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Docket No. 6680-FR-2022

Rail Delivery Disruptions in the US in 2022: An Overview of Scale and Extent

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I. Introduction

In early 2022, demand for coal by utility companies increased substantially because of skyrocketing prices of natural gas and power prices in the US. During this period, acute logistical and capacity challenges in rail transportation have limited many coal shippers' ability to deliver critical inputs to electric utilities. More generally, rail service delivery issues were widespread throughout the country across many industries with shippers experiencing slower train speed, increased delays, poor on-time performance, and inability to satisfy demand for rail shipments. This issue was openly acknowledged by the White House in a press briefing stating that "over the past year, businesses have been dealing with frequent freight delay — rail delays and poor service, which has stranded shipments of grain, fertilizer, ethanol, and other critical commodities across the country."[1] System-wide rail service issues have had adverse consequences for the ability of many electric utilities to increase generation output from their coal plants to mitigate the impacts of higher gas and power prices.

In this report, we briefly document rail service issues observed in the US in 2022. We begin with an overview of shipper complaints from a variety of industries, as well as some system-

[1] Press Briefing by White House Press Secretary Jen Psaki, April 25, 2022. Accessed at https://www.whitehouse.gov/briefing-room/press-briefings/2022/04/25/press-briefing-by-press-secretary-jen-psaki-april-25-2022/.

wide indicators. We subsequently provide additional detail of the impacts of these system-wide rail service issues as experienced by shippers of coal and their utility customers, with a focus on the Midwest.

II. System-Wide Indicators Demonstrate that Rail Service Problems in 2022 Were Widespread and Long-Lasting

In 2022, the freight railroad system in the United States was characterized by widespread service disruptions that caused serious problems for shippers across a wide variety of industries and geographies. These disruptions began to surface in late 2021 but persisted through much of 2022. In the second quarter of 2022, the Surface Transportation Board ("STB" or "Board") responded to these complaints and ongoing service issues by establishing a new docket on "Urgent Issues in Rail Freight Service" and holding a public hearing in Washington to discuss the problems and recovery efforts by the four largest railroads.[2] This hearing was notable in that it was the first time a sitting Secretary of Transportation had spoken at an STB hearing in over 20 years.[3]

a. Rail disruptions resulted in wide-ranging complaints by shippers across the country

The abnormally high level of disruptions resulted in adverse effects on shippers, where those effects included but were not limited to unfilled car orders, delays in transportation for rail

[2] Surface Transportation Board. Notice Urgent Issues in Freight Rail Service, Dkt. No. EP 770. April 7, 2022.

The STB is an independent federal agency that is charged with the economic regulation of freight rail and other modes of surface transportation.

The Notice of Hearing directed executives from the four largest railroads to appear. Those four railroads are BNSF Railway Company (BNSF), CSX Transportation, Inc. (CSXT), Norfolk Southern Railway Company (NSR), and Union Pacific Railroad Company (UP). Those four railroads account for approximately 90% of Class I rail traffic in the United States.

[3] *See* video recording of STB Hearing on Urgent Issues in Freight Rail Service - April 26 and 27, 2022 at 00:01:35. Available at https://www.youtube.com/watch?v=Q0rk5tnrFqA&t=1s

traffic, imposed embargoes on rail shipments, and ineffective customer assistance. Some of the complaints made throughout the year—including some that may have influenced the STB's decision to hold the April 2022 hearing—are summarized below.

- **Secretary of Agriculture Thomas Vilsack** wrote to the Board explaining that "[t]he grain and feed industry are experiencing significant issues affecting agriculture at rail-served origins and destinations, and other West Coast stakeholders are describing the situation as a complete collapse of rail service."[4] In his letter, Secretary Vilsack provided examples of the real-world implications for the agricultural sector, including instances in which both shippers of grain (such as grain elevators) and receivers of grain (such as flourmills) needed to shut down or otherwise curtail normal operations. There were also reports of livestock operations running dangerously low on feed.[5]
- **Growth Energy, the largest biofuels industry association,** wrote to the STB with similar concerns, citing examples of ethanol refineries needing to curtail production after exhausting their storage due to delays in the arrival of empty cars. At the same time, destination fuel terminals exhausted their inventories, while traffic was taking anywhere from 2 to 14 days longer than usual.[6]
- In testimony before the board, the **American Chemistry Council** reported that late in 2021, 78% of its rail users reported longer transit times and 46% reported reduced service days.[7] In a more recent survey conducted in July of 2022, 46% of chemical industry respondents reported that railroad delays and service challenges had gotten worse since the end of 2021, with 7% observing improvements. Nearly 60% of members surveyed said they were also charged higher rates.[8]
- The **National Mining Association** wrote to the Board in September of 2022, with member complaints including poor rail service leading to oversized stockpiles at the mines and

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4 Thomas J. Vilsack, Letter dated March 30, 2022 re: Rail Services Issues Affecting Agriculture.

5 For example, in the summer of 2022, Foster Farms needed at least nine trainloads of corn each month to feed its tens of millions of chickens and turkeys at its California facilities, but the trains were not showing up. Starved chickens become aggressive and turn to cannibalism. Foster Farms VP emailed a Union Pacific director "Your failure to deliver is about to kill millions of chickens." Eventually STB stepped in with an emergency service order to UP.

6 Letter to Chairman Oberman and STB from Growth Energy Senior VP, Chris Bliley, dated April 8, 2022.

7 American Chemistry Council, Public Hearing on Urgent Issues in Freight Rail Service Docket No. EP 770, April 26, 2022. "https://www.americanchemistry.com/content/download/10951/file/ACC-Testimony-to-STB-on-Urgent-Issues-in-Freight-Rail-Service-042622.pdf"

8 *Ibid.*

ultimately curtailments of production.[9] The letter further cited member complaints that service had not improved since the April 2022 hearings and in some cases had gotten worse.

- In a survey of utility members of the **National Coal and Transportation Association (NCTA)** regarding rail service in the first half of 2022, 100% reported that railroad service has forced their utility to modify coal operations and 87% reported rail service was worse in 2022 when compared to 2021 or the last three years.[10] These service levels have had significant consequences on coal-fired generation plants, which have had to reduce or limit their coal burn as a result. Later in this report, we discuss in additional detail the impact of rail disruptions on the coal-fired generation fleet.

b. More systematic data, including metrics collected by the STB, provide several indications of poor rail service throughout 2022

Rail service data regularly collected by the STB corroborate these anecdotal complaints, particularly in the early months of 2022. Data collected by the STB since the initial hearing provide several indications that rail service issues persisted through the remainder of 2022. We present and discuss some of these indicators in this section. Taken as a whole, along with the wide variety of shipper complaints (some of which are cited above), these trends paint a clear picture of rail service that was measurably worse in 2022 than in previous years. The data below also suggest that any improvements since the STB hearing have been modest.

