



**SUMMER
2023**

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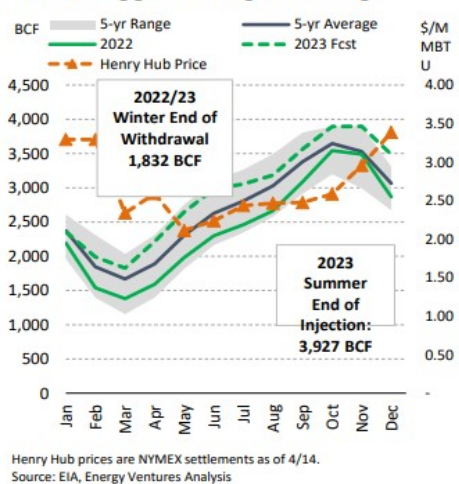
Summer 2023 Natural Gas Market Outlook

- ◆ On the supply side, U.S. natural gas dry gas production is expected to grow by 3.3 BCFD in Summer 2023 on a YoY basis to a new all-time record of over 101 BCFD, primarily driven by increased associated gas output and Haynesville production gains to support Gulf Coast LNG feedgas demand gains. Canada imports are forecast to drop by 0.2 BCFD on a YoY basis. Canadian supply is at risk due to robust U.S. storage levels, wildfire in Canada and a perceived production overhang yielding relatively cheap U.S. natural gas prices.
- ◆ On the demand side of the ledger, the estimated power burn for Summer 2023 is higher by 1.4 BCFD YoY, largely due to increased gas-fired generation utilization driven by cost competitive advantages to coal-fired generation.
- ◆ Export sectors once again lead demand growth as LNG feedgas demand is expected to average a record 14.1 BCFD for Summer 2023 which is 2.6 BCFD higher YoY while Mexico pipeline flows are projected to actualize 0.3 BCFD higher YoY.
- ◆ U.S. LNG feedgas demand will remain dependent on European natural gas storage inventories throughout Summer 2023.
- ◆ The U.S. natural gas markets finished the 2022-23 winter heating season much looser than market expectation. Throughout 2022 summer and winter storage levels were projected to remain tighter than the 5-yr average. However, a lack luster Fall shoulder season along with a moderate winter heating season allowed for larger than expected storage injections.
- ◆ Additionally, the delayed return of Freeport LNG was a contributing factor to the looser balances given the ~2 BCFD of demand loss.
- ◆ After trading as high as \$10/MMBTU during Summer 2022, Henry Hub futures traded around \$7/MMBTU in December 2022 before falling to below \$2/MMBTU during the 1H 2023 on robust natural gas storage levels, healthy production, inflation concerns, ongoing geopolitical tensions, as well as financial crisis concerns.
- ◆ Looking forward, U.S. natural gas storage will remain at a surplus to the 5-yr average. Coal forwards have moved much lower as compared to the Q4 2022 curves but with the significantly lower

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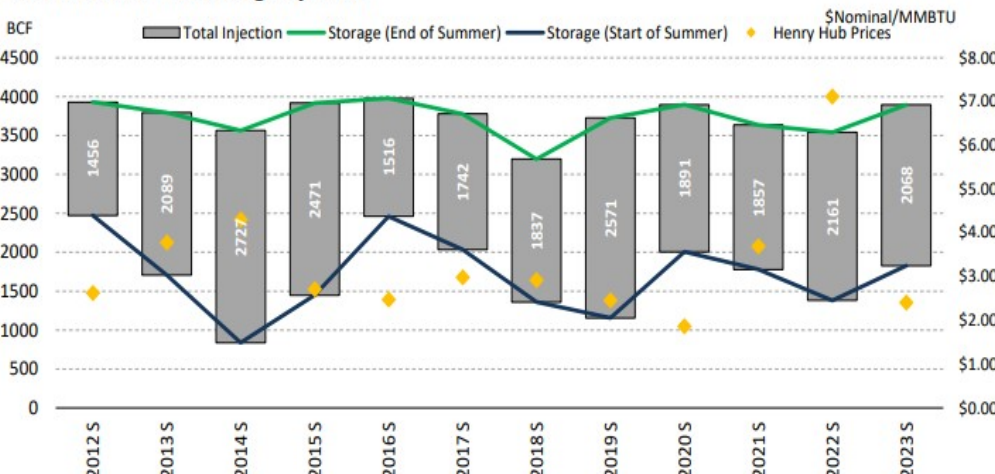
Summer Natural Gas Supply and Demand Summary	2023 Summer	2022 Summer	Difference vs Last Summer	Difference vs Last Three Summers
Supply (BCFD)				
Dry Production	101.3	98.1	3.3	8.1
Net Canadian Imports	5.3	5.4	(0.2)	0.5
LNG Imports	0.1	0.0	0.0	0.0
Total Supply	106.7	103.5	3.1	8.6
Demand (BCFD)				
Power Burn	37.2	35.8	1.4	2.9
Industrial	21.9	22.0	(0.1)	0.5
Res/Comm	11.3	11.9	(0.6)	(0.2)
Net Mexico Exports	6.1	5.8	0.2	0.2
LNG Exports	14.1	11.5	2.6	4.8
Other	6.3	6.9	(0.6)	(0.3)
Total Demand	97.0	94.0	3.0	8.0
Average Injection (BCFD)	9.7	9.5	0.2	0.6
Total Injection (BCF)	2,161	1,857	304.1	277.8
CDDs	1,278	1,372	(94.0)	(111.0)

