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S&P Global
Commodity Insights

IECA: US Gas Market Update

Nov. 7, 2023

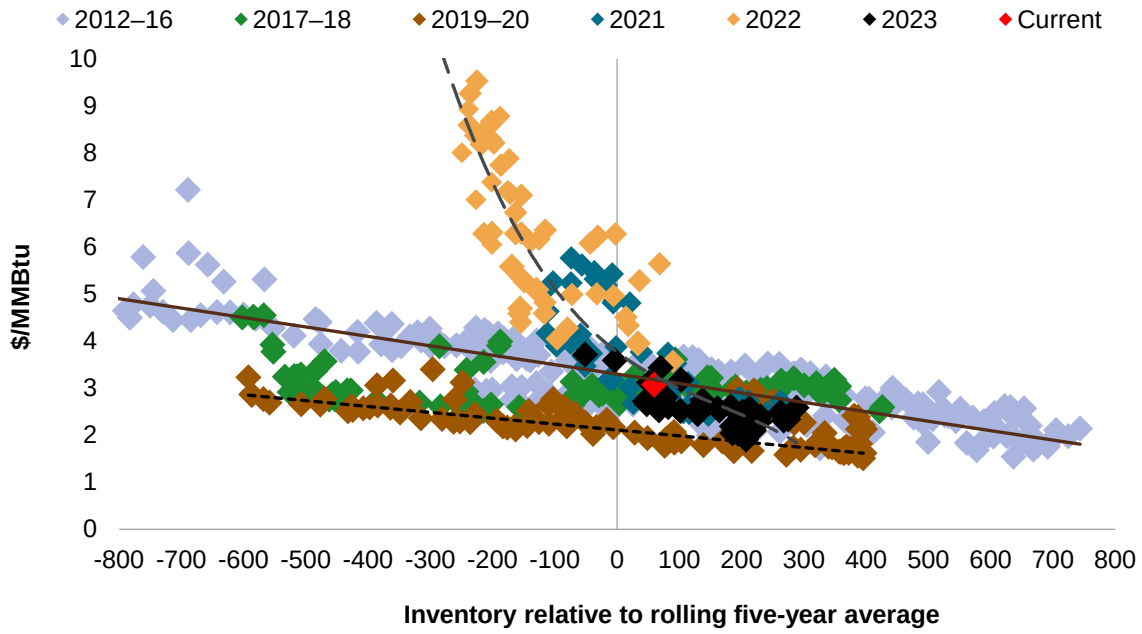
Nikolay Filchev / Global Gas / Director

Natural gas yield curve

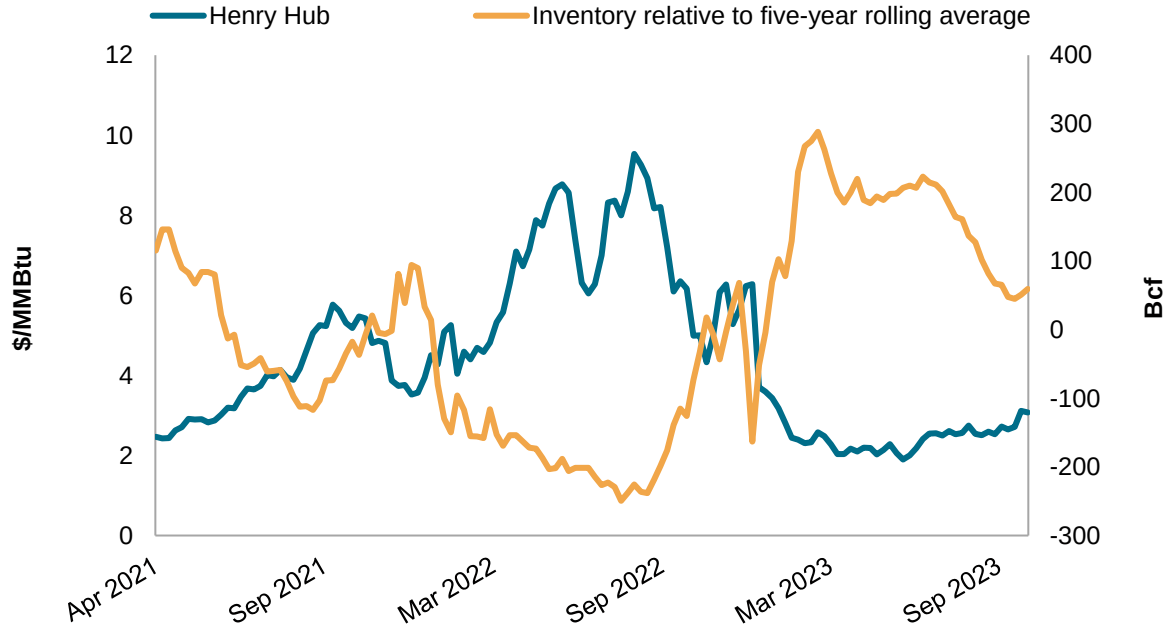
Storage surplus eroded since July, prices push higher along trend

US Lower 48 storage inventories on Oct. 20 were at a 59-Bcf surplus to the rolling five-year average as Henry Hub prices for the corresponding week averaged $3.07/MMBtu (see the red diamond in the figure).

Henry Hub and natural gas storage yield curve



Henry Hub and natural gas storage



Data compiled Oct. 26, 2023.
Sources: S&P Global Commodity Insights; EIA.

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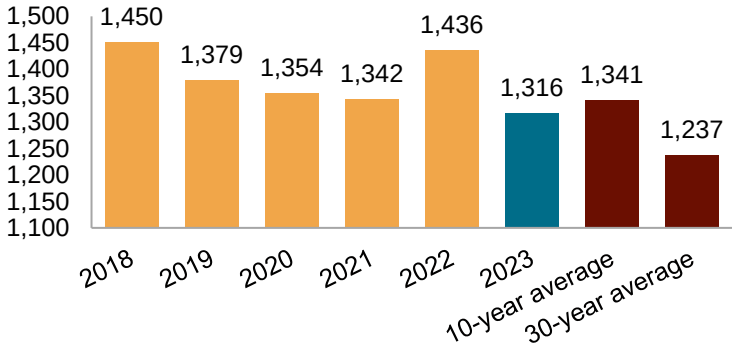
How is the weather in your neighborhood?

Summer ended with 1% fewer PWCDDs than the 10-year normal and 6% more than the 30-year normal

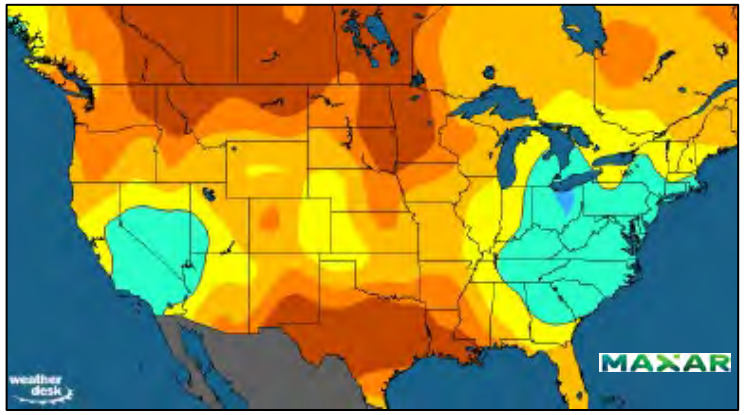
PWCDD tracker (May 1 to September 30)



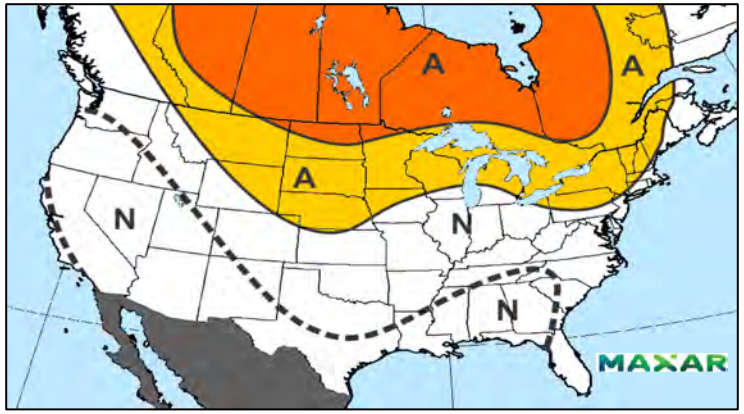
The current forecast for November is for 2% fewer gas-weighted heating degree-days than the 10-year normal and 3% fewer than the 30-year normal, projecting above-normal temperatures in the Northern Plains through the Northeast.

The current forecast for December is for 1% more gas-weighted heating degree-days than the 10-year normal and 5% fewer than the 30-year normal, with widespread above-normal temperatures across the eastern half of the US and below-normal temperatures over the Interior West.

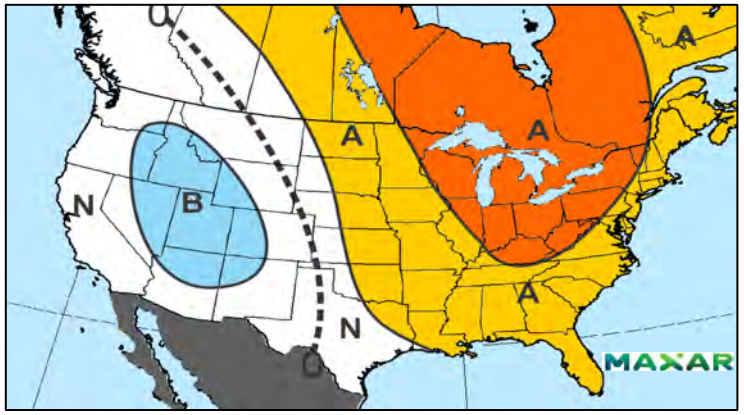
PWCDD tracker (May 1 to Oct. 14)



November 2023



December 2023



Data compiled Oct. 19, 2023.
PWCDDs = population-weighted cooling degree-days.
Sources: S&P Global Commodity Insights; Maxar.

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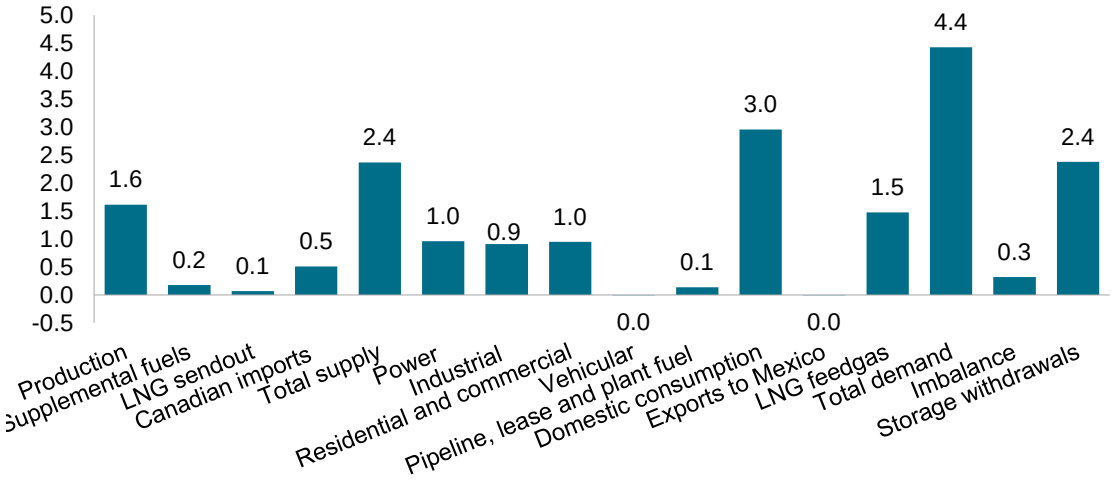
Winter 2023/24: A tighter market year on year despite 2.4 Bcf/d of production and imports growth winter over winter

US Lower 48 winter 2023/24 versus 2022/23 (Bcf/d)



- Record gas demand from the power sector and anemic production, impacted by pipeline outages, have reduced the storage overhang since late June, but the withdrawal season should still start with around 100 Bcf of storage surplus above the rolling five-year average. However, an expected 4.4 Bcf/d surge in demand winter over winter (assuming normal weather) will bring the market to balance by end-March 2024 and support prices in early 2024.
- LNG feedgas demand should rise 1.5 Bcf/d winter over winter, assuming normal operations at Freeport LNG and all other liquefaction facilities. Residential/commercial (0.9 Bcf/d; normal weather), industrial (0.9 Bcf/d; normal weather and new manufacturing capacity) and power sector consumption (1 Bcf/d; low gas prices and coal-fired capacity retirements) will combine for 2.9 Bcf/d growth winter over winter.
- Despite a declining US Lower 48 production in early 2024, winter 2023/24 gas output is still expected to be 1.6 Bcf/d higher than the previous winter, largely due to growth in the Permian and Haynesville, aided by recent takeaway capacity expansions.
- The expected net short supply/demand balance, even with 0.5 Bcf/d higher imports from Canada, will require 2.4 Bcf/d higher storage withdrawals this winter versus last.