Train Velocity

One standard measure of rail service quality is simply the average velocity of trains in moving from origin to destination.[11] Congestion tends to slow the speed of train movements. We note

[9] Letter to Members of the Surface Transportation Board from K. Mills, Associate General Counsel of NMA re Rail Service Issues Continue to Cripple U.S. Supply Chains, September 13, 2022, # 305302 in Freight Rail Service Docket No. EP 770, September 14, 2022 at https://dcms-external.s3.amazonaws.com/DCMS_External_PROD/1663188222379/305302.pdf

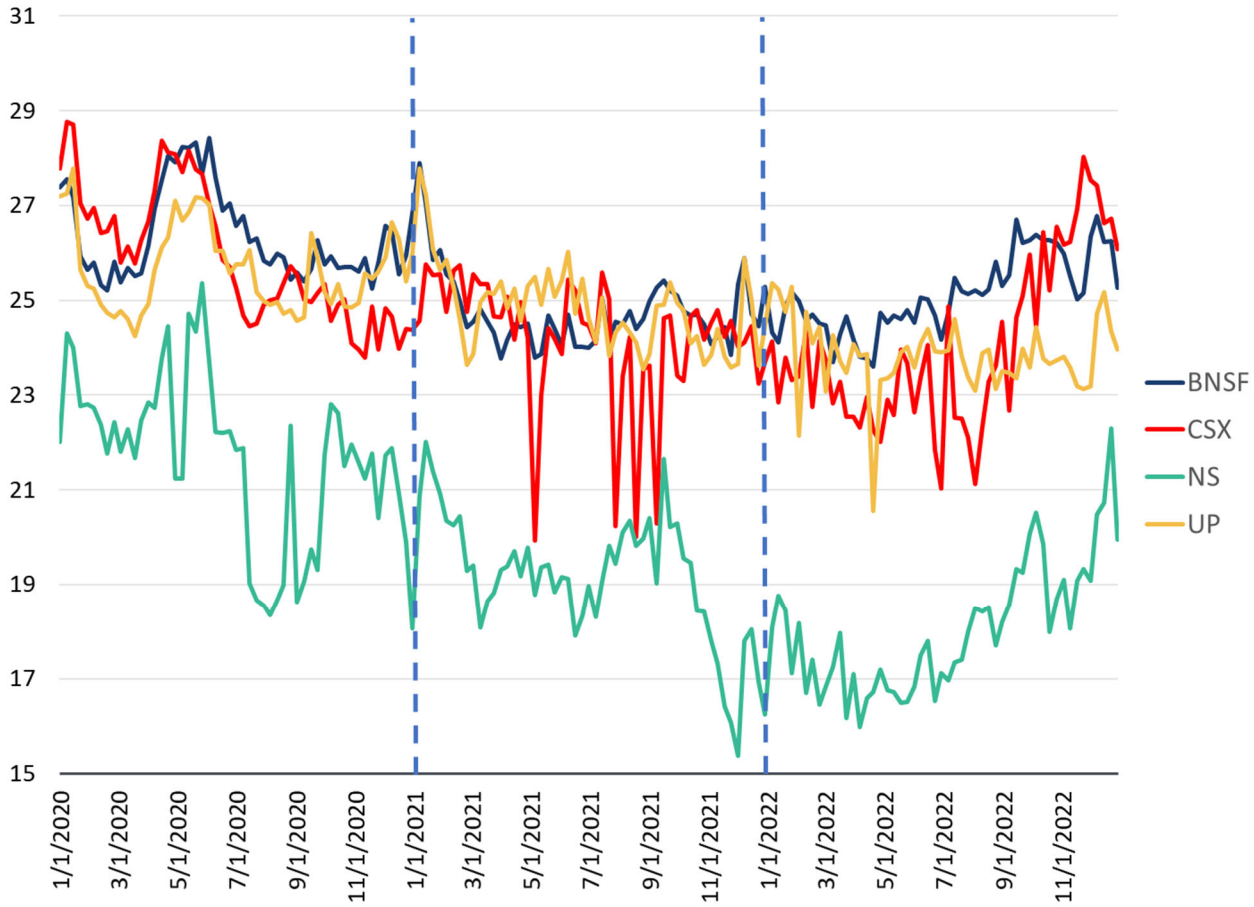
[10] Freight Rail Customer Alliance and National Coal Transportation Association, Response to EP 770 (Sub-No. 1), Urgent Issues in Freight Rail Service—Railroad Reporting, Nov 17, 2022 at 10.

[11] Class I railroads generally use the methodology established by the American Association of Railroads ("AAR"), which calculates train speed by dividing train miles by total hours from origin to destination less intermediate terminal time. *See, e.g.*, Union Pacific's Explanation of Methodology at https://www.stb.gov/wp-content/uploads/UP-Methodology-EP-724-03.01.22.pdf

that this measure does not account for wait time (*e.g.*, to load the train at the origin, to unload the train at the destination, and time spent at intermediate terminals). It is nevertheless an important measure of operational performance.

As Figure 1 indicates, the four largest Class I railroads generally have seen average train velocities decrease since the beginning of 2020. For example, in the case of the Union Pacific, system-wide weekly average train speeds were usually in the range of 26 miles per hour ("mph")—with speeds approaching 28 mph in certain weeks—during the first half of 2020. In 2022, average velocities decreased below 24 mph, with some weeks experiencing markedly worse performance. Similar patterns occurred in the case of the three other largest railroads. While three of the four roads saw modest recoveries in average train velocities over the course of 2022, only CSX approached its 2020 velocity levels. Speeds on the UP did not generally improve following the STB Hearing in April 2022.