U.S. working gas in underground storage



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U.S. L48 Summer Gas Storage Injection



CSU researchers increase forecast, now predict near-average 2023 Atlantic hurricane season

Colorado State University hurricane researchers have increased their forecast slightly and are now predicting a near-average Atlantic hurricane season in 2023. El Niño development appears imminent, as water temperatures across the eastern and central tropical Pacific have anomalously warmed over the past couple of months. Tropical and subtropical Atlantic sea surface temperatures are now much warmer than normal.

The tropical Pacific currently has warm neutral ENSO conditions, that is, water temperatures are slightly above-normal across the eastern and central tropical Pacific. Current large-scale conditions and forecasts indicate that a transition to El Niño is virtually assured in the next couple of months. However, there remains uncertainty as to how strong El Niño will be. El Niño tends to increase upper-level westerly winds across the Caribbean into the tropical Atlantic. The increased upper-level winds result in increased vertical wind shear, which is a difference in direction and strength of winds from the lower to the upper levels of the atmosphere. Vertical wind shear can tear apart hurricanes as they try to form.

Waters across the tropical and subtropical Atlantic have anomalously warmed over the past couple of months and are near or at record levels in the eastern part of the basin. Warmer-than-normal waters in the eastern and central tropical Atlantic tend to force a weaker subtropical high that leads to weaker winds blowing across the tropical Atlantic. These weaker winds favor additional anomalous warming of the tropical Atlantic for the peak of the Atlantic hurricane season. The warmer-than-normal tropical Atlantic may counteract some of the increase in vertical wind shear typically associated with El Niño. The increase in sea surface temperature anomalies in the Atlantic are the primary reason for the increase in forecasted hurricane activity.

Given the conflicting signals between a potentially robust El Niño and a much warmer-than-normal tropical and subtropical Atlantic, the team

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Summer 2023 Natural Gas Market Outlook, Continued from page 1.

- Henry Hub price curve, gas-fired generation is benefiting from improved cost competitive advantages causing coal-to-gas switching. This switching has helped to buoy power burn demand and has brought some support to market balances.
- The return of Freeport LNG in Q1 2023 also provided a much needed lift to demand which helped to balance storage injections. The combination of stronger power burns and higher LNG partially offset the weaker RESCOMM demand due to the moderate winter heating season.
- Looking forward, gas fired generation is expected to remain strong on a weather-adjusted basis throughout Q2 but should lose market share heading into Q3 as higher power prices and a seasonal lift to electric demand will open the door for increased coal-fired generation. The low coal stockpile concern from Summer 2022 does not appear to be an issue for Summer 2023. In fact, more coal plant retirements are

scheduled to happen during 2023.

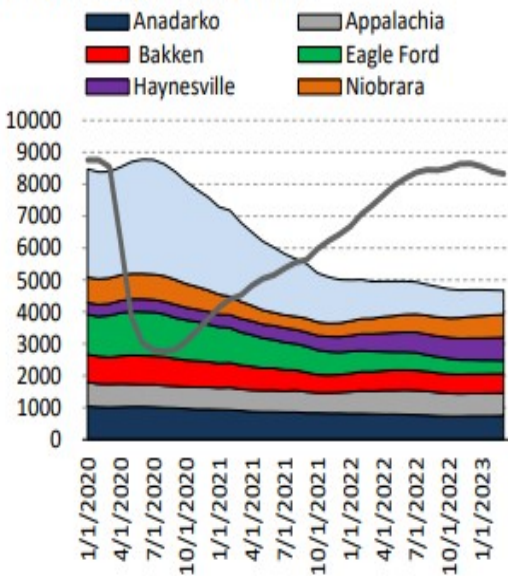
- U.S. working gas inventory fell to 1,830 BCF at the end of March, which was a surplus to the 5-year average of 298 BCF. As of late April 2023, EVA projects an injection of 2,068 BCF for Summer 2023.

