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Coal's landscape (watch out, the weeds are voracious)

Presentation to: The Coal Institute's 2023 Summer Trade Seminar

July 10, 2023

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McCloskey Services: Coal, Metals & Mining

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Energy Coal and Steel Raw Materials Prices

- Daily and weekly historical price assessments for metallurgical coal, energy coal & petcoke
- Daily iron ore assessments
- Trade, freight, production, stocks and other coal data

Global Coal News & Analysis

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- McCloskey Newswires
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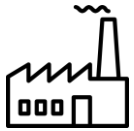
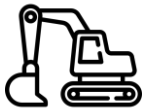
Regional Market Analysis & News

- Tracks the world's major energy coal and steel raw materials regions
- Market information on regional energy coal and steel raw material trends and news
- Expanding to other metals
- Australia
- South Africa
- India
- China
- APAC
- North America



Energy Coal Research

- Global Energy coal outlooks covering supply, demand & prices to 2050 – updated on a monthly basis
- Weekly report reflecting on recent market developments and their impact on our outlooks.
- Quarterly report including country-level demand & supply analysis and 5-year outlook for all major importing and exporting thermal coal markets
- Costs curves & freight outlooks
- Country profiles



Steel Raw Materials

Markets

- Integrated offering of market intelligence, price indices & forecasting
- Daily publication on:
- Met coal
- Iron Ore
- Scrap
- Coke
- Production cash costs

Research

- Research outlooks with S&D and price forecasts as add-on option

Analytics

MineSpans: Met Coal

- 360° bottom-up view of costs, supply/demand
- Comprehensive view of the mining industry's cost structure

Coal Supply Chain Emissions

- Annual and per-ton emissions from all seaborne-serving thermal and met coal mines globally
- Scope 1, 2 and 3 emissions, capturing emissions from source to final destination

Domestic update

Weather, Natural Gas, Power Generation Trends, Inventories, Regulatory, Coal Unit Retirements, Metallurgical, Exports

Key takeaways – domestic US markets

- Russia/Ukraine war impossible to predict – biggest affect has been changing geopolitical alignments and impact on seaborne trade routes
  - Do not believe the effects are over – be ready to be surprised!
- Even with the price run last year – little “new” production capacity added
  - Increases came with adding shifts, reopening idled mines (restarts), and overall improving logistics
  - No major new thermal mine announced
  - Investment picture = low hanging fruit (restarts) will get a look, but large new thermal mines – no way
  - Metallurgical build-out slowing, coming to the end of an expansion cycle?
- Markets in a quandary, just as mines mostly filled out needed labor and the trains began to run more regularly, the market craters
  - Mining companies will be loathe to reduce staffing given the uncertain labor market: “cycles happen”
- Sales book in 2023 mostly solid at attractive pricing – getting it shipped this year is a double-edged sword
  - Inventories are too high

Temperatures have been mild compared to 2022

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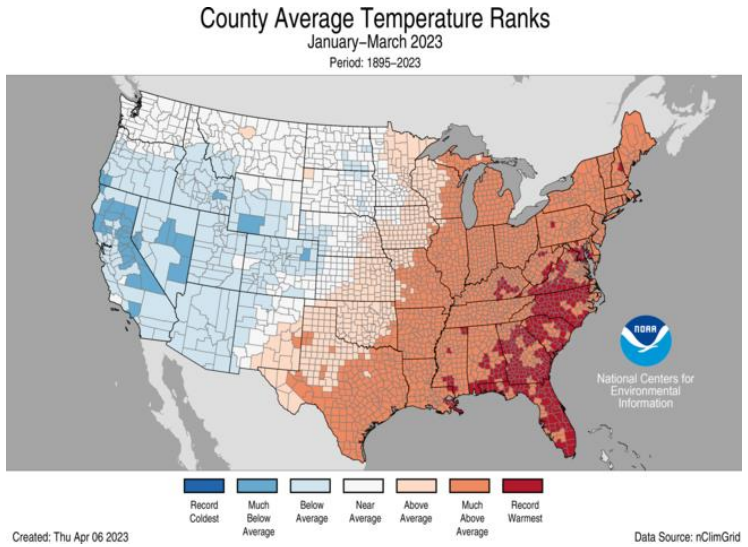
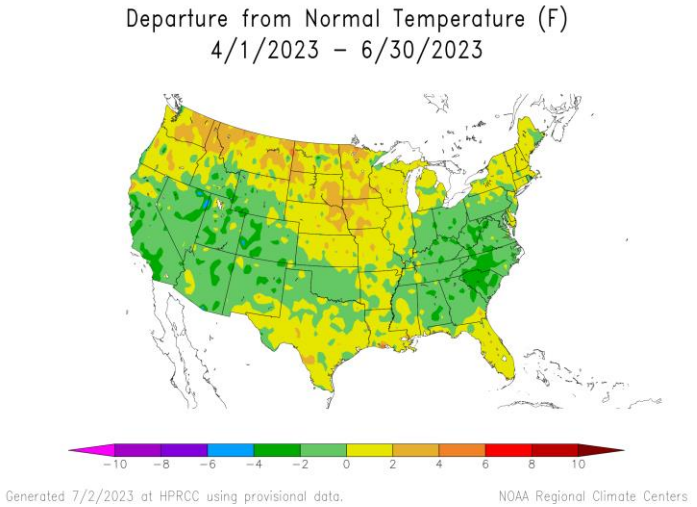
Q1 2023

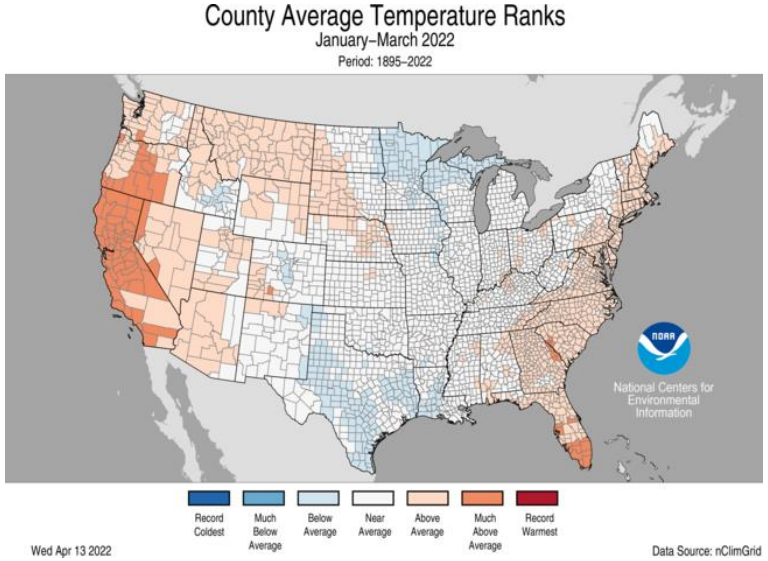


Q2 2023

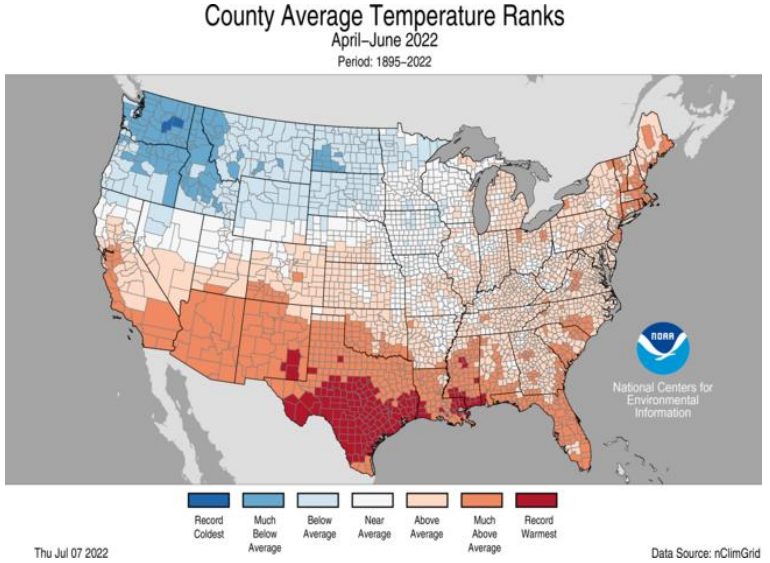


NOAA's version of this map will be published July 11, 2023

Q1 2022



Q2 2022



Outlook for July and the third quarter is generally favorable

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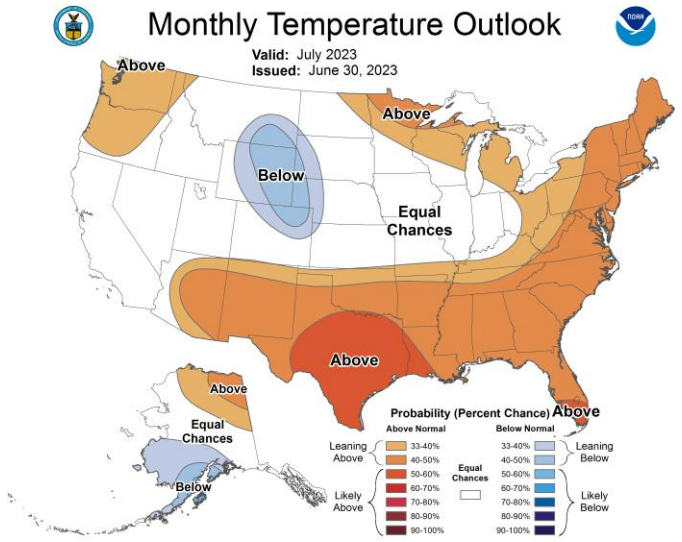
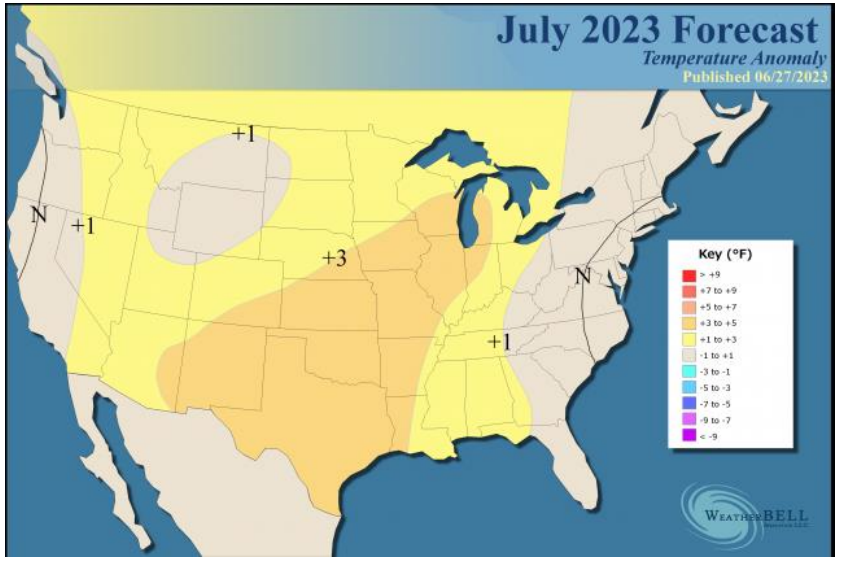
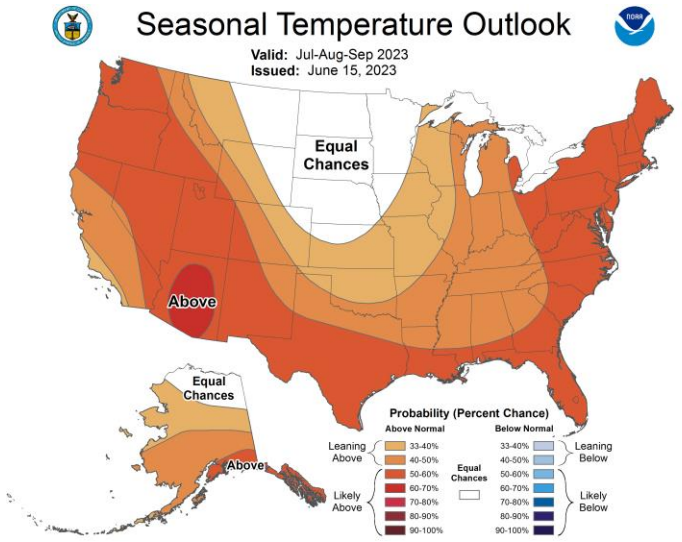
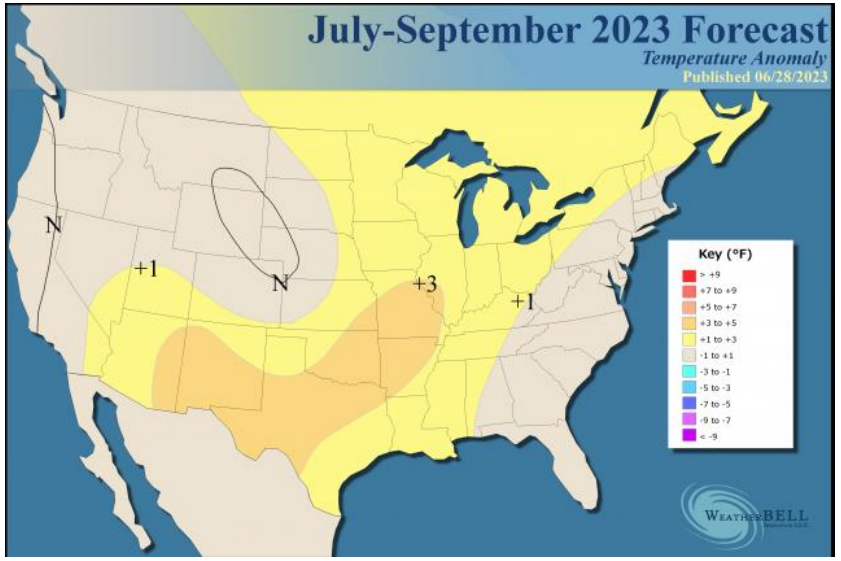
July Forecasts