FIGURE 1: WEEKLY AVERAGE TRAIN VELOCITY SINCE 2020 (MPH) FOR SELECT RAILROAD COMPANIES

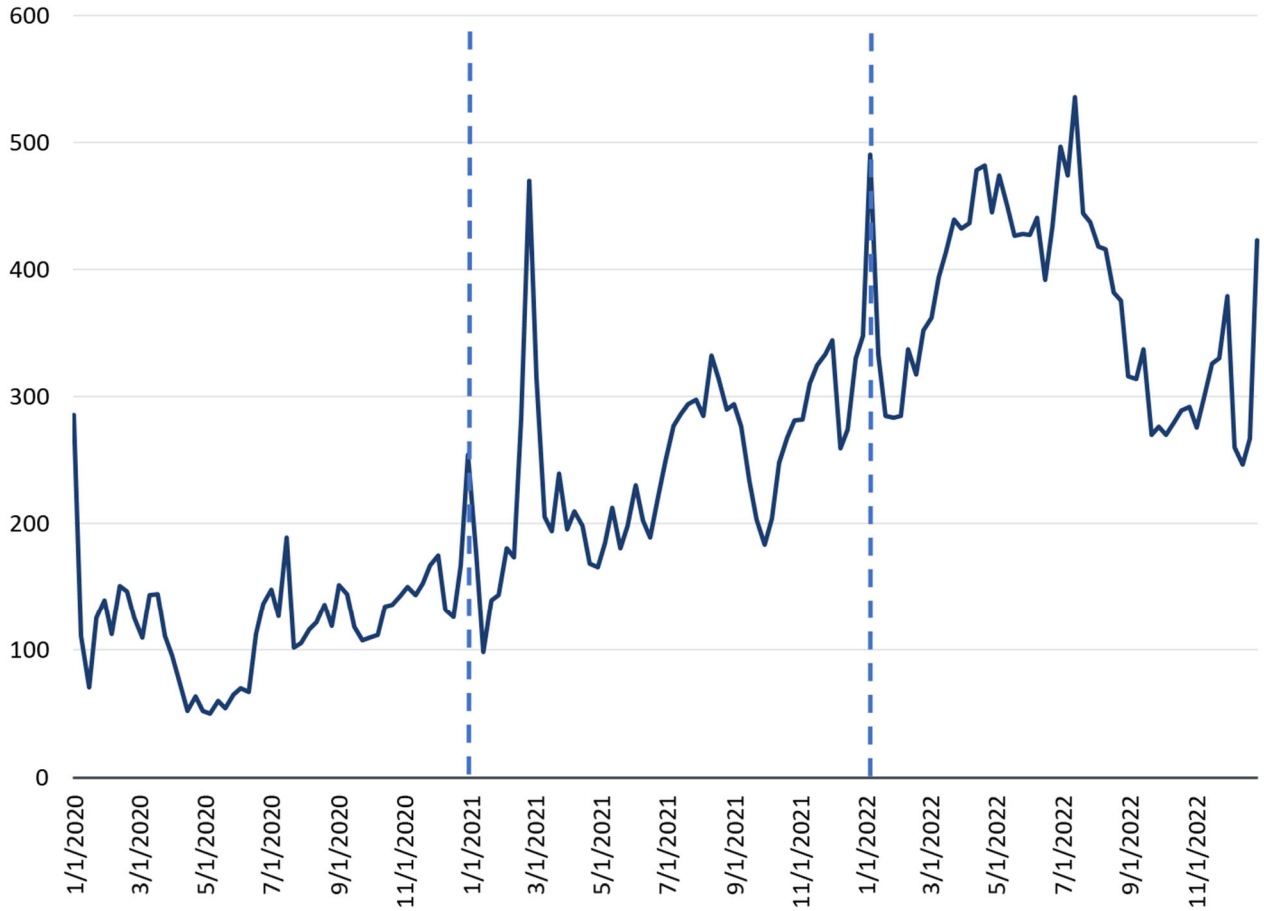


Sources and Notes: Sources and Notes: Data filed with the STB in conjunction with Docket No. EP 724. Reflects System Average Train Speed (Item 1) for each of the four largest Class I railroads.

Trains Holding

The Board also collects and shares information on trains holding, which is a count of the number of trains being held due to congestion or other factors.[12] As Figure 2 indicates, train holdings increased steadily from the beginning of 2020 through the middle of 2022. During the first half of 2020, the number of trains holding on a given day averaged just above 100; that figure climbed to around 400 in 2022 (and exceeded 500 during one week in July 2022). While the upward trend in trains holding was reversed in the second half of 2022, that progress stalled in the 4th quarter, at a level that was roughly three times the level in 2020.

FIGURE 2: WEEKLY AVERAGE NUMBER OF TRAINS HOLDING PER WEEK



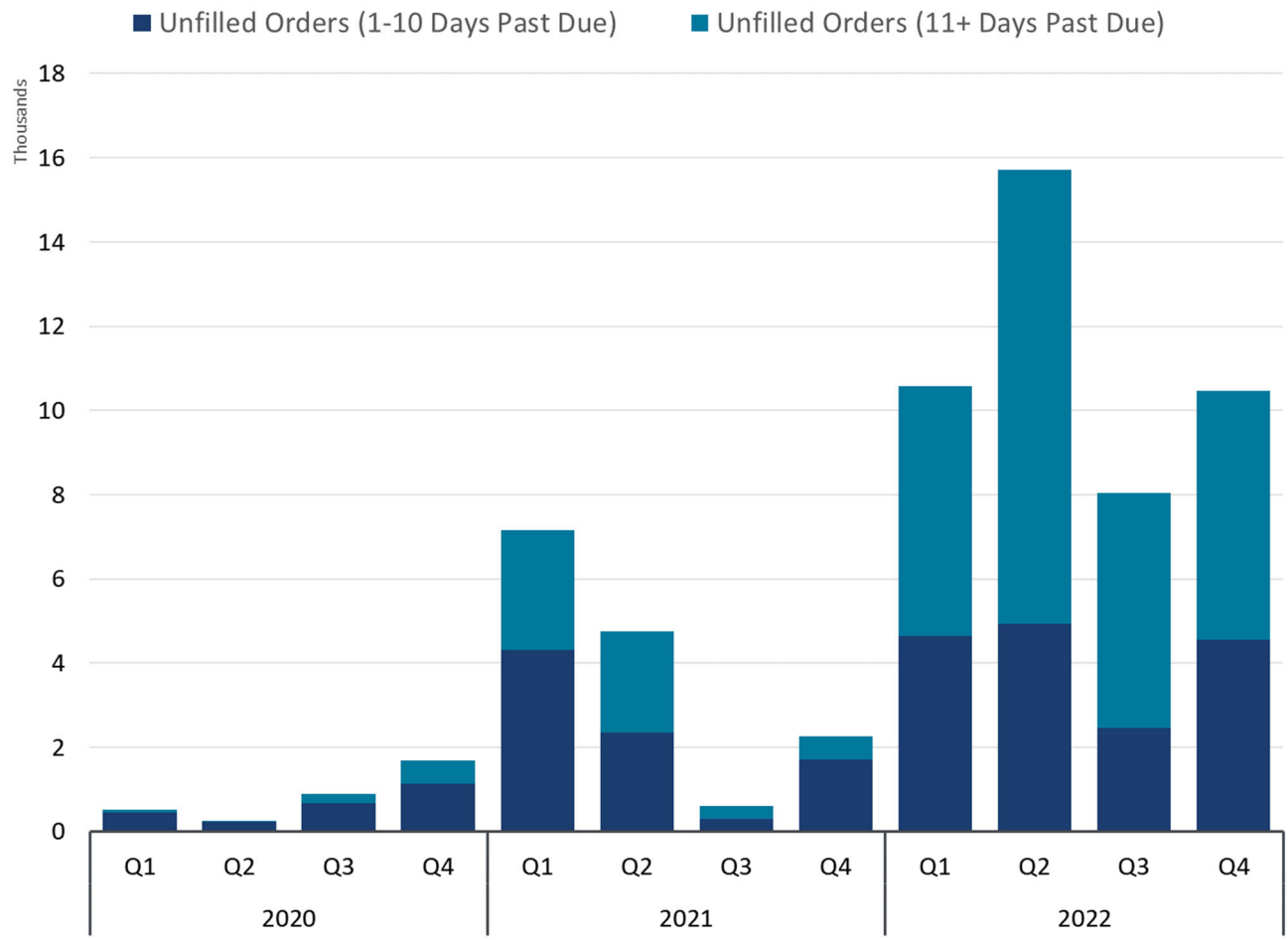
Sources and Notes: Data filed with the STB in conjunction with Docket No. EP 724 (Item 5). Reflects total trains holding across all seven Class I railroads, train types, and causes.

