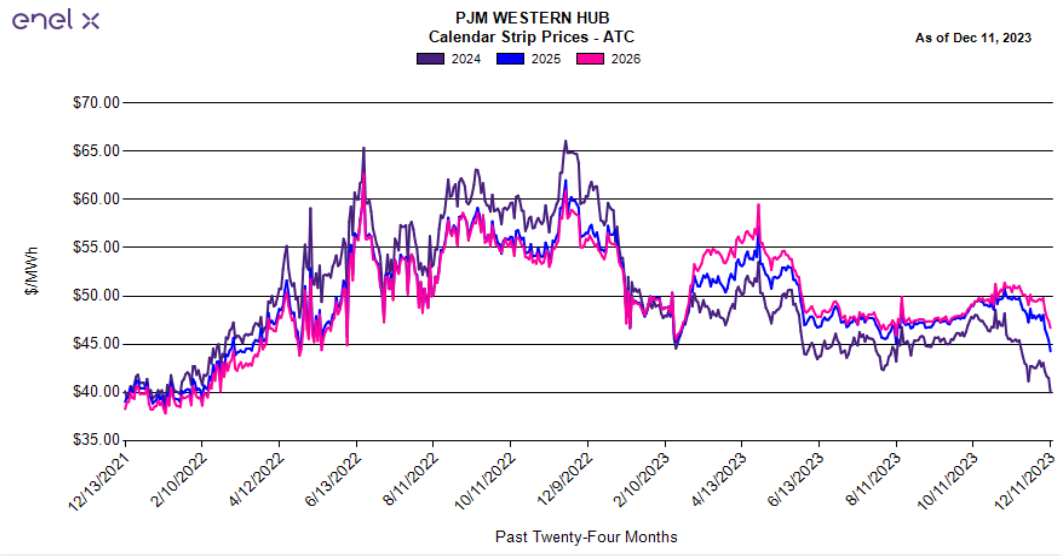
KEY TAKEAWAY: Customers in Pennsylvania regions indicated on the map will likely see notification of upcoming changes regardless if they are on utility or competitive supply. While major changes are not expected initially, cost efficiencies will be passed down to customers via future rate cases.

PJM power prices

Forward prices take a sharp turn downwards, following natural gas

Where are forwards trending?

- Power forward prices in PJM have seen an active early-December, with weather forecasts and natural gas production levels being the main factors behind a sharp decline.
- 2024 remains at a steep discount as major LNG export concerns drive natural gas prices, and electricity prices as a result.



Where are index prices trending?

- WestHub hourly prices see increases in October and November due to planned generation outages, but remain far below 2022 levels.
- December should finish out close to, or even lower than the current MTD average as a mild forecast points to low power price volatility.

Average Monthly Day Ahead LMP - West Hub

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$36.01	$132.05	$38.62	$30.99	$31.24	$72.91	$33.57	$22.03	$25.76	$68.75	$38.12
Feb	$36.23	$71.44	$75.79	$28.48	$26.51	$27.61	$27.28	$19.89	$42.32	$51.25	$32.01
Mar	$40.19	$69.56	$39.94	$25.49	$31.66	$33.69	$29.82	$18.63	$24.85	$46.31	$29.14
Apr	$39.76	$41.45	$32.99	$30.00	$29.41	$35.25	$25.76	$17.38	$26.95	$66.53	$30.59
May	$39.37	$42.04	$34.74	$24.30	$29.14	$35.50	$25.30	$17.38	$28.00	$79.21	$30.19
Jun	$37.27	$40.79	$31.57	$26.34	$26.16	$29.64	$22.61	$18.53	$30.86	$86.00	$27.60
Jul	$47.37	$37.23	$34.07	$32.38	$28.88	$32.27	$27.64	$25.42	$36.63	$91.06	$37.94
Aug	$34.66	$34.46	$30.45	$32.60	$27.08	$32.23	$24.30	$23.18	$43.54	$97.81	$30.05
Sep	$36.31	$35.63	$30.25	$30.76	$29.99	$32.71	$26.15	$19.56	$45.27	$82.19	$31.94
Oct	$35.83	$35.34	$31.46	$30.20	$29.34	$33.21	$25.02	$21.75	$59.23	$61.14	$37.17
Nov	$36.48	$39.43	$27.71	$26.81	$30.23	$37.34	$29.22	$21.32	$65.47	$54.66	$39.95
Dec	$41.20	$33.31	$25.42	$32.13	$36.70	$33.79	$23.63	$26.03	$38.81	$89.91	$36.16
Avg	$38.39	$51.06	$36.08	$29.21	$29.70	$36.34	$26.69	$20.92	$38.97	$72.90	$33.40

PJM gas prices

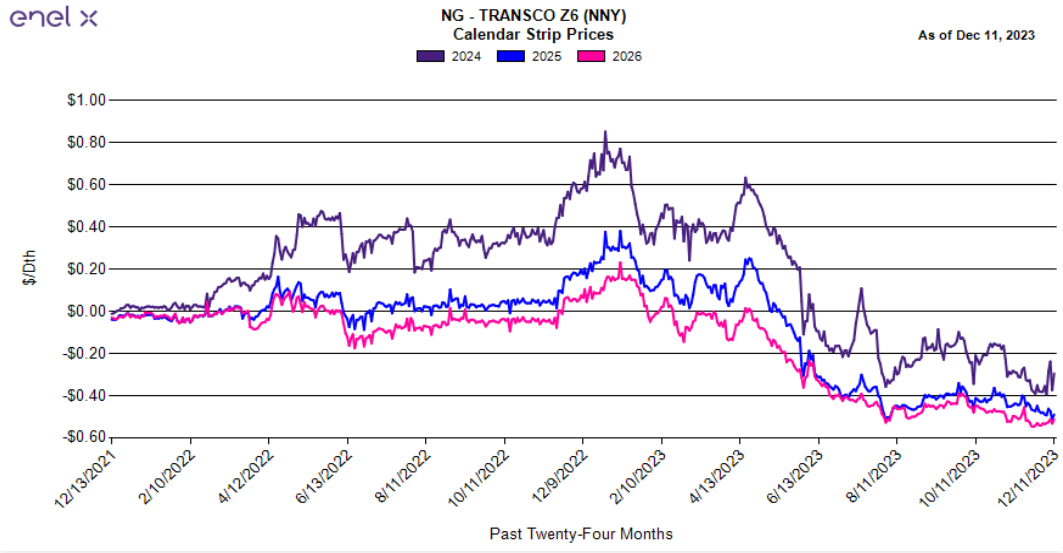
Forwards quiet amidst natural gas commodity free-fall

Where are forwards trending?

- Transco Z6 NNY basis prices remain unaffected by the recent downturn in commodity prices
- Look for basis to shake off major NYMEX price volatility as regional situation remains the same.

Where are index prices trending?

- Index prices climbed from October due to normal increases in heating demand with the onset of colder weather.
- December prices will likely remain in the same range as milder weather is forecast for the end of the month, avoiding a price spike as was seen in 2022.



Average of Daily Prices - Transco Zone 6 xNY											
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$4.77	$25.21	$5.12	$3.19	$3.56	$16.78	$4.16	$2.16	$2.82	$9.60	$3.07
Feb	$3.96	$8.47	$14.03	$2.66	$2.72	$3.07	$2.74	$1.85	$4.88	$5.40	$2.96
Mar	$4.09	$5.96	$3.53	$1.31	$3.15	$2.78	$2.88	$1.48	$2.23	$4.44	$2.22
Apr	$4.33	$4.27	$2.22	$1.57	$2.84	$2.77	$2.35	$1.50	$2.12	$6.07	$1.68
May	$4.13	$3.52	$2.62	$1.60	$2.83	$2.55	$2.26	$1.36	$2.34	$7.34	$1.42
Jun	$3.88	$3.22	$2.41	$1.92	$2.38	$2.77	$2.09	$1.42	$2.59	$6.88	$1.35
Jul	$3.74	$2.70	$2.11	$2.18	$2.47	$2.87	$2.16	$1.67	$3.31	$6.63	$1.60
Aug	$3.49	$2.38	$2.41	$2.12	$2.25	$3.01	$1.87	$1.46	$3.73	$8.08	$1.22
Sep	$3.71	$2.22	$2.17	$1.53	$2.31	$2.73	$1.74	$1.23	$4.25	$6.59	$1.36
Oct	$3.65	$2.15	$2.22	$1.36	$2.31	$2.86	$1.52	$1.20	$4.54	$4.63	$1.25
Nov	$3.90	$3.87	$1.81	$2.16	$2.83	$4.10	$2.59	$1.46	$4.88	$4.64	$2.12
Dec	$4.77	$3.37	$1.58	$3.69	$4.93	$4.01	$2.43	$2.78	$3.36	$10.64	$2.12
Avg	$4.03	$5.61	$3.52	$2.11	$2.88	$4.19	$2.40	$1.63	$3.42	$6.74	$1.87

Midwest

December 2023

< back to beginning

Michigan RPS Target Ramps Up

Target Changed from 15% to 50% by 2030

The State of Michigan enacted the Clean Energy Future Package in late-November. The package is comprised of five bills designed to ensure alignment with the objectives of the Paris Climate Agreement this decade.