US Lower 48 winter 2023/24 versus 2022/23 natural gas supply and demand outlook (Bcf/d)

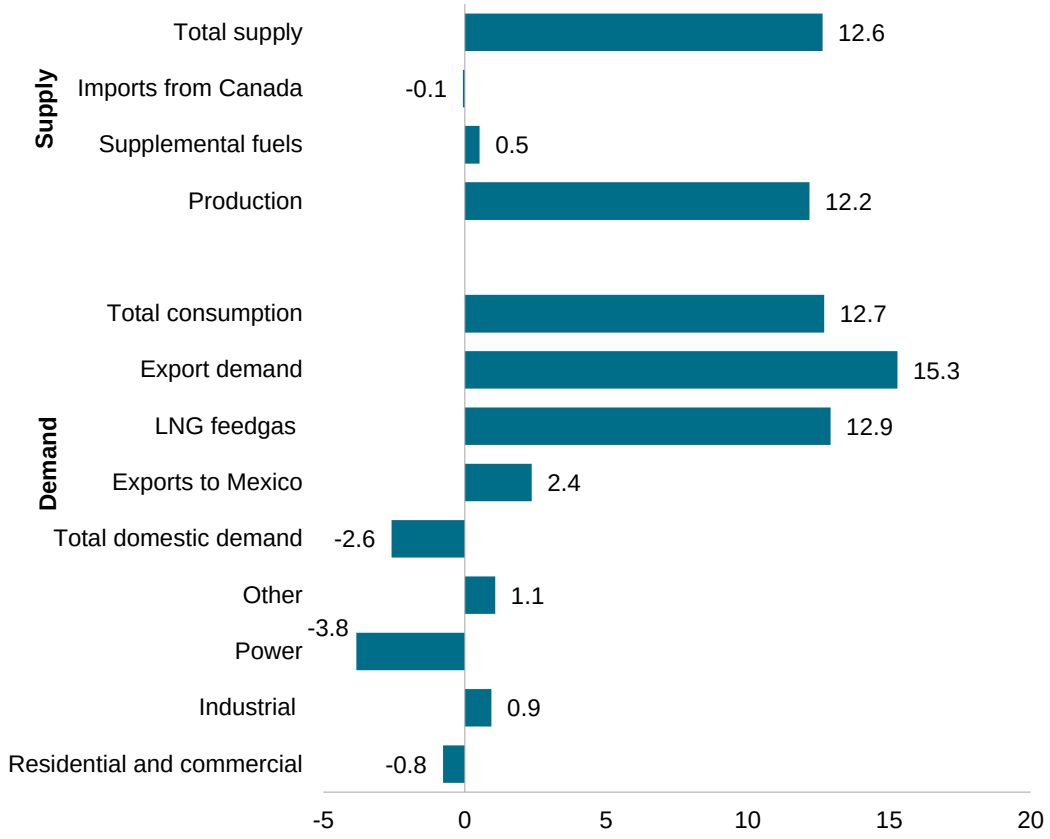
Season	Production	Supplemental fuels	LNG sendout	Net Canadian imports	Total supply	Power	Industrial	Residential and commercial	Vehicular	Pipeline, lease and plant fuel	Domestic consumption	Exports to Mexico	LNG feedgas	Total demand	Imbalance*	Storage withdrawals	Henry Hub price ($/MMBtu)
Winter 2022/23	100.7	0.2	0.1	5.3	106.3	30.8	24.5	37.0	0.2	7.7	100.2	5.4	12.4	117.9	-0.3	11.4	3.81
Winter 2023/24	102.3	0.4	0.2	5.8	108.6	31.8	25.4	38.0	0.2	7.9	103.1	5.4	13.8	122.4	0.0	13.7	3.25
Change**	**1.6**	**0.2**	**0.1**	**0.5**	**2.4**	**1.0**	**0.9**	**1.0**	**0.0**	**0.1**	**3.0**	**0.0**	**1.5**	**4.4**	**0.3**	**2.4**	**-0.6**

Data compiled Oct. 17, 2023.
*There is an imbalance between EIA historical supply, demand and storage data.
**Totals and absolute changes may not reconcile fully with the composite data shown in this table because of rounding.
Sources: S&P Global Commodity Insights; EIA.

Five-year outlook

US Lower 48 supply and demand balance to 2028

US lower-48 supply and demand balance, 2028 versus 2022 (Bcf/d)

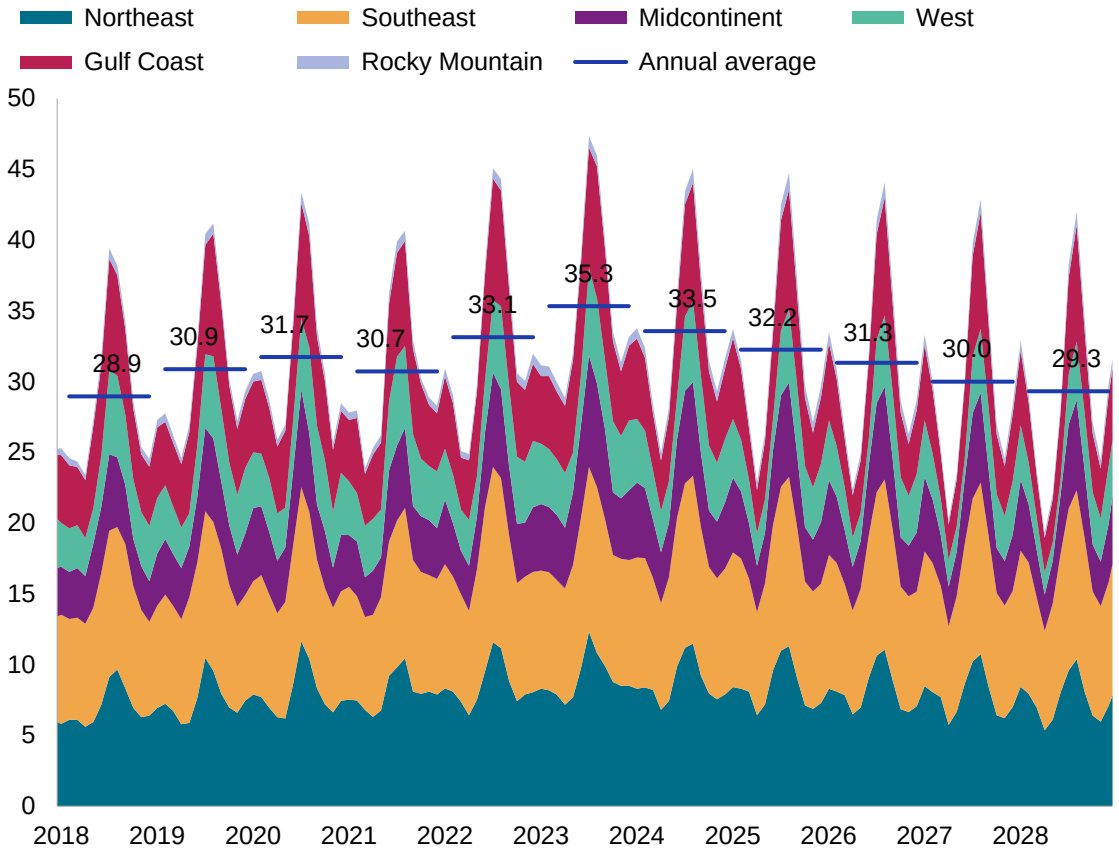


- **We expect US Lower 48 annual average supply in 2028 to be up 12.6 Bcf/d from the 2022 level.**
  - Dry gas production is expected to grow by 12.2 Bcf/d, to 110.8 Bcf/d, on an annual average level by 2028, given the rise in LNG and Mexico exports.
  - Imports from Canada and supplemental fuels (renewable natural gas) account for a combined net 0.4 Bcf/d of growth over 2023–28.
- **Total US Lower 48 consumption in 2028 is forecast to be up 12.7 Bcf/d from 2022,** as the 15.3-Bcf/d growth in export demand is partially offset by the 2.4-Bcf/d decline in domestic demand (power and residential/commercial sectors).
  - **LNG feedgas** demand is expected to more than double (12.9 Bcf/d) by 2028 compared with 2022 levels as significant new LNG export capacity comes from Golden Pass LNG, Plaquemines LNG, Corpus Christi LNG Stage III, Delfin FLNG 1, CP2 LNG Phase 1, Rio Grande LNG T1-3 and Port Arthur LNG Phase 1. Summer 2028 liquefaction utilization is projected to be reduced. For more details, see slides 15 and 16.
  - **Exports to Mexico** should increase by more than 40% from 2022 levels by 2028, based on our latest outlook for Mexican production, power sector demand and ramping LNG exports from Baja California and Tamaulipas.
  - **The residential, commercial and power sectors** are in decline, while industrial gas demand is expected to rise modestly by 0.9 Bcf/d as the economy grows and new petrochemical capacity starts up.
  - Power sector gas demand will decline materially by 2028 (3.8 Bcf/d) as the assumptions from the IRA support stronger renewables penetration in electricity generation at the expense of natural gas.

Data compiled Oct. 17, 2023.
Other demand is vehicle fuel plus pipeline, lease and plant fuel.
Sources: S&P Global Commodity Insights; EIA.

Annual US power sector gas demand expected to peak in 2023 at 35.3 Bcf/d

US Lower 48 power sector gas demand by region (Bcf/d)



US Lower 48 power sector gas demand change (Bcf/d)

	2022	2028	Change	Percent change
Northeast	8.5	7.5	-1.0	-12%
Southeast	9.4	9.3	-0.1	-1%
Midcontinent	4.5	4.2	-0.3	-8%
West	4.2	3.0	-1.2	-29%
Gulf Coast	5.9	4.7	-1.2	-21%
Rocky Mountain	0.6	0.6	0.0	2%
Total	**33.1**	**29.3**	**-3.8**	**-12%**

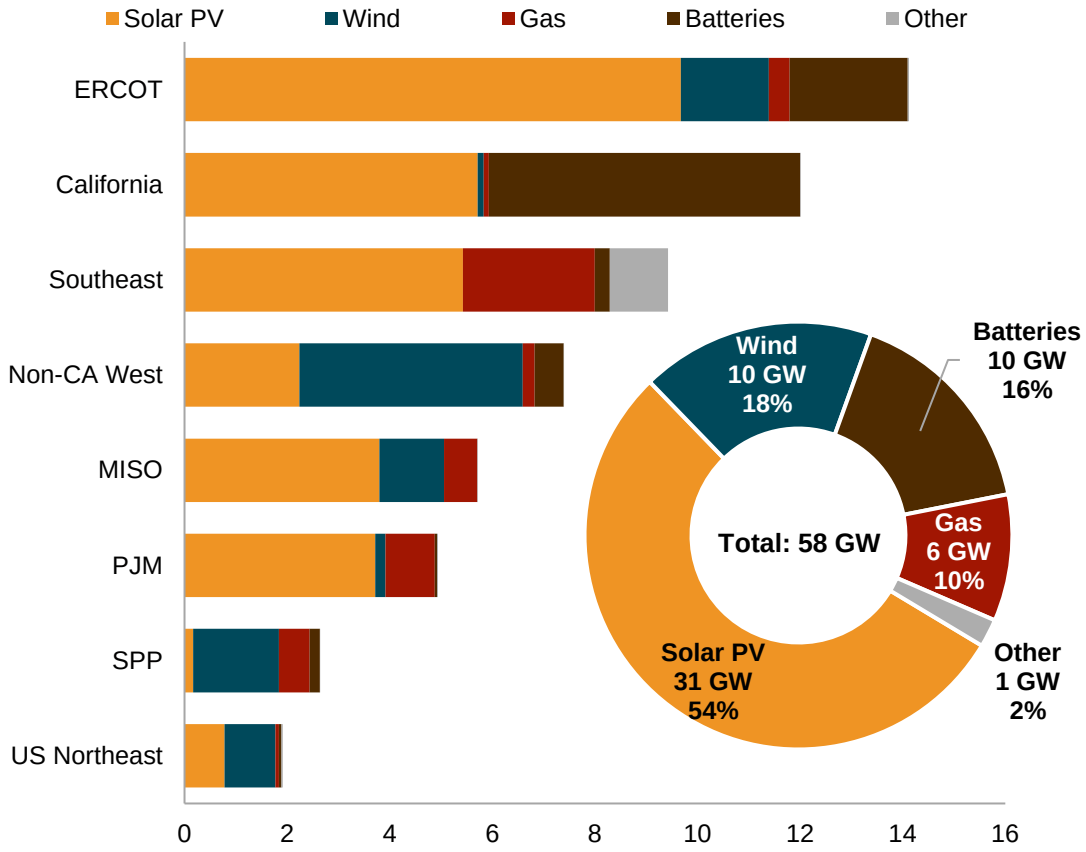
Data shown may reflect rounding.