[12] The exact methodology varies by railroad, but in general, this measure captures the daily count of active trains delayed for a specified number of hours while in route.

Unfilled Grain Car Orders

Another indicator that provides some insight into the nature and magnitude of the disruptions is unfilled grain car orders. Shippers need empty railcars in order to load and ship their product from origin to destination, and many shippers rely on the railroads to deliver these cars when ordered. The STB tracks the number of (empty) grain cars ordered but not yet received by grain shippers. As Figure 3 indicates, the number of unfilled grain car orders was substantially higher in 2022 than in previous years, and persisted throughout the year. Specifically, for large parts of the year, there were more than 10,000 unfilled grain car orders at any given point in time, with the majority of those unfilled orders being 11 or more days overdue. The inability of railroads to fulfill grain car orders provides further evidence of the systematic imbalance between the demand and supply for rail services in 2022.

FIGURE 3: AVERAGE NUMBER OF UNFILLED GRAIN CAR ORDERS BY QUARTER, 2020-2022



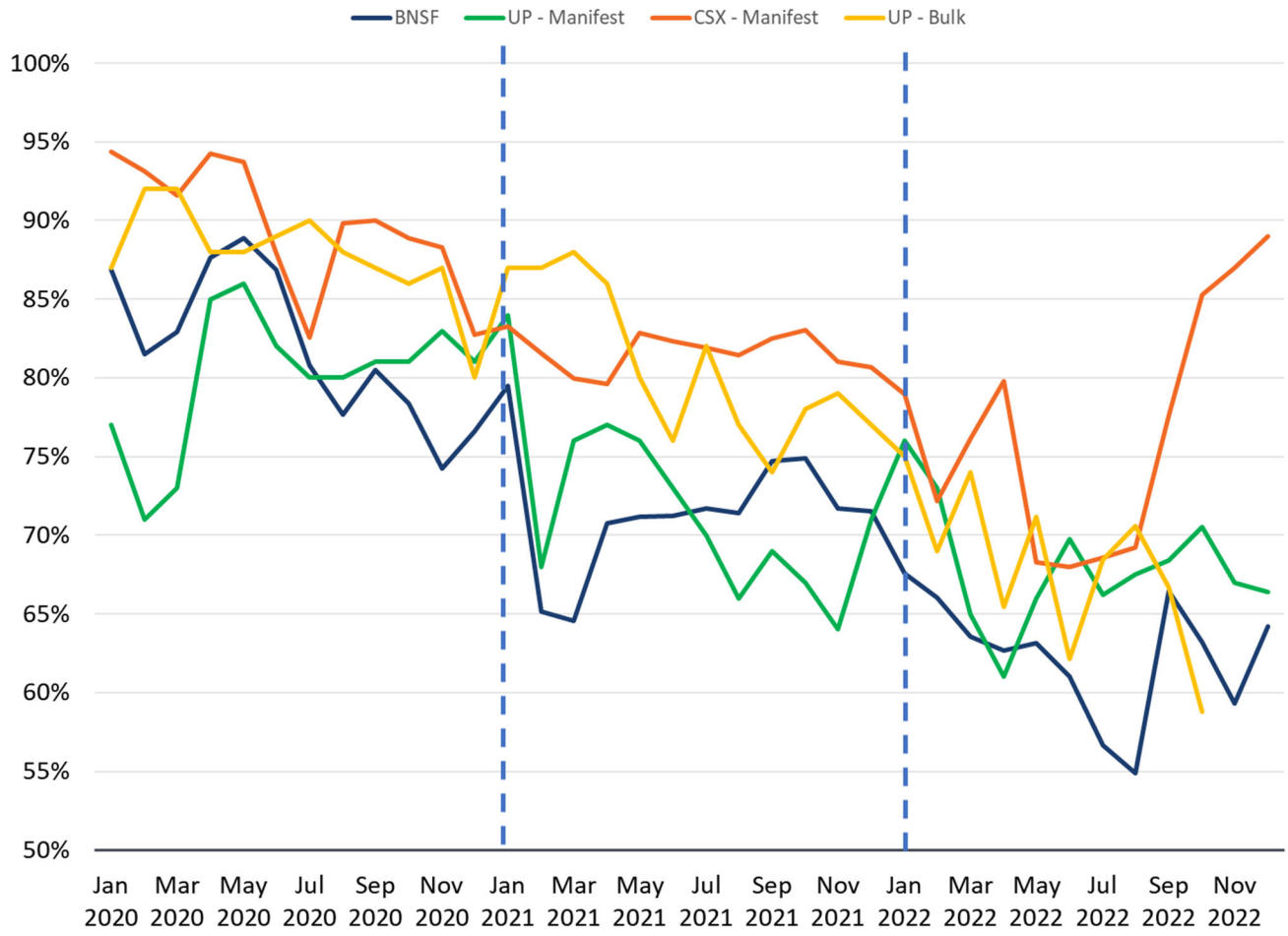
Sources and Notes: Data filed with the STB in conjunction with Docket No. EP 724 (Item 8). Reflects total unfilled grain car orders across all seven Class I railroads.

On-time Delivery Statistics

Another indicator of rail service quality for which the STB has begun collecting data measures on-time performance, defined as "the percentage of cars constructively or actually placed at destination within 24 hours of the original estimated time of arrival," for various train types.[13] Figure 4 presents average monthly on-time rail performance for a selection of carriers and train types. The chart indicates a general downward trend over the 2020 to 2022 period, with 2022 on-time performance generally being 15 to 20 percentage points worse than that of 2020. Moreover, any improvement in performance during the latter half of 2022 was limited and fell short of restoring this metric to 2020 levels. The chart below largely supports the impressions expressed by shippers that the railroads were more unlikely to deliver shipments on time in 2022 than in previous years.

[13] On-time delivery performance is one of several performance metrics that the STB required railroads to begin producing following the April 2022 hearing. Specifically, the STB directed the four largest railroads to report separate statistics for rail cars moving in manifest service, unit trains, and intermodal traffic. The STB also directed railroads to provide these indicators for the past 36 months. *See* Surface Transportation Board Decision 51225, Dkt. No. EP 770 (Sub-No. 1), May 6, 2022. However, not all carriers presented these data as precisely specified by the STB.

FIGURE 4: AVERAGE MONTHLY ON-TIME RAIL PERFORMANCE



Sources and Notes:

Data taken from the Surface Transportation Board's records on filings for docket EP770 "Urgent Issues in Freight Rail Service – Railroad Reporting" available at https://www.stb.gov/proceedings-actions/search-stb-records/ (accessed: March 22, 2023).

Analogous historical on-time performance statistics for Norfolk Southern were not available on the STB's website.

On-time performance is the weekly percentage of rail cars that arrived within 24 hours of the originally estimated time.