Summer 2023 features a different challenge for producers, yet the theme remains the same: “proceed with caution”

- Natural gas output increased through December 2022 but has been relatively flat since the increase and is likely to resume an upward trend. However, the rate of change will look much different on a YoY basis. The majority of the supply gains from associated supply or from Haynesville to support Gulf Coast LNG have already been realized. Small growth, despite recently declining rig activity from efficiency gains, is forecast for the remainder of Summer 2023. U.S. dry gas production sits near 101 BCFD and the Summer 2023 forecast is once again calling for a new record level.
- The YTD price decline and storage surplus will likely fuel concerns about production shut-ins, especially if summer weather is cooler than normal and coal-fired generation recovers.

- EVA expects U.S. dry gas output to average 101.3 BCFD in Summer 2023, over 3 BCFD higher YoY.
- Throughout 2022, natural gas and oil rig counts rose, supported by high prices driven by concerns of a global fuel shortage. However, drilled but uncompleted well inventories have been in decline as a much lower forward curve across all fuels

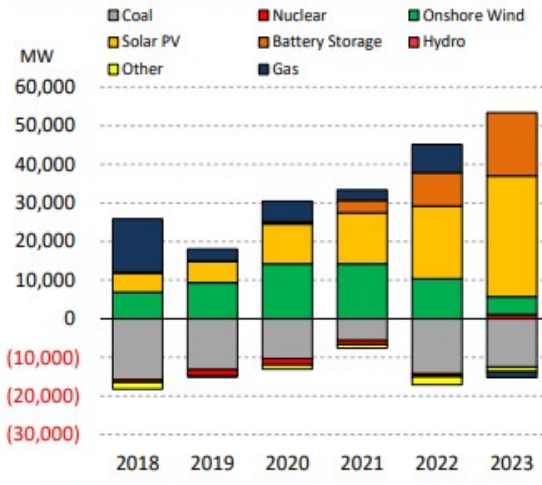
Drilled but uncompleted wells inventory in major U.S. producing areas



after a weak winter demand season and healthy storage levels have increased the appeal of DUCs due to their lower capital expenditure.

- For natural gas, takeaway capacity plays a role in E&P investment. The path forward for new projects feature increased risk due to ESG compliance and ongoing litigation costs.

Net change in U.S. generating capacity



Source: Energy Ventures Analysis, U.S. EIA

Summer natural gas-fired generation is supported by coal retirements, delayed renewable installations, and coal-to-gas switching economics

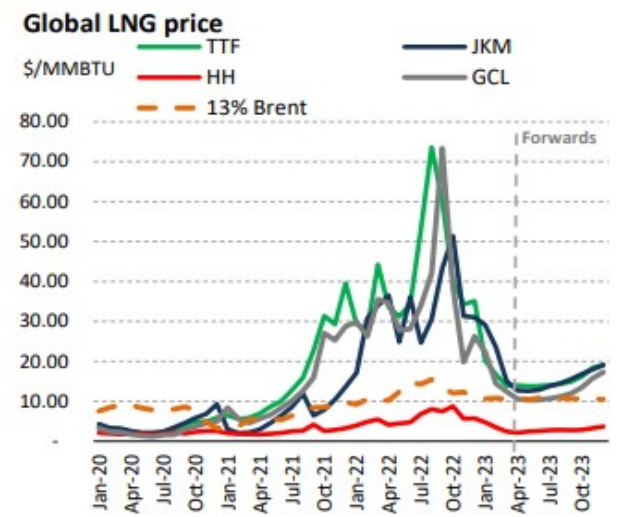
- With Henry Hub prices falling by over \$5/MMBTU since the end of 2022, power generation by natural gas has been robust, well outperforming the first four months of 2022. On a YoY basis, weather adjusted power burns are adjusting strong by nearly 2 BCFD. This trend is expected to continue given the current spark spread vs. dark spread comparison.
- Comparing this summer to a baseline of 2015, a gain of 6.6 BCFD of long-term structural

demand growth from new combined cycle gas unit (CCGT) to an increase of 1.4 BCFD of economic switching due to lower natural gas prices increasing the dispatch of natural gas-fired generation. More coal plant retirements are on the horizon, which could allow for increased utilization of gas-fired generation in the near future.

- However, higher power prices for Q3 should allow for the displacement of natural gas fired generation by coal-fired power plants.

- In 2023, nearly 13 GW of coal capacity will be retired.
- 2023 features more of the same with regards to renewable installations. Over 52 GW of new wind, solar, and battery storage resources are expected to be installed by year end. However, the same considerations impacting all sectors will have to be considered: supply chain constraints, the Russia-Ukraine conflict, inflation concerns, banking crisis, etc.