Senate Bill 271 will significantly alter Michigan's electric generation composition through the establishment of new targets for:

- Renewable energy standard, which will increase significantly the current 15% cap to a 50% requirement by 2030 and 60% requirement by 2035
- Clean energy standard, which enacts targets of 80% by 2035 and 100% by 2040
  - Clean energy includes all generation that does not emit greenhouse gas (e.g., renewable resources plus nuclear and natural gas combined cycles that incorporate carbon capture and sequestration technology that reduce emissions by at least 90%, per the bill)
- Energy storage, which enacts a 2,500 MW standard by 2030
- Rooftop solar, which increases the capacity limit from 1% to 10%

	SB 271 Renewable and Clean Energy Targets	
Timeline	Renewable Standard	Clean Energy Standard
Current	15%	none
2030	50%	none
2035	60%	80%
2040	60%	100%

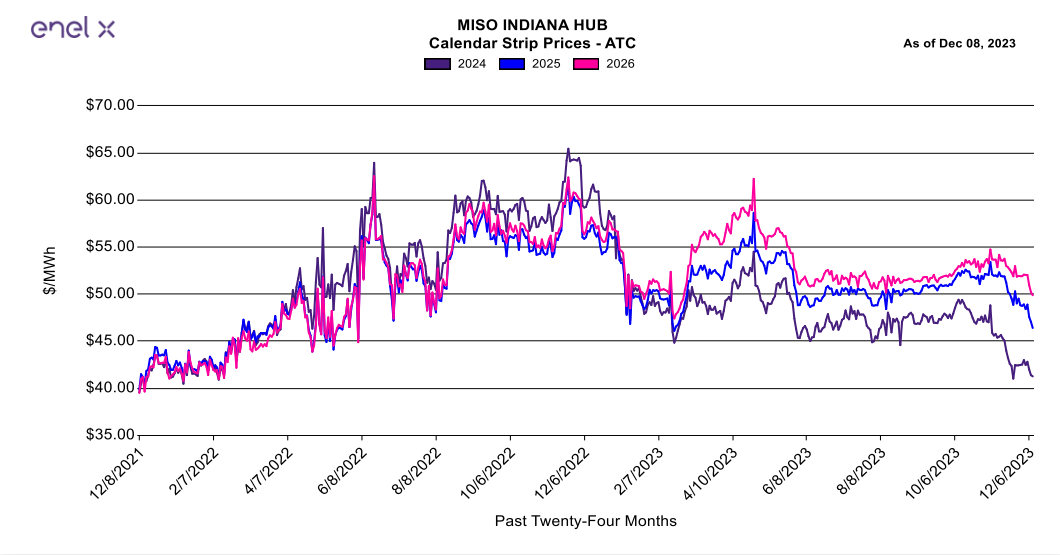
KEY TAKEAWAY: There will be intense competition for renewable generation driven by this legislation as, generally, RECs must be obtained from facilities located in the state of Michigan. The current ramp rate for RECs may prove untenable and the evolution of renewables in Michigan will need to be tracked to understand the implications.

MISO power prices

Significant month-on-month decrease

Where are forwards trending?

- Indiana Hub strip prices remain in contango, with the CY2024 strip substantially lower than CY2025 and CY2026 prices.
- Strong natural gas storage levels entering winter are driving forward prices lower in CY2024.
- CY2024 strip price as of December 8 is 10% lower than last month and less than 1% higher than the 12-month low established on November 22.



Where are index prices trending?

- November prices settled lower than October on warmer than average temperatures and net injections of natural gas into storage at a time of the year when we typically to see withdrawals from storage.
- Persistently high gas storage levels through December have resulted in prices (through the 10th) settling 4% lower than in November.

Average Monthly Day-Ahead LMP - Indiana Hub

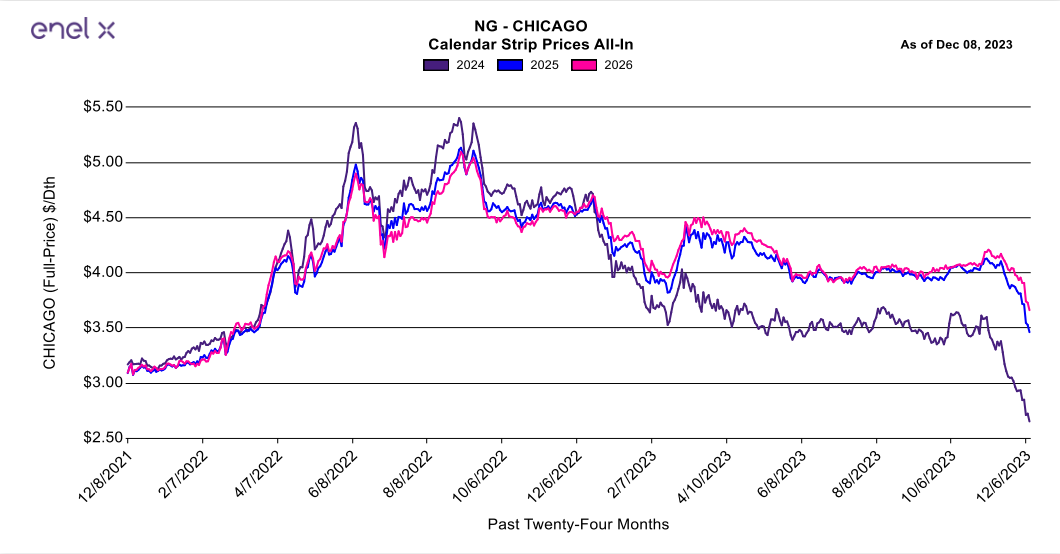
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$63.86	$30.77	$23.96	$31.28	$40.67	$32.80	$23.49	$25.78	$52.64	$37.48
Feb	$58.29	$40.41	$22.23	$26.45	$27.77	$27.25	$22.00	$61.88	$49.55	$29.37
Mar	$46.93	$30.22	$22.03	$28.37	$28.32	$29.18	$20.81	$23.78	$49.51	$30.78
Apr	$37.30	$27.64	$27.99	$29.86	$31.37	$27.18	$19.73	$28.27	$67.22	$32.45
May	$38.41	$29.47	$24.35	$29.66	$33.79	$25.84	$19.94	$27.27	$77.29	$34.46
Jun	$36.35	$27.52	$27.13	$28.90	$32.47	$24.58	$22.16	$34.17	$90.23	$32.40
Jul	$32.12	$28.52	$31.28	$29.94	$31.59	$28.45	$26.88	$37.86	$89.12	$36.75
Aug	$32.49	$27.36	$31.14	$27.49	$31.73	$25.21	$25.36	$44.24	$98.20	$34.41
Sep	$32.51	$27.97	$32.69	$33.55	$33.39	$26.83	$21.34	$45.15	$83.77	$32.31
Oct	$33.09	$26.90	$32.66	$29.60	$36.12	$24.98	$25.36	$58.19	$58.68	$34.04
Nov	$35.99	$25.37	$27.87	$28.39	$36.07	$27.81	$24.12	$64.62	$55.42	$32.61
Dec	$31.21	$22.82	$33.76	$28.88	$34.46	$23.56	$24.39	$43.31	$70.97	$31.38
Avg	$39.88	$28.75	$28.09	$29.36	$33.15	$26.97	$22.97	$41.21	$70.22	$33.20

Chicago gas prices

Significant month-on-month decrease

Where are forwards trending?

- Chicago City-Gate natural gas strips (as of December 8) for CY2024, CY 2025 and CY2026 are down 21%, 15% and 12%, respectively, since November 13.
- US total and Midwest gas storage levels are still above the 5-year average.
- Midwest US storage is 6.0% above the 5-year average, down from a 22.7% surplus in mid-June.



Where are index prices trending?

- Pricing at Chicago City-Gate has trended lower month-on-month following:
- Pricing in December (through December 10) is 3% lower than November 2023.
- December 2023 pricing is 62% lower than December 2023, maintaining the trend of significant year-over-year changes that emerged in January.

Average of Daily Prices - Chicago City Gate										
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$7.93	$3.04	$2.34	$3.29	$3.79	$3.22	$1.92	$2.53	$4.17	$3.25
Feb	$11.95	$3.98	$1.99	$2.81	$2.57	$2.64	$1.74	$22.75	$4.48	$2.33
Mar	$9.35	$2.90	$1.79	$2.84	$2.48	$3.39	$1.57	$2.47	$4.60	$2.33
Apr	$4.72	$2.59	$1.90	$2.96	$2.77	$2.45	$1.66	$2.54	$6.39	$1.98
May	$4.59	$2.81	$1.91	$3.02	$2.49	$2.36	$1.67	$2.75	$7.79	$1.94
Jun	$4.64	$2.70	$2.46	$2.79	$2.75	$2.11	$1.55	$3.12	$7.42	$2.01
Jul	$4.11	$2.83	$2.72	$2.80	$2.69	$2.12	$1.67	$3.61	$6.82	$2.29
Aug	$3.92	$2.85	$2.74	$2.81	$2.86	$1.98	$2.05	$3.91	$8.31	$2.35
Sep	$3.94	$2.69	$2.89	$2.87	$2.81	$2.13	$1.80	$4.80	$7.02	$2.28
Oct	$3.84	$2.39	$2.86	$2.78	$3.21	$1.94	$2.08	$5.26	$5.08	$2.33
Nov	$4.37	$2.14	$2.41	$2.97	$4.06	$2.51	$2.41	$4.89	$4.91	$2.40
Dec	$3.49	$1.94	$3.63	$2.84	$3.75	$2.10	$2.44	$3.60	$6.13	$2.33
Avg	$5.53	$2.73	$2.47	$2.90	$3.02	$2.41	$1.88	$5.06	$6.10	$2.32

California

December 2023

< back to beginning

CAISO Seeks Access to Idaho Wind

Approval sought for over 1,000 MW of new import capacity

The California Independent System Operator (CAISO) has been examining the importation of Idaho wind as part of its annual transmission planning process and will recommend to the CAISO Board approval of a plan to acquire capacity on the planned Southwest Intertie Project (SWIP) North transmission line.

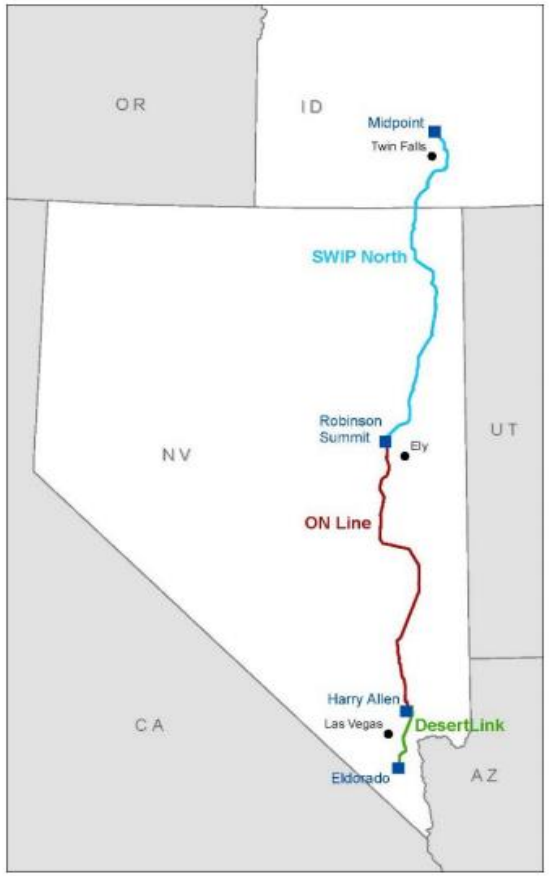
SWIP North, which is currently permitted, is the final link of a 576-mile SWIP buildout that will provide 2,300 MW of firm new transmission rights between Idaho, Nevada and California. The line (see blue segment in the map to the right) will connect Midpoint, ID to the current northern terminus of the SWIP project in Robinson Summit, NV.