Manifest trains are made up of mixed rail cars (box cars, tank cars, piggyback cars, etc. whereas bulk unit trains are made up of a single "bulk" commodity and car type (such as coal, grain, metals, ore, etc.)

Union Pacific Railroad reports on-time performance for Manifest and Bulk unit trains whereas CSX only reports Manifest trains. BNSF's historical data only reports one system-wide series.

III. Implications of the Rail Disruptions for Coal Shippers

The effects of the rail disruptions varied by industry and geography. However, there is substantial evidence that many coal deliveries were adversely affected by the rail service disruptions in 2022.

More than any other commodity, shippers of coal are especially dependent on railroads. According to data from the Energy Information Administration ("EIA"), 69% of U.S. coal shipments in 2021 were delivered to their final destinations by rail.[14] Furthermore, coal was the single most important commodity for U.S. Class I railroads in terms of tonnage, as coal accounted for 27% of all originated tonnage in 2021.[15]

The deterioration of rail delivery conditions in 2022 coincided with an increase in demand for coal-fired electricity—and therefore for coal shipments via rail. Natural gas prices increased to their highest levels in 14 years, creating a market opportunity for many utilities to increase output at their coal-fired generators in order to reduce exposure both to higher costs to run their gas-fired generation plants and higher costs to purchase power in the wholesale power markets.

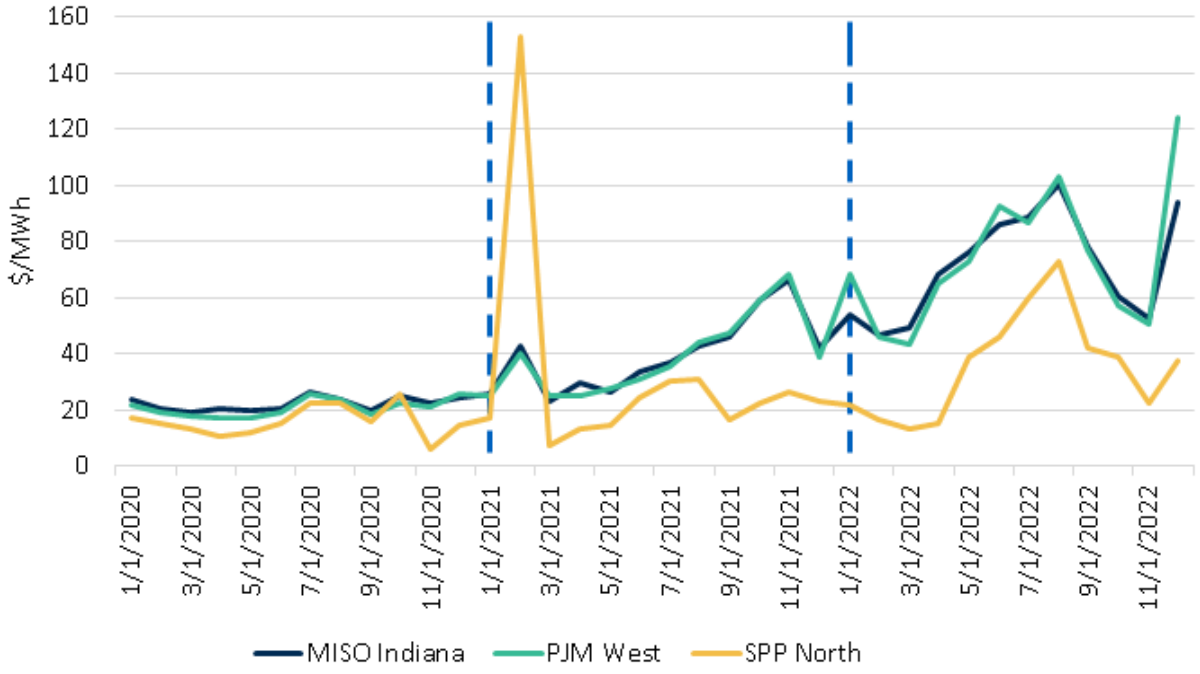
As shown in the charts below, spot prices of wholesale power and gas increased substantially in 2022. For example, monthly average wholesale power price at the MISO Indiana Hub increased from around $20-$40/MWh range in 2020 and the first half of 2021 to around $100/MWh levels in the second half of 2022. Similarly, monthly average spot prices of natural gas at Henry Hub increased from about $2/MMBtu in 2020 to $3-$5/MMBtu range in 2021 and to as high as $9/MMBtu in late 2022.

[14] EIA, Annual Coal Distribution Report, October 18, 2022, available at https://www.eia.gov/coal/distribution/annual/

[15] Association of American Railroads, "What Railroads Haul: Coal," Fact Sheet, May 22, 2022. https://www.aar.org/wp-content/uploads/2020/07/AAR-Coal-Fact-Sheet.pdf

FIGURE 5: MONTHLY HISTORICAL SPOT WHOLESALE ENERGY PRICES AT SELECTED HUBS

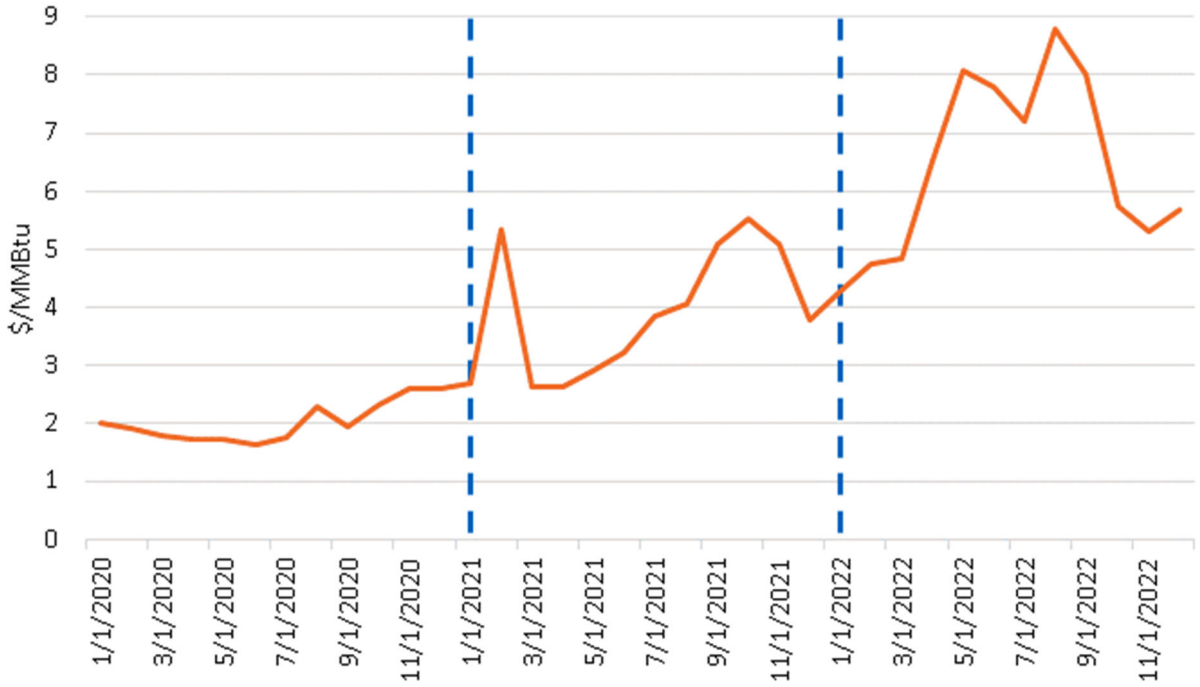
All-hour Average (Nominal $/MWh)