- US power sector gas demand for 2023 will be up an estimated 2.2 Bcf/d year over year, reflecting increased reliance on gas-fired power generation as natural gas prices remain low. In this outlook we expect slightly higher power sector gas burns for summer 2023, averaging 38.1 Bcf/d, up 0.5 Bcf/d from our prior month's outlook given the higher power demand reported by the EIA for July.
- In this outlook, we continue to expect annual average power sector gas burns to peak in 2023 and then decline through 2028. In the short term, lower gas prices are expected to lift gas-fired power demand at the expense of coal-fired plants utilization. However, by the end of the forecast, power demand declines owing to the strong build-out of renewables spurred on by the passing of the IRA.

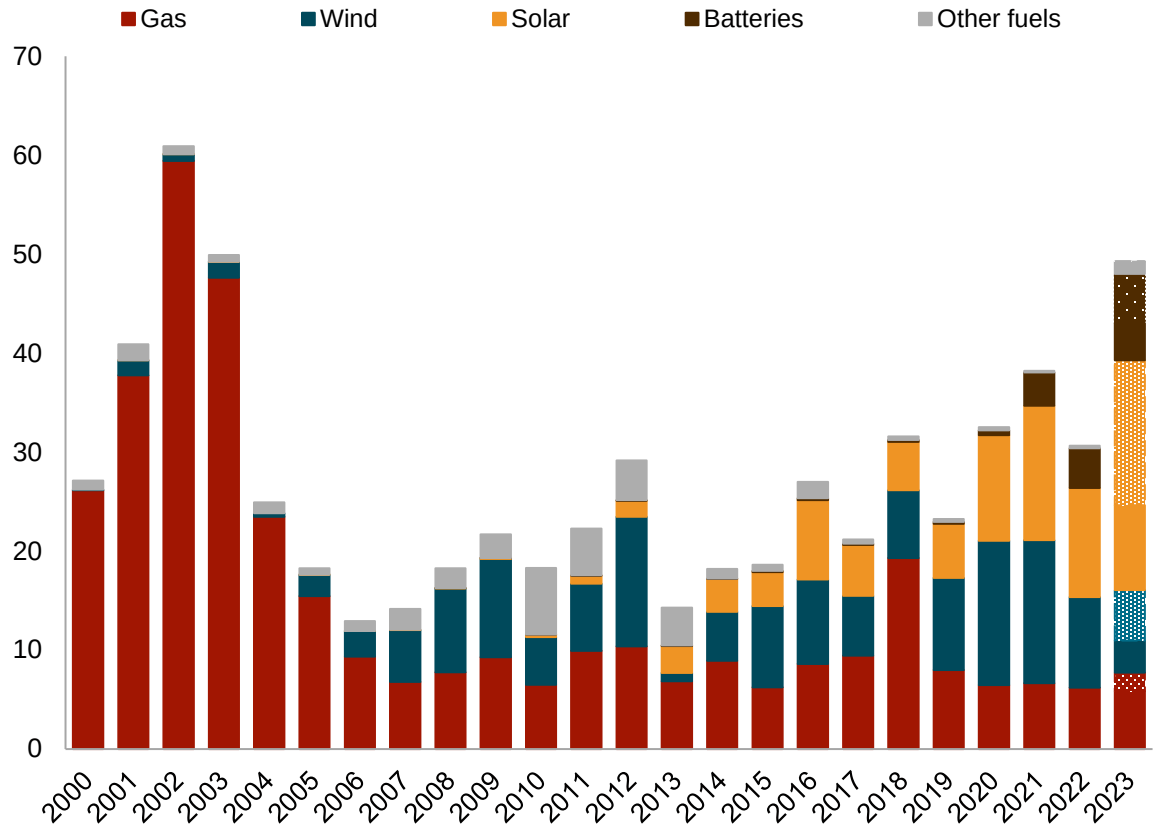
Data compiled Oct. 15, 2023.
Sources: S&P Global Commodity Insights; EIA.

US power sector on pace to complete more than 50 GW of utility-scale supply in 2023 — the largest expansion of the supply fleet in two decades

US generating capacity under construction by region (GW)



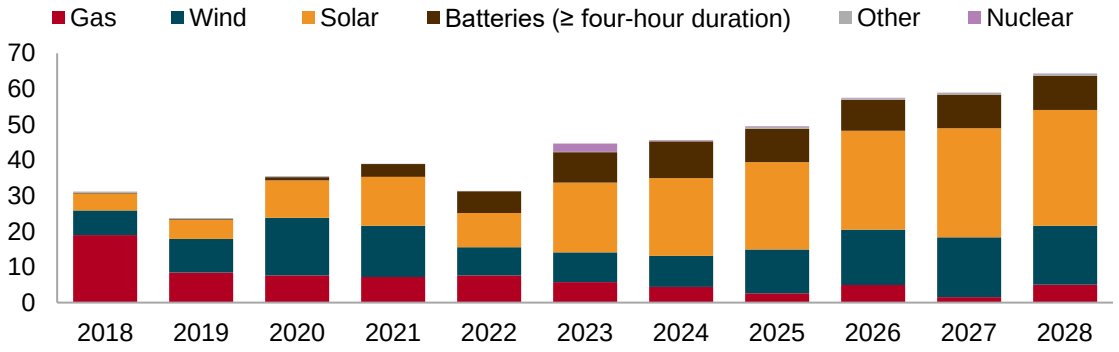
US Lower 48 generating capacity by online year (GW)



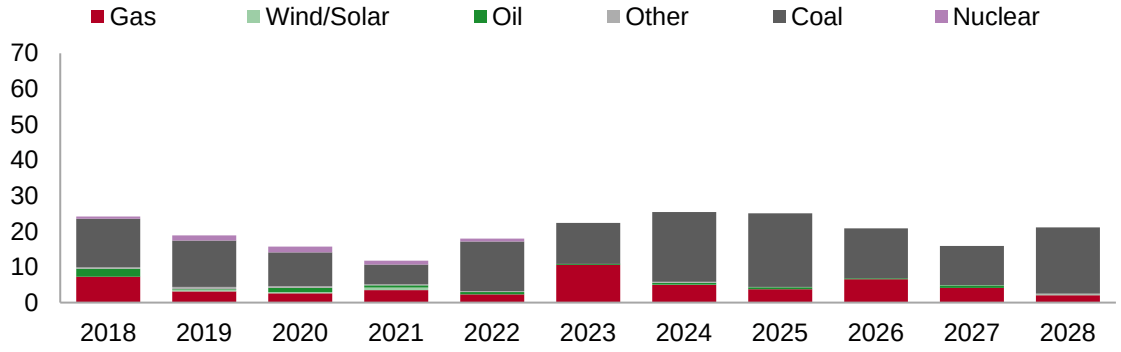
Data compiled Oct. 13, 2023.
Data includes generating units at electric power plants with 1 MW or greater of combined nameplate capacity; data as of August 2023.
Sources: S&P Global Commodity Insights, EIA.

Solar and wind dominate capacity additions through 2028, gas-fired capacity declines slightly on a net basis

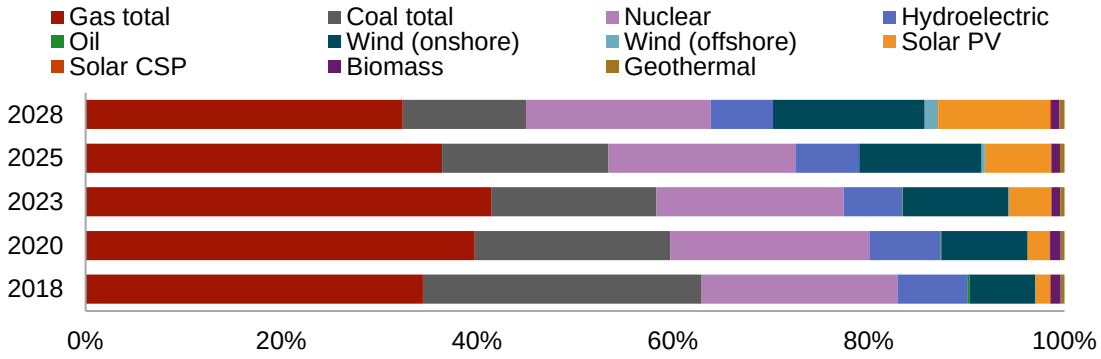
US Lower 48 generating capacity additions (GW)



US Lower 48 generating capacity retirements (GW)



Percentage of total US power generation

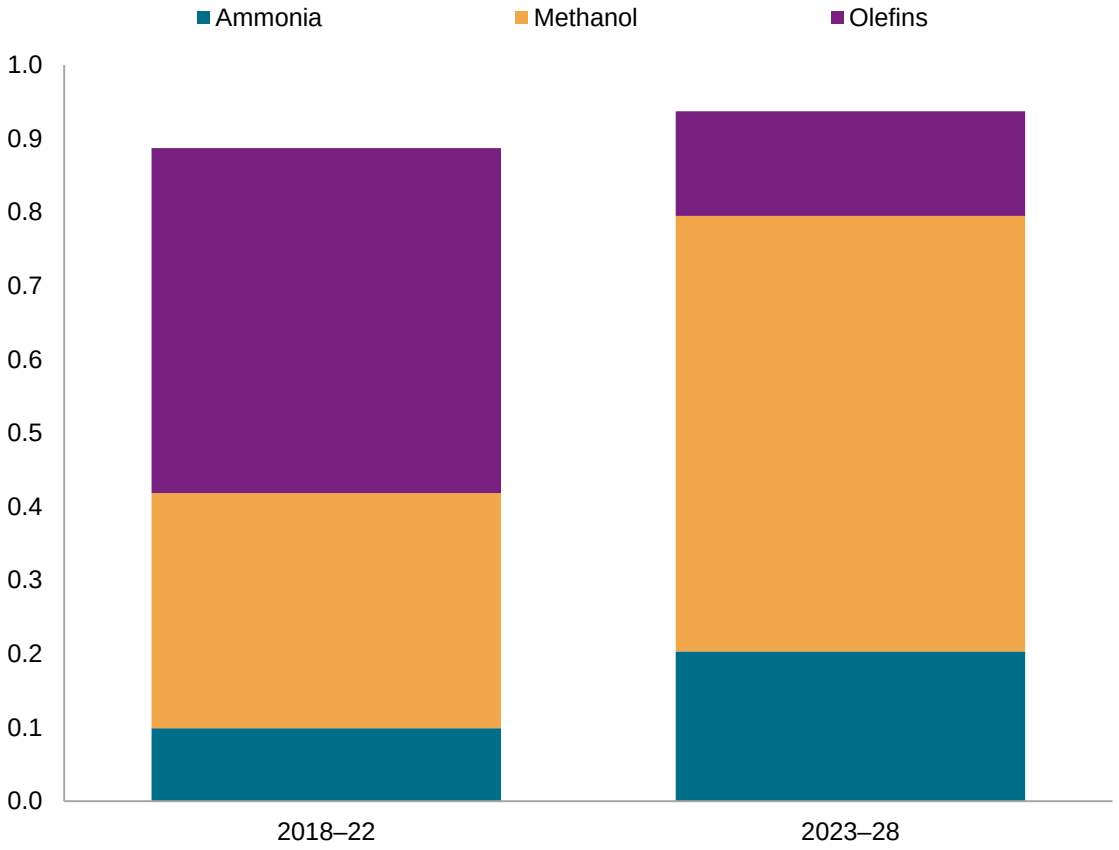


- **In this outlook, US power sector net generating capacity additions are expected to average nearly 40 GW per year during 2023–28.**
- **For 2023–28, we expect nearly 130 GW of generating capacity to be retired** across the US Lower 48. The US coal-fired fleet is expected to dip below 107 GW by 2028 from nearly 200 GW in 2022. Coal-fired power plants, which continue to struggle financially, are forecast to account for 70% of the retiring capacity during this period.
- **For 2023–28, US power sector capacity additions will total just less than 60 GW per year, with a peak year in 2027.** The pace has slowed owing to headwinds like supply chain bottlenecks for solar. However, robust renewables capacity additions are still expected, with solar expected to add 160 GW and wind nearly 80 GW from 2023 through 2028.

Data compiled Oct. 15, 2023.
CC = combined cycle; CT = combustion turbine; ST = steam turbine; CSP = concentrating solar power; PV = photovoltaic.
Sources: S&P Global Commodity Insights; EIA; North American Electric Reliability Corporation; ABB Velocity Suite.