CAISO has been analyzing the transmission line against alternative renewable generation options under four criteria (e.g., meeting reliability needs, policy objectives, economic goals, enhancing interregional connectivity) and finds it the best option to forward its goals.

CAISO's capacity entitlement on the project would be 1,118 MW.

SWIP North could be energized and delivering Idaho wind to CAISO as early as 2026.

KEY TAKEAWAY: Approval to purchase 1,118 MW of transmission capacity on SWIP will help address CAISO's acute resource adequacy shortage and provide an additional source for renewable generation as the state's RPS targets increase over time. While this capacity will not necessarily address the entirety of the capacity shortfall in the state, it is an important source as the CPUC looks to stabilize resource adequacy costs to ratepayers.



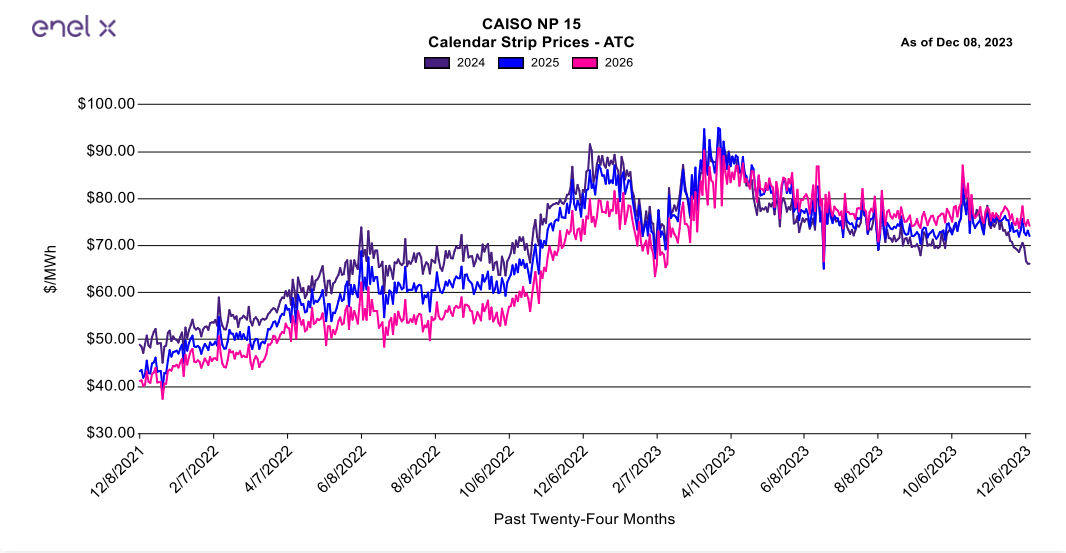
Source: CAISO 2022-2023 TPP: SWIP North, presentation made during Nov. 7, 2023 Stakeholder Meeting

Northern California power prices

Prices are down month-on-month

Where are forwards trending?

- Calendar year strip prices (as of December 8) are down for each of the next 3 years month-on-month:
  - CY2024 is down 13%
  - CY2025 is down 5%
  - CY2026 is down 3%



Where are index prices trending?

- Day-ahead LMPs at NP 15 averaged $62.32/MWh in November 2023, down 1% MoM and down 32% YoY.
- December 2023 DA LMPs (through December 11) averaged $57.57/MWh, down 8% MoM and down 78% YoY..

CAISO NP 15
Monthly DA Averages - ATC
As of Dec 11, 2023
Lowest 5% (< $21.61)
Median = $35.54
Highest 5% (> $74.46)

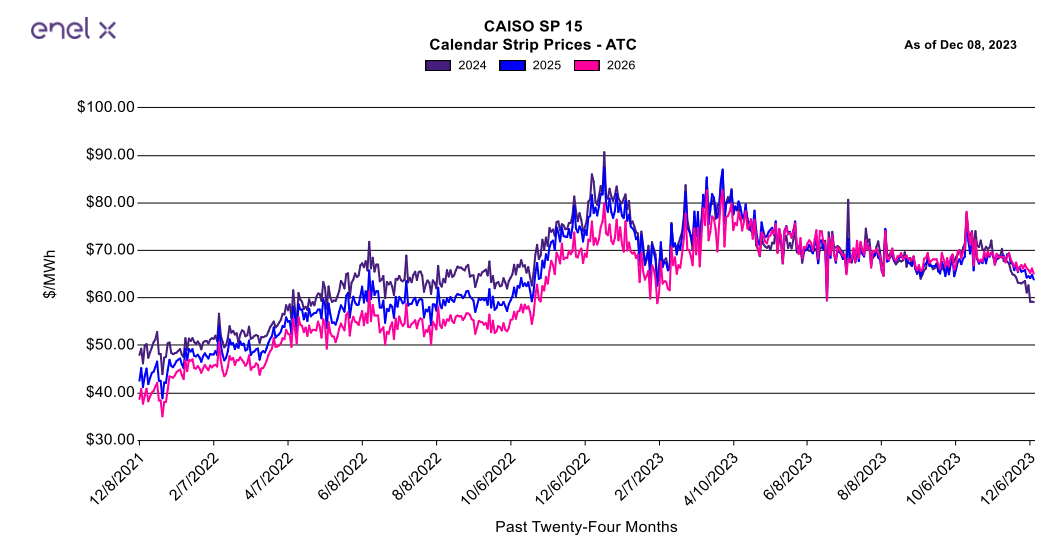
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$ 47.10	$ 32.54	$ 27.09	$ 37.35	$ 46.07	$ 33.40	$ 28.54	$ 34.90	$ 32.94	$ 41.09	$ 31.19	$ 33.61	$ 52.71	$ 141.28
Feb	$ 43.58	$ 31.83	$ 25.27	$ 37.50	$ 61.99	$ 30.71	$ 24.01	$ 29.23	$ 30.47	$ 75.58	$ 26.34	$ 59.48	$ 47.63	$ 74.22
Mar	$ 39.62	$ 25.32	$ 21.80	$ 40.19	$ 47.63	$ 30.72	$ 19.60	$ 22.12	$ 30.06	$ 36.63	$ 26.58	$ 33.04	$ 46.90	$ 75.83
Apr	$ 34.41	$ 25.11	$ 20.21	$ 41.96	$ 47.48	$ 32.27	$ 21.23	$ 22.13	$ 24.91	$ 22.25	$ 21.61	$ 35.58	$ 63.42	$ 55.58
May	$ 30.63	$ 23.50	$ 23.39	$ 38.42	$ 46.67	$ 32.69	$ 20.76	$ 29.28	$ 20.75	$ 18.46	$ 18.43	$ 35.95	$ 66.57	$ 18.76
Jun	$ 27.40	$ 25.16	$ 25.37	$ 39.80	$ 45.42	$ 34.64	$ 28.09	$ 33.12	$ 28.14	$ 22.94	$ 23.49	$ 50.31	$ 73.67	$ 27.75
Jul	$ 34.57	$ 31.93	$ 26.79	$ 42.65	$ 47.23	$ 35.54	$ 32.80	$ 35.84	$ 54.89	$ 30.28	$ 25.70	$ 67.21	$ 74.46	$ 55.05
Aug	$ 33.52	$ 34.48	$ 35.24	$ 39.43	$ 46.49	$ 34.32	$ 34.85	$ 45.20	$ 49.84	$ 31.82	$ 49.66	$ 60.30	$ 97.50	$ 67.19
Sep	$ 35.29	$ 35.80	$ 31.01	$ 40.76	$ 45.45	$ 34.46	$ 34.66	$ 39.72	$ 33.42	$ 34.55	$ 41.66	$ 66.53	$ 115.23	$ 41.98
Oct	$ 33.95	$ 31.63	$ 36.25	$ 38.75	$ 44.73	$ 32.49	$ 34.03	$ 41.19	$ 43.74	$ 36.32	$ 42.90	$ 66.29	$ 70.00	$ 62.75
Nov	$ 35.49	$ 32.17	$ 34.86	$ 40.74	$ 45.12	$ 29.41	$ 30.17	$ 36.27	$ 52.40	$ 41.51	$ 38.58	$ 58.84	$ 91.37	$ 62.32
Dec	$ 34.18	$ 30.82	$ 32.38	$ 49.41	$ 37.52	$ 28.65	$ 36.60	$ 34.22	$ 54.17	$ 39.82	$ 40.06	$ 61.88	$ 264.48	$ 57.57
Avg	$ 35.78	$ 30.01	$ 28.33	$ 40.60	$ 46.70	$ 32.45	$ 28.81	$ 33.65	$ 38.08	$ 35.67	$ 32.23	$ 52.36	$ 89.03	$ 61.99

Southern California power prices

Prices are down month-on-month

Where are forwards trending?

- Calendar year strip prices (as of December 8) are down for each of the next 3 years month-on-month:
  - CY2024 is down 16%
  - CY2025 is down 7%
  - CY2026 is down 5%



Where are index prices trending?

- Day-ahead LMPs at SP 15 averaged $52.75/MWh in November 2023, down 2% MoM and down 36% YoY.
- December 2023 DA LMPs (through December 11) averaged $45.34/MWh, down 14% MoM and down 82% YoY..