Q3 Forecasts

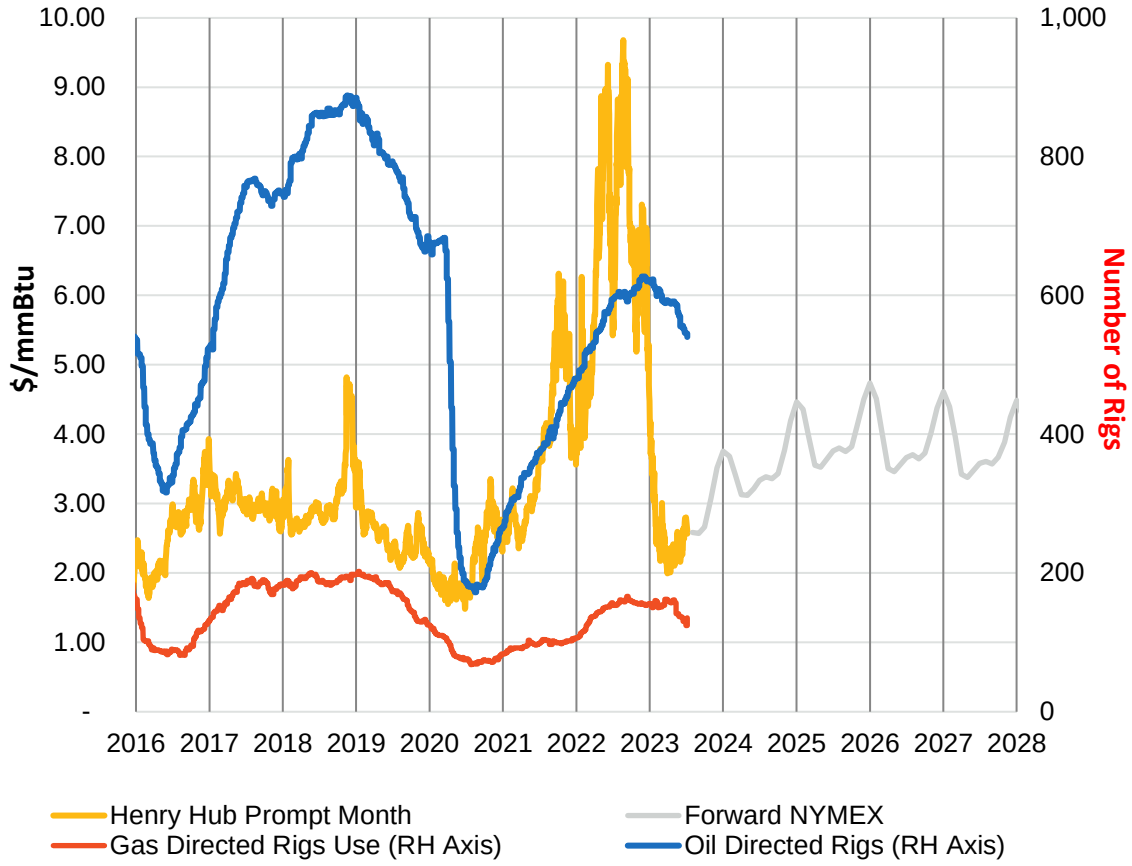




Natural gas prices crashed last winter

- We began to see a problem when gas inventories were growing while prices remained high last fall
  - Told us that gas supply was ample but fears about winter shortages caused by the Russia/Ukraine war kept prices aloft
  - The correction was swift and brutal
- Are we in the beginnings of a natural gas price correction?
  - Yes
    - Rigs (natural gas and oil) coming down. Since the start of 2023
      - Natural gas rigs down 13%
      - Oil rigs down 13%
    - Natural gas producers slowing production
  - and No
    - While oil prices remain “low,” OPEC is still calling for production cuts
    - Macro economics still pointing to trouble

Henry Hub natural gas price and rig count



Source: McCloskey, EIA, NYMEX and Baker Hughes

Natural gas price still matters – but not in all cases

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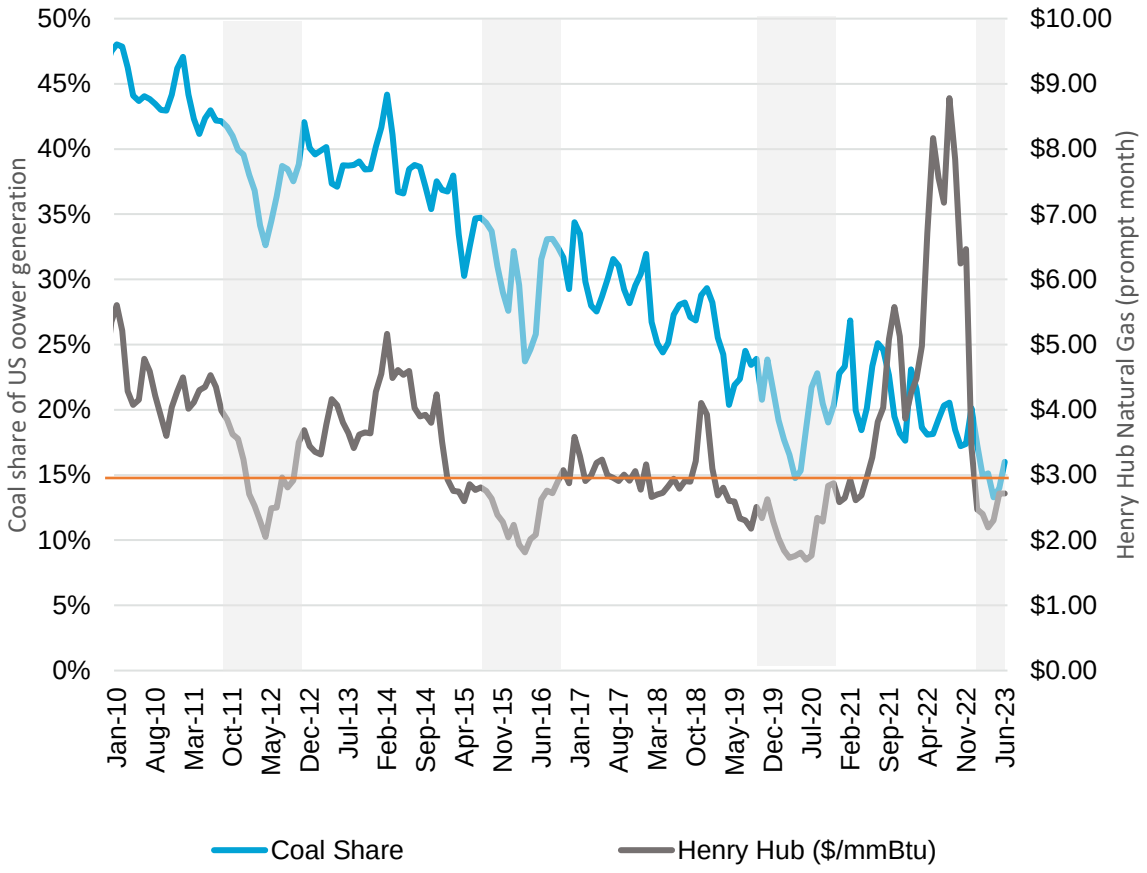
Natural gas prices and coal's share of the power market



Source: McCloskey by OPIS

- Low natural gas prices, historically less than $3/mmBtu, have caused a strong loss of market share for coal
  - We are now in Cycle #4 since the shale boom
- Natural gas price spike in 2022, however, did not produce a growth in coal share
  - Supply chain issues last year to blame – both mining and logistics
- Based on trend, coal's share of the power market should return to 17-19% once natural gas prices move higher
  - Breakeven is now closer to $3.50-$4.00/mmBtu for Henry Hub gas

Any “fix” for thermal coal will need to start with natural gas: some positive signs

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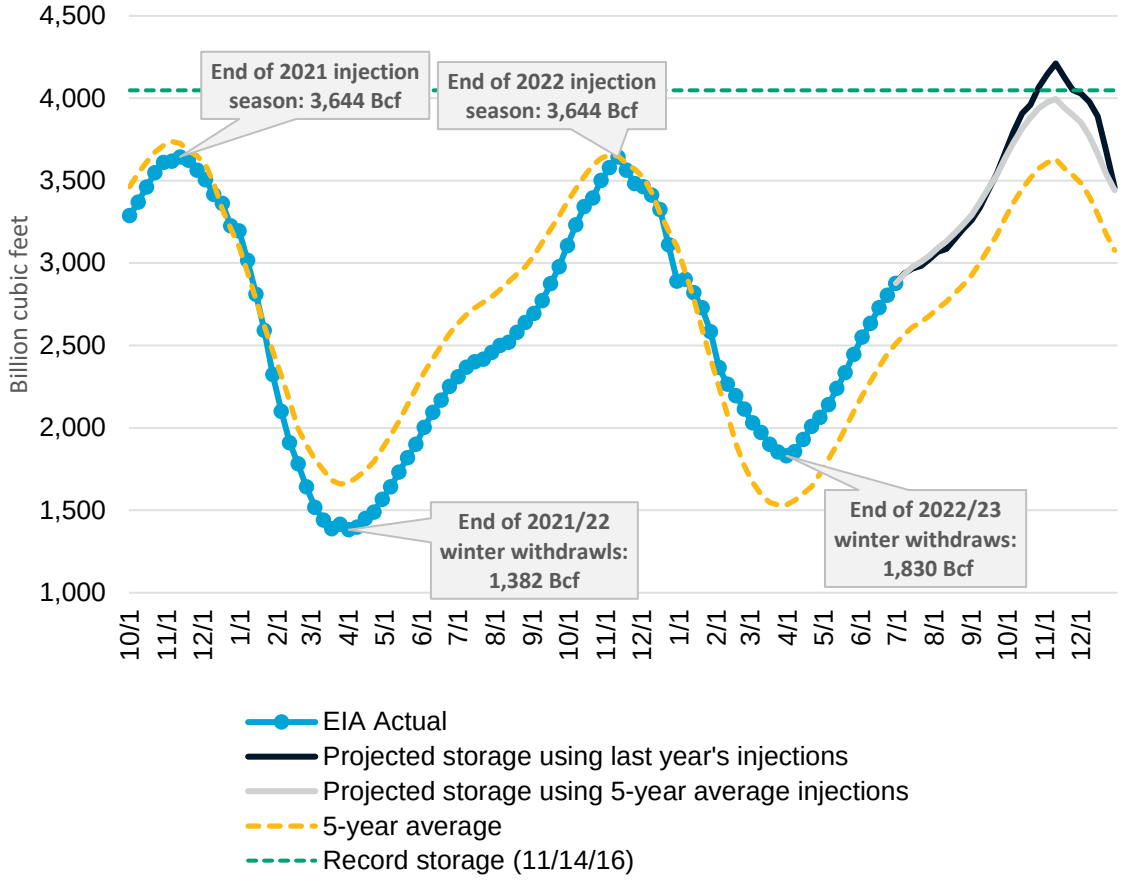
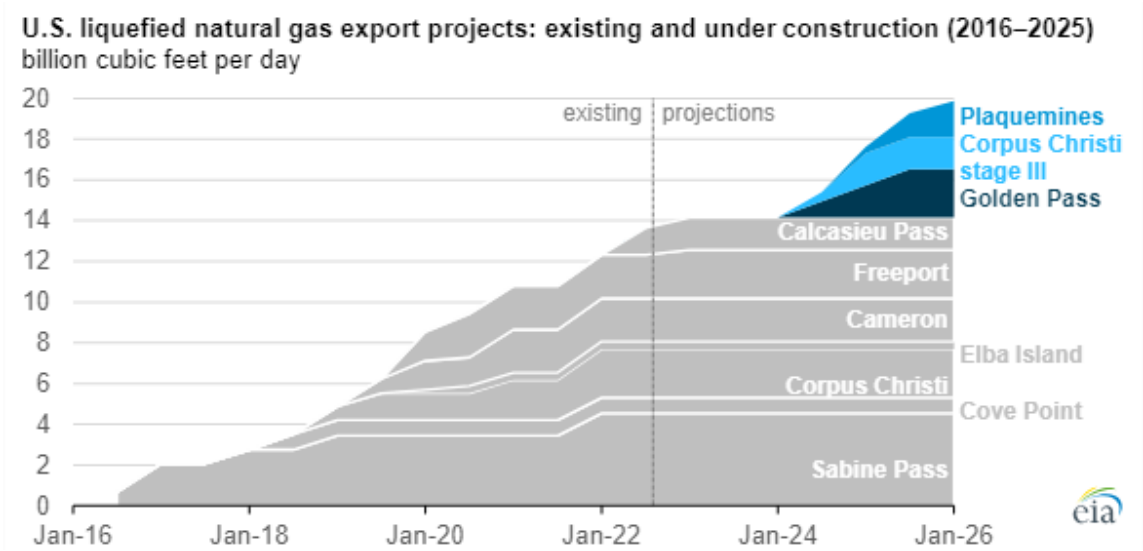
- Natural gas in storage is currently 14.6% above the 5-year average but
  - Rates of injections have mostly been less than the 5-year average
  - This means the “excess” is slowly eroding
    - At the end of Q1, storage volumes were over 20% above the 5-year average
- Many natural gas producers are trimming their well development
  - High labor and material costs have squeezed profit margins for oil drillers and have made it nearly impossible for gas-directed drillers

Natural gas inventories

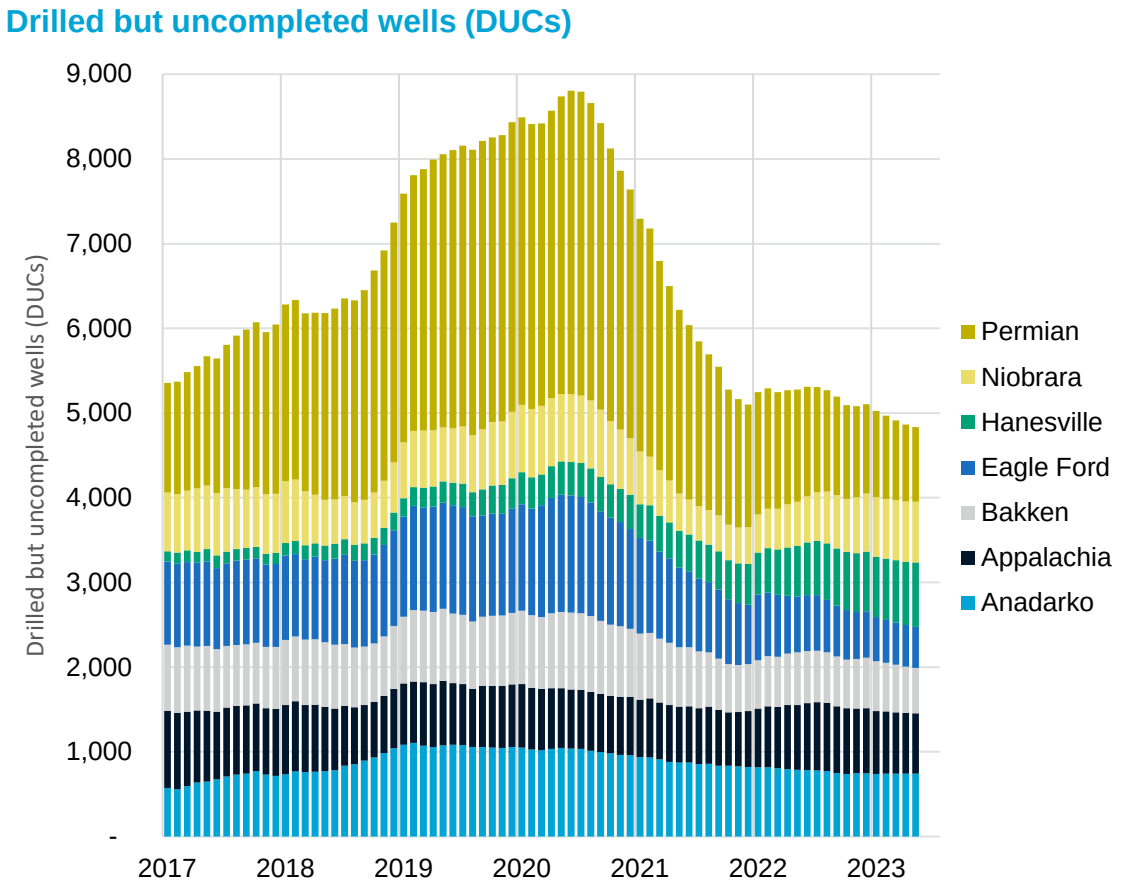


Source: McCloskey by OPIS and EIA

Natural gas demand is set to grow – outside of domestic power generation



- LNG liquefaction capacity looks to increase by over 40% next year adding close to 6 bcfd capacity
  - These terminals are all under construction
- Concurrently, drilling activity is slowing and the number of DUCs has been steadily declining – for both oil and natural gas
- These are the advance indicators we are looking for
- Forward prices for natural gas are in contango