Sources and Notes: Capital IQ, Commodity Charting Tool

FIGURE 6: MONTHLY HISTORICAL HENRY HUB SPOT GAS PRICES

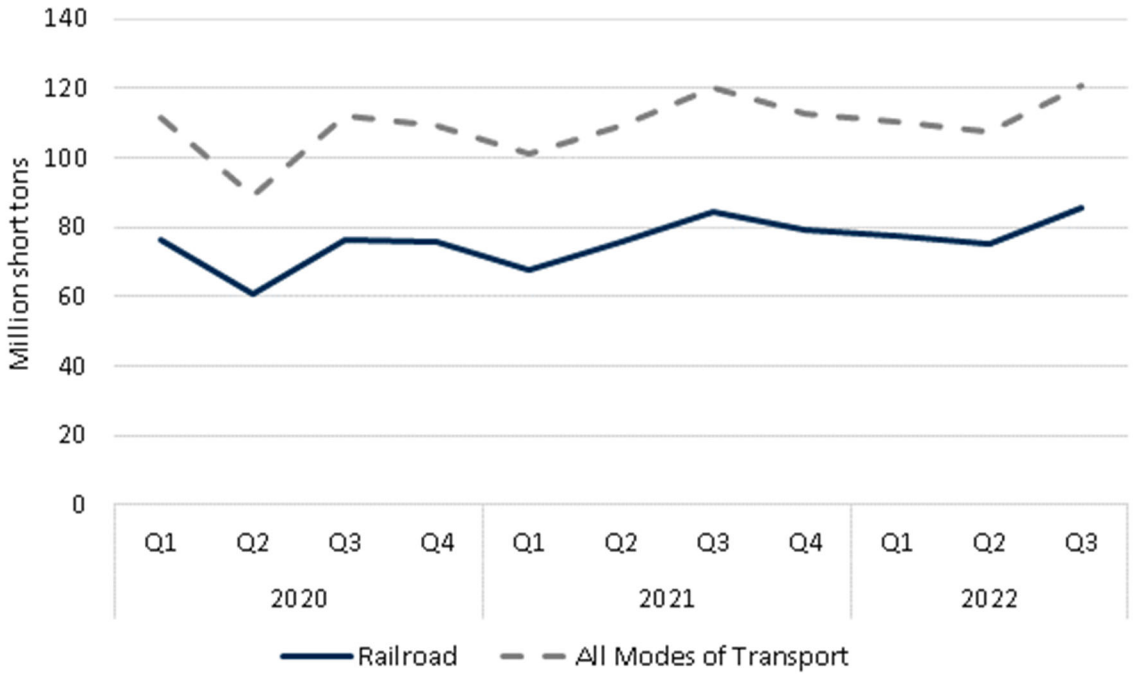
(Nominal $/MMBtu)



Sources and Notes: Capital IQ, Commodity Charting Tool

During the first three quarters of 2022, even though the wholesale power and gas prices almost doubled relative to 2021, the average quarterly US-wide total delivered coal volumes to electric power sector increased by only 2% relative to the average of the first three quarters in 2021 (from 112 million short tons in 2021 to 115 million short tons in 2022), as seen in Figure 7.

FIGURE 7: US-WIDE TOTAL COAL SHIPMENTS TO ELECTRIC SECTOR
(Million short tons)



Sources and Notes: EIA, Quarterly Coal Report

The Powder River Basin ("PRB") is an important coal-producing region, providing 43% of U.S. total coal production in 2018.[16] However, complaints among those in the coal-producing industry indicate that rail service issues constrained the ability of PRB coal producers to respond to higher demand for coal in the electricity industry in 2022. Wyoming Mining Association Executive Director Travis Deti explained, "Coal is in demand and we just can't get it there. If the trains were running the way they should be running, we'd be having a very, very good production year in the Powder River Basin."[17] Deti estimated that rail issues had choked 2022 PRB coal production by about 30 million tons, or 12.5% of Wyoming's annual coal

[16] U.S. Energy Information Administration. https://www.eia.gov/todayinenergy/detail.php?id=41053, August 26, 2019. (Accessed: March 14, 2023).

[17] D. Bleizeffer, "Railroad under fire for costly decrease in coal shipments," *WyoFile*, December 17, 2022.

production.[18] S&P Global also reported that "[m]any coal producers…found that inadequate rail service was preventing a more robust rebound in sales."[19] For example, Arch Coal executives indicated they expected about 5% to 10% of their mined output to be pushed to later years due to rail issues.[20] Coal producers' frustration stemmed from the increased demand and pricing for coal all over the country. With the price premiums for Illinois basin and Appalachian coal at their highest levels since September 2009, eastern US utilities were considering taking more Powder River basin (PRB) coal because of limited supply and higher prices for Appalachian and Illinois basin coal.[21]

Data submitted to the STB demonstrates that 2022 saw an increasing divergence between train loading plans and actual loadings for coal shipments originating in the Powder River Basin. Railroads shipping coal generally report to the STB both planned loadings and actual loadings of coal by originating region, on a weekly basis. The "loadings plan" represents the number of coal unit trains from the PRB region that were planned in a given week. The "loadings average" represents the number of trains that were actually loaded in the same period. Figures 8 and 9, representing Union Pacific and BNSF Railways respectively, chart the weekly difference between the two series. The figures show that since mid-2021, the shortfall of the railways' actual loading of planned coal shipments from the PRB region has continuously grown steadily, peaking in mid to late 2022. This performance trend seems to be in line with complaints from the coal industry.