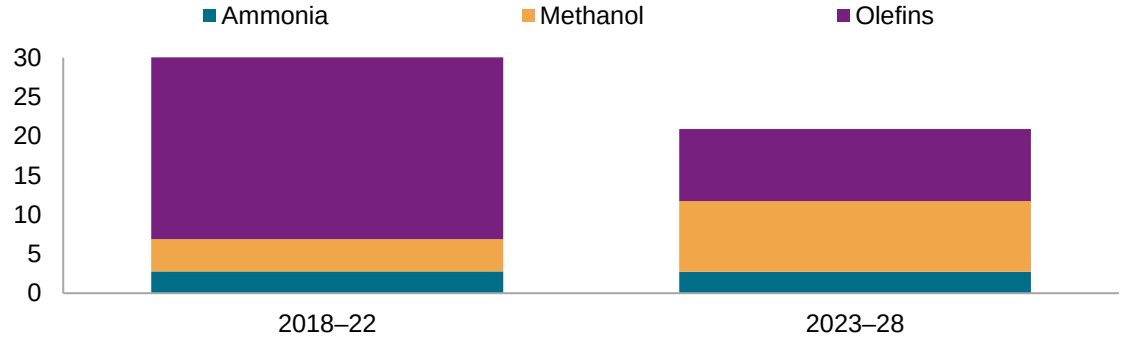
Olefins and methanol production capacity additions are expected to drive US petrochemical demand in the short term

US Lower 48 incremental petrochemical natural gas demand (Bcf/d)



- **Incremental natural gas demand in the petrochemical sector is expected to come predominantly from the methanol, ammonia and olefins value chains,** which use natural gas as a feedstock or as a process fuel.
- **As a result of expected petrochemical capacity additions, modest demand growth from the petrochemical industry is expected in 2023–28** resulting in industrial demand overall increasing by 0.9 Bcf/d by 2028 as compared with 2022 levels.

US Lower 48 incremental petrochemical production capacity (MMtpa)



Data compiled Oct. 15, 2023.
MMtpa = million metric tons per annum.
Source: S&P Global Commodity Insights.

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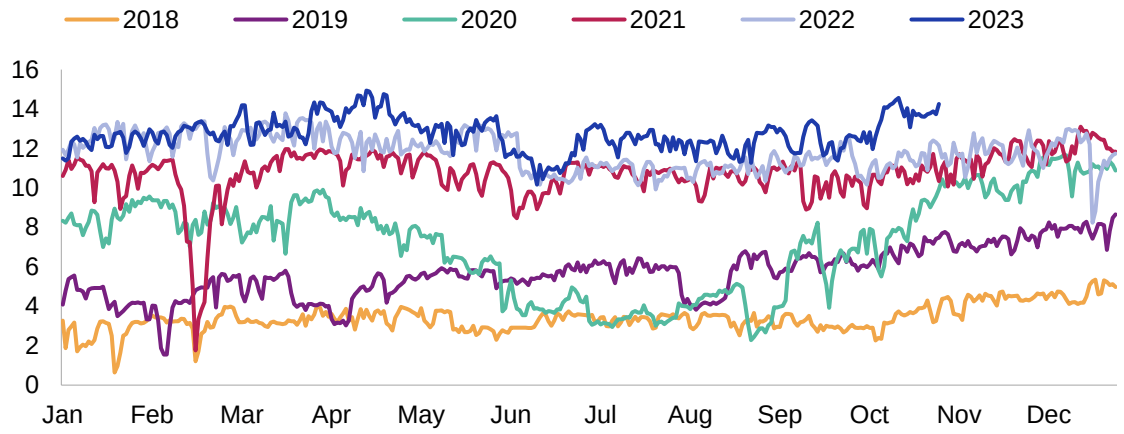
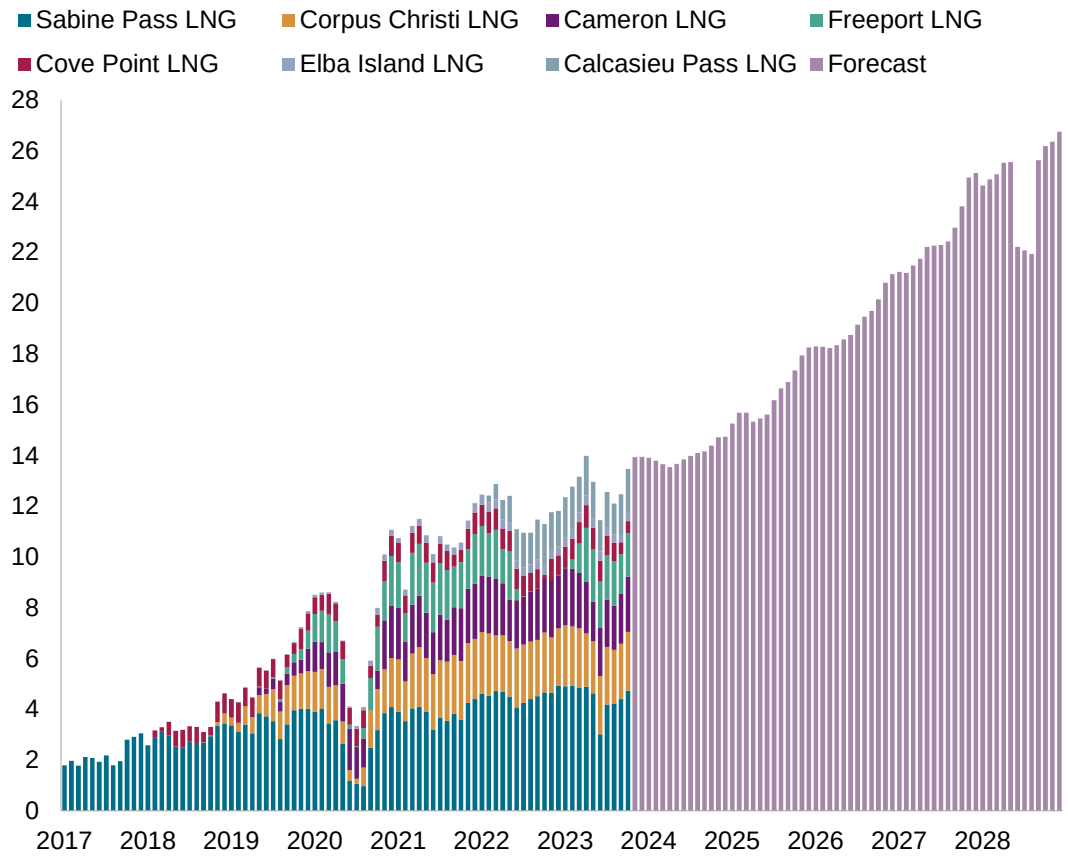
US LNG feedgas will reach 24.7 Bcf/d by 2028, but increasingly loose global LNG fundamentals may challenge US liquefaction facilities' summer utilization

LNG export facility	Commercial start dates	Feedgas (Bcf/d)
Golden Pass LNG	Sept 24–Sept 25	2.3
Plaquemines LNG	May 25–Sept 26	2.9
Corpus Christi LNG Stage III	Jun 26–Dec 27	1.4
Delfin FLNG 1	Apr-26	0.5
CP2 LNG Phase 1	Sept 26–May 27	1.5
Rio Grande LNG	Oct 27–Oct 28	2.4
Port Arthur LNG Phase 1	Dec 27–Jun 28	1.7

US Lower 48 LNG feedgas by year (Bcf/d)



US Lower 48 LNG feedgas (Bcf/d)



Data compiled Nov. 1, 2023.
Source: S&P Global Commodity Insights.

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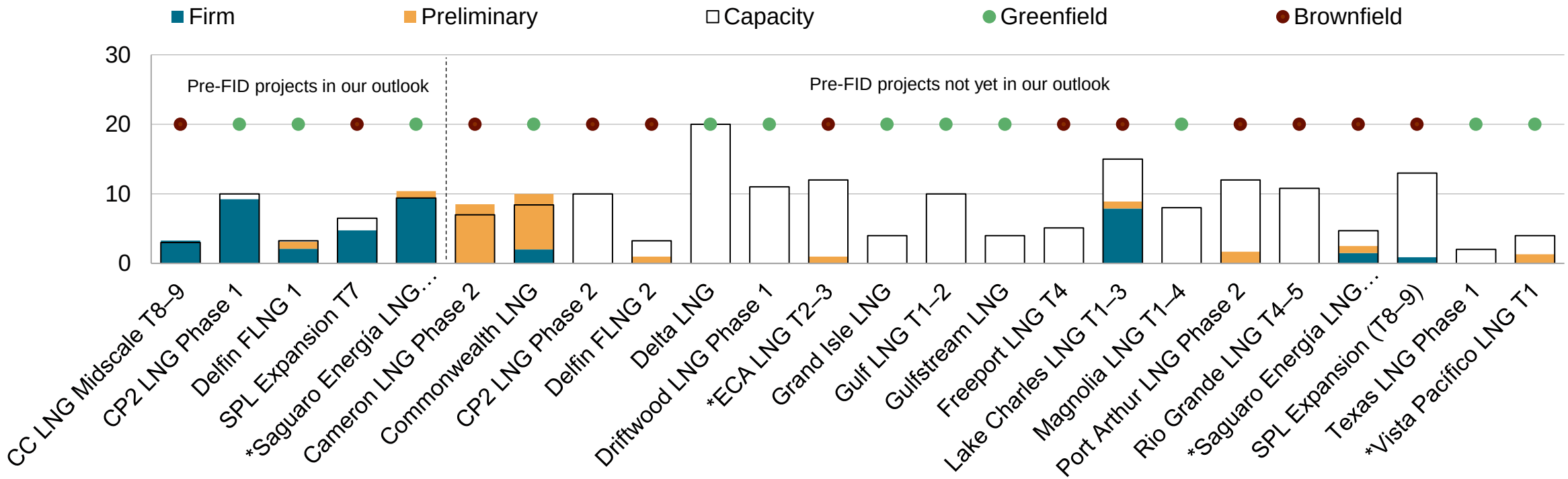
North American LNG export facilities in S&P Global's short-term outlook

The next round of US LNG export capacity buildout is underway

Record-high global natural gas prices in 2022 spurred renewed interest in US LNG, and there is no shortage of liquefaction projects proposed along the US Gulf Coast. Beyond the 92 MMtpa in operation today and the 78 MMtpa under construction, an additional 166 MMtpa of export capacity is in various stages of development.

LNG contracting progress at select pre-FID US and Mexican LNG projects (MMtpa)

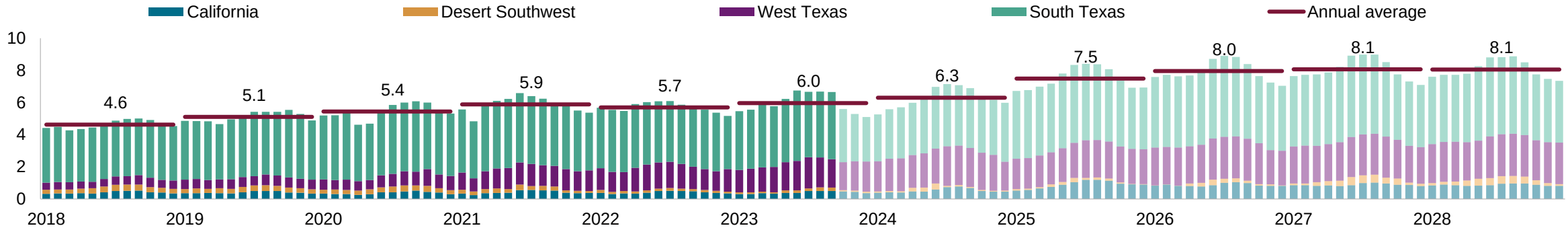


Data compiled Nov. 2, 2023.
CC = Corpus Christi. SPL = Sabine Pass LNG. *Asterisked projects are based in Mexico. Brownfield includes expansions at existing regasification facilities as well as subsequent phases of yet-to-constructed greenfield projects.
Source: S&P Global Commodity Insights.