2023 European natural gas storage remains robust and prices are much lower on a YoY basis, but risks remain



Source: ICE. Future curves are based on April 18 settlements

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- Ongoing geopolitical tensions in Europe and the loss of both Nord Stream 1 & Nord Stream 2 resulted in high utilization of U.S. LNG. Europe was the primary consumer of U.S. LNG exports. China reopened from COVID-related restrictions but has yet to attract U.S. LNG supply from Europe. All eyes will remain focused on European natural gas storage levels given the direct correlation to U.S. LNG feedgas demand, especially if netbacks to Asia remain at parity with Europe.
- European storage is sitting well above the 5-yr average (20% higher) as of mid-May. As a result of EU price policy, demand reduction efforts, economic concerns and the warm winter European gas balances have loosened significantly. The EU Commission has confirmed that the 15% demand reduction plan will remain in effect throughout 2023

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CSU researchers increase forecast, now predict near-average 2023 Atlantic hurricane season
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stresses that there is more uncertainty than normal with this outlook.

15 named storms

The CSU Tropical Meteorology Project team is predicting 14 additional named storms during the Atlantic hurricane season, which runs from June 1 to November 30. Of those, researchers expect seven to become hurricanes and three to reach major hurricane strength (Saffir/Simpson category 3-4-5) with sustained winds of 111 miles per hour or greater. The National Hurricane Center has recently identified that a subtropical storm formed in January, so this storm has been added to the total for the 2023 season.

The team bases its forecasts on a statistical model, as well as four models that use a combination of statistical information and climate model output from the European Centre for Medium-Range Weather Forecasts, the UK Met Office, the Japan Meteorological Agency, and the Centro Euro-Mediterraneo sui Cambiamenti Climatici. These models use 25-40 years of historical hurricane seasons and evaluate conditions including: Atlantic sea surface temperatures, sea level pressures, vertical wind shear levels (the change in wind direction and speed with height in the atmosphere), El Niño (warming of waters in the central and eastern tropical Pacific), and other factors.

So far, the 2023 hurricane season is exhibiting characteristics similar to 1951, 1957, 1969, 2004, and 2006. "Our analog seasons exhibited a wide range of outcomes, from below-normal seasons to hyperactive seasons," said Phil Klotzbach, research scientist in the Department of Atmospheric Science and lead author of the report. "This highlights the large uncertainty that exists with this outlook." Forecasters also note that there are not many good analogs for this season, where a moderate/strong El Niño and a much warmer-than-normal Atlantic are likely to co-exist.

The team predicts that 2023 hurricane activity will be about 100 percent of the average season from 1991-2020. By comparison, 2022's hurricane activity was about 75 percent of the average season. The 2022 hurricane season will be most remembered for its two major hurricanes: Fiona and Ian. Fiona brought devastating flooding to Puerto Rico before causing significant surge, wind and rain impacts in the Atlantic Provinces of Canada as a post-tropical cyclone. Ian made landfall as a Category 4 hurricane in southwest Florida, causing over 150 fatalities and \$113 billion dollars in damage.

In addition to the various hurricane metrics that CSU has forecast for many years, the forecast team is introducing a new metric this year. This metric is Accumulated Cyclone Energy (ACE) occurring west of 60°W. ACE is an integrated metric accounting for storm frequency, intensity and duration. ACE generated west of 60°W correlates better with landfalling storms in the Atlantic basin than basinwide ACE. Generally, a slightly lower percentage of basinwide ACE occurs west of 60°W in El Niño years, and since the team favors El Niño in 2023, the percentage of basinwide ACE occurring west of 60°W is slightly lower this year.

Landfalling probability included in report

The report also includes the probability of major hurricanes making landfall:

- ◆ 43 percent for the entire U.S. coastline (average from 1880-2020 is 43 percent)
- ◆ 21 percent for the U.S. East Coast including the Florida peninsula (average from 1880-2020 is 21 percent)
- ◆ 27 percent for the Gulf Coast from the Florida panhandle westward to Brownsville (average from 1880-2020 is 27 percent)
- ◆ 47 percent for tracking through the Caribbean (average from 1880-2020 is 47 percent)