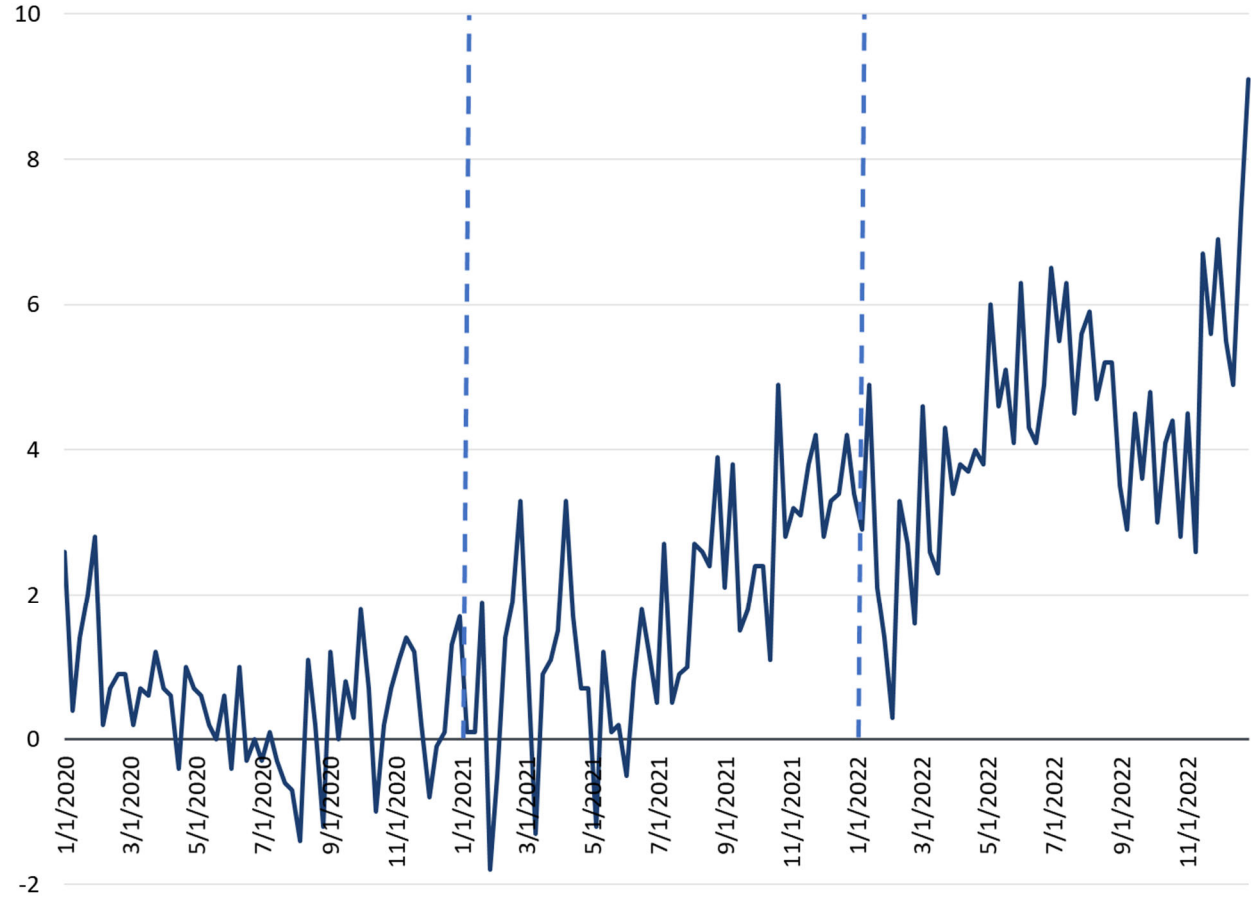
[18] *Ibid.*

[19] S&P Global. "Rail service 'meltdown' constraining US coal sector in hot market." May 9, 2022.

[20] S&P Global. "Rail service 'meltdown' constraining US coal sector in hot market". Arch also estimated that in the first quarter, it received only 60% of the trains required by its Eastern U.S.-based metallurgical coal segment.

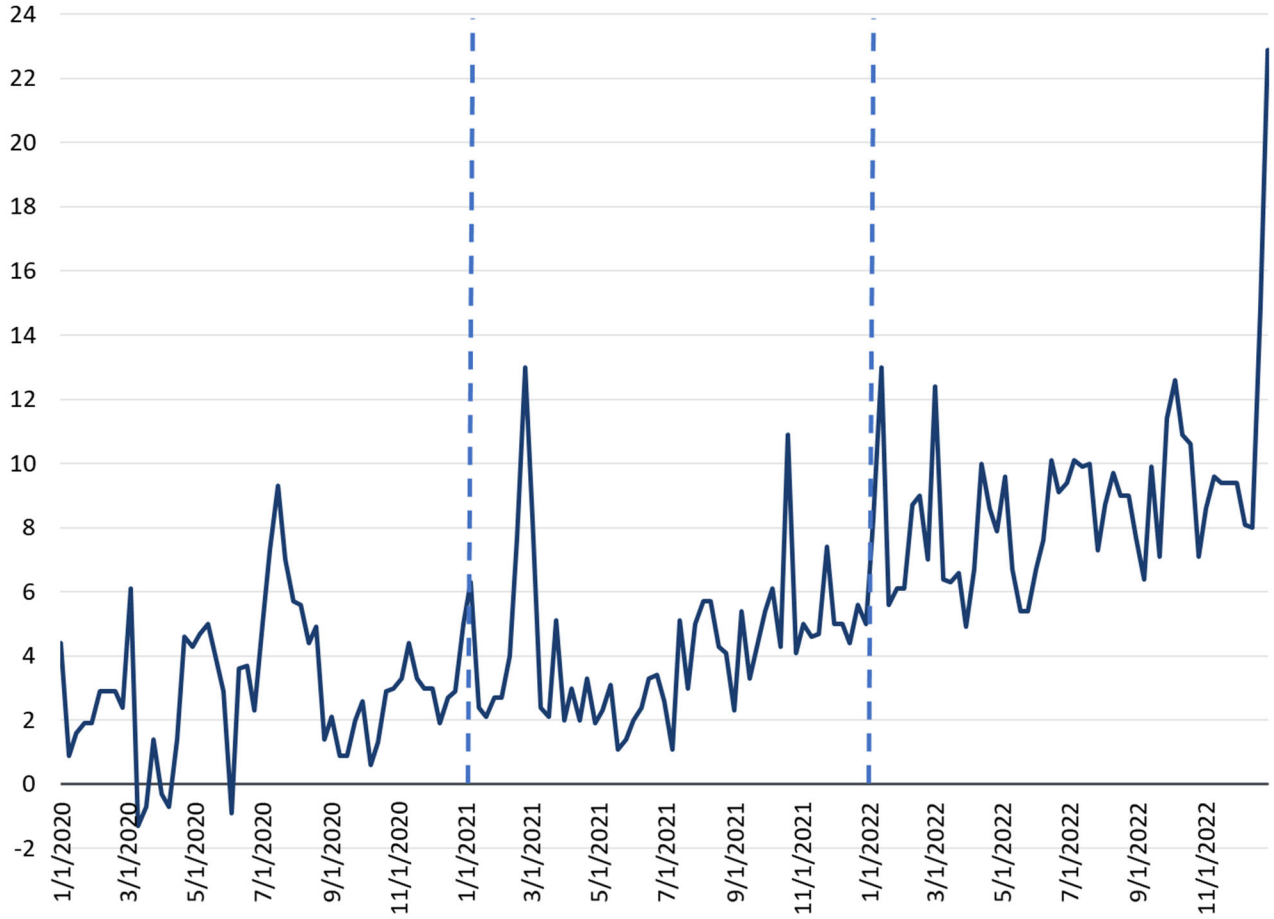
[21] N. Georgiou and E. Vasilyeva, "US utilities review coal mix as eastern prices rise," *Argus*, June 9, 2022.