CAISO SP 15
Monthly DA Averages - ATC
As of Dec 11, 2023
Lowest 5% (< $21.75) Median = $35.90 Highest 5% (> $74.97)

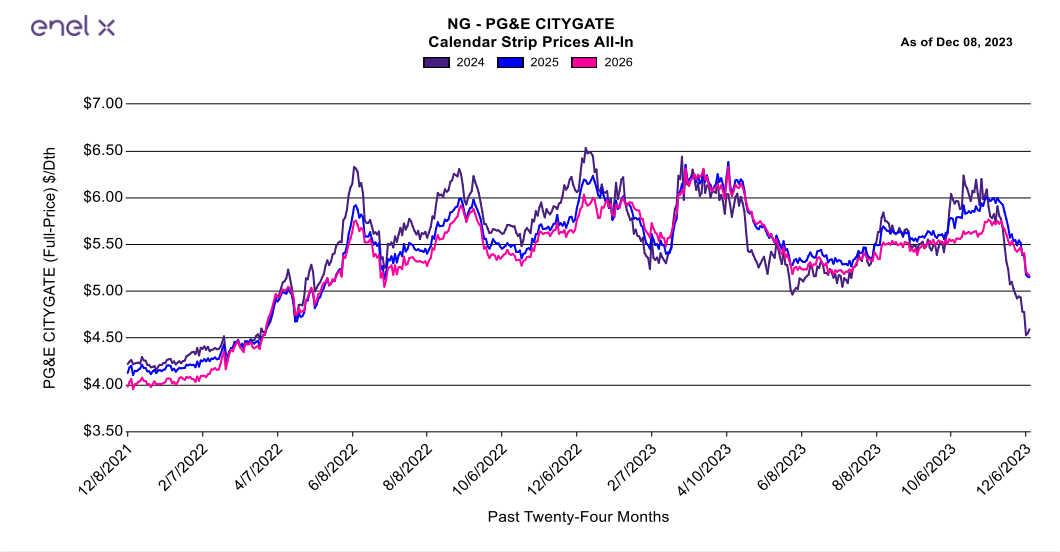
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$ 46.63	$ 32.42	$ 26.08	$ 42.88	$ 46.47	$ 33.51	$ 28.18	$ 33.55	$ 34.37	$ 39.96	$ 31.22	$ 31.73	$ 50.69	$ 138.72
Feb	$ 43.43	$ 32.23	$ 25.58	$ 42.75	$ 61.70	$ 30.05	$ 22.99	$ 26.39	$ 34.24	$ 70.89	$ 25.67	$ 64.01	$ 43.17	$ 69.33
Mar	$ 40.20	$ 26.02	$ 22.59	$ 46.44	$ 47.60	$ 29.00	$ 18.05	$ 21.75	$ 30.53	$ 36.02	$ 24.99	$ 30.48	$ 41.47	$ 68.06
Apr	$ 34.21	$ 27.63	$ 25.16	$ 49.05	$ 44.71	$ 27.93	$ 18.44	$ 24.80	$ 24.88	$ 23.52	$ 18.53	$ 30.30	$ 56.09	$ 50.56
May	$ 29.58	$ 23.84	$ 26.64	$ 43.69	$ 45.85	$ 27.21	$ 21.01	$ 28.35	$ 21.65	$ 18.43	$ 17.26	$ 28.13	$ 59.06	$ 18.40
Jun	$ 27.17	$ 27.54	$ 26.07	$ 42.14	$ 45.25	$ 33.94	$ 29.95	$ 32.80	$ 28.17	$ 23.07	$ 22.20	$ 49.85	$ 68.10	$ 27.36
Jul	$ 35.10	$ 34.45	$ 29.67	$ 43.85	$ 47.75	$ 36.02	$ 34.29	$ 36.70	$ 75.43	$ 31.52	$ 27.99	$ 67.94	$ 74.37	$ 69.58
Aug	$ 33.50	$ 36.25	$ 36.61	$ 41.25	$ 45.89	$ 35.69	$ 34.93	$ 45.35	$ 69.73	$ 32.84	$ 77.05	$ 59.05	$ 102.82	$ 74.97
Sep	$ 34.77	$ 35.89	$ 35.90	$ 43.42	$ 46.65	$ 34.76	$ 32.89	$ 38.43	$ 35.33	$ 36.08	$ 44.22	$ 66.09	$ 117.77	$ 37.67
Oct	$ 33.32	$ 31.33	$ 37.76	$ 39.97	$ 45.17	$ 32.62	$ 33.06	$ 41.09	$ 38.88	$ 34.36	$ 42.23	$ 56.90	$ 63.44	$ 53.88
Nov	$ 33.49	$ 30.40	$ 35.55	$ 40.64	$ 44.98	$ 28.86	$ 27.79	$ 39.51	$ 51.59	$ 42.03	$ 36.74	$ 56.35	$ 82.27	$ 52.75
Dec	$ 33.25	$ 29.61	$ 34.30	$ 48.58	$ 37.87	$ 28.09	$ 33.95	$ 39.12	$ 52.93	$ 40.24	$ 38.68	$ 59.17	$ 253.78	$ 45.34
Avg	$ 35.35	$ 30.62	$ 30.18	$ 43.73	$ 46.55	$ 31.49	$ 28.00	$ 34.05	$ 41.61	$ 35.51	$ 33.98	$ 49.88	$ 84.80	$ 59.77

California gas prices

Prices are down month-on-month

Where are forwards trending?

- Calendar year strip prices (as of December 8) are down for each of the next 3 years month-on-month:
  - CY2024 is down 22%
  - CY2025 is down 14%
  - CY2026 is down 10%



Where are index prices trending?

- PG&E Citygate spot prices averaged $5.25/Dth in November 2023, down 11% month-on-month and down 45% year-over-year.
- SoCal Border spot prices averaged $3.75/Dth in November 2023, up 31% month-over-month and down 55% year-over-year.

Average of Daily Prices - PG&E City Gate

	2019	2020	2021	2022	2023
Jan	$3.68	$2.96	$3.53	$5.24	$16.32
Feb	$7.55	$2.64	$4.58	$5.10	$7.75
Mar	$4.02	$2.55	$3.59	$5.45	$7.89
Apr	$3.23	$2.32	$3.75	$7.30	$5.57
May	$3.24	$2.53	$3.87	$9.30	$3.84
Jun	$2.51	$2.37	$4.38	$8.76	$3.10
Jul	$2.54	$2.44	$5.08	$7.86	$4.57
Aug	$2.60	$3.07	$5.35	$9.77	$5.18
Sep	$3.03	$3.59	$6.64	$8.84	$3.67
Oct	$3.15	$3.99	$6.99	$7.33	$5.88
Nov	$3.36	$3.82	$6.08	$9.56	$5.25
Dec	$3.38	$3.61	$5.74	$30.53	$4.53
Avg	$3.50	$2.99	$4.96	$9.63	$6.23

Average of Daily Prices - SoCal City Gas

	2019	2020	2021	2022	2023
Jan	$3.52	$2.26	$2.86	$5.14	$16.83
Feb	$6.78	$1.86	$23.08	$4.71	$6.84
Mar	$3.23	$1.54	$2.61	$4.36	$5.33
Apr	$1.99	$1.39	$2.81	$6.38	$3.49
May	$1.77	$1.63	$2.86	$7.90	$1.90
Jun	$1.76	$1.60	$3.90	$7.82	$2.18
Jul	$2.35	$1.71	$5.07	$7.34	$4.30
Aug	$2.39	$3.21	$5.23	$9.69	$4.28
Sep	$2.65	$2.62	$6.51	$8.63	$2.68
Oct	$2.44	$2.78	$5.73	$5.58	$2.87
Nov	$2.71	$2.97	$5.15	$8.32	$3.75
Dec	$2.99	$3.43	$5.79	$29.24	$3.89
Avg	$2.86	$2.25	$5.84	$8.80	$4.92

Texas

December 2023

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Insight of the Month

ERCOT's ongoing winter preparedness and direct impact on ratepayer bills

Almost three years have passed since Texas experienced prolonged electric outages during Winter Storm Uri. As a result, ERCOT has been trying to improve grid reliability through various measures, ranging from enforcing weatherization standards to considering a new market design mechanism. While these changes affect grid operations to varying degrees, some have had a more noticeable impact on ratepayer bills.

One example is the recently implemented ancillary service called ERCOT Contingency Reserve Service (ECRS) which became the most expensive ancillary in 2023. Due to price fluctuations, many suppliers have been hesitant to fix this component in new contracts and have passed through the cost to all ratepayers under current contracts.

What to expect in 2024? ERCOT plans to continue implementing additional changes, including the introduction of another ancillary service (DRRS), and most likely a temporary bridge solution before potentially adopting a new market design known as the Performance Credit Mechanism (PCM). The impact of these changes remains uncertain, but like adjustments made in 2022-2023, there is an expectation of a potential increase in retail costs for non-energy components.

Grid improvements	Timeline Implementation	$/kWh Impact to Ratepayer Bills
Weatherization Standards	Q4 2021	**Low**
Conservative operating mode	Q4 2021	**Low**
Changes to ORDC (Exposure to surges in energy prices reaching as high as $5,000/MWh)	Q1 2022	**Low to Med – Fixed** **Med to High – Indexed**
Firm Fuel Supply Service	Q4 2022	**Medium**
ERCOT Contingency Reserve Service	Q2 2023	**High**
Dispatchable reliability reserve service (DRRS)	TBD (2024)	
Performance Credit Mechanism	TBD (2024-2025)	

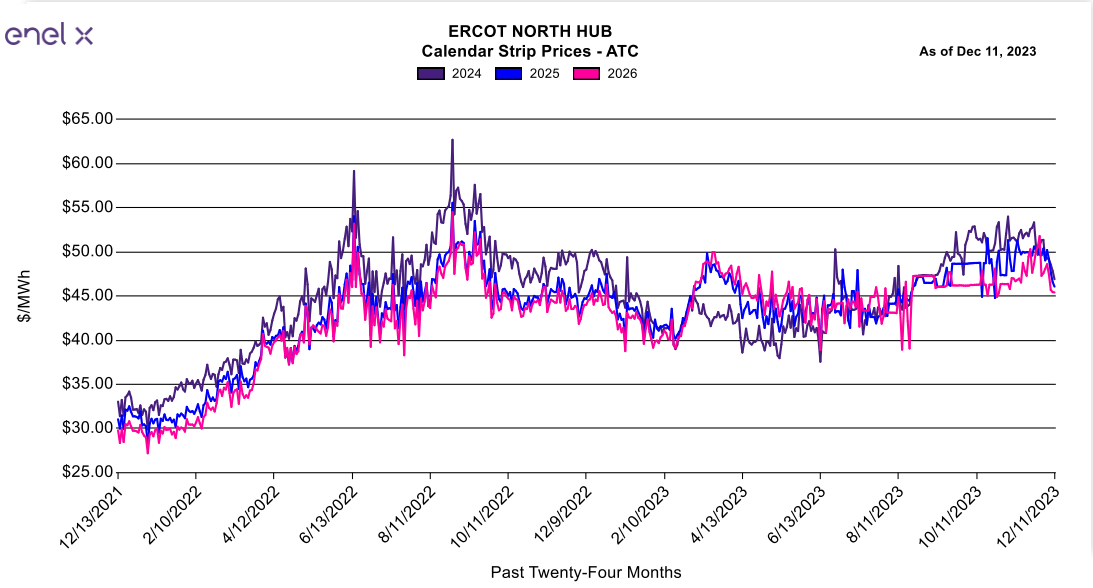
KEY TAKEAWAY: The table summarizes measures taken since Storm Uri and ranks their impact on ratepayer bills. Changes in the Operating Reserve Demand Curve can affect customers on indexed products as they pass through all or a portion of energy and are subject to market volatility. FFSS and ECRS are both components passed on to all ratepayers and are treated as separate line items by certain suppliers

ERCOT power prices

CY strips in ERCOT following NYMEX's downward trend

Where are forwards trending?