Extended range Atlantic Basin hurricane forecast for 2023

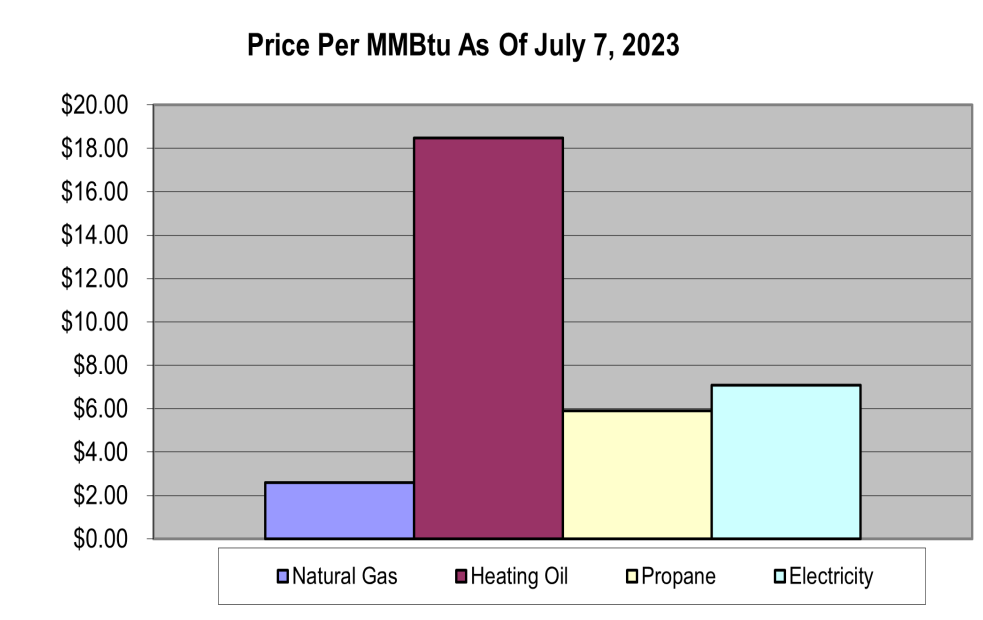
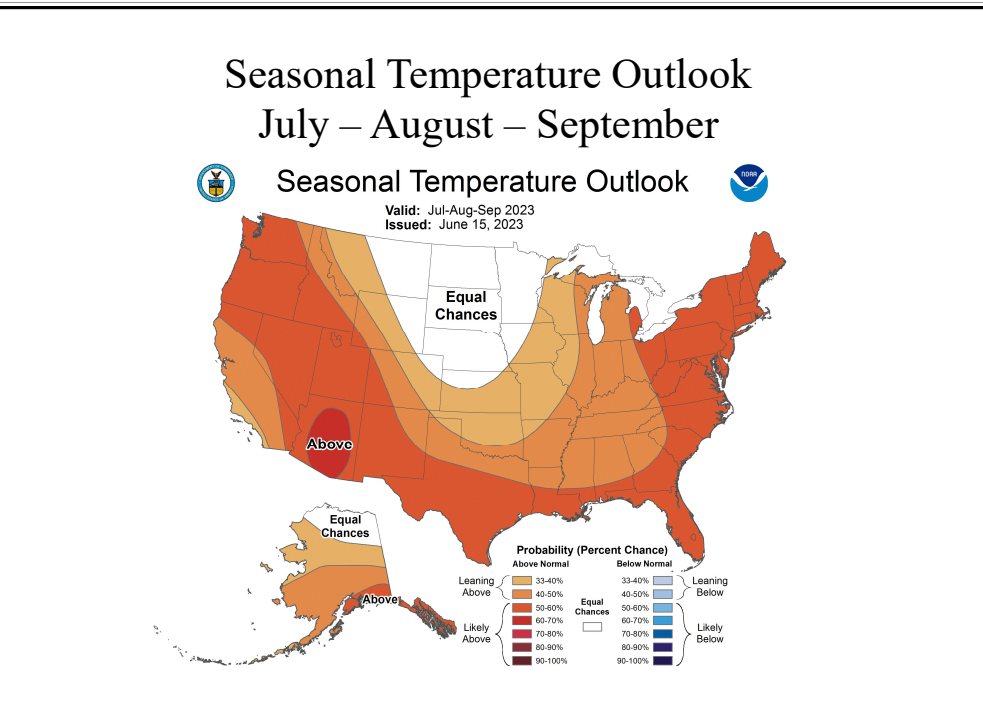
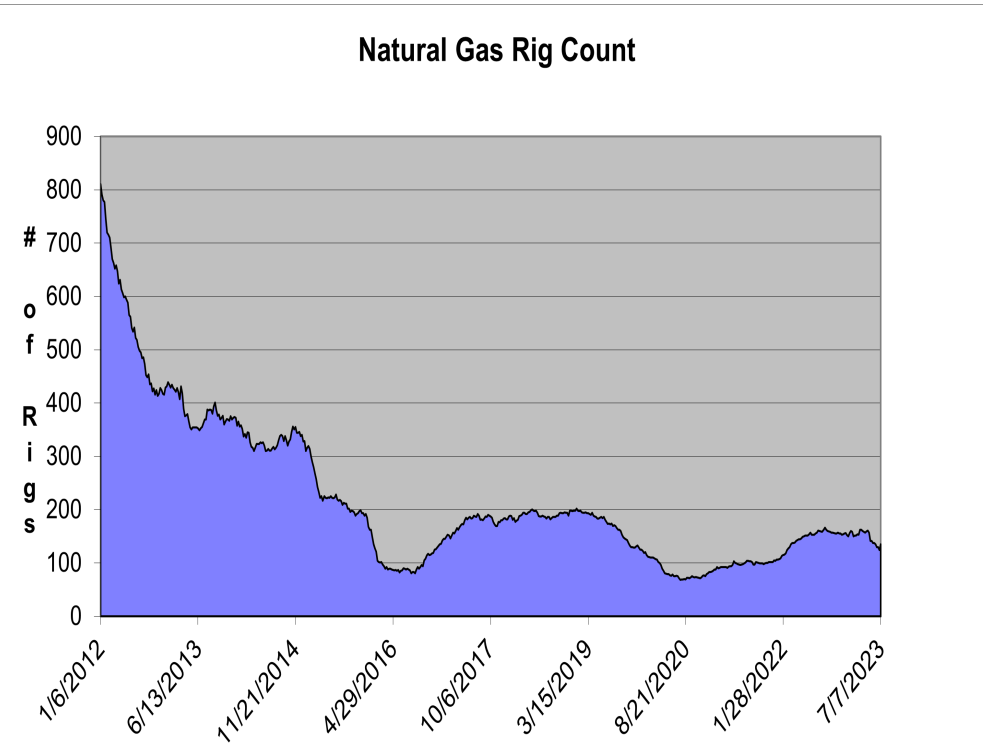
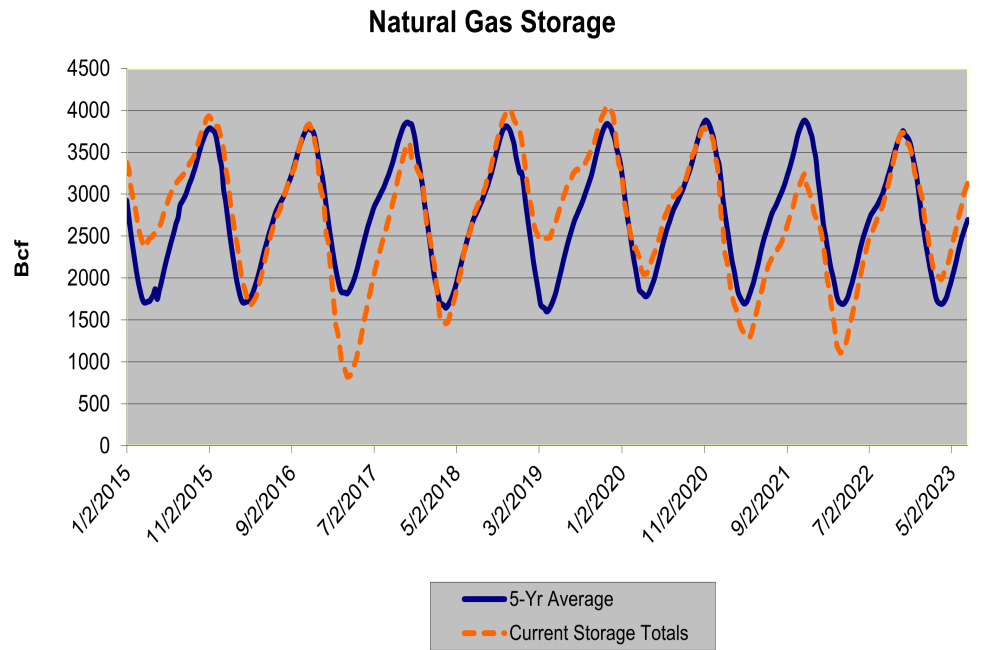
Released June 1, 2023