FIGURE 8: COAL UNIT TRAIN LOADING PLANS MINUS ACTUALS IN POWDER RIVER BASIN (UP)



Sources and Notes: Union Pacific data filed with the STB in conjunction with Docket No. EP 724 (Item 9). Reflects the difference between the variables "Loadings Average" and "Loadings Plan" for the measure series of "Coal Unit Train Loadings or Car Loadings by Coal Production Region (Count)."

FIGURE 9: COAL UNIT LOADING PLANS MINUS ACTUALS IN POWDER RIVER BASIN (BNSF)



Sources and Notes: BNSF data filed with the STB in conjunction with Docket No. EP 724 (Item 9). Reflects the difference between the variables "Loadings Average" and "Loadings Plan" for the measure series of "Coal Unit Train Loadings or Car Loadings by Coal Production Region (Count)."

Statements by utility industry representatives indicate that, like coal producers, several utilities were frustrated by rail service issues constraining their ability to take delivery of coal.

For example, Arizona Electric Power Cooperative ("AEPCO") reported that the round trip cycle time between the PRB and its plants had increased from 8-9 to 10-14 days in 2021.[22] As a result, AEPCO's fuel services manager reported that AEPCO would have run out of coal if it had not curtailed coal fired generation at its facilities.[23] As of the middle of 2022, AEPCO indicated that deteriorating rail service was again affecting the delivery of coal and other commodities.[24]

[22] Kevin Clark, "Coal generating utilities grapple with rail service issues," *Power Engineering*, June 1, 2022.

[23] *Ibid.*

[24] *Ibid.*

AEPCO was not the only utility for whom coal deliveries posed issues in 2022. The Sikeston Power Plant in Missouri, for instance, relies on PRB coal delivery by the BNSF railroad. In May, a representative from the Sikeston Board of Municipal Utilities (which owns the plant) reported that it was seeing both slower delivery times and potentially fewer coal trains than needed at high-demand times of the year.[25] The result as of May 2022 was that the Sikeston plant was derated to 65% of its normal capacity in order to make its coal inventory last, and was rationing its coal supplies in an effort to match its generation to peak hours.[26]

Xcel Energy in Colorado also experienced rail-driven under-deliveries of coal to its coal-fired power plants, resulting in under-recovery of its fuel costs. In a late 2022 filing, Xcel stated that railroad labor shortages have led those railroads to reduce contracted deliveries of coal to Xcel's and other utilities' coal-fired power plants.[27] As a result, Xcel explained, Xcel had implemented measures to reduce coal use and maintain coal inventories at levels needed for reliability, and had to replace the reduced coal plant output with higher-cost natural gas-fired generation.

Perhaps most notably, the latest in a series of surveys of coal shippers conducted by three industry groups have indicated widespread utility concerns regarding rail delivery issues in 2022, as briefly discussed above. The National Coal Transport Association, Freight Rail Customer Alliance, and the National Rural Electric Cooperative Association have teamed up to conduct surveys of utilities' perspectives on railroad performance on several occasions over the last few years. The most recent survey, covering the first six months of 2022, found that:[28]

- 100% of the respondents had to modify operations due to railroad service issues.
- 87% reported that rail service was worse than in 2021.
- As part of the survey, each responding plant rates average service in each month. In the case of plants who rely on PRB coal, more than 80% of the plant-month observations were characterized by the utility as being 10% to 30% worse than forecasted.

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[25] David Jenkins, "BMU Noticing Impacts of Labor Shortage in Train Industry," *Standard Democrat*, May 27, 2022.

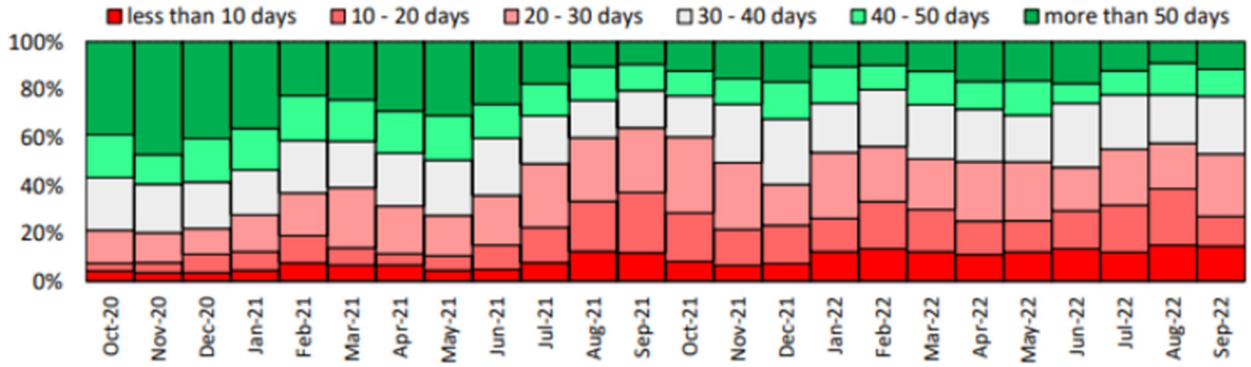
[26] *Ibid.*

[27] Public Service Company of Colorado's Motion for Partial Waivers of Electric Tariff Sheet Nos. 143D and 143E. Proceeding No. 22AL-XXXXE. November 30th, 2022. Xcel's filing indicates that it was affected by under-deliveries beginning in August 2022.

[28] Freight Rail Customer Alliance and National Coal Transportation Association, Response to EP 770 (Sub-No. 1), Urgent Issues in Freight Rail Service—Railroad Reporting, Nov 17, 2022 at 10.

Accordingly, coal plants have on average, not been able to rebuild coal stockpiles. Consistent with the experiences described earlier in this section, Figure 10 indicates that many coal plants saw their fuel stockpiles shrink in the second half of 2021. The figure, prepared by Energy Ventures Analysis as part of its Coal Stockpile Report for September of 2022, also shows that in most of the first 9 months of 2022, approximately half of the coal plants included in the analysis had less than 30 days' worth of coal in their stockpiles (and about a quarter of them had less than 20 days of coal).[29]

FIGURE 10: DISTRIBUTION OF COAL-FIRED POWER PLANTS BY DAYS OF REMAINING COAL IN STOCKPILES



Sources and Notes: Chart originally prepared by Energy Venture Analysis, as reproduced in Lower Colorado River Authority's October Utility Update, https://movecoal.org/shared-files/2501/FRCA-NCTA-EP-770-Sub-No.-1-Filing-November-17-2022-00013266x7A285.pdf

[29] Chart originally prepared by Energy Venture Analysis, as reproduced in Lower Colorado River Authority's October Utility Update, https://movecoal.org/shared-files/2501/FRCA-NCTA-EP-770-Sub-No.-1-Filing-November-17-2022-00013266x7A285.pdf