- CY 2024-2026 continue to trade in contango, with longer-term curves trading at a discount. Higher prices in CY 2024 are driven by short-term volatility as we enter the winter months coupled with grid reliability concerns.
- All CY strips are down by ~$5/MWh since last month and trading south of $50/MWh.



Where are index prices trending?

- North Hub DA prices in November averaged $30.35/MWh, 5% down from October and 31% down from last year.
- The DA LMP average for November 2023 is close to the 10-year average for the month of $28.69/MWh
- The month-to-date average is ~$57/MWh, down $3/MWh from a month ago.

Average Monthly Day Ahead LMP - North Hub

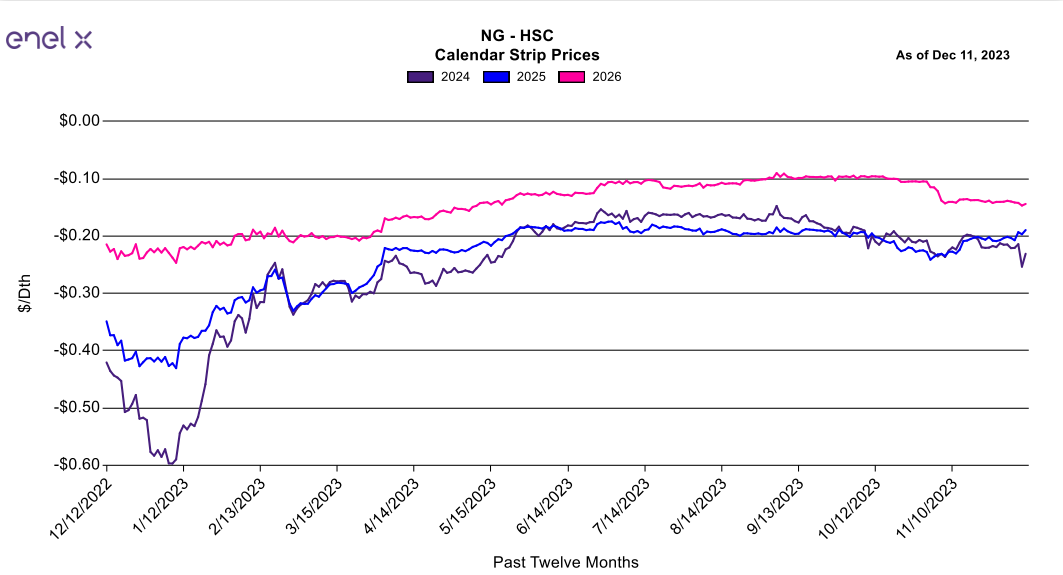
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	$26.19	$36.71	$25.00	$19.13	$22.99	$37.59	$24.32	$16.96	$21.54	$33.65	$24.69
Feb	$25.12	$51.30	$23.93	$15.29	$19.45	$21.77	$20.86	$17.72	$1,485.49	$39.39	$21.25
Mar	$30.73	$49.91	$26.24	$16.86	$21.23	$22.61	$28.10	$23.34	$20.87	$38.49	$23.85
Apr	$33.81	$40.29	$23.62	$18.35	$21.41	$23.52	$22.99	$19.91	$29.63	$52.52	$22.75
May	$33.05	$35.77	$23.79	$17.91	$23.42	$35.31	$23.98	$18.23	$24.23	$80.51	$27.96
Jun	$34.96	$39.73	$24.32	$23.16	$25.89	$30.21	$25.18	$18.92	$42.23	$79.20	$70.64
Jul	$33.06	$36.02	$29.46	$26.80	$30.65	$78.97	$29.78	$22.99	$41.48	$122.41	$56.31
Aug	$35.84	$39.33	$45.30	$29.83	$26.83	$31.60	$126.52	$39.21	$41.36	$100.77	$263.45
Sep	$33.44	$33.87	$24.58	$26.25	$23.35	$27.30	$79.88	$18.99	$45.25	$69.36	$68.84
Oct	$29.73	$34.69	$20.82	$24.01	$21.41	$30.03	$28.00	$23.36	$53.70	$47.82	$31.94
Nov	$30.46	$34.53	$19.20	$18.66	$21.58	$31.22	$23.62	$23.73	$39.78	$44.09	$30.35
Dec	$35.42	$26.57	$17.44	$25.15	$20.95	$30.40	$18.73	$20.89	$29.70	$64.22	
Avg	$31.82	$38.23	$25.31	$21.78	$23.26	$33.38	$37.66	$22.02	$156.27	$64.61	$57.54

ERCOT gas prices

CY Strip prices in HSC starting to trade in contango

Where are forwards trending?

- CY 2024–2026 basis curves are spread apart and have started to trade in contango. Longer terms are trading at a premium compared to shorter terms.
- CY 2024–2025 are no longer trading in tandem, while CY 2024 is close to $(0.23)/Dth, CY 2025 is slightly above $(0.20)/Dth. CY 2026 is trading at a discount compared to a month ago, near $(0.15)/Dth.



Where are index prices trending?

- November 2023 HSC basis average is up 17 cents compared to a month ago and 84 cents higher than a year ago.
- The 2023 November LMP average of $(0.43)/Dth was 25 cents lower than the 10-year average of (0.18)/Dth from 2013–2022.
- The YTD for HSC basis is ~($0.32)/Dth, down 1 cent from a month ago.

Average of Daily Prices - Houston Ship Channel Basis Only											
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jan	($0.06)	($0.08)	($0.07)	($0.06)	($0.10)	$0.35	($0.06)	($0.09)	$ (0.00)	$ (0.30)	$ (0.67)
Feb	($0.06)	$0.21	($0.15)	($0.08)	($0.03)	($0.02)	$0.00	($0.03)	$ 50.19	$ (0.33)	$ (0.42)
Mar	($0.04)	($0.02)	($0.11)	($0.01)	$0.04	$0.03	($0.01)	($0.06)	$ (0.20)	$ (0.35)	$ (0.23)
Apr	($0.02)	($0.03)	($0.02)	($0.03)	$0.04	$0.07	($0.04)	($0.03)	$ (0.04)	$ (0.20)	$ (0.30)
May	$0.02	($0.10)	($0.03)	($0.04)	$0.11	$0.04	($0.06)	$0.00	$ (0.00)	$ (0.17)	$ (0.15)
Jun	($0.04)	$0.04	($0.05)	($0.07)	$0.12	$0.07	($0.04)	($0.00)	$ (0.12)	$ (0.31)	$ (0.09)
Jul	($0.01)	$0.01	($0.00)	($0.08)	$0.01	$0.09	($0.06)	$0.00	$ (0.15)	$ (0.34)	$ (0.19)
Aug	($0.01)	$0.06	($0.03)	($0.05)	($0.01)	$0.08	($0.07)	$0.01	$ (0.09)	$ (0.57)	$ (0.17)
Sep	$0.02	$0.02	($0.03)	($0.03)	($0.01)	$0.04	($0.07)	$0.07	$ (0.05)	$ (0.94)	$ (0.24)
Oct	($0.04)	($0.06)	$0.02	$0.15	$0.05	$0.25	($0.05)	$0.14	$ (0.20)	$ (0.85)	$ (0.60)
Nov	($0.07)	($0.07)	($0.02)	$0.00	($0.04)	$0.05	($0.14)	$0.04	$ (0.25)	$ (1.27)	$ (0.43)
Dec	$0.09	($0.12)	$0.06	($0.09)	($0.00)	($0.01)	($0.11)	($0.03)	$ (0.20)	$ (1.21)	
Avg	($0.02)	($0.01)	($0.04)	($0.03)	$0.01	$0.09	($0.06)	$0.00	$4.07	$ (0.57)	$ (0.32)

Mexico

December 2023

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Insight of the month

Energy Regulatory Commission (CRE) grants Last Resource Supply contract to Iberdrola

- In Mexico, so far, there are 3 main ways of being a consumer from the grid: self-supply scheme, being with the utility (CFE) or to be in the wholesale market (MEM).
- The last scheme (MEM), it is mandatory to have a supplier. If for some reason the supplier cannot supply any more to the consumer, the CENACE (system coordinator) assign a supplier to the consumer. This supplier is named last resource supplier.
- The Energy Regulatory Commission (CRE) in Mexico authorized Iberdrola Clients the contract model to provide the Last Resource Supply service in the electrical sector.
- The later means that the company may supply energy when the Qualified Service Supplier does not comply with their obligations.

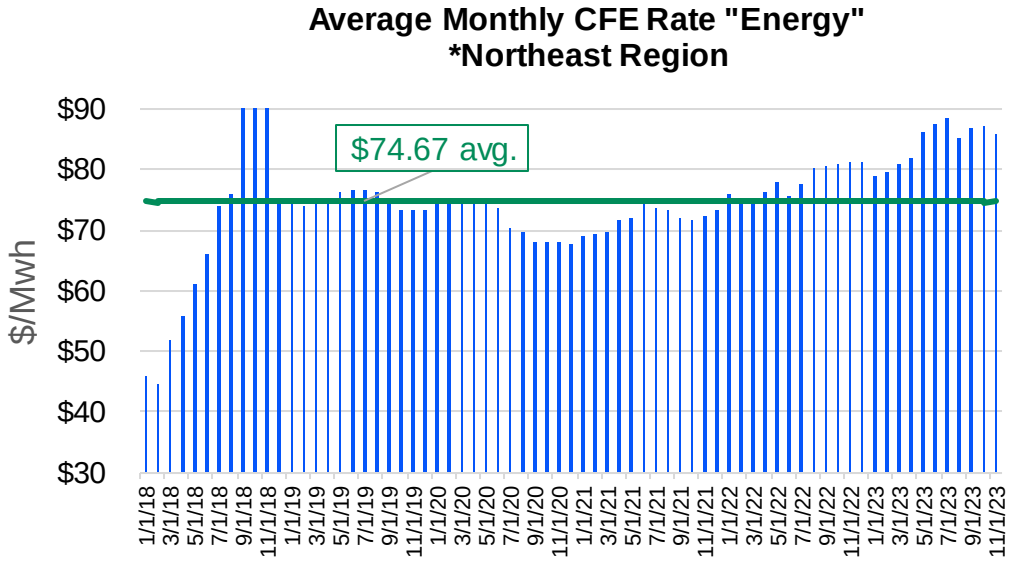
KEY TAKEAWAY: This is the first time that this contract model has been granted to a private company, previously the only company that could provide the last resource supply service was the Federal Electricity Commission (CFE).