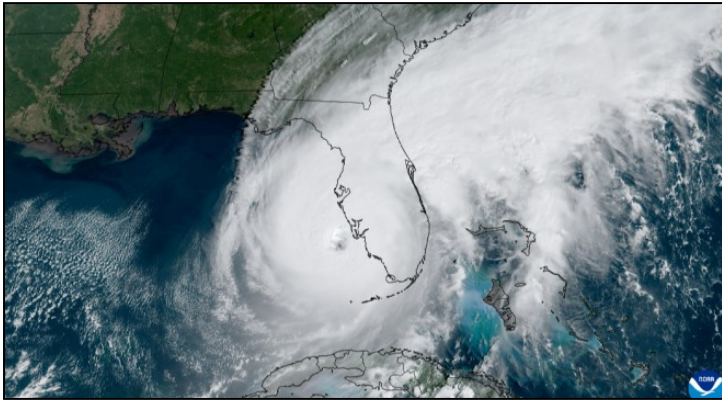
- Tropical Cyclone Parameters Extended Range (1991-2020 Climatological Average Forecast for 2023 in parentheses)
- Named Storms (14.4)* 15**
 - Named Storm Days (69.4) 60
 - Hurricanes (7.2) 7
 - Hurricane Days (27.0) 30
 - Major Hurricanes (3.2) 3
 - Major Hurricane Days (7.4) 7
 - Accumulated Cyclone Energy (123) 125
 - Accumulated Cyclone Energy West of 60°W (73) 70
 - Net Tropical Cyclone Activity (135%) 135
- * Numbers in () represent averages based on 1991-2020 data.
** Forecast numbers include the unnamed subtropical storm that formed in January.

Summer 2023 Natural Gas Market Outlook, Continued from page 4.