Source: McCloskey by OPIS and EIA

YTD demand for power generated by coal is down 26%

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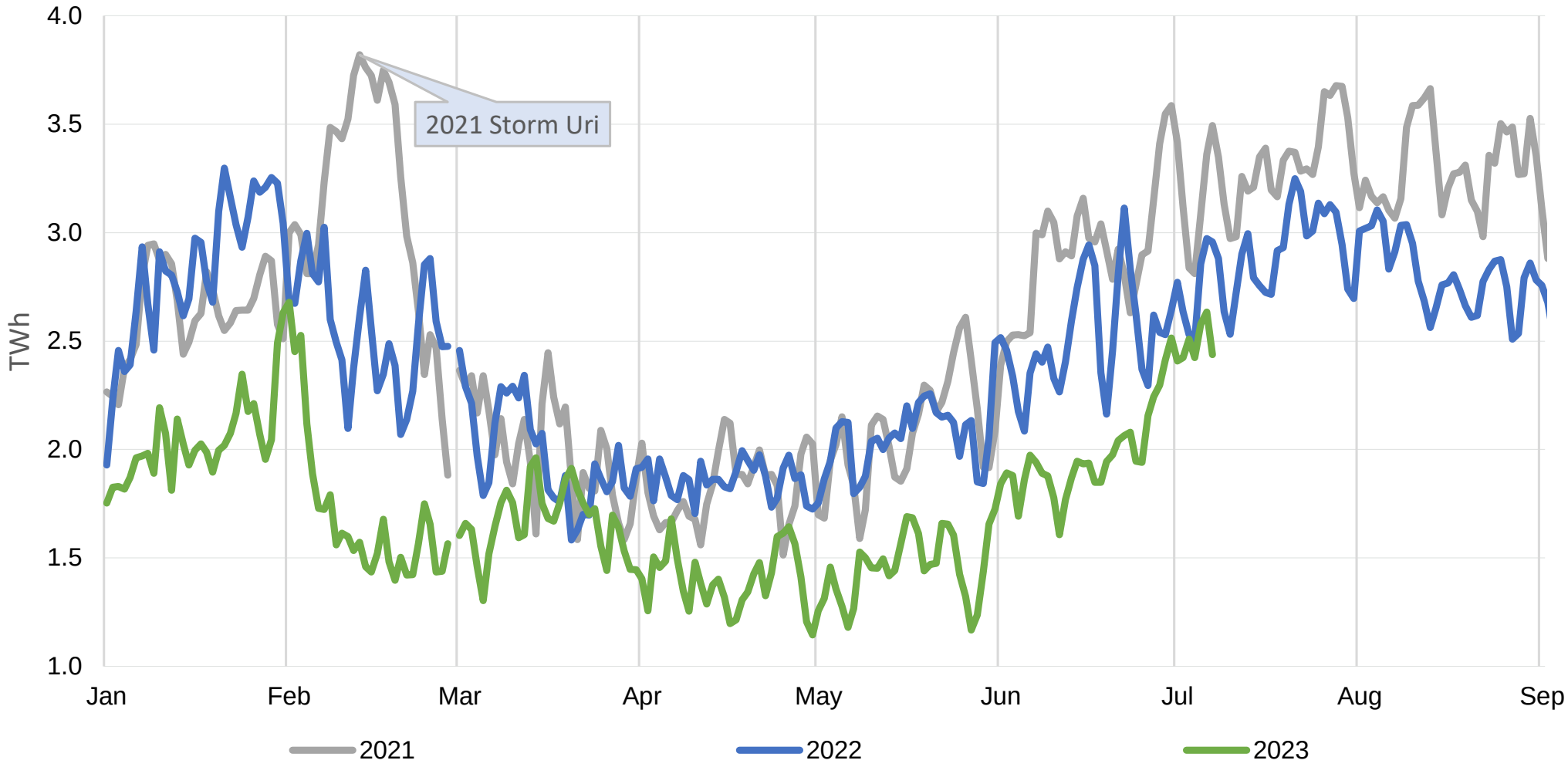
US Coal Power Generation



Source: McCloskey by OPIS and EIA

YTD regional demand for coal-fired power

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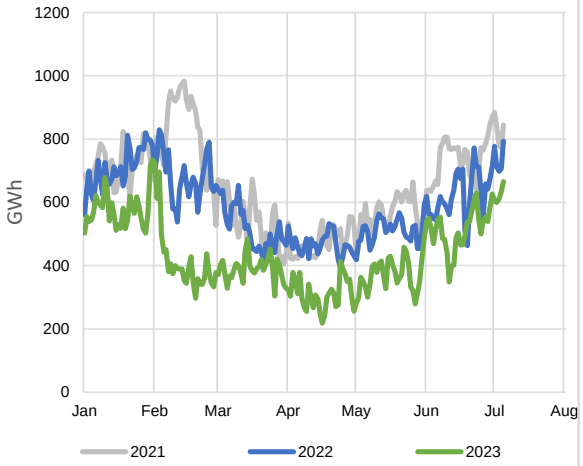
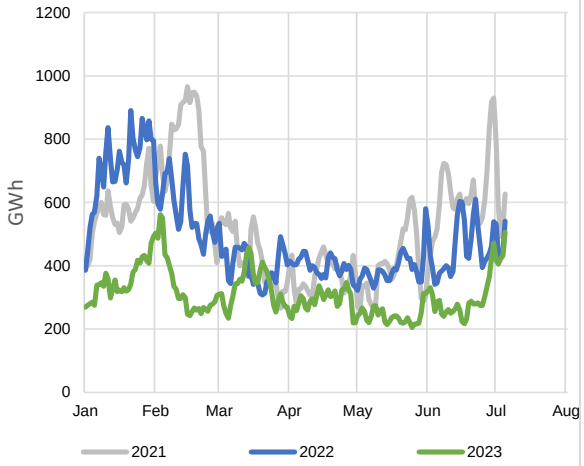
MISO - Coal Gen



Source: McCloskey by OPIS and EIA © 2023 Dow Jones Energy Limited

PJM - Coal Gen



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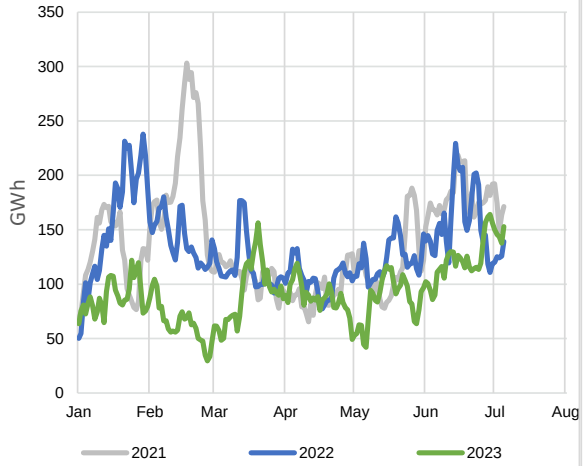
Southeast - Coal Gen



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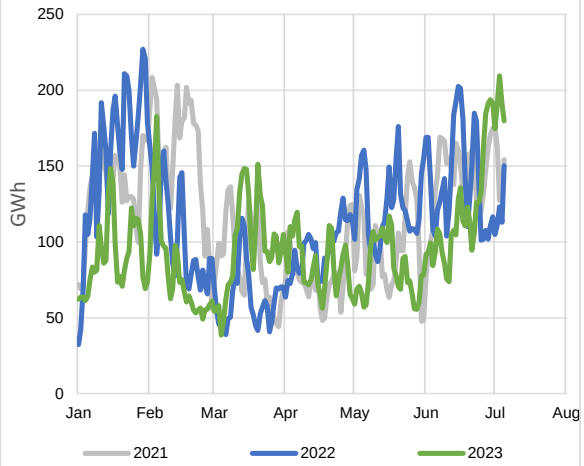
Carolinas - Coal Gen



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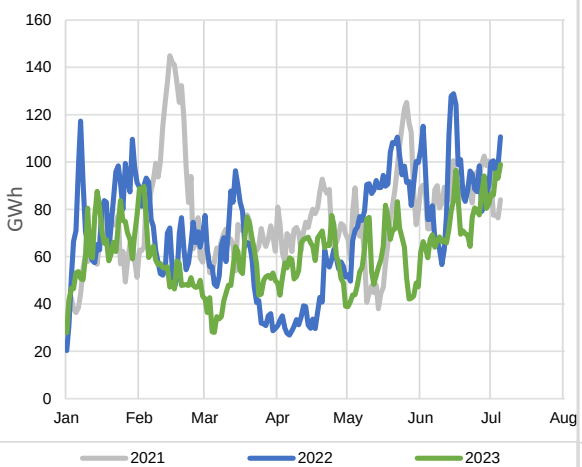
Tennessee - Coal Gen



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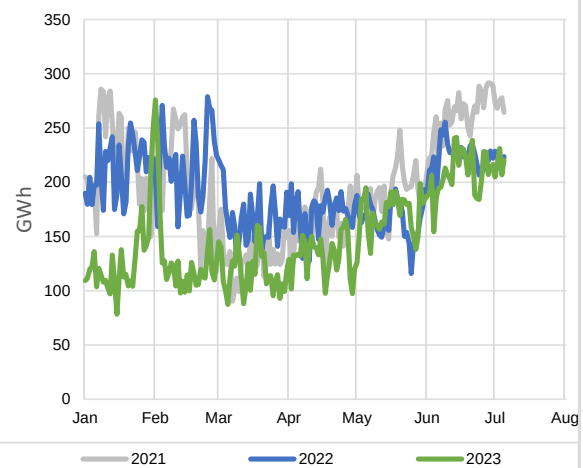
ERCOT - Coal Gen



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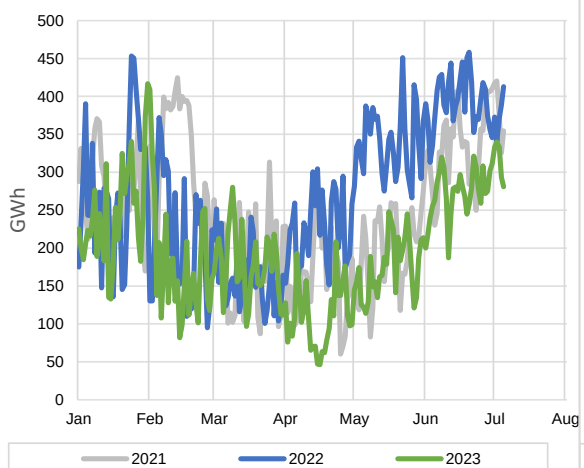
SPP - Coal Gen



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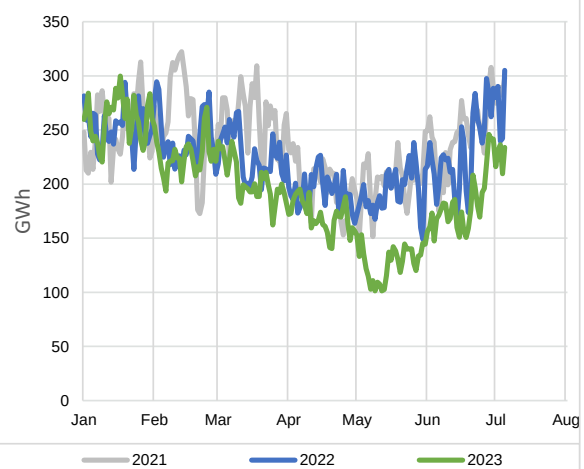
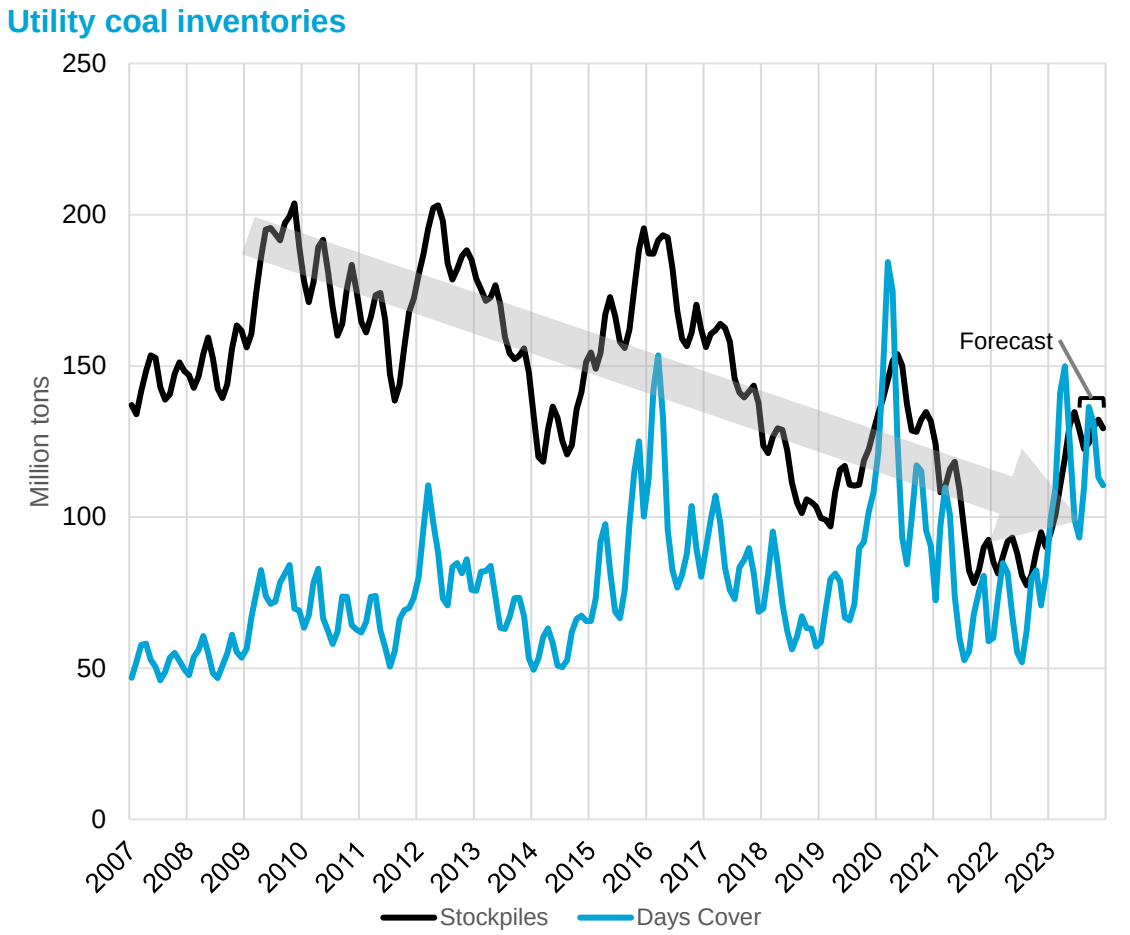
Northwest - Coal Gen