Monthly CFE Rates

CFE rates increase year-over-year in November

Where are index prices trending?

- In November 2023, Northeast Region GDMTH energy prices decreased ~1.2% month-over-month and increased ~6% year-over-year.



Where are capacity prices trending?

- Monthly GDMTH capacity prices decreased month-over-month 0.78% and increased ~6.2% year-over-year in the West region.

Average Monthly CFE GDMTH Capacity- West*					
USD/MW					
	2019	2020	2021	2022	2023
Jan	$ 19,772	$ 19,829	$ 18,438	$ 20,012	$ 21,639
Feb	$ 19,637	$ 19,681	$ 18,562	$ 20,185	$ 21,848
Mar	$ 20,023	$ 19,809	$ 18,605	$ 20,185	$ 22,248
Apr	$ 19,950	$ 19,935	$ 19,303	$ 20,792	$ 22,565
May	$ 20,341	$ 19,719	$ 19,403	$ 21,262	$ 23,126
Jun	$ 20,421	$ 19,530	$ 20,147	$ 20,597	$ 23,514
Jul	$ 20,462	$ 19,065	$ 19,909	$ 21,192	$ 23,849
Aug	$ 20,301	$ 18,775	$ 19,871	$ 21,311	$ 23,611
Sep	$ 19,865	$ 18,242	$ 19,415	$ 21,432	$ 23,376
Oct	$ 19,438	$ 18,245	$ 19,363	$ 21,517	$ 23,412
Nov	$ 19,418	$ 18,250	$ 19,545	$ 21,573	$ 23,097
Dec	$ 19,411	$ 18,226	$ 19,792	$ 21,573	$ 22,918
Avg	**$ 19,920**	**$ 19,109**	**$ 19,363**	**$ 20,969**	**$ 22,934**

Definitions and Acronyms:

***CFE**: Federal Electricity Commission, Utility Company.*
***GDMTH**: Rate classification most used in medium voltage.*
***Northeast** region includes the states of Nuevo Leon and Tamaulipas.*
***West** region includes the states of Nayarit, Jalisco, Zacatecas, Aguascalientes, Colima, Michoacan, San Luis Potosi, Queretaro*

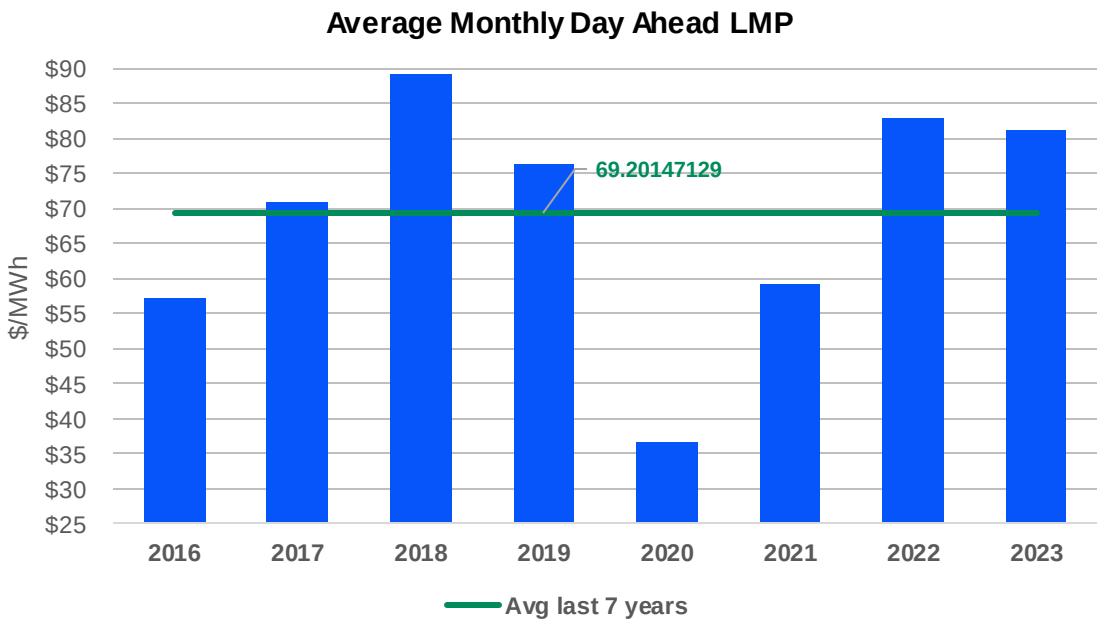
Note:

CFE prices are issued in MXN/kWh. For publication this chart is presented in USD/MWh, for which an average annual exchange rate of $17.40 MXN is used. This rate can change monthly.

Average monthly Day Ahead LMP

Where are index prices trending?

- Day Ahead LMPs averaged $70.58/MWh in October, which is 21% lower month-over-month and 4% lower year-over-year.
- So far in 2023, LMPs have averaged $78.58/MWh, 6.9% lower than the year before when prices averaged $84.30/MWh from Jan to Oct 2022.
- This decrease follows the return of normal costs of fossil fuels in the region and the world.



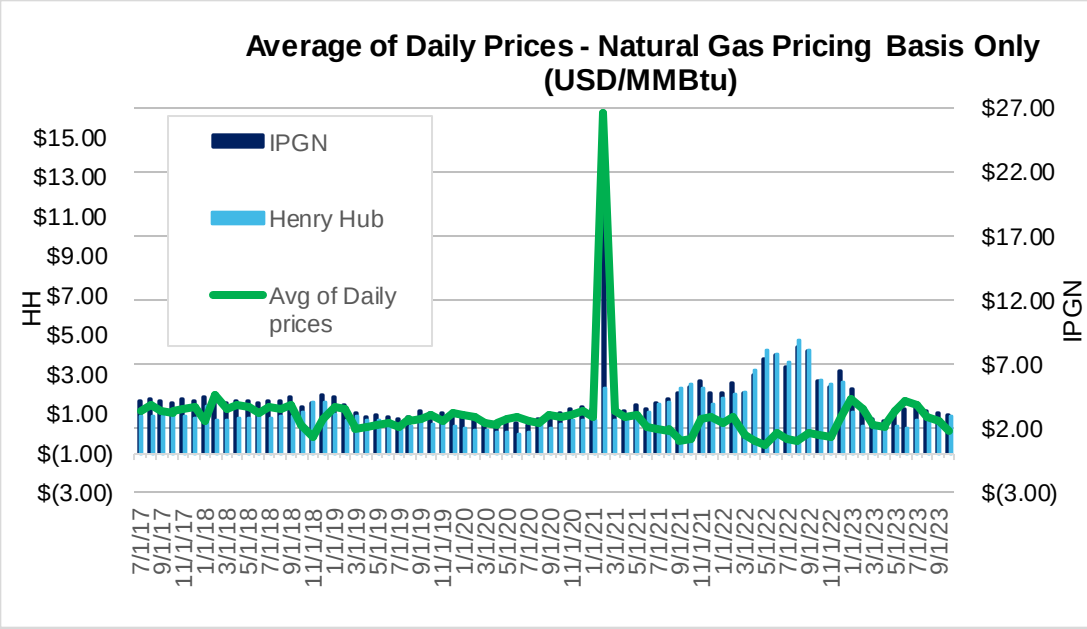
Average Monthly Day Ahead LMP					
USD/MWh					
	2019	2020	2021	2022	2023
Jan	$ 61.59	$ 29.62	$ 37.85	$ 56.30	$ 56.69
Feb	$ 78.43	$ 31.70	$ 71.62	$ 58.19	$ 73.21
Mar	$ 81.47	$ 27.04	$ 38.62	$ 67.50	$ 70.04
Apr	$ 92.96	$ 21.69	$ 47.47	$ 83.26	$ 75.82
May	$ 96.22	$ 28.85	$ 55.10	$ 103.71	$ 66.65
Jun	$ 84.62	$ 36.24	$ 59.96	$ 94.32	$ 87.44
Jul	$ 83.11	$ 41.14	$ 71.41	$ 108.25	$ 99.15
Aug	$ 92.77	$ 51.49	$ 71.62	$ 107.08	$ 100.10
Sep	$ 87.93	$ 43.06	$ 69.30	$ 96.19	$ 89.76
Oct	$ 66.80	$ 44.84	$ 75.37	$ 73.21	$ 70.58
Nov	$ 54.97	$ 47.02	$ 61.57	$ 70.04	
Dec	$ 36.12	$ 36.29	$ 50.03	$ 77.78	
Avg	**$ 76.42**	**$ 36.58**	**$ 59.16**	**$ 82.98**	**$ 78.94**

Sources: S&P Global Platt and CENACE. The published average price considers the 9 regions of the country. In turn, the misalignment of information is due to its publication by CENACE.

Natural gas price index (NGPI)

Where are index prices trending?

- NGPI daily basis prices traded at positive $3.03 USD/MMBtu in October, the eleventh consecutive month the index traded at a premium to Henry Hub. In comparison, NGPI fetched a ($0.08) discount to Henry Hub in October 2022.
- In 2023, prices are averaging $0.91 USD/MMBtu, roughly 1,300% higher year-over-year through the same date, when prices averaged ($0.08) USD/MMBtu.
- These changes are due to the decrease in both IPGN and HH.