- ◆ Ongoing climate change policy goals are growing more ambitious. In April, Germany announced the shut down of its last nuclear plant. This will likely increase the call on coal and gas generation in the immediate future as Germany progresses towards a green future. As the rest of the world moves towards developing renewable resources, natural gas will remain a key resource in supporting this future.

Snapshots





The upcoming Atlantic hurricane season is expected to be less active than recent years, due to competing factors—some that suppress storm development and some that fuel it—driving this year's overall forecast for a near-normal season.

NOAA predicts a near-normal 2023 Atlantic hurricane season

El Nino above-average Atlantic Ocean temperatures set the stage
NOAA GOES satellite captures Hurricane Ian as it made landfall on the barrier island of Cayo Costa in southwest Florida on September 28, 2022

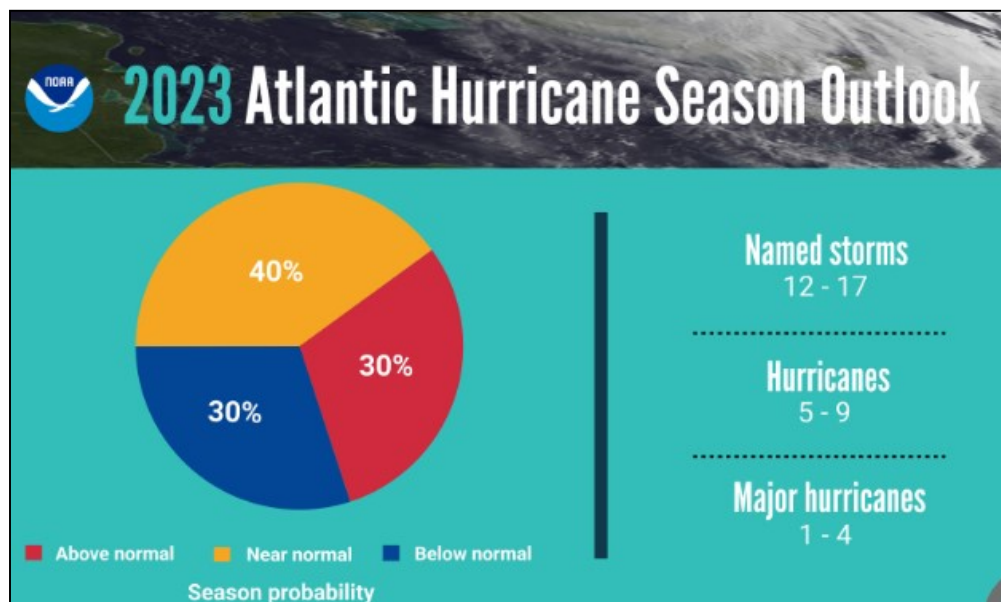
NOAA forecasters with the Climate Prediction Center, a division of the National Weather Service, predict near-normal hurricane activity in the Atlantic this year. NOAA's outlook for the 2023 Atlantic hurricane season, which goes from June 1 to November 30, predicts a 40% chance of a near-normal season, a 30% chance of an above-normal season and a 30% chance of a below-normal season.

NOAA is forecasting a range of 12 to 17 total named storms (winds of 39 mph or higher). Of those, 5 to 9 could become hurricanes (winds of 74 mph or higher), including 1 to 4 major hurricanes (category 3, 4 or 5; with winds of 111 mph or higher). NOAA has a 70% confidence in these ranges.

A summary infographic showing hurricane season probability and numbers of named storms predicted from NOAA's 2023 Atlantic Hurricane Season Outlook.



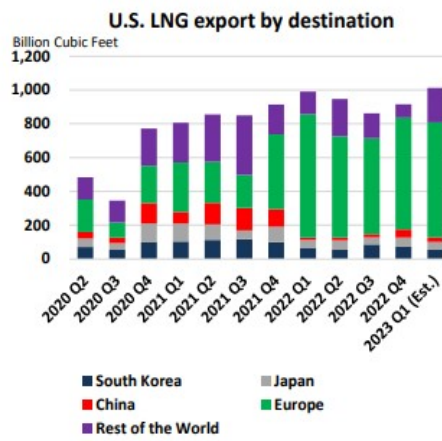
After three hurricane seasons with La Nina present, NOAA scientists predict a high potential for El Nino to develop this summer, which can suppress Atlantic hurricane activity. El Nino's potential influence on storm development could be offset by favorable conditions local to the tropical Atlantic Basin. Those conditions include the potential for an above-normal west African monsoon, which produces African easterly waves and seeds some of the stronger and longer-lived Atlantic storms, and warmer-than-normal sea surface temperatures in the tropical Atlantic Ocean and Caribbean Sea which creates more energy to fuel storm development. These factors are part of the longer term variability in Atlantic atmospheric and oceanic conditions that are conducive to hurricane development - known as the high-activity era for Atlantic hurricanes - which have been producing more active Atlantic hurricane seasons since 1995.