Growing domestic industrial and power sector demand and the start of Mexico LNG exports will increase US piped exports to Mexico by 2.1 Bcf/d through 2028

- New Fortress Energy's (NFE) first Fast LNG vessel near the Altamira LNG terminal is now assembled and connected to the Sur de Texas–Tuxpan pipeline to receive feedgas, suggesting imminent start of liquefaction activities.
- Net domestic production is expected to average about 2.7 Bcf/d in 2023, and piped imports from the US Lower 48 will account for about 70% of the total gas supply in Mexico. In 2023, we expect average US Lower 48 exports to Mexico to gain 0.2 Bcf/d year over year and continue an upward trend, gaining 2.2 Bcf/d by 2028. By the end of the outlook, we expect that US Lower 48 exports to Mexico will account for nearly 80% of the total supply in Mexico.
- Domestic demand growth in the power, industrial and LNG export sectors will contribute to a 2.2-Bcf/d gain in total demand by 2028:
  - **Power sector:** The national utility company (Federal Electricity Commission [CFE]) plans to build about 7 GW of new gas-fired capacity in the short-to-medium term, which will drive a 0.9-Bcf/d increase in gas demand from the sector over 2022 levels (reaching 5.5 Bcf/d by 2028).
  - **Industrial sector:** Sustained industrial demand, mainly in the northern part of Mexico, is expected to add an incremental 0.3 Bcf/d by 2028.
  - **LNG exports:** In Tamaulipas, NFE's plans to deploy three Fast LNG units near Altamira will add 0.6 Bcf/d to export demand by the first quarter of 2025, and the startup of Energía Costa Azul LNG T1 in July 2025 (with commissioning flows beginning around March 2025) will create more than 0.4 Bcf/d of LNG export demand in Baja California.

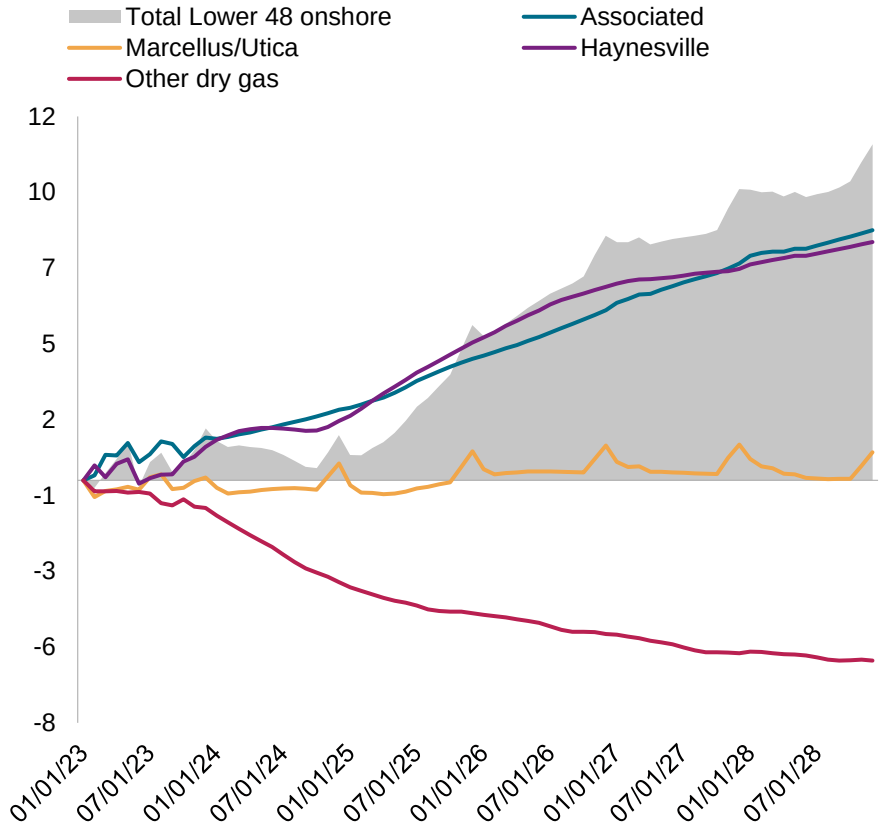
Net pipeline exports to Mexico (Bcf/d)



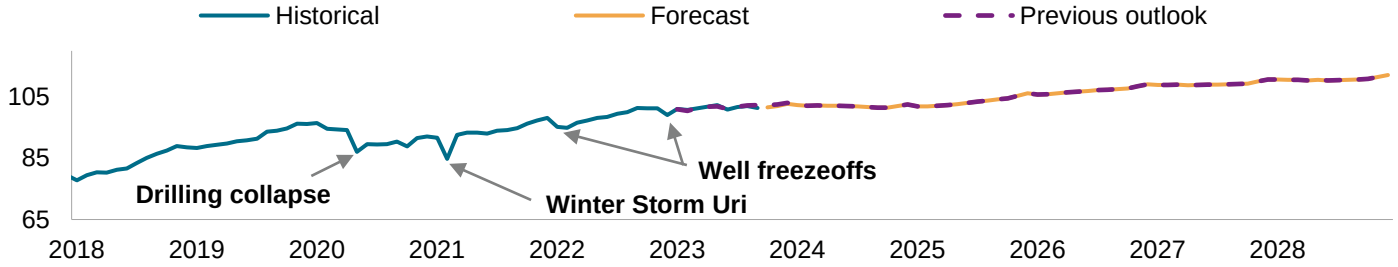
Data compiled Oct. 20, 2023.
Source: S&P Global Commodity Insights.

Production slows in 2023–24 due to the lack of demand growth and low gas price environment prior to LNG exports growth providing an uplift in 2025 and beyond

Change in natural gas production since January 2023 (Bcf/d)



US Lower 48 natural gas production (Bcf/d)

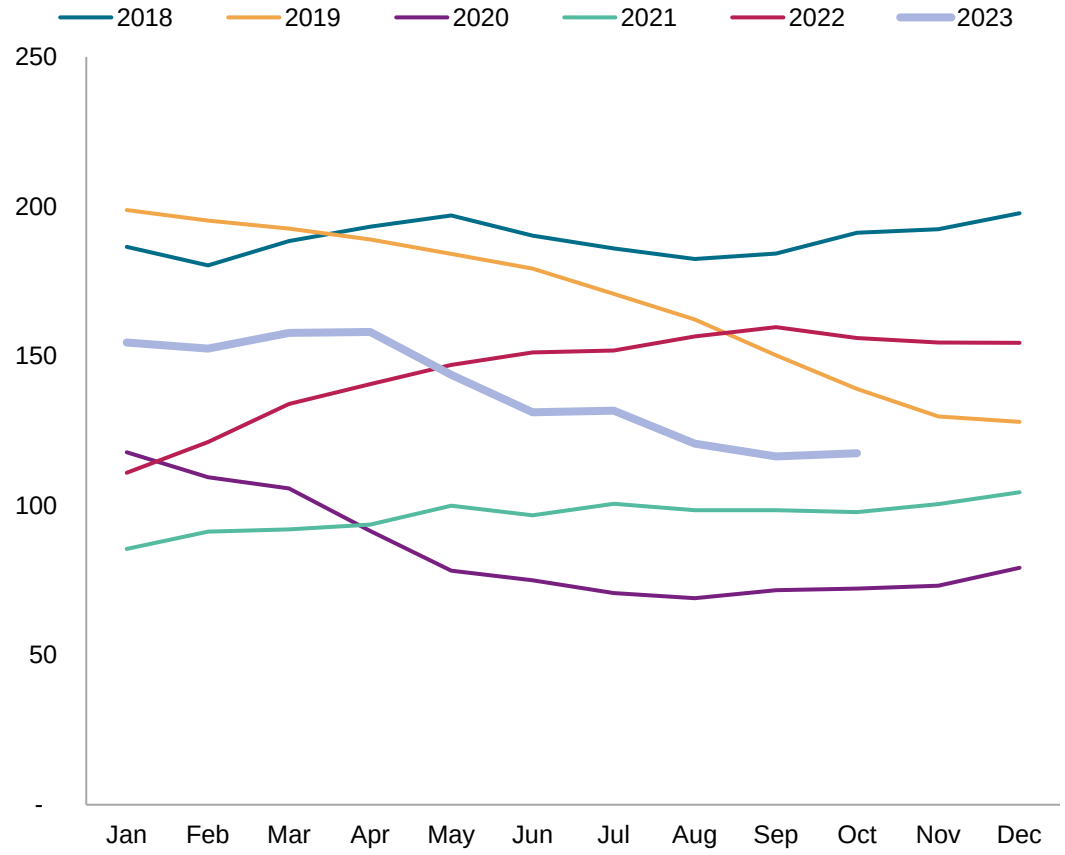


- US Lower 48 production averaged an estimated 101.3 Bcf/d in September, dropping by 0.6 Bcf/d from August. October has seen large swings in output, with the first seven days dropping to an average of 100.4 Bcf/d due to multiple expected and unplanned pipeline maintenance events in the Northeast and Texas, but the following nine days posting a 102.1 Bcf/d average. As of October 16, US Lower 48 month-to-date gas production is averaging 101.4 Bcf/d, just 0.2 Bcf/d shy of our forecast for the month.
- Declining gas prices at the beginning of 2023 have had a significant impact on rig activity, with the steepest decline starting in May, persisting through late August and only gradually slowing down in September. The total drilled-but-uncompleted well count continues to decline except for the Haynesville play, where it increased in September.
- US Lower 48 production is projected to average 101.6 Bcf/d in 2023 and tick up by only 0.4 Bcf/d in 2024. In the second half of 2024 we expect new LNG export capacity to come online, pulling prices higher and providing the necessary incentive to increase drilling and supply through 2028.
- The level of associated gas production and demand will dictate the call on nonassociated gas. With Appalachia crippled by limited infrastructure and higher-cost dry gas uneconomic, Haynesville is the primary source of production to meet the growing LNG feedgas demand.

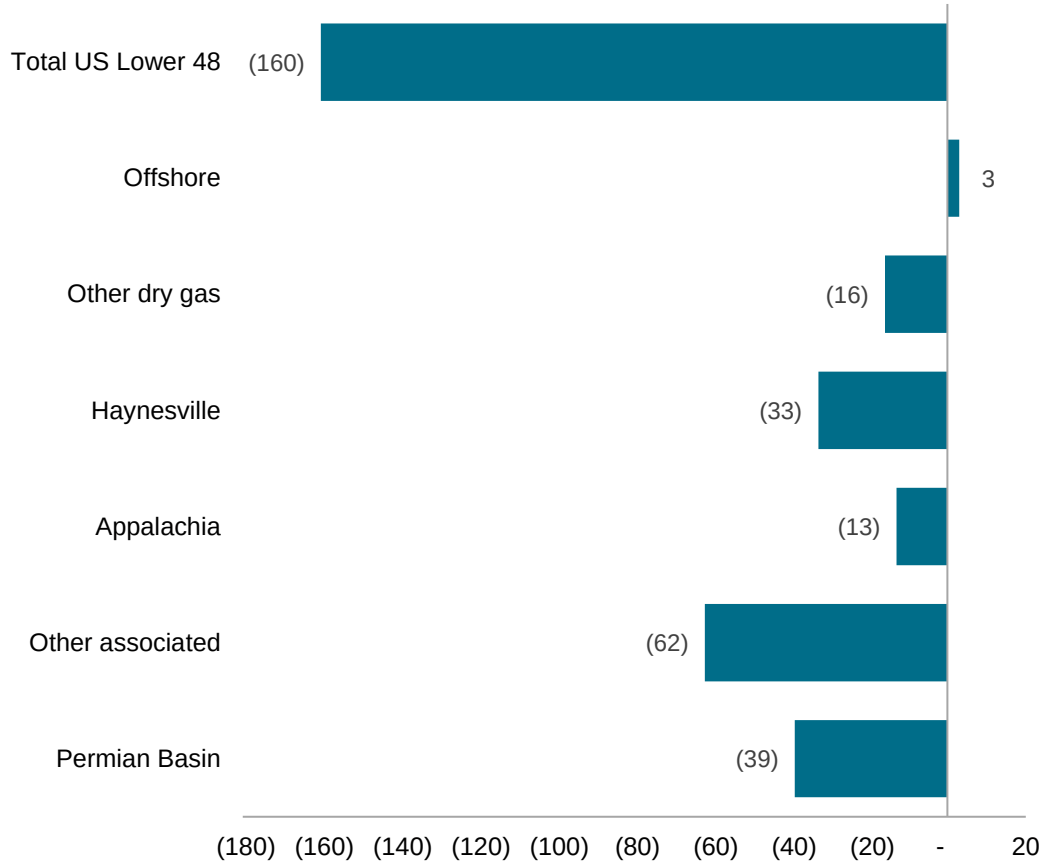
Data compiled Oct. 16, 2023.
Sources: S&P Global Commodity Insights; EIA.

The steep decline in rigs from April through August flattens out entering the shoulder season in October; gas count down nearly 40 rigs since last year

US Lower 48 gas-directed rig count by year



Rig count change since peak in November 2022



Data compiled Oct. 16, 2023.
Data includes all rig orientations (horizontal, vertical, directional wells).
Sources: S&P Global Commodity Insights; Baker Hughes.

