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Performance Evaluation of the Weekly Coal Production Report for 2012

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Background

The *Weekly Coal Production Report (WCPR)* is the only source of weekly state level coal production estimates produced by the U.S. Government. Every Thursday by 5 p.m., EIA releases on its website state level coal production estimates for the week ending the previous Saturday. The WCPR also includes summary totals for the Appalachian, Interior, and Western coal producing regions. After a month is completed, the weekly estimates in that month are aggregated to give monthly state level coal production estimates.

This evaluation compares the performance of the WCPR estimates with surveyed coal production data released by the U.S. Mine Safety and Health Administration (MSHA). MSHA is the federal agency responsible for collecting actual coal production data. The agency collects coal production data on a quarterly basis, therefore the weekly EIA estimates in a given quarter need to be summed to compare with the quarterly data collected by MSHA. MSHA collects coal production data from individual mines on the survey form 7000-2, "Quarterly Mine Employment and Coal Production Report." The actual MSHA production is usually available to EIA in final form about 2.5 months after the end of a quarter.

This evaluation compares total U.S. coal production between the WCPR estimates and MSHA surveyed coal production data for 2012. Comparisons are also made at the state level for the year. The top three coal-producing states (Wyoming, West Virginia, and Kentucky) in 2012 are also compared in each individual quarter.

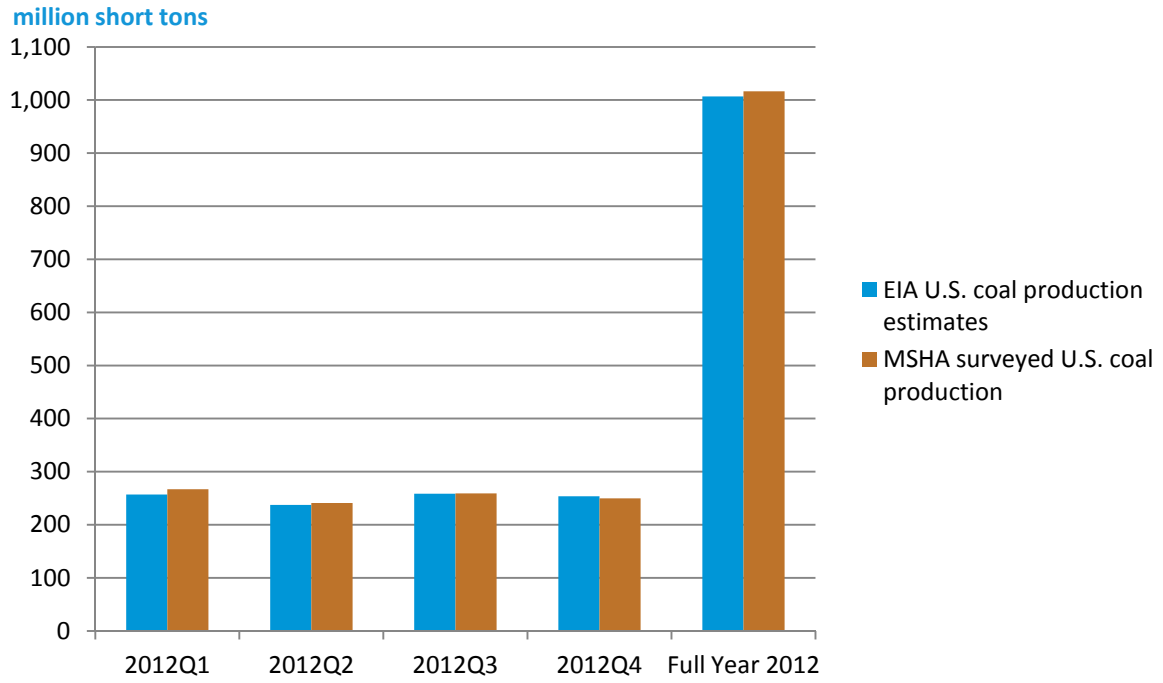
Performance

The WCPR relies on a statistically-based autoregressive model[1] for states east of the Mississippi River (east), with readily available east regional weekly data of number of railcar loadings of coal, population weighted heating degree days (HDD), and population weighted cooling degree days (CDD) as inputs. For states west of the Mississippi River (west), a direct input/output method is used with state-specific numbers of trains loaded with a specific amount of tons of coal per train. The eastern and western parts of this model use the coal loaded on trains as a proxy for production, and assume the coal loaded in a given week was produced that week.

EIA obtains the needed data for the WCPR model from a variety of sources. The Association of American Railroads (AAR) produces a weekly report that provides the total number of rail cars loaded with coal in the east. Union Pacific and BNSF railroads provide to EIA the weekly number of train loads, and the tons loaded per train, by coal-producing state for the west. The National Oceanographic and Atmospheric Administration (NOAA) posts the weekly HDD and CDD on the publicly available NOAA website.