Source: McCloskey by OPIS and EIA © 2023 Dow Jones Energy Limited

Coal inventory values can be misleading



Source: McCloskey by OPIS

- Data show volume of coal held in utility stockpiles is declining (as it should with fewer power plants)
  - The current situation is the beginning of another cycle and on its own, it appears relatively innocuous
- Days of supply helps but this calculation is fraught with irregularities
  - Month-to-month; annual average, rolling annual average, historical/forward rolling average, “max burn” estimates
  - Each can result in meaningfully different stories and outcomes
- Another issue is data quality
  - Methods for calculating inventories
  - Do inventories capture dead or off-site storage?
  - Not all inventory is captured in the data
    - Coal stored at intermediate sites including rail-to-river and export terminals, inventory held in barges.
    - Says nothing about in-transit and producer inventory

Something's amiss in latest inventory data from EIA

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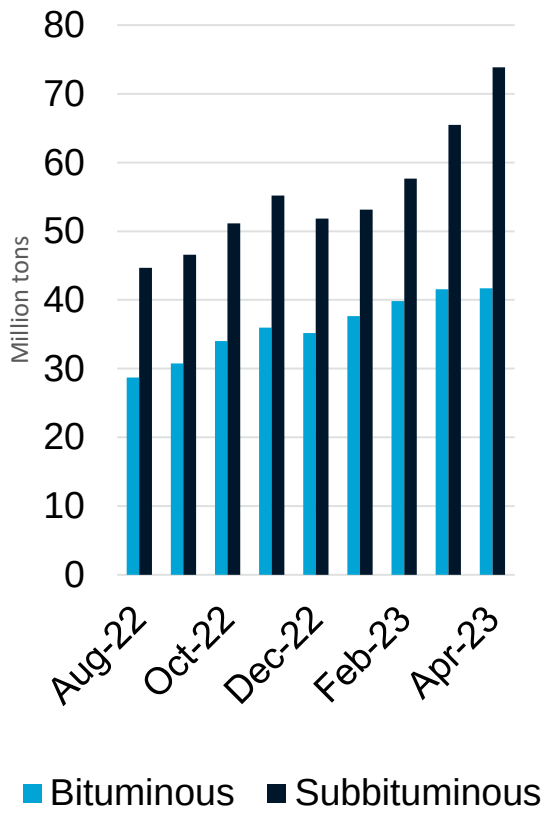
EIA inventories by rank



Source: EIA

- EIA's coal inventories by rank shows subbituminous inventories have grown 42% since the end of December but bituminous inventories have increased 19%
  - Does not logically fit with either coal production or power generation trends
    - YTD deliveries to utilities of bituminous coal have been close to year-ago rates but burn is down significantly (see previous regional power generation)
    - Thermal coal exports off east coast are higher, but not even close to account for the supply/demand differences
- April results show a large gap between supply and demand which was not explained in the inventory data
  - Supply: coal production + waste coal + imports = 49.1 mst
  - Demand: utility burn + exports + industrial/coking coal = 33.6 mst
  - Difference: 15.5 mst more coal supplied than consumed yet utility inventories increased 8.8 mst (of which only 1% was bituminous)
- Where is the other ~7 million tons in April???

US utilities are storing record amounts of coal per GW of installed capacity

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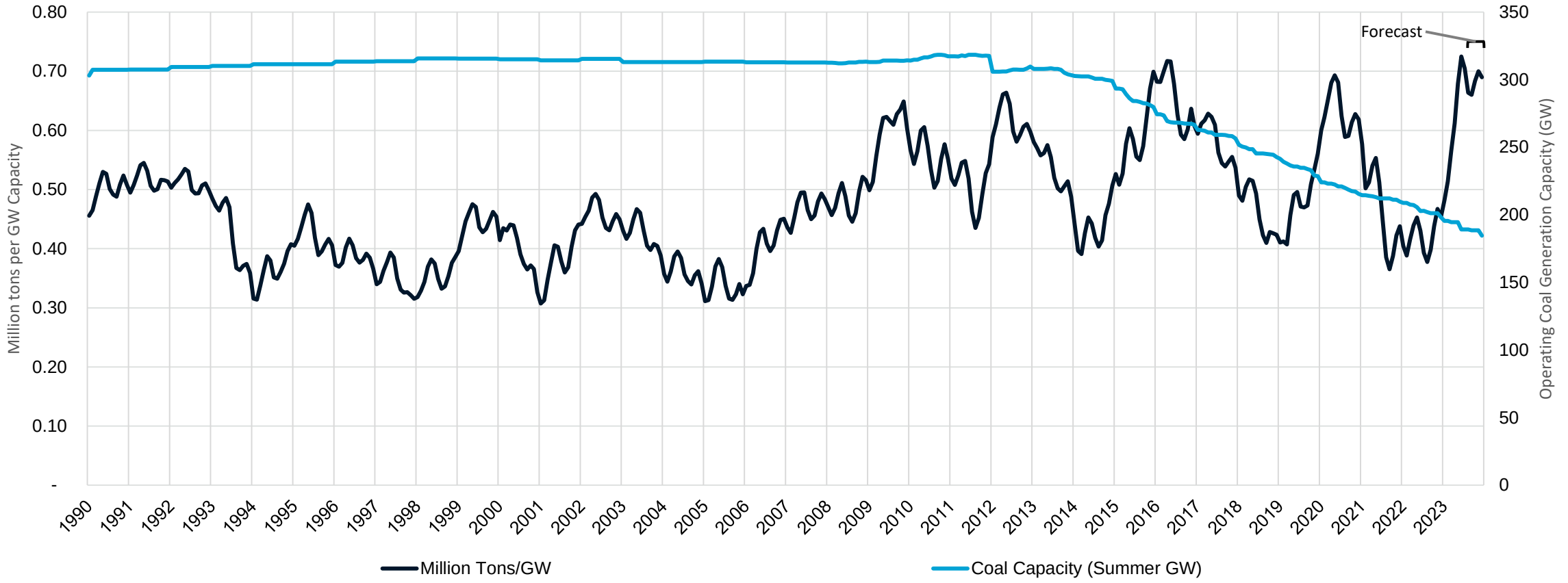
A different perspective on inventories – still imperfect but captures the movement in operating capacity

Million tons of coal in utility inventories per GW operating coal generating capacity



Source: McCloskey by OPIS, FERC, EIA, Velocity Suite

. . . and that coal sitting there is expensive

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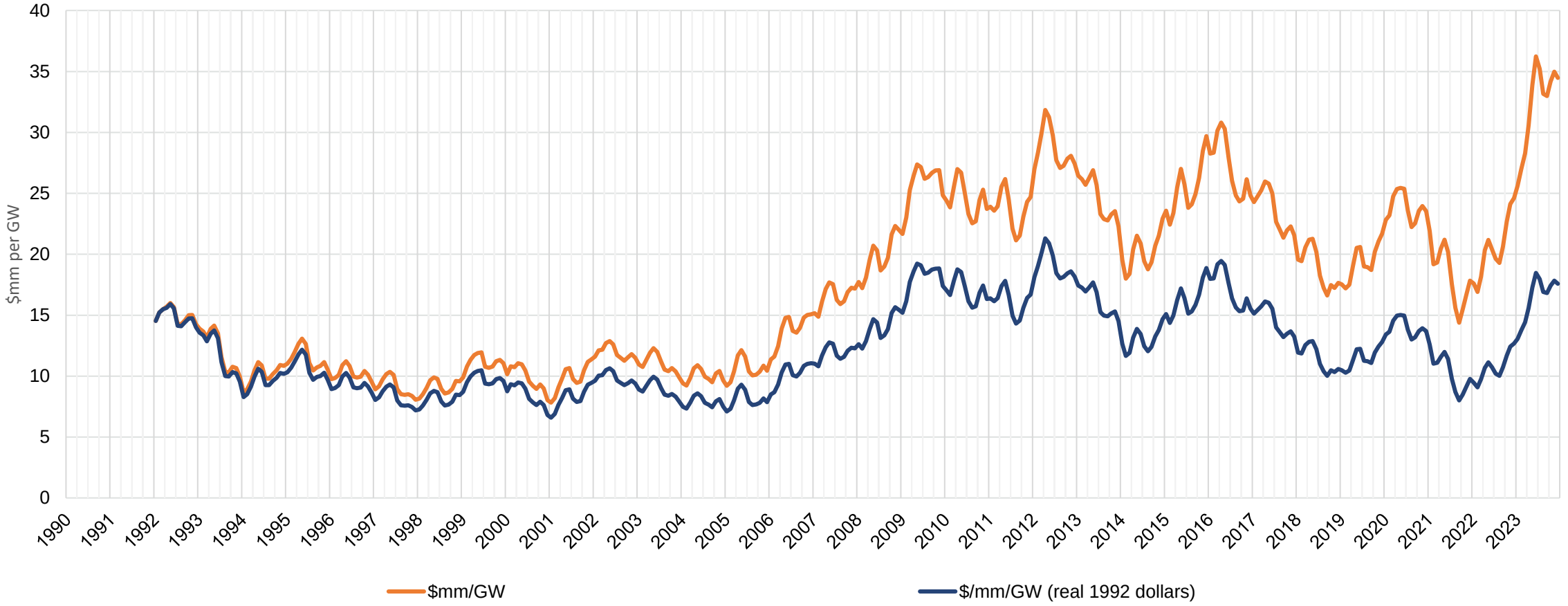
Estimated value of coal in inventory per GW of operating capacity



Source: McCloskey by OPIS

Regulatory risks to domestic coal market

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- New rulemaking designed to further disadvantage coal units – using both carrot and stick
  - Carrot
    - New subsidies/tax credits for renewables – portability of tax credits under the Inflation Reduction Act
    - New subsidies for nuclear power – from pariah to darling (note: Vogtle Unit #3 entering commercial operations with Unit #4 due end of 2023 or early 2024)
    - State incentives in some cases for rooftop solar and energy efficiency programs
  - Stick (Part 1)
    - Tighter limits under NAAQS for fine particulates (PM 2.5): reducing max size from 12 to “9 -10” micrograms/cubic meter. This will significantly expand non-attainment regions
    - Good Neighbor Plan – NOx transport: expansion of summer NOx compliance program from 12 to 22 states – Group 3 allowance becoming more expensive
    - Power plant effluent rules – already seeing a spike in retirements by 2028 to comply with ELG limits
      - March 8: new rule to be finalized in 2024: “zero-discharge” from scrubbers, expands the voluntary retirement category (new subset is for December 31, 2031)
    - Mercury Air Toxics Standards (MATS) Revision: Incorporates new technologies for Hg removal, tightens emissions from 0.03 lbs/mmBtu to 0.01 lbs/mmBtu. Closes the “lignite loophole.” May 2023: Draft rule affecting taconite iron ore processing in the US.
    - Coal Combustion Residuals (CCRs, a.k.a. “coal ash waste”): Some plants may be forced into early retirement
      - May 2023: EPA, responding to a lawsuit, proposed to extend rule to “legacy” waste disposal sites

Regulatory risks to domestic coal market

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- Stick (Part 2)
  - Carbon Emission Standards for Coal and Natural Gas Plants: Announced May11th
    - Latest attempt to regulate carbon emissions from power sector – follows the Clean Power Plan which was replaced by the Trump Administration and ultimately ruled unconstitutional by SCOTUS.
    - Again, relies of Section 111(d) of the Clean Air Act which is a “catch-all” component of the CAA designed to set emission standards for any pollutant not explicitly listed in the CAA
    - Lesson learned from prior attempt – only regulates stationary sources, i.e., “inside the fence”
    - Establishes the “Best System of Emission Reduction” (BSER) based on 90% CO2 capture/storage
    - Sets compliance dates as follows:
      - Units that retire by 2032, no new technology needed if emissions do not increase
      - Units that retire by 2035, no new technology needed if annual capacity factor remains below 20% and emissions do not increase (seasonal use only)
      - Units that retire by 2040, they can co-fire with 40% natural gas or hydrogen and must reduce emissions by 16%
      - Units that are to operate beyond 2040 must have the equivalent of 90% CO2 capture/storage
  - The proposed carbon emission regulations will be opposed. Most likely on the assumption for BSER and the use of 111(d)
  - Combination of all the above (incentives and regulations) designed to achieve carbon emission reductions as was envisioned under the Clean Power Plan
    - January 1, 2032, an important date given both compliance with stepped up ELG and carbon emissions
    - McCloskey believe another large round of coal unit retirements will come as a result