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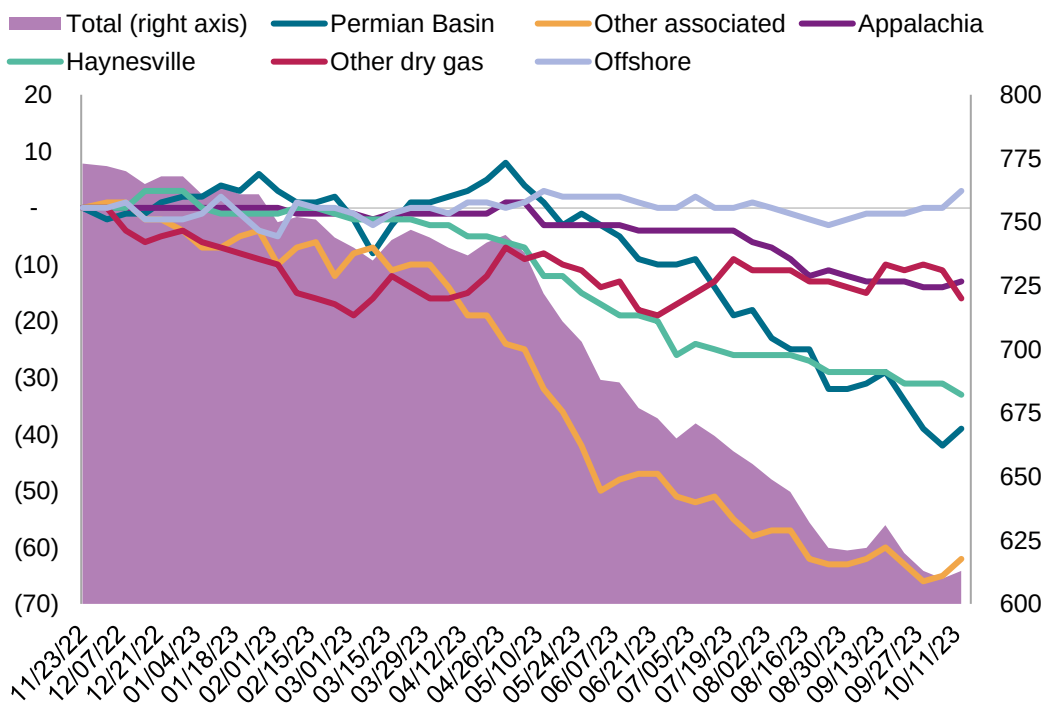
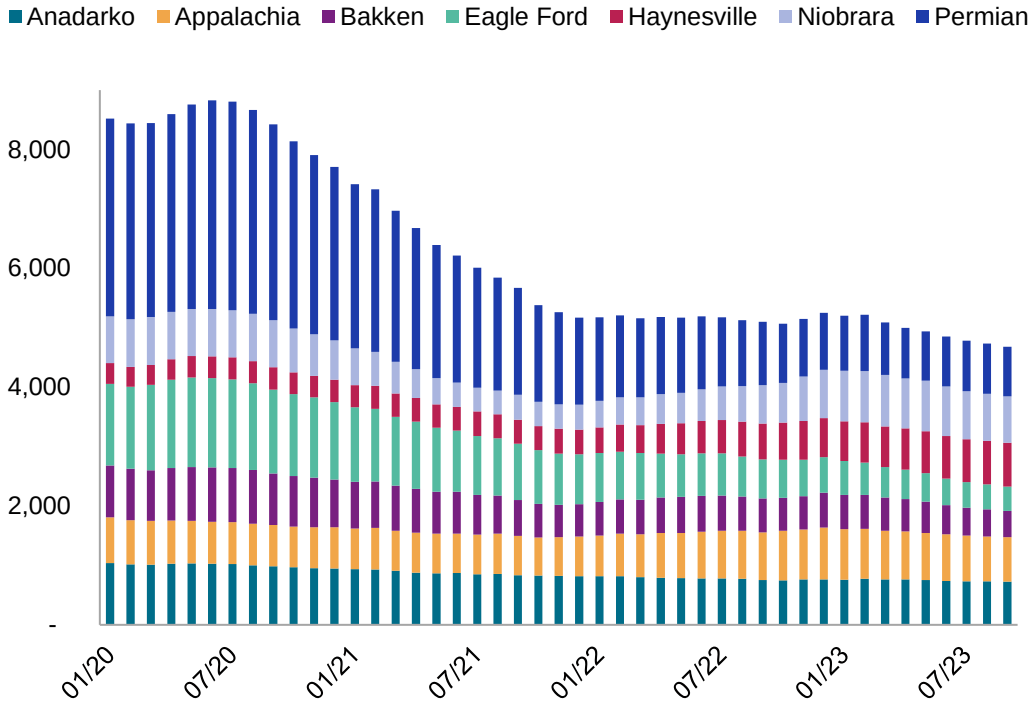
The downward trend of rig activity appears to be slowing in early October 2023

Total DUC inventory drops by over 50 in September 2023, falling in all regions except in the Haynesville

US Lower 48 weekly rig count versus peak November 2022 by major



DUC well inventory for select plays

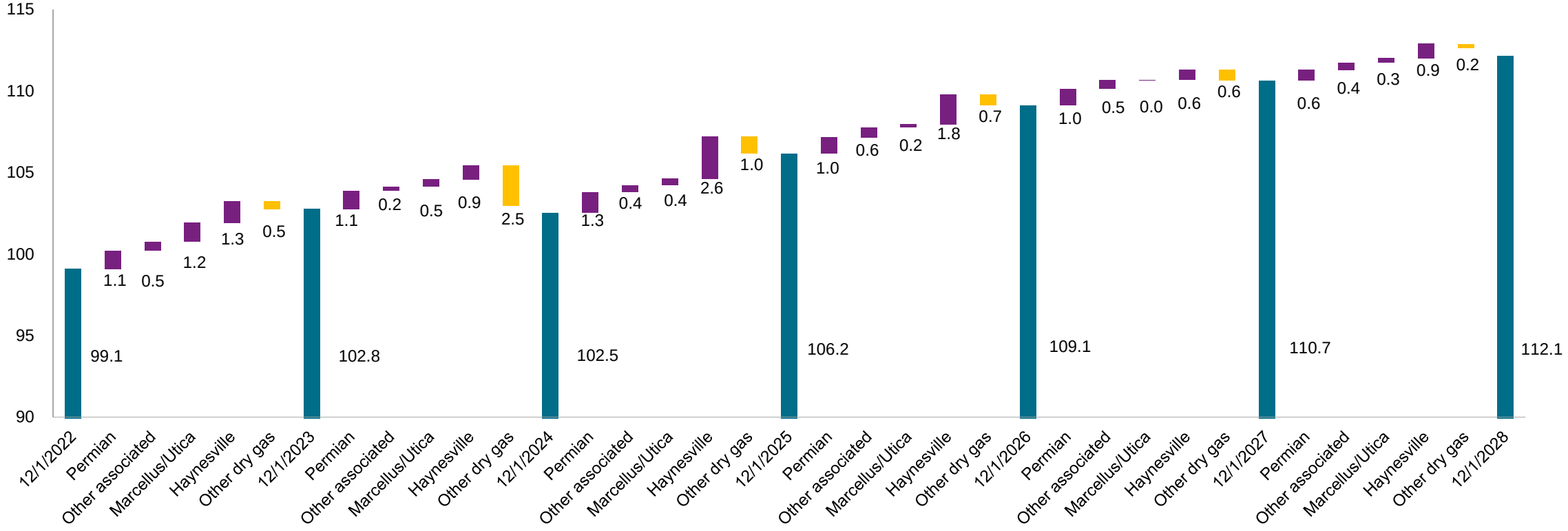


Total DUC inventory fell by 54 in September to 4,681 DUCs, driven primarily by completions in all plays excluding the Haynesville which grew by five DUCs to 737. Largest DUC reductions (in the double digits) was reported for the Niobrara, Bakken, and Permian plays, which saw their DUCs drop from the previous month by 15, 14, and 10, respectively.

Data compiled Oct. 16, 2023.
Sources: S&P Global Commodity Insights; Baker Hughes; EIA Drilling Productivity Report.

Production dips in 2024, with other dry gas taking the largest hit, before ramping up in 2025 as LNG feedgas demand rises; Permian and Haynesville drive supply growth through 2028

US Lower 48 natural gas production forecast by play (Bcf/d)



Data compiled Oct. 16, 2023.
Sources: S&P Global Commodity Insights; EIA.

S&P Global
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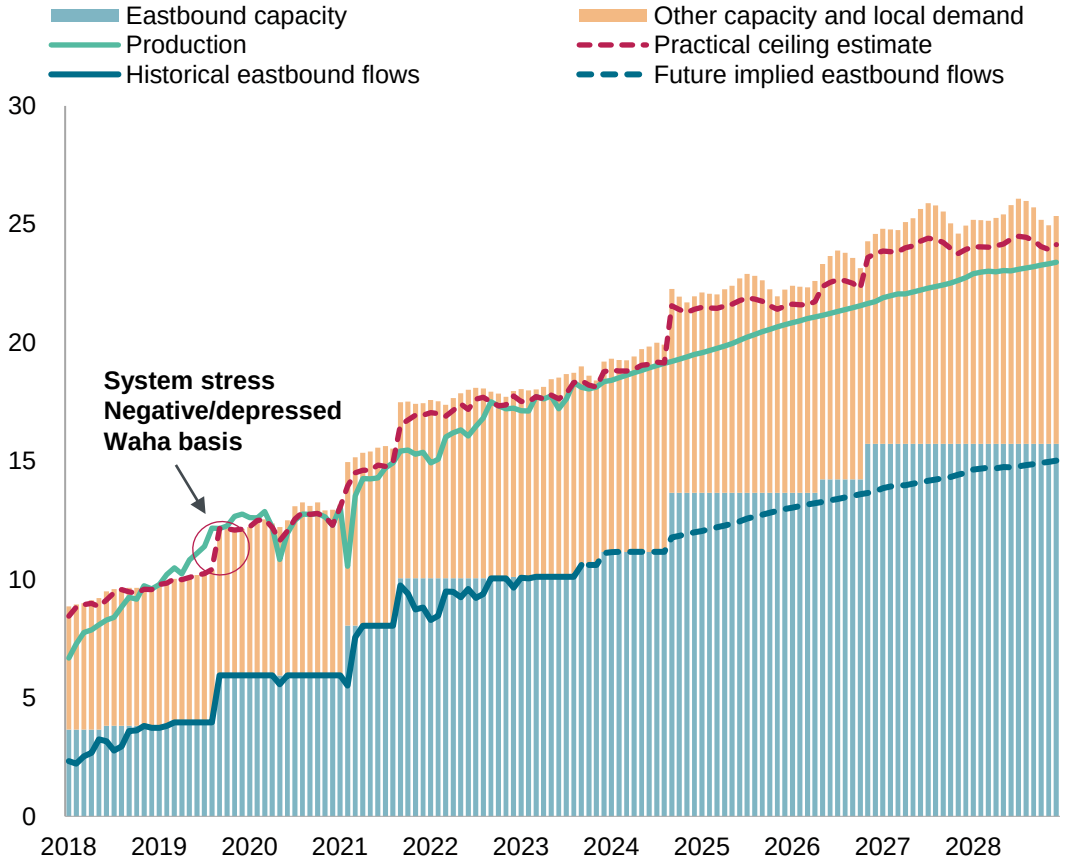
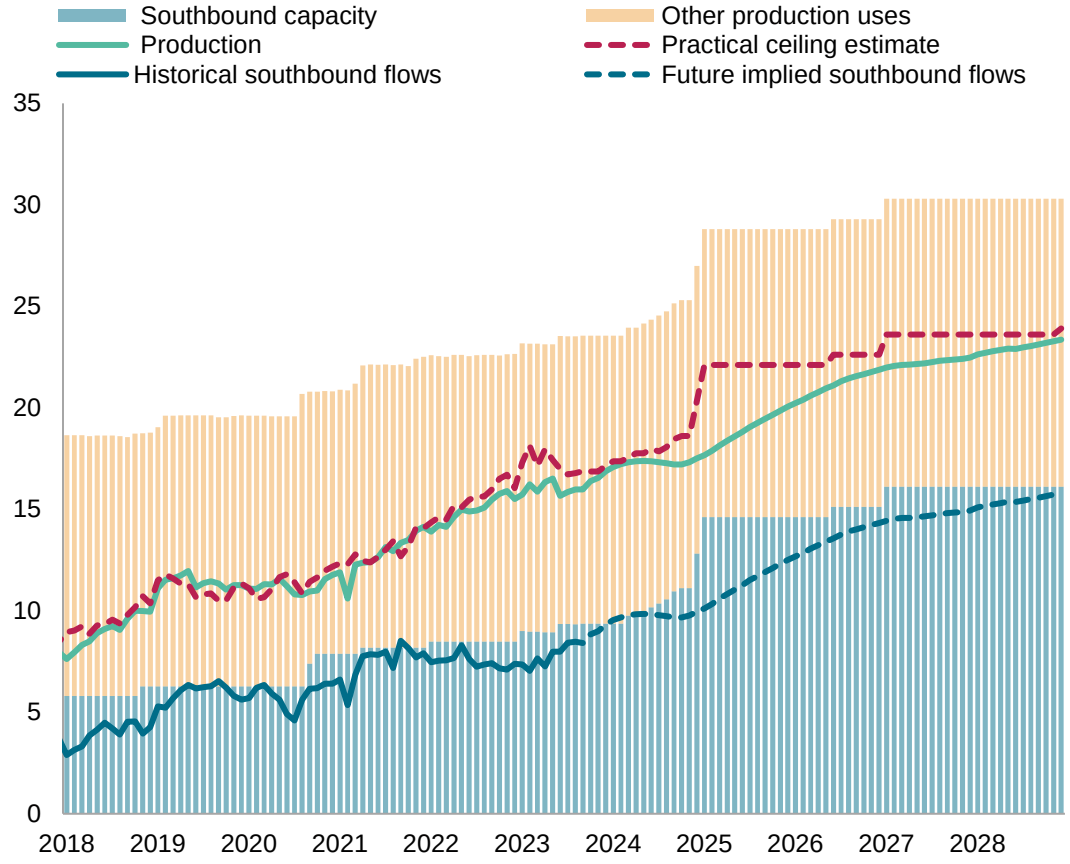
Massive takeaway expansions debottleneck the Permian and Haynesville