Average of Daily Prices - Natural Gas Pricing Basis Only					
USD/Mmbtu					
	2019	2020	2021	2022	2023
Jan	$1.30	$0.91	$0.78	$0.50	$1.73
Feb	$1.15	$0.84	$16.23	$0.74	$1.17
Mar	$0.25	$0.47	$1.05	-$0.10	$0.40
Apr	$0.28	$0.44	$0.81	-$0.38	$0.35
May	$0.41	$0.68	$0.86	-$0.61	$1.05
Jun	$0.45	$0.76	$0.33	-$0.04	$1.59
Jul	$0.32	$0.60	$0.19	-$0.33	$1.37
Aug	$0.68	$0.47	$0.18	-$0.43	$0.77
Sep	$0.73	$0.94	-$0.32	-$0.03	$0.57
Oct	$0.92	$0.81	-$0.29	-$0.08	$0.06
Nov	$0.55	$0.89	$0.65	-$0.23	
Dec	$1.00	$1.07	$0.81	$0.77	
Avg	**$0.67**	**$0.74**	**$1.77**	**-$0.08**	**$0.91**

Sources: NGI, S&P Global Platt

Natural Gas

December 2023

< back to beginning

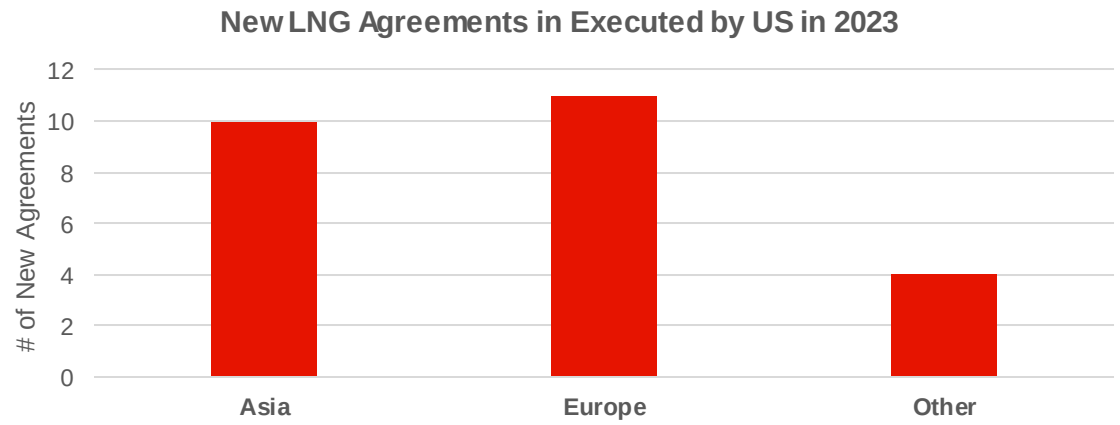
Energy Trends in 2023

Liquified Natural Gas Popularity Increases

EU Becomes Largest Importer of LNG

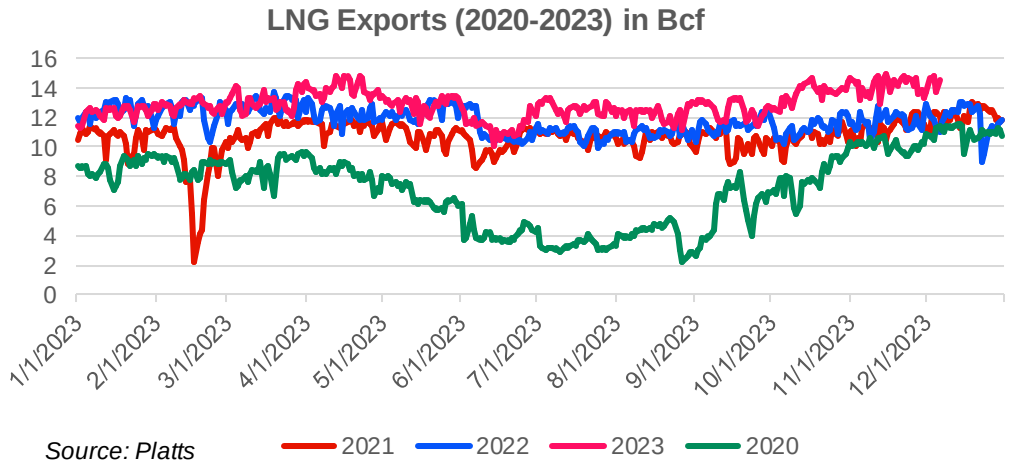
The European Union continues to fill the natural gas supply void left by the Russian/Ukrainian conflict with U.S. gas. In 2023, the U.S. executed more agreements with European nations than any other continent, including Asia (see below). Europe built their supply around LNG imports, which rose by 60% in 2023 from 2022, which made Europe the largest importer of LNG in the world.

2023 was a fortunate year for Europe, as gas stocks stayed at a surplus to their 5-year average, which was mostly due to decreased HDD's from a milder 2022-2023 winter. Despite the surplus in Europe, global gas supply is tight, which spawns a volatile trading market. This is unlikely to change in 2024, as the growth in global demand is forecasted to outpace the growth in global supply.



Source: BNEF

US Continues to Lead Global LNG Exports



Source: Platts

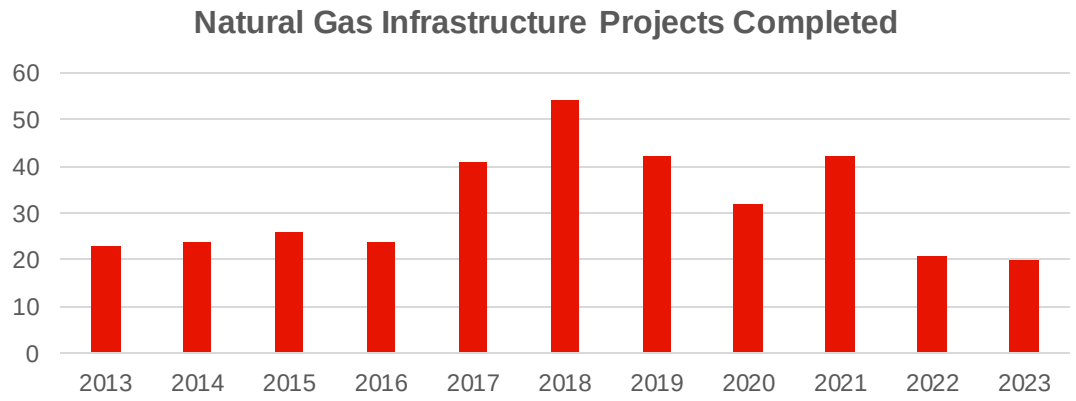
Eight years ago, the U.S. produced barely any LNG. In 2023, the US became the world's leading exporter, with Australia 2nd and Qatar coming in 3rd. The growth in LNG follows suit with the U.S.'s growth in natural gas production and infrastructure. In particular, infrastructure buildout of the Marcellus/Utica shale regions of the US, and increased Permian takeaway capacity for associated gas have helped facilitate supply to these terminals.

The completion of these LNG projects aligned fittingly with Europe's increase in demand for natural gas resources outside of Russia. The U.S. continues to buildout LNG terminals as 2025 forecasts for increased LNG export capacity to come online with Golden Pass, Plaquemines, and expansions to existing facilities.

KEY TAKEAWAY: Global LNG is becoming more popular as an energy feedstock, as well as a tool to assist with decarbonization transitions as natural gas generates fewer emissions than burning coal or oil.

Energy Trends in 2023

Natural Gas Infrastructure Continues to Grow



Source: EIA

Of the 51 natural gas projects originally forecasted to be completed in 2023, only about 20 are expected to be operational at the end of 2023. A combination of local regulatory issues, supply chain issues, increased costs, and financing issues have led 2023 to likely see the smallest growth in gas infrastructure projects in the past 10 years (see chart above). The U.S. federal reserve hiking interest rates to 15-year highs has likely slowed down the pace of these projects, as the cost of borrowing has increased significantly.

Major recent trends in infrastructure buildout have centered around increasing lines and capacity towards the Gulf of Mexico and eastern Texas, where supplies can feed existing and newer LNG projects that are being built. Additionally, Permian takeaway capacity is increasing, while many pipelines are switching out compression stations for electrification for noise reduction, increased HP (and increased capacity), and to serve decarbonization goals.

Major Projects to Monitor Going into 2024

- **Mountain Valley Pipeline**
  - Mountain Valley Pipeline original price tag was ~$3.5 billion, but has ballooned to $7.2 billion. The 300-mile-long gas pipeline is expected to be finished in Q1 2024. The additional deliveries (2 Bcf/day) will put some downward pressure on basis pricing in the Carolina region (Transco Z5).

- **Permian Highway Expansion**
  - Expected to increase Permian Highway's 2.1 Bcf/day capacity to ~2.65 Bcf/day. This will increase takeaway capacity from the Permian basin to Katy, TX and multiple Gulf Coast markets. Expected online in late-2023 or early-2024.

- **Whistler Pipeline Expansion**
  - Increases Whistler Pipeline from 2.0 Bcf/day to 2.5 Bcf/day. Similar to PHP mentioned above, where this construction will increase Permian takeaway capacity. Expected online Q4 2023, or early-2024.

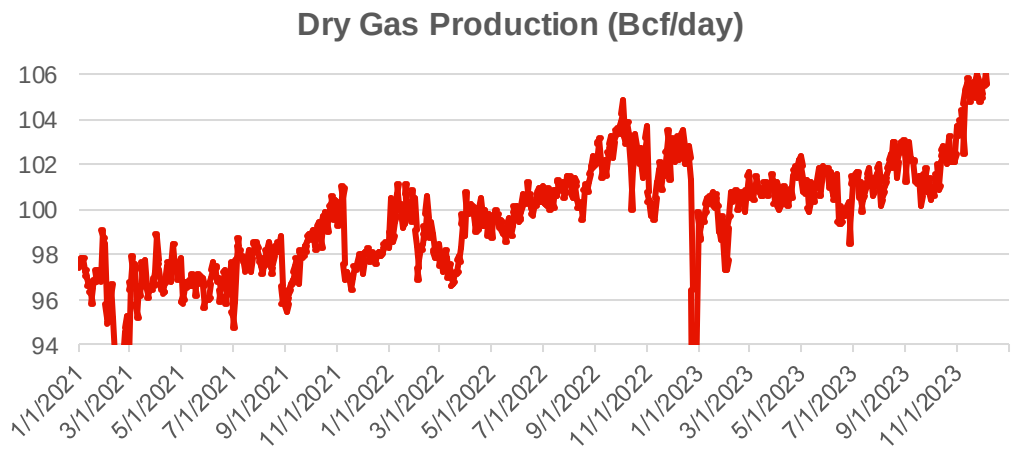
- **Regional Access Project**
  - Transco project that increases pipeline capacity by 829k Dth/day. The project moves gas from Western PA to Eastern PA and Eastern MD. This project has potential to put downward pressure on Transco Z6 NNY during peak times. In service, as of Q4 2023.

KEY TAKEAWAY: Current major natural gas projects are centered around LNG exports, and Permian takeaway capacity.