December 31, 2031 – the average age of the coal fleet will be over 50 years

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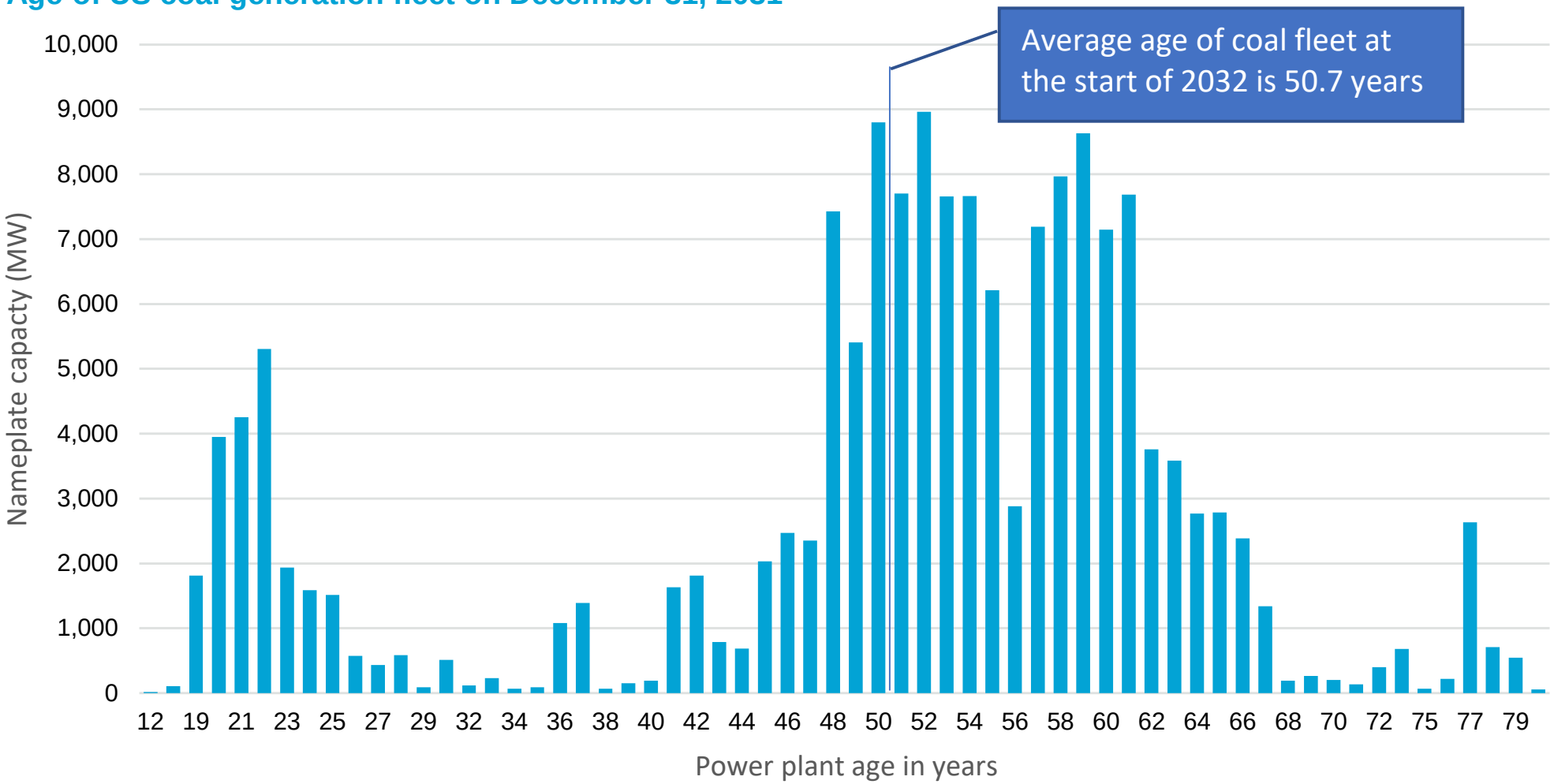
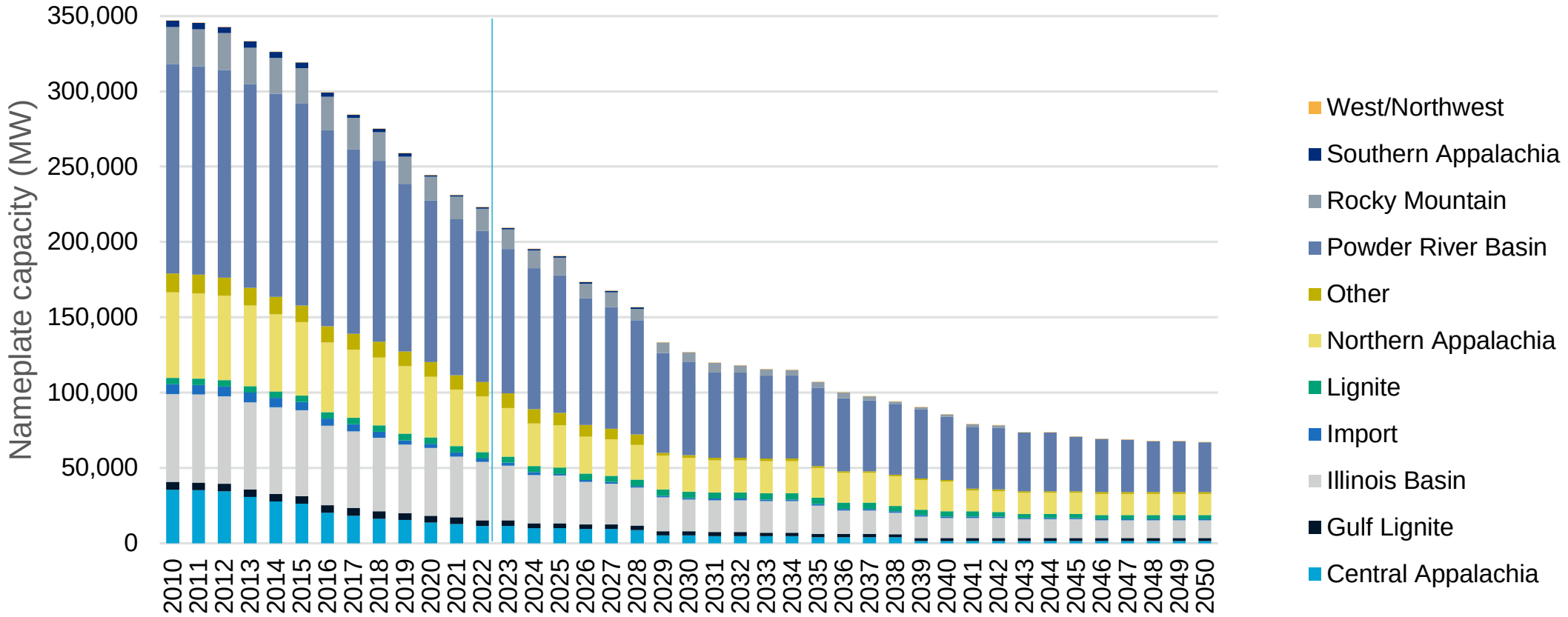
Age of US coal generation fleet on December 31, 2031



Note: Announced retirements between now and 2032 have been removed from these data
Source: McCloskey by OPIS

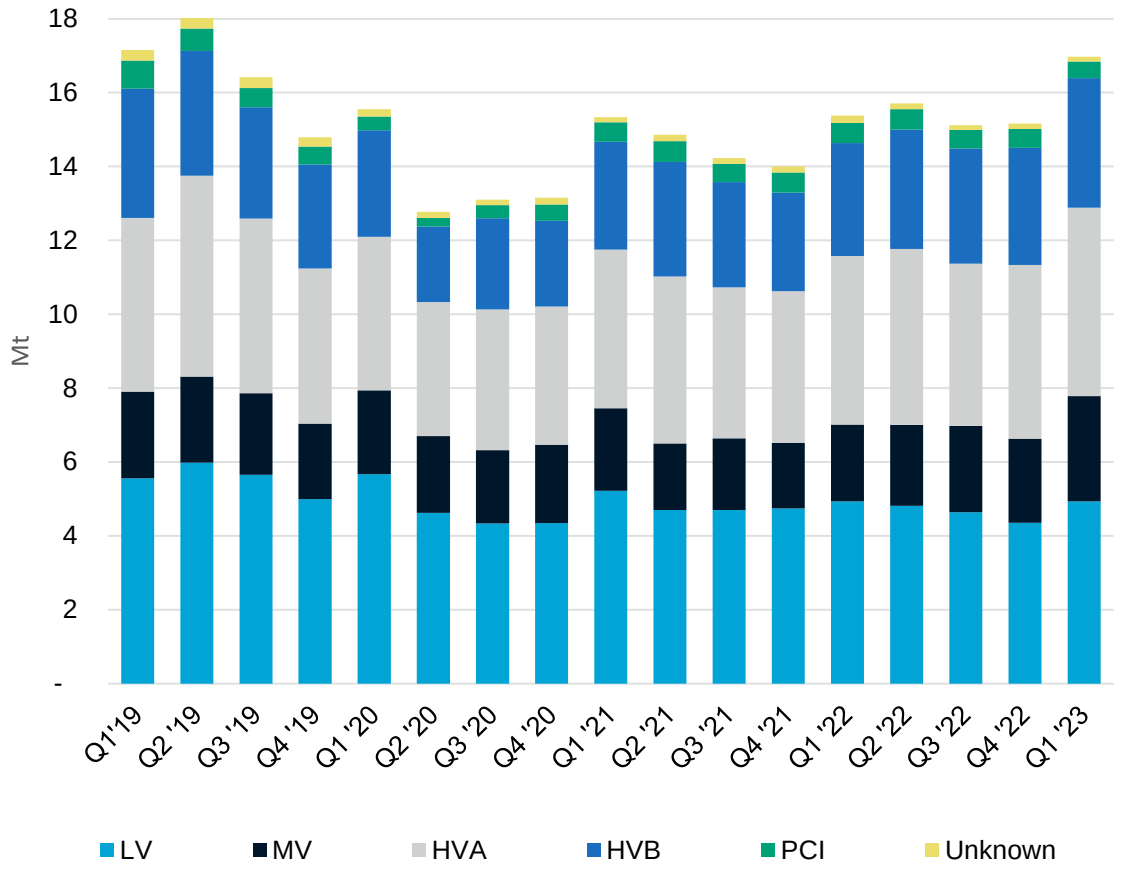
US coal power capacity profile

Expected coal power generation capacity through 2050 (based on announced retirements)



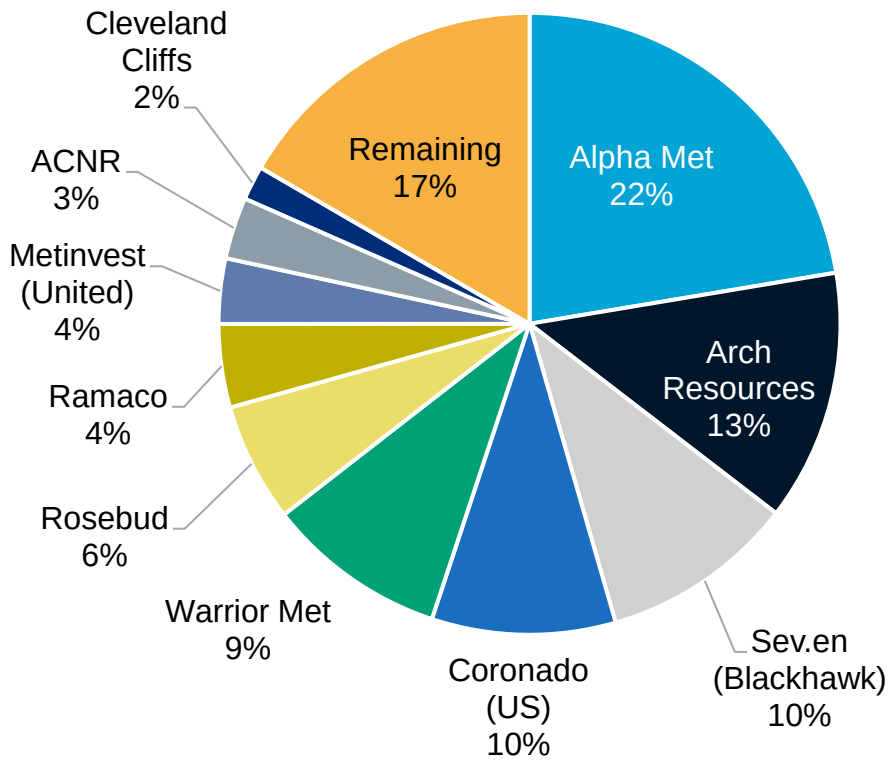
Metallurgical coal production trends

US met coal production by volatile



Source: McCloskey by OPIS

Top 10 US met coal production share



First quarter 2023

Source: McCloskey by OPIS, MSHA, EIA

US coal exports an obvious outlet for excess supply, except . . .

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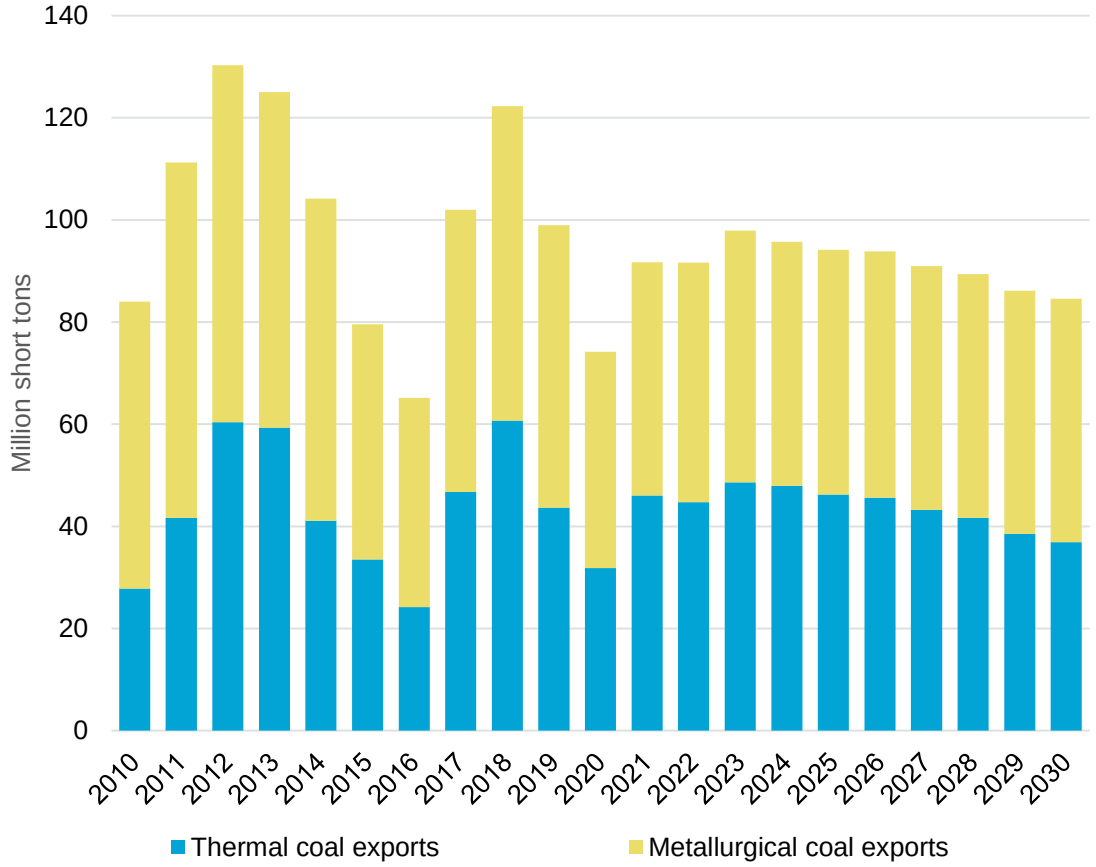
US coal exports - history and forecast