Increasing need for “middle-mile/last-mile” pipeline connectivity

Permian production, uses and ceiling (Bcf/d)



Haynesville production, uses and ceiling (Bcf/d)



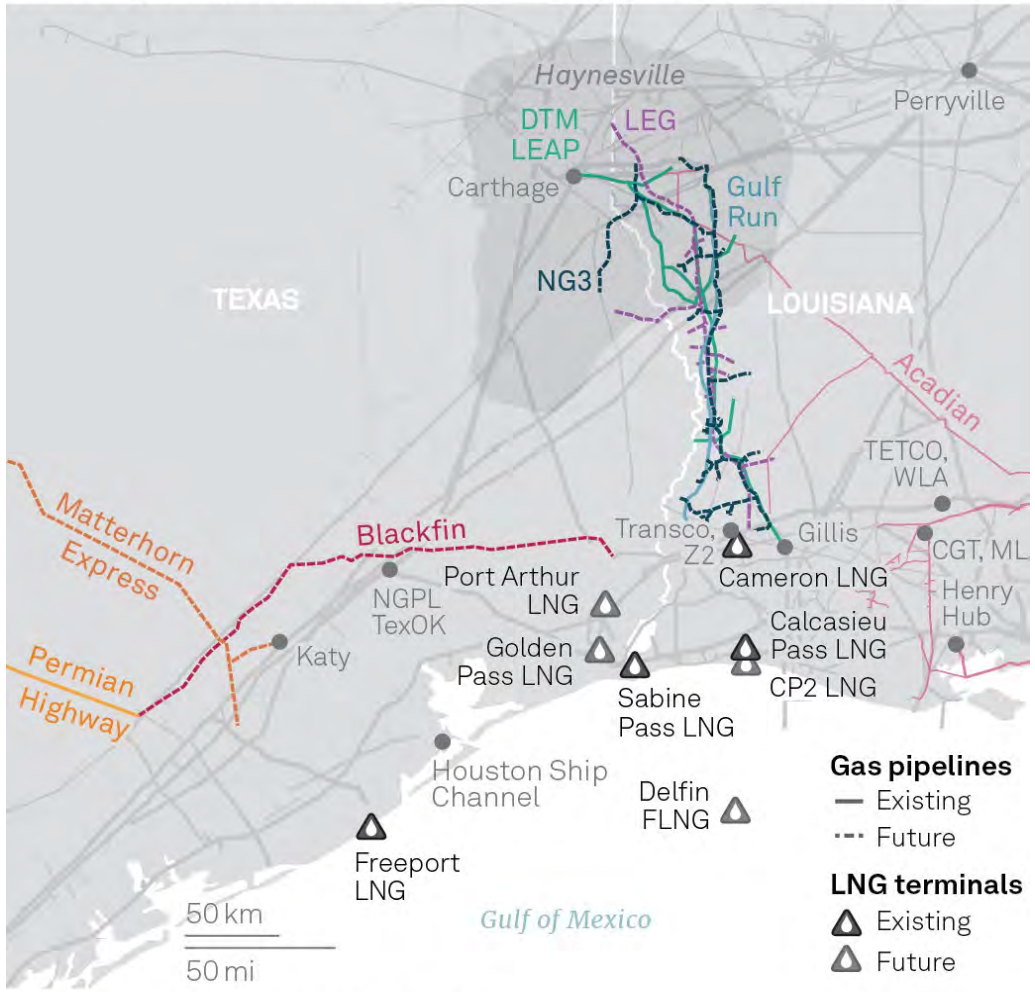
Data compiled Oct. 19, 2023.

Production uses refer to the ways production can be consumed (stacked bars). Other production uses reflect other capacity, Mexico flows, local demand, and fuel. Practical ceiling reflects the total production potential estimate and can be lower than the theoretical limit because of conditional properties. Future implied eastbound or southbound flows based on recent share and premium direction of production growth.

Source: S&P Global Commodity Insights.

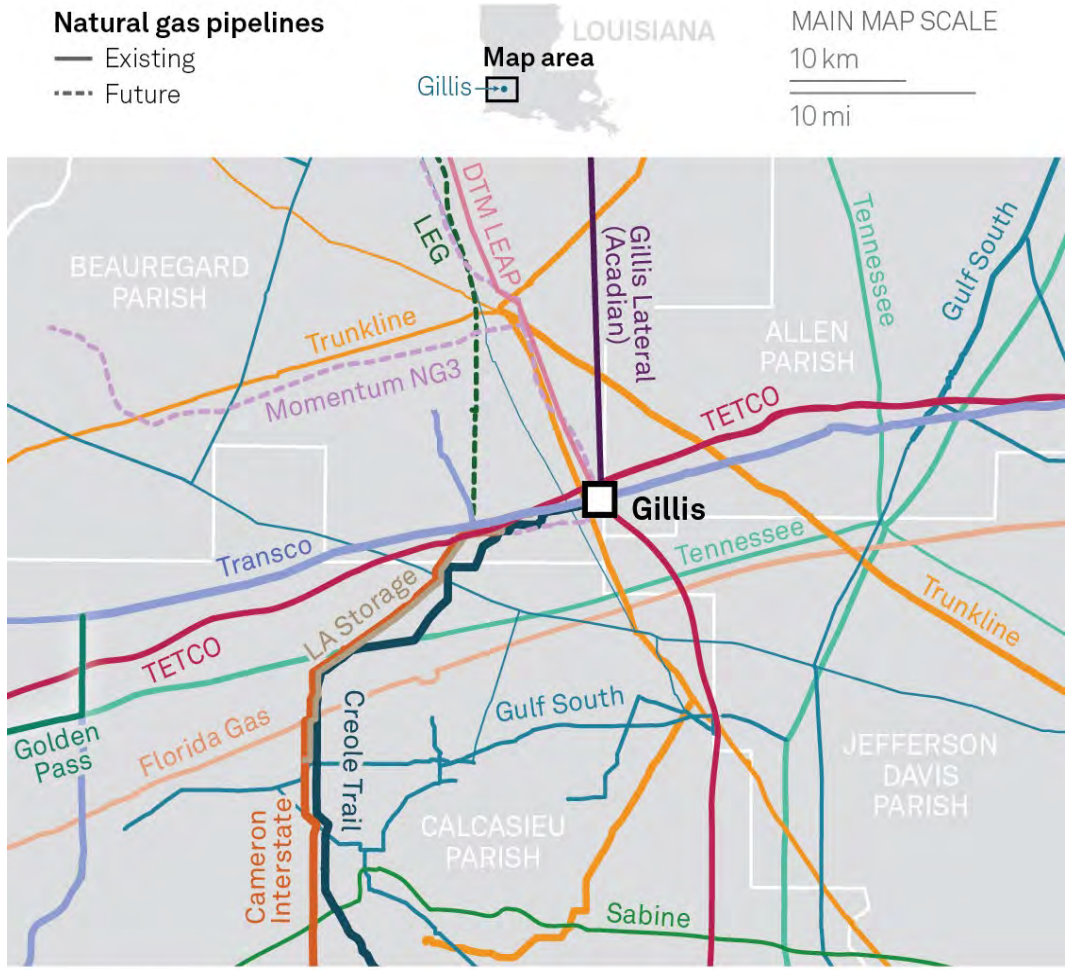
Permian and Haynesville gas access spurs pipeline development in SETX/SWLA

LNG export facilities near Louisiana/Texas border



Source: S&P Global Commodity Insights

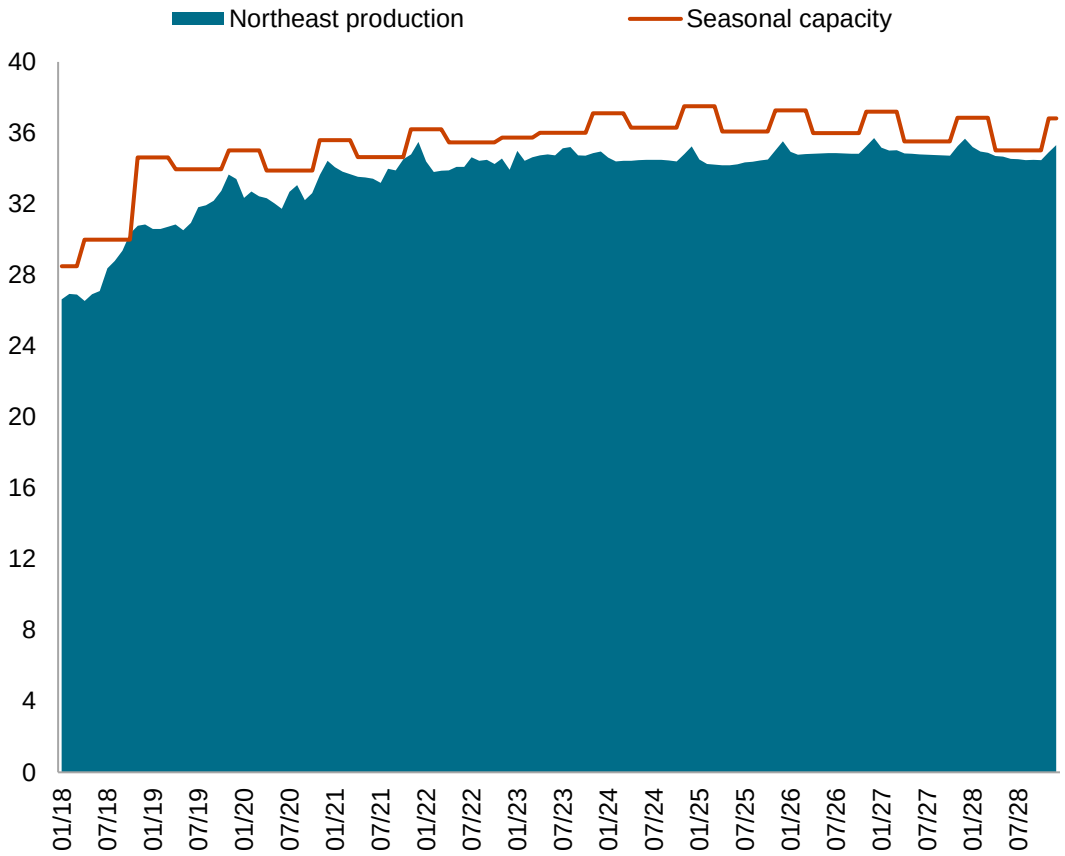
Gas pipelines around Gillis Hub



Source: S&P Global Commodity Insights

Narrowing in Northeast production room deferred until later in the outlook

Northeast production ceiling (Bcf/d)