Energy Trends in 2023

Natural Gas Production and Coal Retirements Increases

US Continues to Grow Record Gas Production



Source: Platts / Pointlogic

Entering Q4 of 2023, natural gas production continues to climb to robust levels never seen before; putting further downward pressure on the Henry Hub, despite high demand from power generation and record high demand from LNG exports. Production was recorded above 106 Bcf/day on Nov 23-25 (see chart above). The bulk of these increases have come from the Permian and Marcellus basins. The increased production has helped contribute to a widening storage surplus which stands at 234 Bcf above the 5-year average as of 12/01/23, as a rare late season storage injection was posted for the week of 11/24/23. The late injection marks the weakest start to the withdrawal season in 5 years. Increased production along with the decreased heating demand sets the stage for a potentially low-price environment at the Henry Hub

ISO's Continue Decarbonization Goals as More Coal Generators are Retired

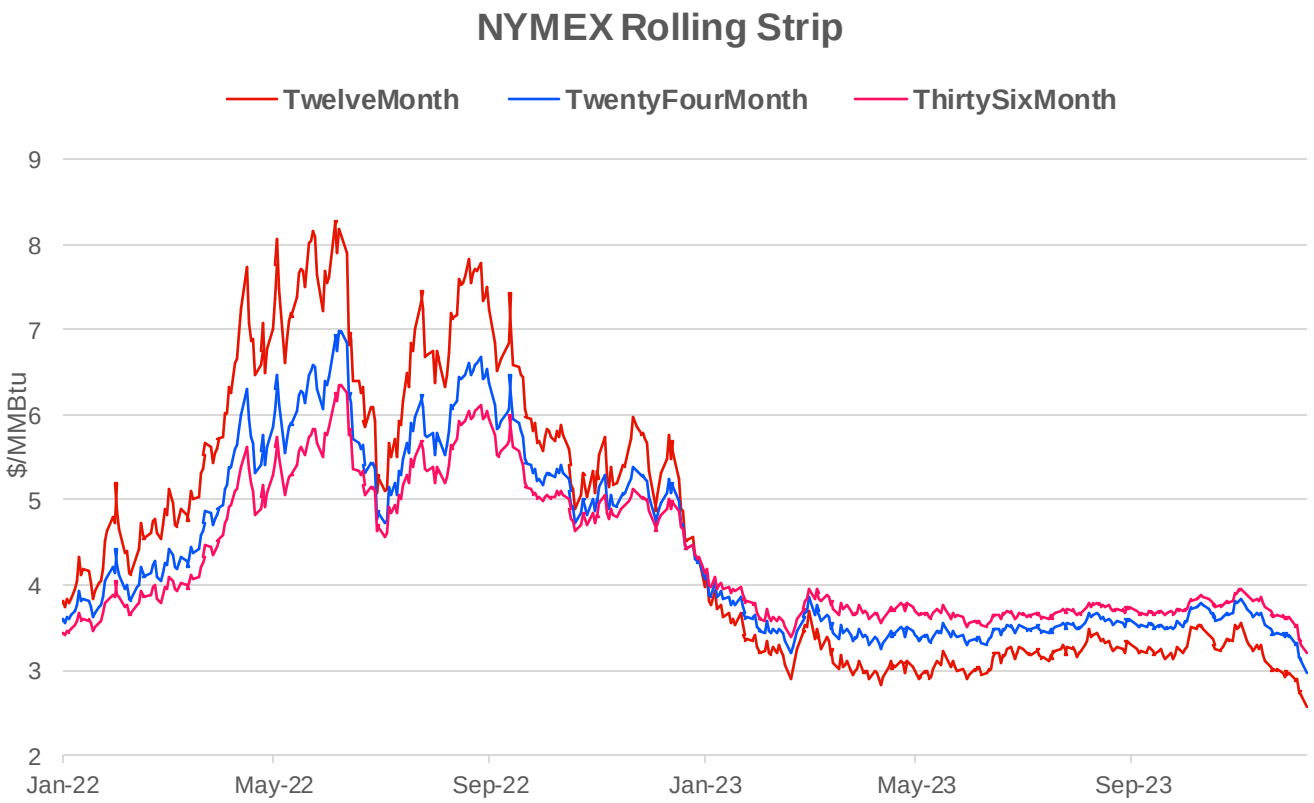
Coal-fired power generators have declined by over 1/3 over the past decade, and this decline continues as additional generation was scheduled to be shut down in 2023. The closures address a decarbonization goal by many utilities, but also indicate a strong commitment to future long-term spending and resource allocation plans. The average age of many of these facilities closing is over 50 years. The increasing costs of maintaining and operating these units make retirement a more attractive option. The more inexpensive and readily available natural gas molecule is filling in the void left by these plants, until additional renewable assets can come online.

Coal Generators Scheduled to be Retired in 2023:

- Sammis Power Plant in Ohio (1,490 MW)
- Pleasants Power Station (1,278 MW)
- Homer City Generating Station (2,000 MW)
- AB Brown Generating Station (700 MW)
- Jim Bridger Steam (1 unit – 700MW)
- Columbia Energy Center (1 unit – 500MW)
- FB Culley Generating Station (369 MW)
- Dallman Generating Station (437MW)
- Lawrence Energy Center (517MW)

KEY TAKEAWAY: As coal generator retirements continue, U.S. natural gas is positioned well to fill the void in power generation demand.

Natural Gas Pricing



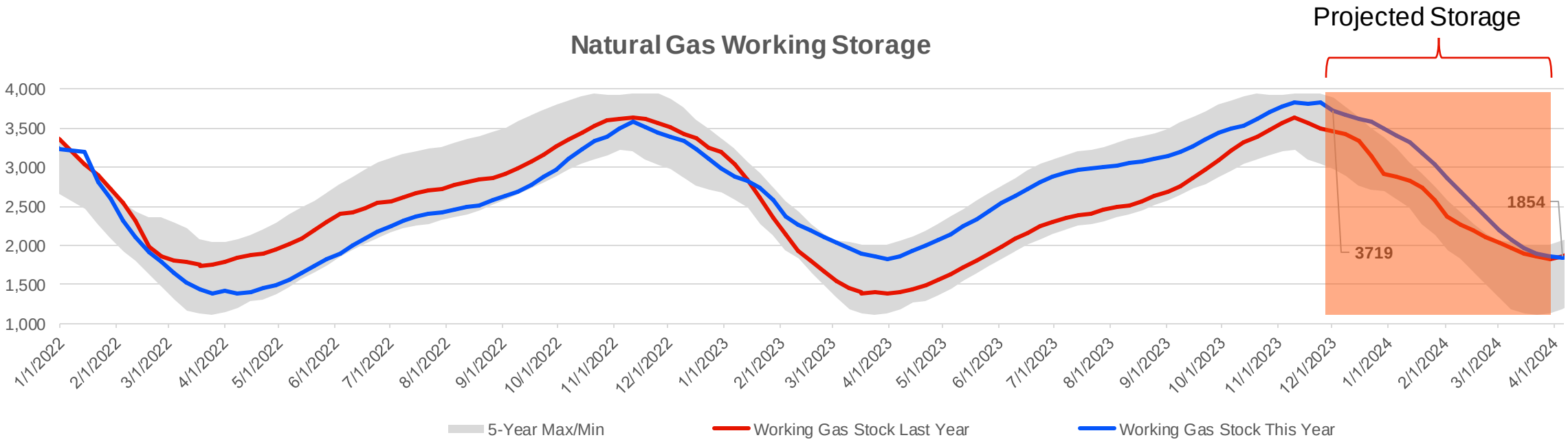
Rolling strip price data points refer to NYMEX futures 1, 2 and 3 years out respectively. Pricing updated as of 12/11/2023 close.

Term	Price	Variance to last week	Variance to last year
12 month	$2.56	-11.21%	-53.79%
24 month	$3.97	-10.65%	-42.30%
36 month	$3.19	-9.61%	-35.72%

The Henry Hub 1 year rolling strip is down -11.21% from last week, and -53.79% down from last year

- The Henry Hub is facing mostly bearish fundamentals right now from
  - ⬇ Strong domestic gas storage, well above the 5 year average
  - ⬇ Warmer temperatures in Europe tempering LNG export prices
  - ⬇ Record high gas production
  - ⬆ Decreasing gas costs prices out coal for power generation in some ISO's
  - ⬆ Record high LNG Exports

Natural Gas Storage



EIA Weekly Storage Report

3,719

Bcf as of 12/01

Variance to Current Year	
5YA	**1YA**
3,485	**3,465**
6.71%	7.33%

- Current working stocks are 3,719 Bcf, which is 254 Bcf more than storage levels 1 year ago at this time, and 234 Bcf more than the 5-year average.
- The East Region had the largest change from last week decreasing 4.262%, while the South-Central Region had the smallest change at 2.54% less than last week at this time
- With current stocks at 3,719 Bcf, we project the withdrawal season to end at about 1.85 Tcf, which would be bearish against the 5-year historical range

Renewables

December 2023

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Insight of the Month

Recent trends in PV technology – Cells, Modules and Systems

The EIA Photovoltaic Power Systems Program (PVPS) has released a report titled "Trends in Photovoltaic Applications, 2023" highlighting recent advancements in the PV power systems market and the changing landscape of product and technology applications worldwide.

The information presented on the right provides a summary of prevalent trends in the technology of PV solar panels but is not limited to the only options available. Over the past decade, there has been a rapid evolution in the material, manufacturing, and efficiency of panels, significantly impacting the economic viability of commercial solar projects.

Key components of a PV power system include cells, modules, mounting structures, and inverters.

Cells are the smallest units in a PV power-producing system and can be classified by size and manufacturing process.

Size – The size of wafers and cells has increased over time improving efficiency. Cells M10 (~182x182 sq mm) and G12 (210 mm) dominated the market share as of 2022.

Material – Cell classification is also dependent on the material used.

- Crystalline Silicon (c-Si) – Most common holding approximately 97% of the market share in 2022
- Compound Semiconductor Thin Film (GaAs, CdTe, CIGS & CIS, etc.) - Easier to manufacture than c-Si but can have lower conversion efficiencies.
- Organic (OPV) - Not yet commercially available due to low conversion efficiency, but among the fastest advancing solar technologies over the past years.

Modules consist of individual PV cells connected and encapsulated with materials like glass or plastic. The wattage of most recent modules can range from 300 W to 600 W or even up to 740 W in 2023.

- A typical residential system module has a power rating of around 300-435 W.
- Modules for ground-mounted systems are usually 400W or larger
- Modules eligible for reuse/resale in the secondary market are generally accepted if they fall within the 200-300 W range.

Systems consist of one or more modules connected to either the grid or to a series of loads (off-grid) along with inverters, controllers, or batteries that adapt the electricity output of the module to the network standards.