Source: McCloskey by OPIS & US Department of Commerce

- US coal exports were about 92 mst in 2022 and are expected to be close to 100 mst in 2023
  - US coal production for January-June estimated at 293 mst, with imports and “waste coal recovery, total supply estimated at 298 mst
  - US utility demand for January-June estimated at 170 mst, with exports and industrial, total demand estimated at 240 mst
    - This means supply exceeded demand by 58 mst by the end of April
    - Even if exports could climb an additional 10 mst (unlikely), this will not address the supply overhang
- International thermal coal prices have dropped which places some coal producers in an uncomfortable position

Seaborne thermal

Trends, Demand, China, India, Supply

Key takeaways: seaborne thermal

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- **Winter risk not gone:** the near term is still well stocked, which weighs heavily on price. And more supply is coming—albeit slower than expected. But strong buying will resume in Europe and competition for LNG will keep that market tight until mid-decade. Risk of gas tightness in winter 2023/24.
- **Key price relationships:** Russian vs South African into India, Australian vs Russian into Korea and Taiwan, Asia vs Europe for global LNG
- **Demand growth:** Could demand in 2023 hit a record high?
- **Rain, rain, go away:** La Nina is over, El Nino is here
- **Trifurcated market:**
  - **High CV:** Lost Russian supply, strong demand in Europe…will the return of Australian tons be enough to keep prices down?
  - **Lower CV:** Very strong demand growth – China, India, Vietnam, domestic Indonesia
  - **Russian:** Currently loss-making, out of the West Coast
- **Long term impact of Russia-Ukraine war:** Resource depletion

European natural gas prices back to pre-invasion levels, storage at 80% full

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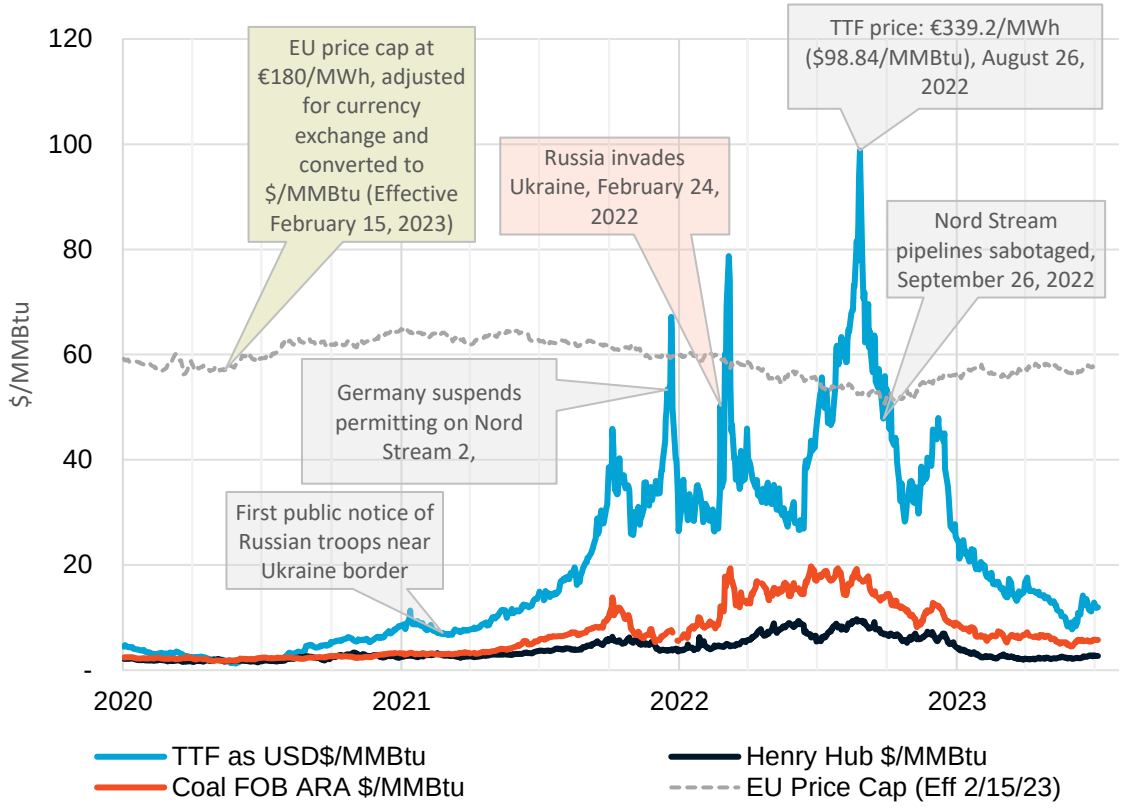
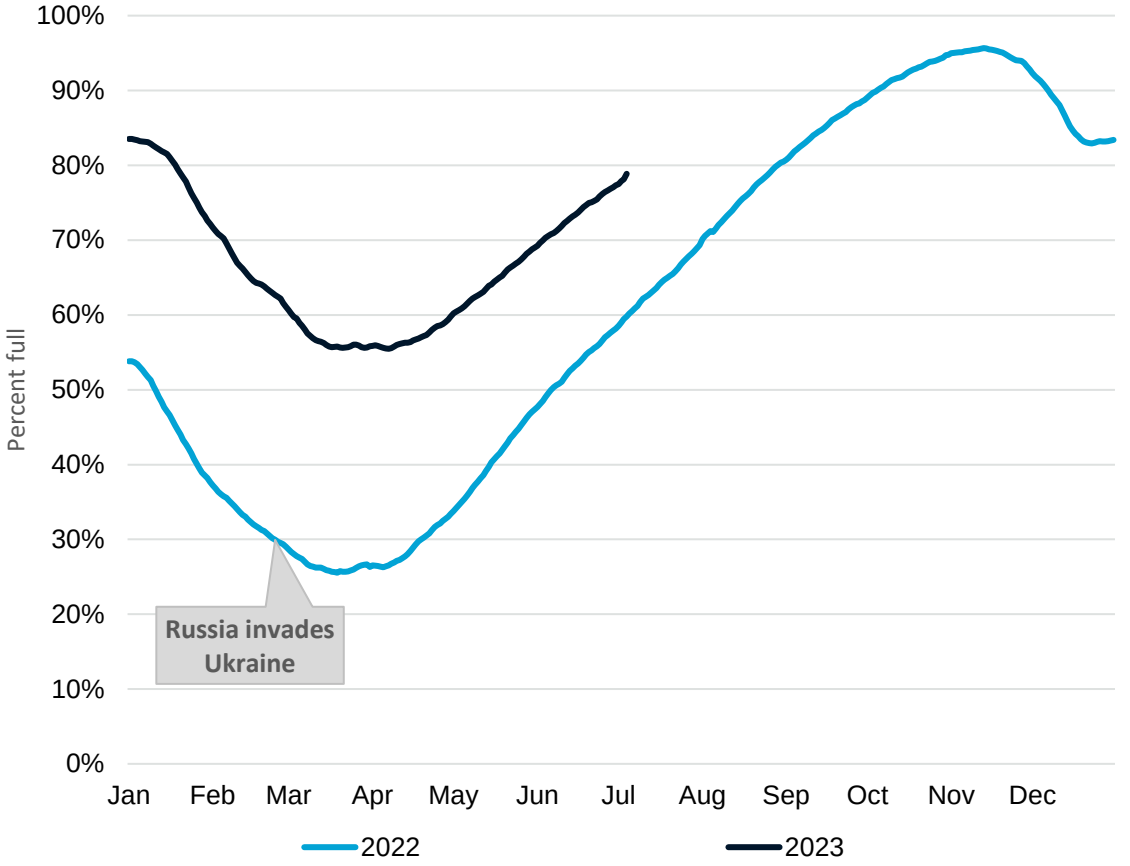
Dutch TTF and Henry Hub (pm) and landed thermal coal in Europe



Note: Dutch TTF (Title Transfer Facility) is quoted as EUR/MWh. Conversion to USD/MMBtu using EUR/USD exchange rate published daily
Source: McCloskey by OPIS, ICE and NYMEX

European natural gas inventories



Source: McCloskey by OPIS, GEI-AGSI

2023 demand will be up ~ 50 mt

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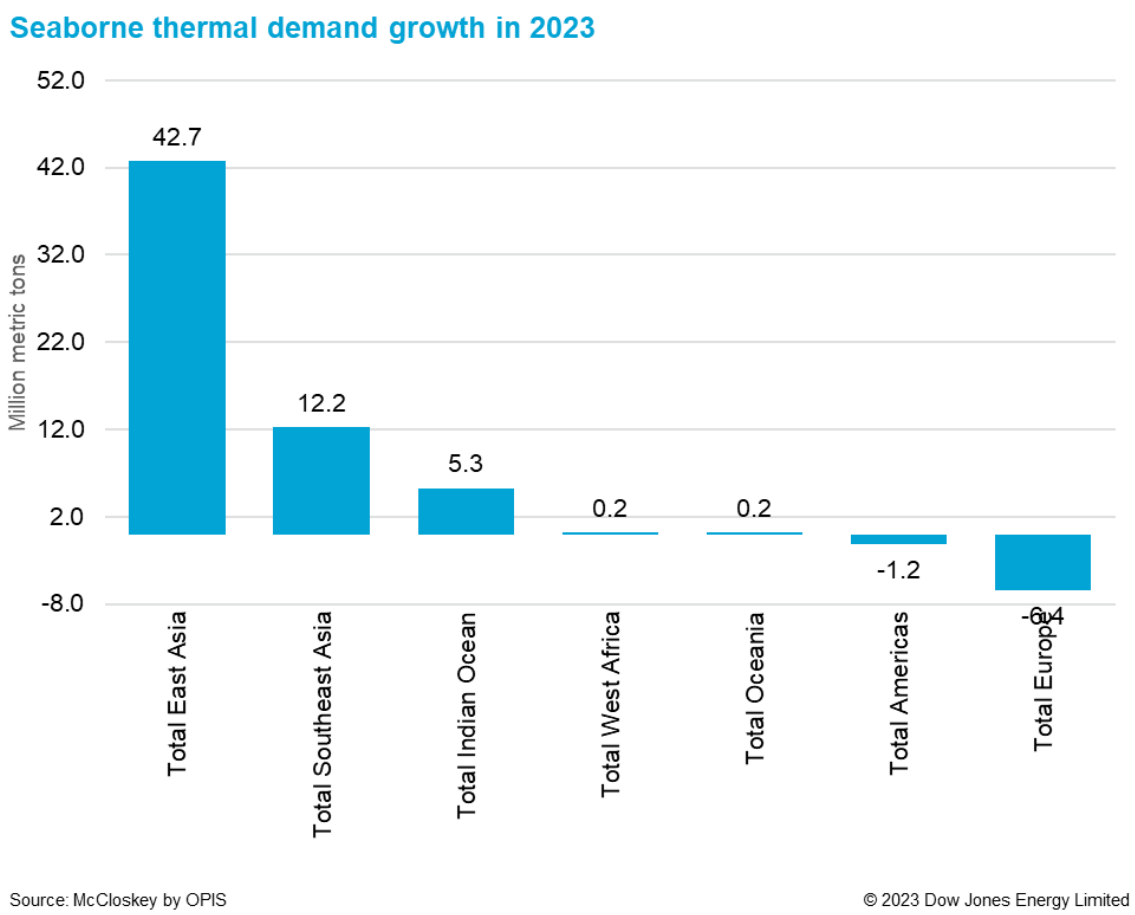
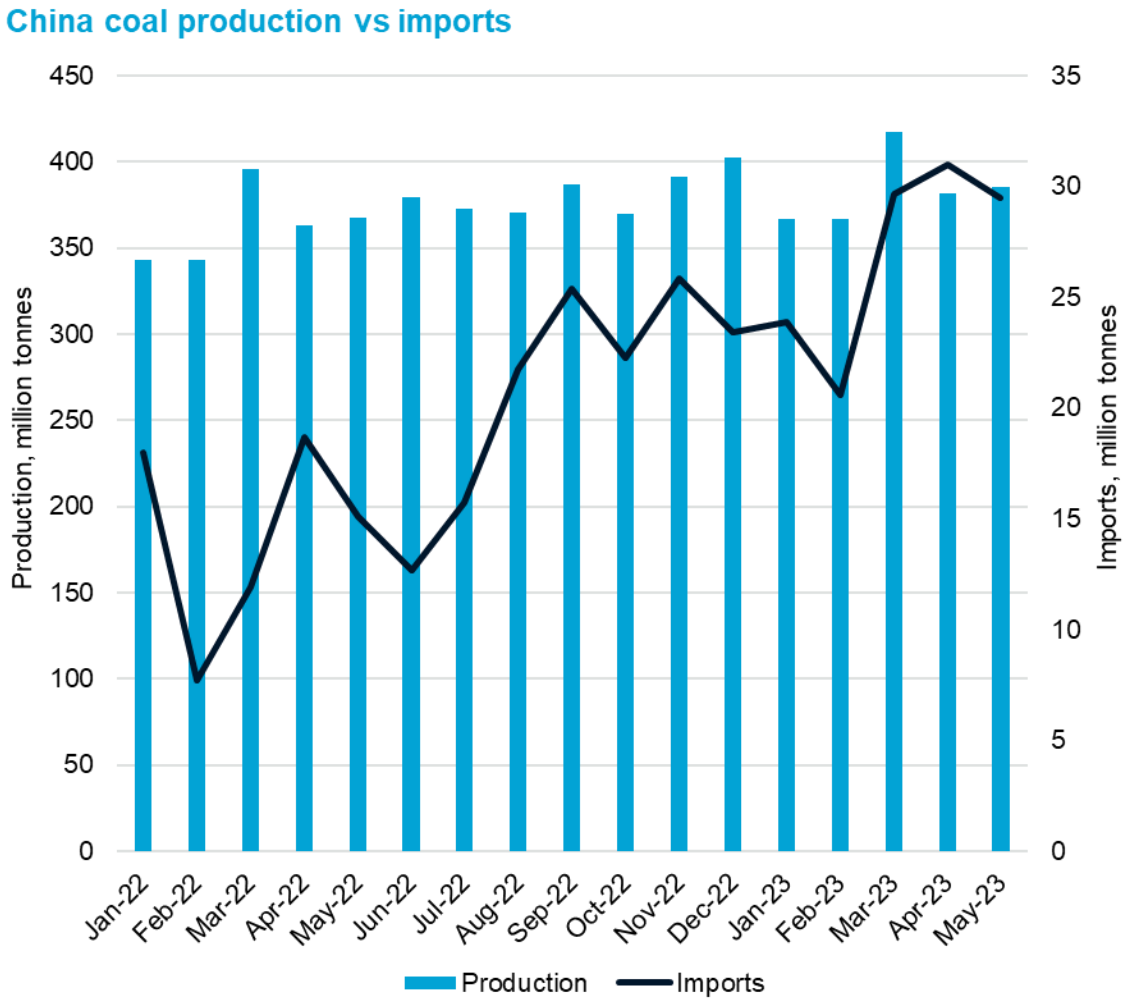