Summer 2023 Natural Gas Market Outlook, Continued from page 2.

and lofty goals to fill storage before the start of the winter heating season will weigh on market participants. This will be the first year restocking without flow from Nord Stream 1. All eyes will remain focused on the netback of U.S. LNG which will remain a critical source of supply for Europe.

U.S. LNG continues to flow into Europe while the total exports remain limited by U.S. LNG exporting capacity



Source: EVA/KPLER

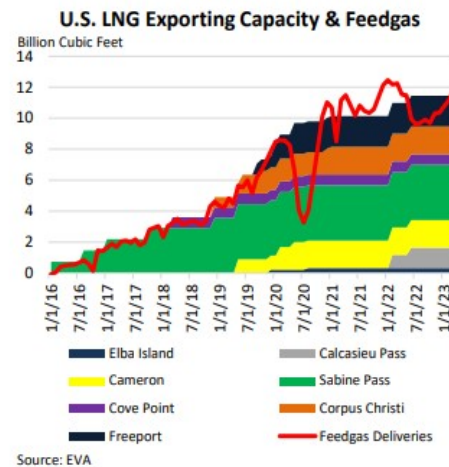
- ◆ Europe will continue to rely on U.S. LNG for the foreseeable future, especially after the loss of the Nord Stream pipes. The percentage of U.S. LNG flowing to Europe has been averaging near 75%, much higher than in years past. Despite the recent decline in European gas prices, netbacks remain healthy and are trading near parity with Asian gas benchmarks.
- ◆ All seven U.S. exporting plants have been operating above nameplate capacity and should remain operating at/near 100% utilization for the remainder of 2023. The risk to U.S. LNG feedgas demand is European natural gas storage.

Should conservation efforts and moderate demand support an accelerated injection schedule, the call on U.S. LNG could be at risk prior to the start of the traditional heating season.

◆ EVA expects U.S. LNG feedgas demand to average 14.1 BCFD in Summer 2023, an increase of 2.6 BCFD since last summer, primarily driven by the return of Freeport LNG.

U.S. LNG is a key supply source

- ◆ Several U.S. LNG projects are expected to advance over the next



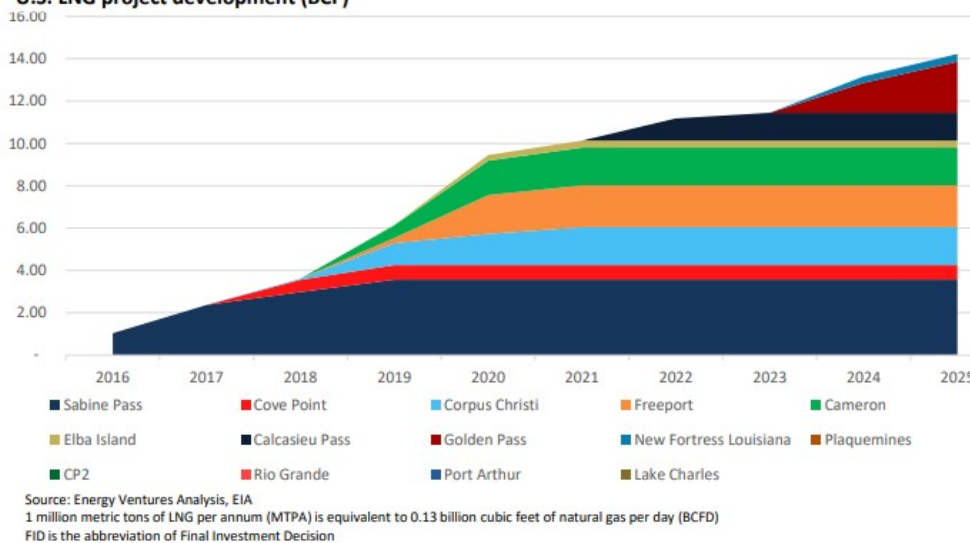
Source: EVA

few years. The next year or so represents the first leg of the next wave of LNG export capacity. EVA anticipates three new projects, New Fortress Altamira 0.37 BCFD, New Fortress Louisiana 0.37 BCFD, and Golden Pass 2.41 BCFD which has an assumed COD of mid-2024.

- ◆ The United States continues to be one of the top three LNG suppliers globally, along with Australia and Qatar. The potential exists for the U.S. to be the largest LNG exporter in the world by the end of 2023. European demand and Asia increasing LNG imports are key drivers of continued growth.

Continued on page 3.

U.S. LNG project development (BCF)



Source: Energy Ventures Analysis, EIA
1 million metric tons of LNG per annum (MTPA) is equivalent to 0.13 billion cubic feet of natural gas per day (BCFD)
FID is the abbreviation of Final Investment Decision

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