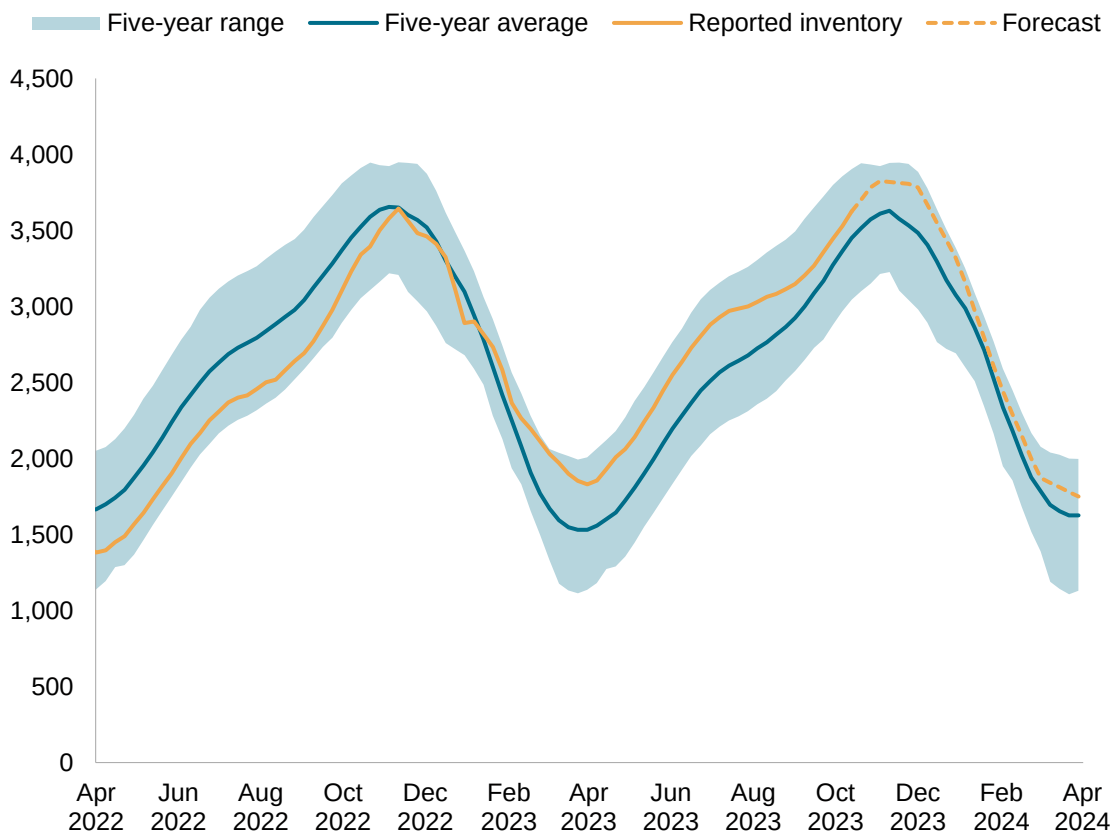
Data compiled Oct. 18, 2023.
PHMSA = US Pipeline and Hazardous Materials Safety Administration.
Project estimates represent our estimated view and do not necessarily reflect the project sponsor expected in-service date.
Source: S&P Global Commodity Insights.

- **The moderate rise in the production ceiling from MVP (West Virginia to Virginia) does not result in significant narrowing between production and potential until later in the outlook given demand profile and production expectations elsewhere.** The production ceiling impact of the 2-Bcf/d pipeline (West Virginia-Virginia) is estimated at up to 1 Bcf/d by 2026. Shrinking local demand and downstream constraints lessen the impact. Reordering flows, production optionality and improved downstream connectivity aid production potential. The complementary Transco Carolina Market Link (August 2024, 0.08 Bcf/d) and Southside Reliability Enhancement (December 2025, 0.16 Bcf/d of 0.42 Bcf/d) projects are included in our outlook. MVP Southgate (June 2026, 0.38 Bcf/d, Virginia-North Carolina) and Transco Southeast Supply Enhancement (November 2027, up to 0.8 Bcf/d, Virginia-Alabama) projects are not included, although they would significantly improve connectivity.
- **We have assumed an MVP start date of April 2024, and Equitrans updated its in-service estimate from end-2023 to first quarter 2024 on Oct. 17.** In its 8-K filing with the SEC, Equitrans also said that challenging terrain and geology contributed to an increasing cost estimate of $7.2 billion from the earlier $6.6 billion estimate. On Oct. 3, Equitrans voluntarily agreed to submit a remedial work plan to the PHMSA and conduct tests on coatings to prevent corrosion, and for pipeline damage. Equitrans indicated that the agreement is not expected to have a material impact on the in-service date estimate. Prior to these developments, MVP had asked FERC to authorize an increase in transportation rates given project cost escalation from an initial $3.7 billion estimate. The request does not impact firm agreements, but prior experience suggests a potential impact to negotiated rate contracts.

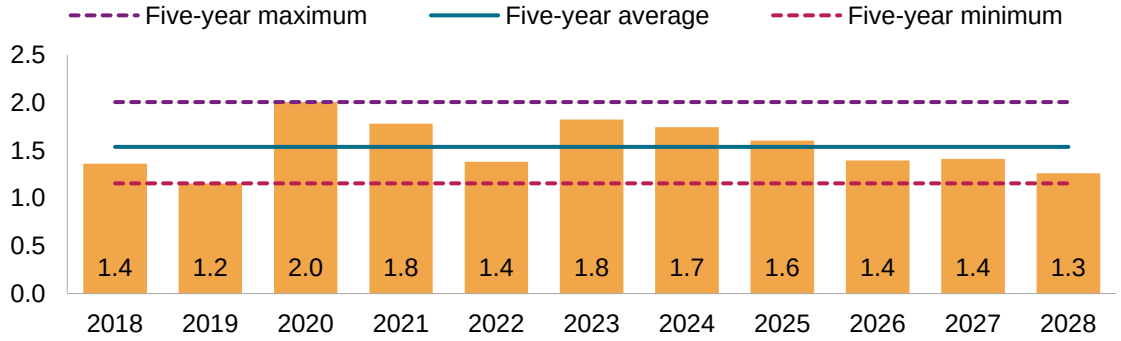
US Lower 48 storage inventory expected to remain above the five-year average

After recent reductions in the storage surplus, October 2023 inventories would finish just above 3.8 Tcf

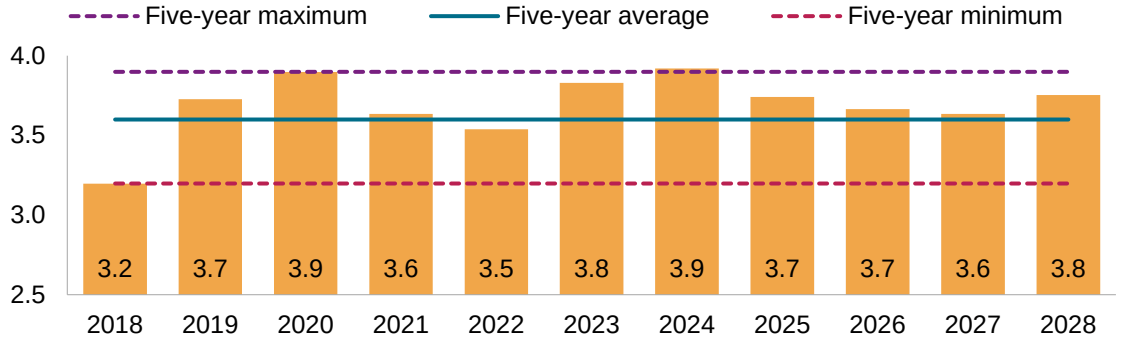
US lower-48 storage inventory (Bcf)



US Lower 48 March inventories (Tcf)



US Lower 48 October inventories (Tcf)

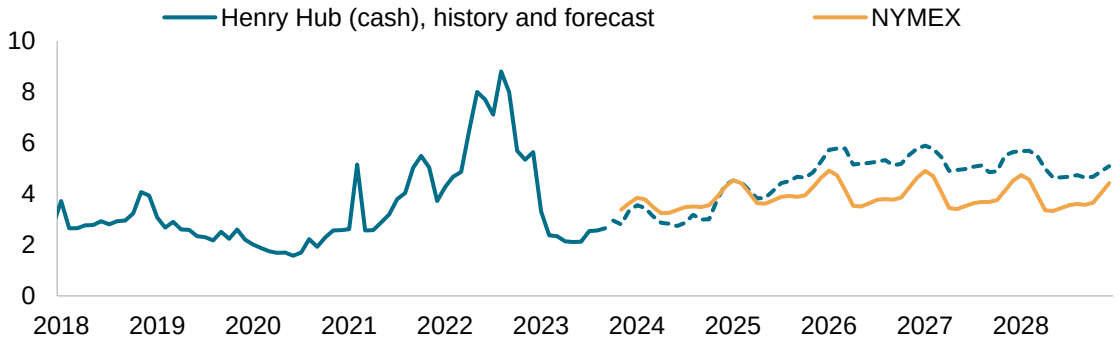


Data compiled Oct. 18, 2023.
Sources: S&P Global Commodity Insights; EIA.

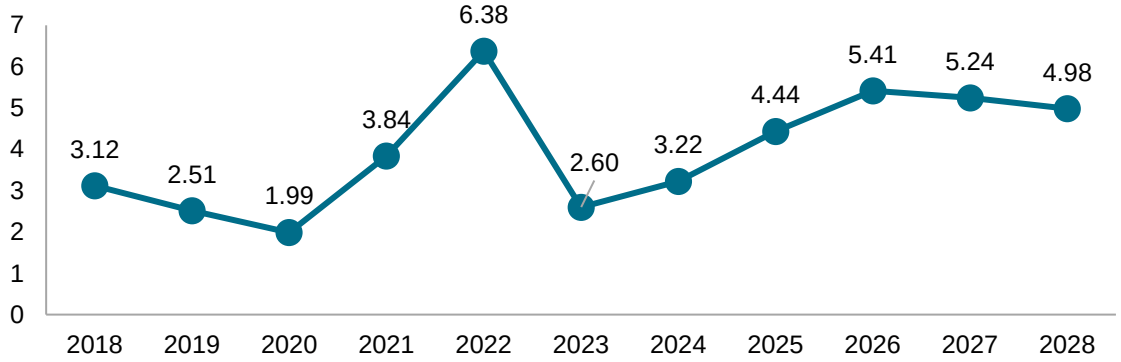
S&P Global
Commodity Insights

Henry Hub expected to average $2.60/MMBtu in 2023 as bearish fundamentals have taken hold of the market

Henry Hub prices and NYMEX futures (nominal $/MMBtu)



Henry Hub annual average (nominal $/MMBtu)



Henry Hub outlook and NYMEX comparison (nominal $/MMBtu)

	Summer 2022	Summer 2023	Summer 2024	Winter 2021–22	Winter 2022–23	Winter 2023–24	2022	2023	2024	2025	2026	2027	2028
Henry Hub	7.39	2.44	2.92	4.51	3.79	3.25	6.38	2.60	3.22	4.44	5.41	5.24	4.98
NYMEX	7.57	2.39	3.41	5.30	4.43	3.62	6.64	2.76	3.59	4.04	4.04	3.95	3.85

The market remains loose as demand and export growth slow until late 2024, while production maintains pace, keeping storage inventories around the five-year maximum and prices subdued. Thereafter, export growth resumes, placing upward pressure on Henry Hub in 2025 and beyond in order to incentivize dry gas production growth.

Data compiled Oct. 18, 2023.
New York Mercantile Exchange (NYMEX) history is monthly settlement and futures as of Oct. 9, 2023.
Source: S&P Global Commodity Insights.

Key messages

- **We expect Henry Hub prices to average $2.60/MMBtu in 2023**, as the market continues to carry a sizeable storage surplus into the last third of the year. However, the addition of 4.1 Bcf/d of incremental LNG feedgas demand from September 2024 to December 2025 quickly wipes out the storage surplus and tightens the market, raising prices materially. **They are expected to increase from around $3.25/MMBtu in 2024 to over $4.00/MMBtu in 2025 and further to under $6.00/MMBtu for 2026–28.**

- **US Lower 48 gas demand from the power sector is on track to average a blistering 38.1 Bcf/d for summer 2023, 2.4 Bcf/d higher than the previous record of 35.8 Bcf/d set last year.** Low gas prices, coal-fired generation capacity retirements and warmer-than-normal weather in recent weeks have supported the strong gas burns.

- **Total US Lower 48 consumption in 2028 is forecast to be up 12.7 Bcf/d from 2022,** as the 15.3-Bcf/d growth in export demand is partially offset by the 2.4-Bcf/d decline in domestic demand (power and residential/commercial sectors).

- **Production growth will come from the Haynesville and associated gas plays, particularly the Permian.** The proximity of the Haynesville play to the booming LNG demand centers in the Gulf Coast (and as the Appalachian Basin is crippled by limited takeaway infrastructure) has made it the primary source of nonassociated gas growth while associated gas continues to drive supply increases.

- **We have assumed a Mountain Valley Pipeline (MVP) start date of April 2024 and Equitrans updated its in-service estimate from end-2023 to first quarter 2024 on Oct. 18.** The 2-Bcf/d MVP could increase the Northeast production ceiling by about 1 Bcf/d by 2026, although the shrinking local demand outlet and downstream constraints lessen the impact.

Sources: S&P Global Commodity Insights, EIA.