Source: McCloskey by OPIS

- China will lead demand growth in 2023, as the government seeks to avert another power supply crunch.
- India will be the strongest driver of growth through the 2020s and will grow >10 mt in 2023.
- Growth in Vietnam and other parts of APAC
- European imports will remain strong
- Declines in older economies (JKT)

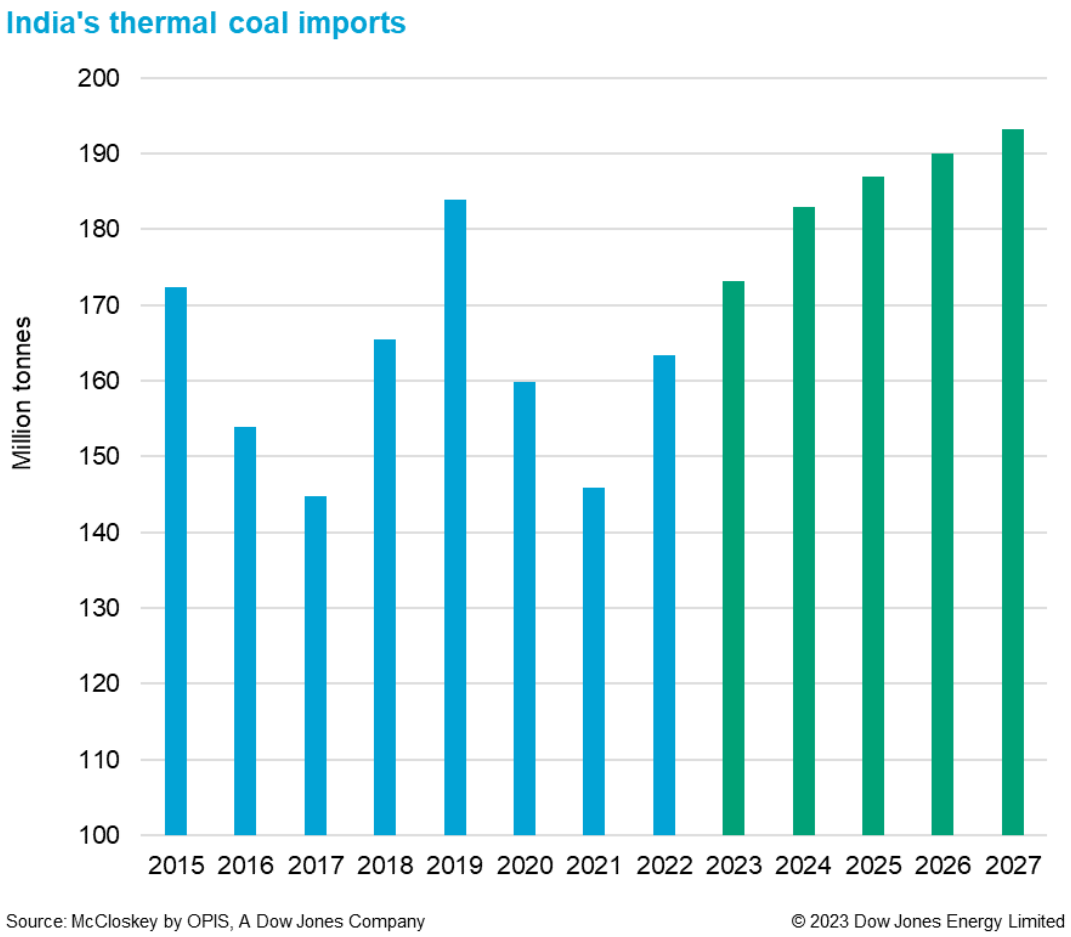
China remains oversupplied as its economy struggles to rebound

- China's domestic market is heavily oversupplied
- Imports have neared record high levels during March–May, and it doesn't seem to be slowing down
- Domestic production hit a record high in March, output has slowed since, but remain high relative to historic levels
- Concerns around a power supply crunch this summer remain, heatwaves have already emerged and the outlook for hydro is uncertain
- Mining safety crackdowns are starting to emerge following the latest deadly accident
- Government efforts to boost the economy do not appear to be bearing any fruit



Source: McCloskey by OPIS, A Dow Jones Company

India



- Demand during monsoon will be key determinant of 2023 import growth—arrivals were uncharacteristically strong during 2022 monsoon
- Coal India exceeded production target for first time in FY2022-23, with a record 81 mt (13%) rise in output. But similar growth unlikely going forward
- Transport infrastructure constraints remain. East and West Dedicated Freight Corridors being developed, completing in two years
- Indian Railways plans to add 90,000 extra rail cars by 2025—increasing efficiency, easing coal supply constraints
- Imports will continue to grow strongly as domestic supply fails to keep up with demand. But import growth should moderate from mid-2020s as domestic supply constraints ease

Supply outlook

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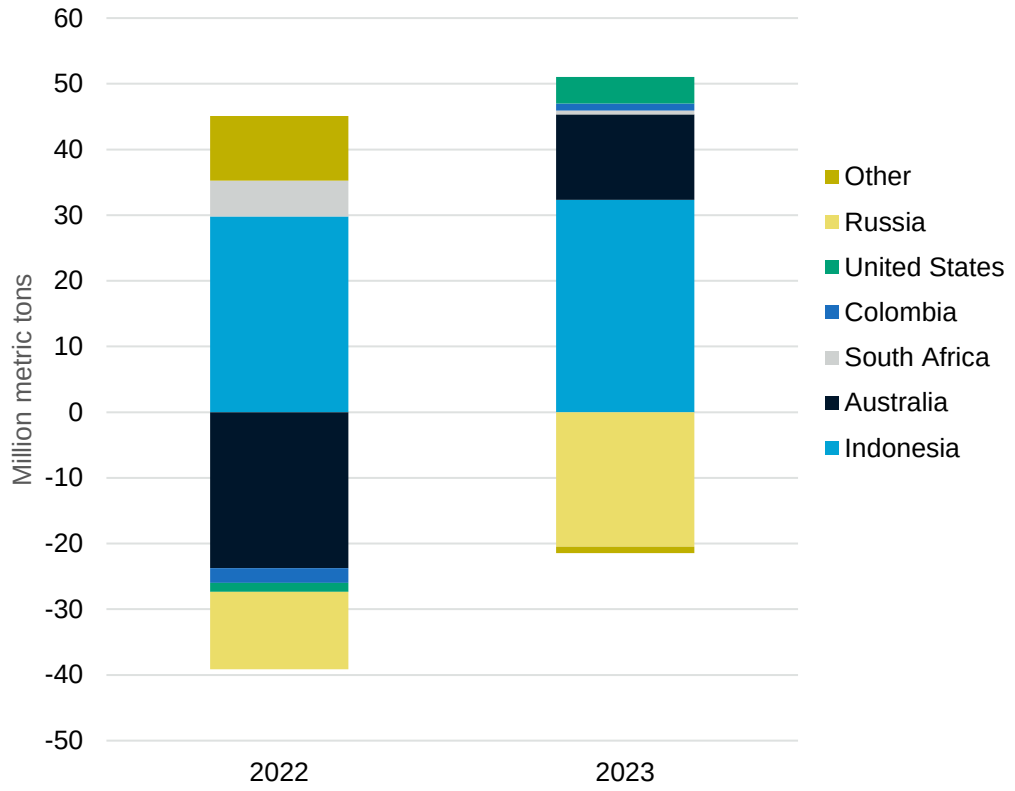
Global seaborne thermal coal exports - year on year change



Source: McCloskey by OPIS, a Dow Jones Company

- **Russia –** lower ability to discount coal at current prices, plus first full year of European sanctions
- **Colombian** supply growth limited — Prodeco return unlikely, while low market prices are challenging for smaller/higher cost producers
- **Australia—**wet weather abating enabling export recovery, but the uptick has been slow so far
- **United States** rail capacity constrained
- **South Africa** exports are steady so far, but continued rail problems and low market prices pose a risk to supply
- **Indonesia** can grow—but mostly low CV coal
- **Others**—Kazakhstan growing supply to Europe

Seaborne metallurgical

Trends, Demand, Supply,

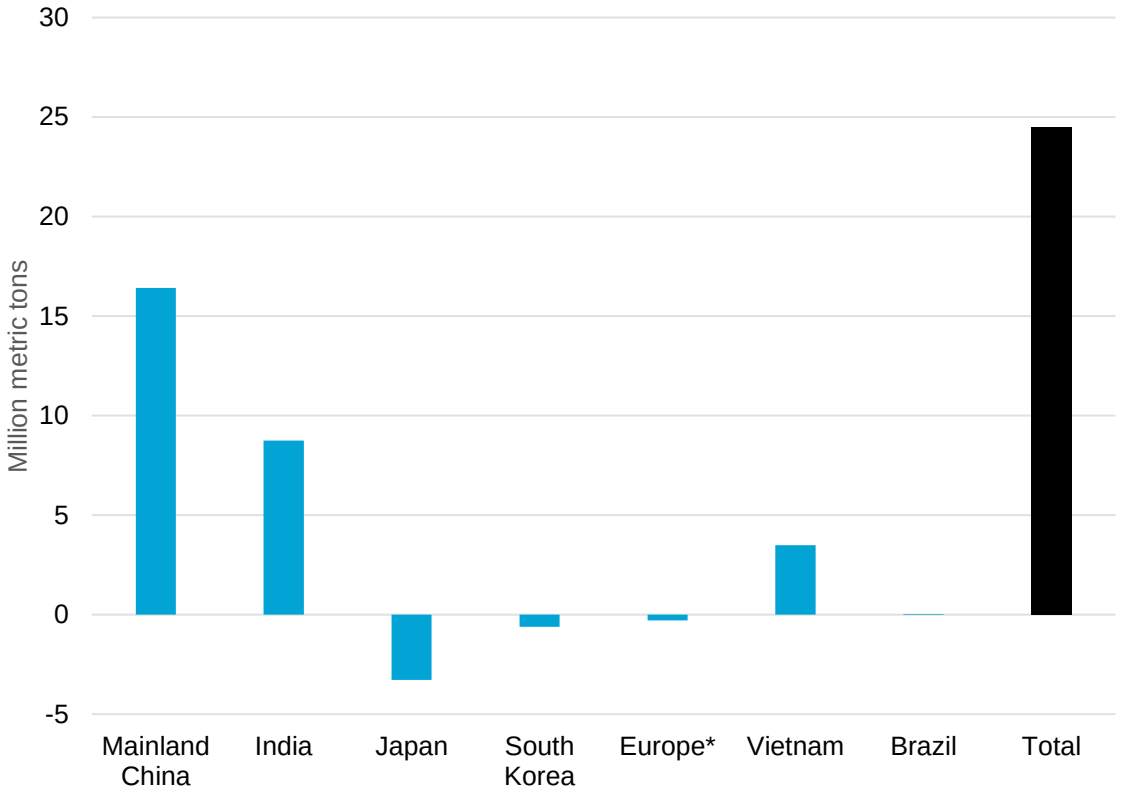
Key takeaways: seaborne metallurgical

- **Demand up slightly:** China remains the key uncertainty…will steel production be forced to fall 2.5%?
- **Substantial supply recovery, but delayed?** Australian availability is growing, since La Nina is now over. But transportation – unchallenged in a couple of years – is showing problems. Recovery of supply may be slower than expected
- **Further price downside:** Prices have eased substantially, and we favor a steady ongoing downturn from here. However, there is risk that prices will more sharply
- **Trade peace?** How long will it take for the China-Australia trade war to end? Little trade so far and arbs mostly closed
- **How long does the European energy crisis continue?** The situation in Europe caused met-to-thermal switching last year. Could that happen again later this year? Key driver of power prices in Europe
- **PCI market structurally tight.** Russian anthracite exports down. With Russian cut off from Europe and Japan, PCI (and anthracite) are tight, and likely will have higher relative pricing for multiple years
- **Costs are up:** Long term PLV price ~$170/t
- **Long term impact of Russia-Ukraine war:** Resource depletion?

Overall import demand growth this year

- However, demand growth in China is partly because of a weak start to 2022 and should tail off as the year goes on
- Growth in India and Vietnam seems more locked in
- European demand includes +1.3mt in Ukraine, so is more negative than it appears

2023 year on year metallurgical coal import demand growth - 2023 (total metallurgical coal)

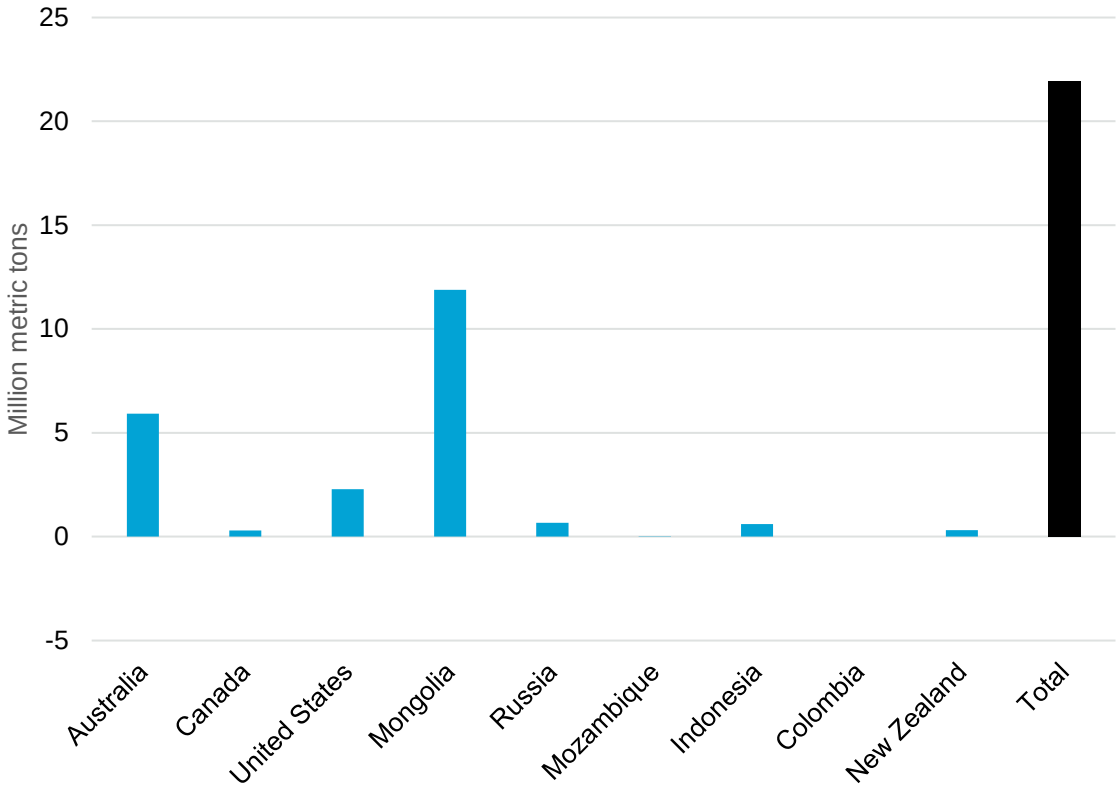


Source: McCloskey by OPIS, a Dow Jones Company

Supply growth?

- Strong growth from Mongolia – but is mainly competing with domestic Chinese supply
- Australian upside constrained by very weak start to the year, and rail transportation issues

2023 year on year metallurgical coal demand growth - 2023 (total metallurgical coal)



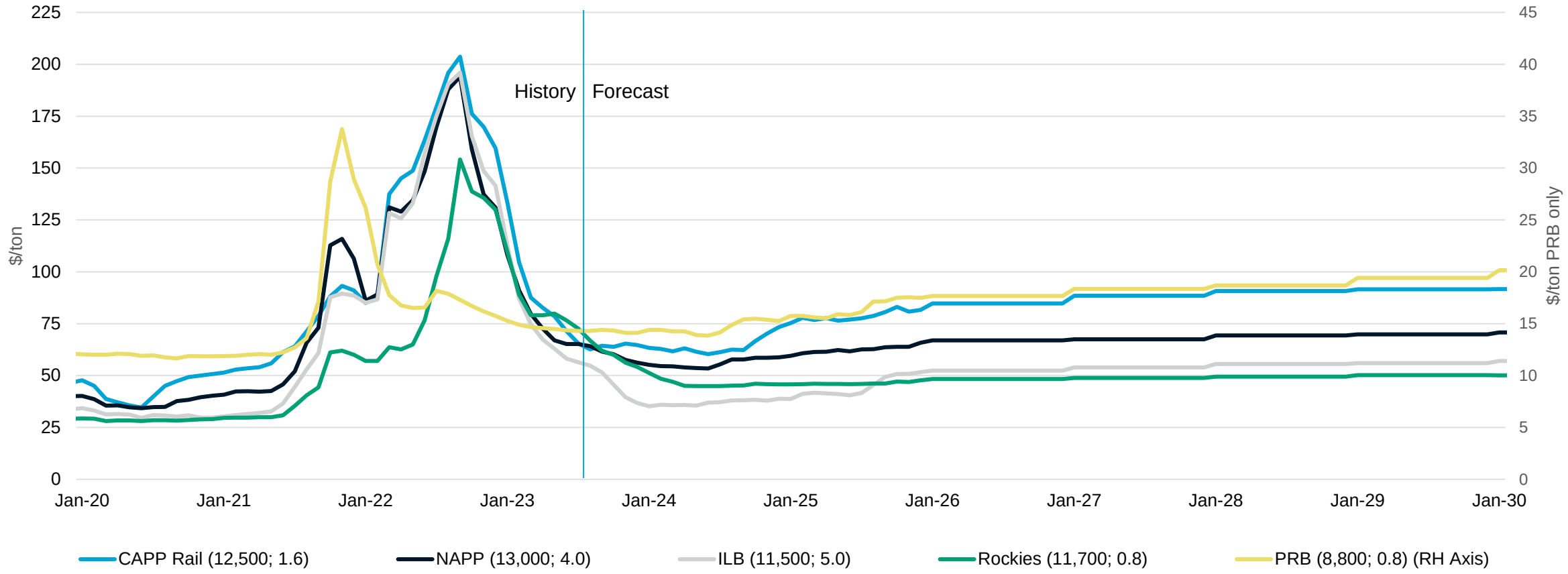
Source: McCloskey by OPIS, a Dow Jones Company

Price outlook

Domestic, Seaborne Thermal, Seaborne Metallurgical

Domestic prices – history and forecast

McCloskey marker prices - history and forecast



Source: McCloskey by OPIS

Seaborne coal price forecasts

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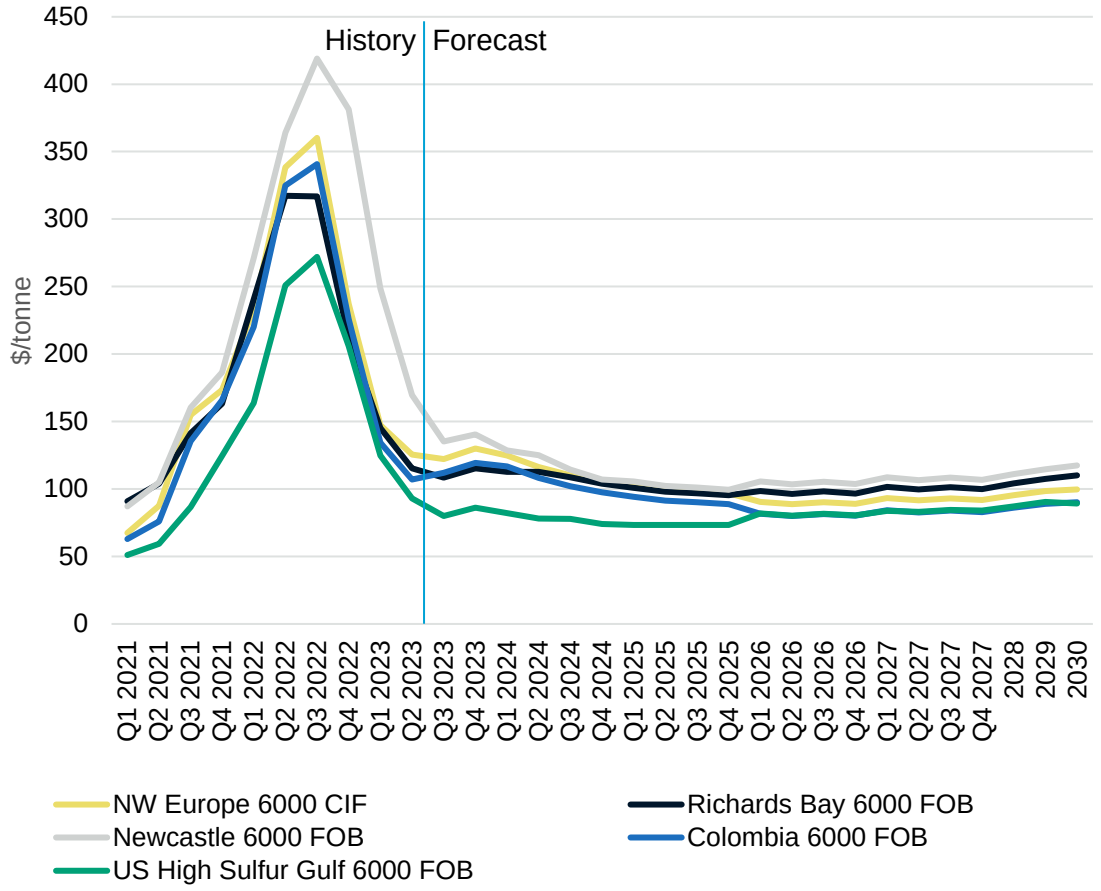
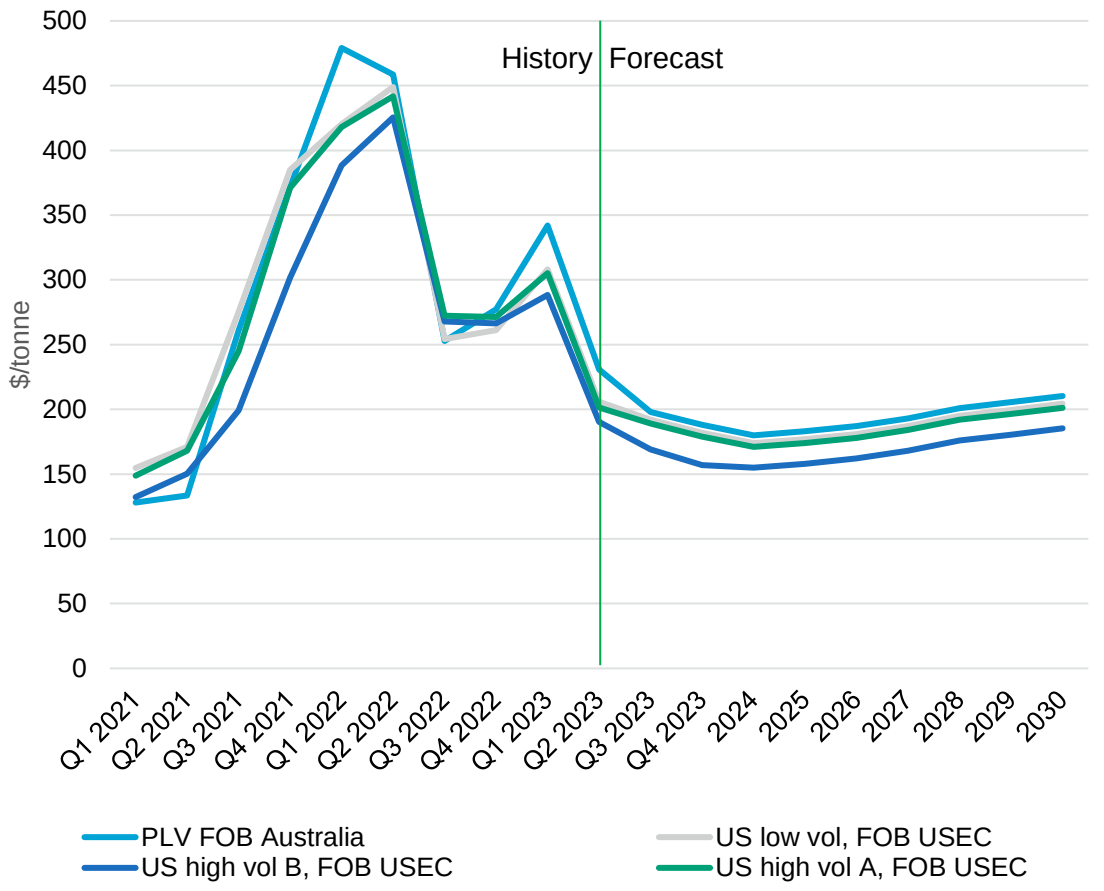
Select seaborne thermal prices -- history and forecast



Source: McCloskey by OPIS

Select seaborne metallurgical prices -- history and forecast



Source: McCloskey by OPIS

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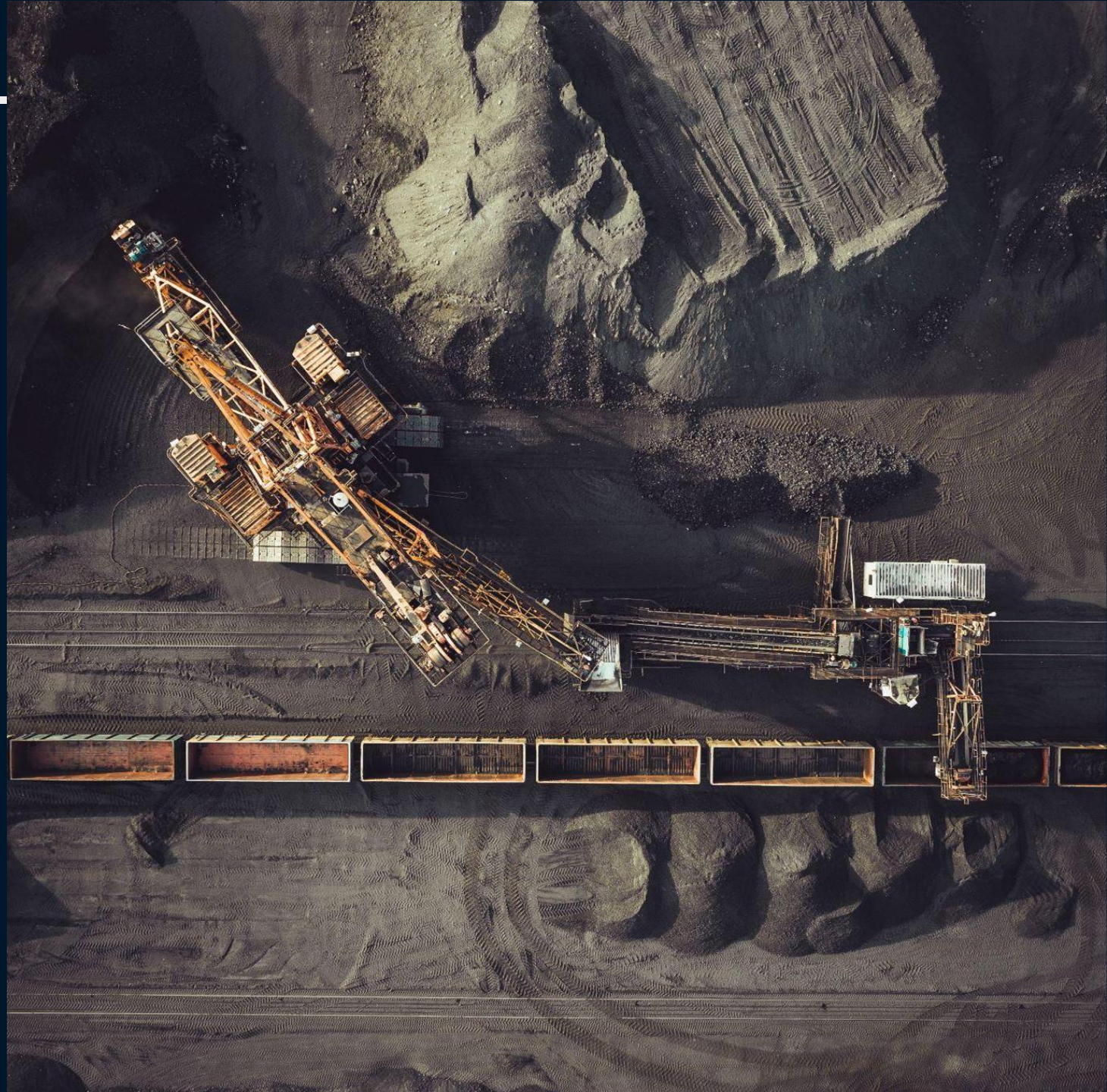

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