When actual MSHA production for a quarter becomes available, the EIA weekly estimates in that quarter are summed and compared with the MSHA number.

Figure 1. EIA U.S. coal production estimates and MSHA surveyed U.S. coal production, 2012



eia Note: MSHA data include refuse coal.

Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.

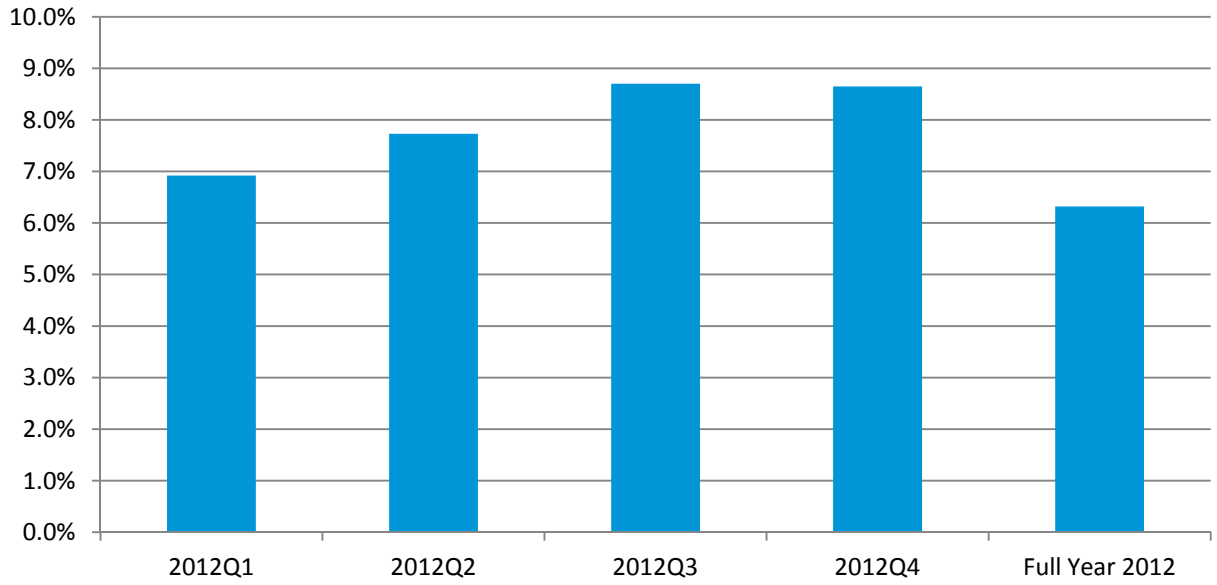
[1] For description of multiple regression and autoregression, see Stock, J.H. and Watson, M.W., *Introduction to Econometrics, Second Edition* (Pearson Education: 2007).

Figure 1 compares the estimated U.S. coal production from the WCPR with the actual U.S. coal production as surveyed by MSHA for each quarter in 2012, and for the full year. The quarterly percent difference between the estimates and actual production ranges from -3.67% to +1.63%. The full year estimate has a -0.94% difference from the actual production. A metric that takes the differences between the WCPR and the actual production at the state level without regard to whether the difference is positive or negative is called the aggregate absolute percent difference (1). This metric accounts for the differences in every state, and relates those differences to the total U.S. MSHA production. The aggregate absolute percent difference is found by dividing the sum of the absolute differences between the WCPR and MSHA production at the state level by the total U.S. MSHA production. This metric generally yields a higher result than a normal percent difference.

$$\text{Aggregate Absolute Percent Difference} = \frac{\sum_{state\ i=Alabama}^{Wyoming} Abs(WCPR_{state\ i} - MSHA_{state\ i})}{Total\ U.S.\ MSHA\ Production} \quad (1)$$

Figure 2 displays aggregate absolute percent differences between EIA estimates and MSHA surveyed data for 2012. Kentucky East, Kentucky West, Pennsylvania Anthracite, Pennsylvania Bituminous, West Virginia North, and West Virginia South are all treated as separate "states" in the aggregate absolute percent difference calculation. These "states" are all estimated weekly, and are also reported in the EIA annual and quarterly coal reports.

Figure 2. Aggregate absolute percent difference between EIA estimated U.S. coal production and MSHA surveyed U.S. coal production, 2012



Note: The full year 2012 aggregate absolute percent difference is calculated on annual data, not the individual quarterly differences. MSHA data include refuse coal.

Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.

For 2012, Table 1 displays the absolute difference and the percent difference in production at the state level between the WCPR and MSHA (production values are in short tons). The divided "states" as mentioned above are shown in Table 1.

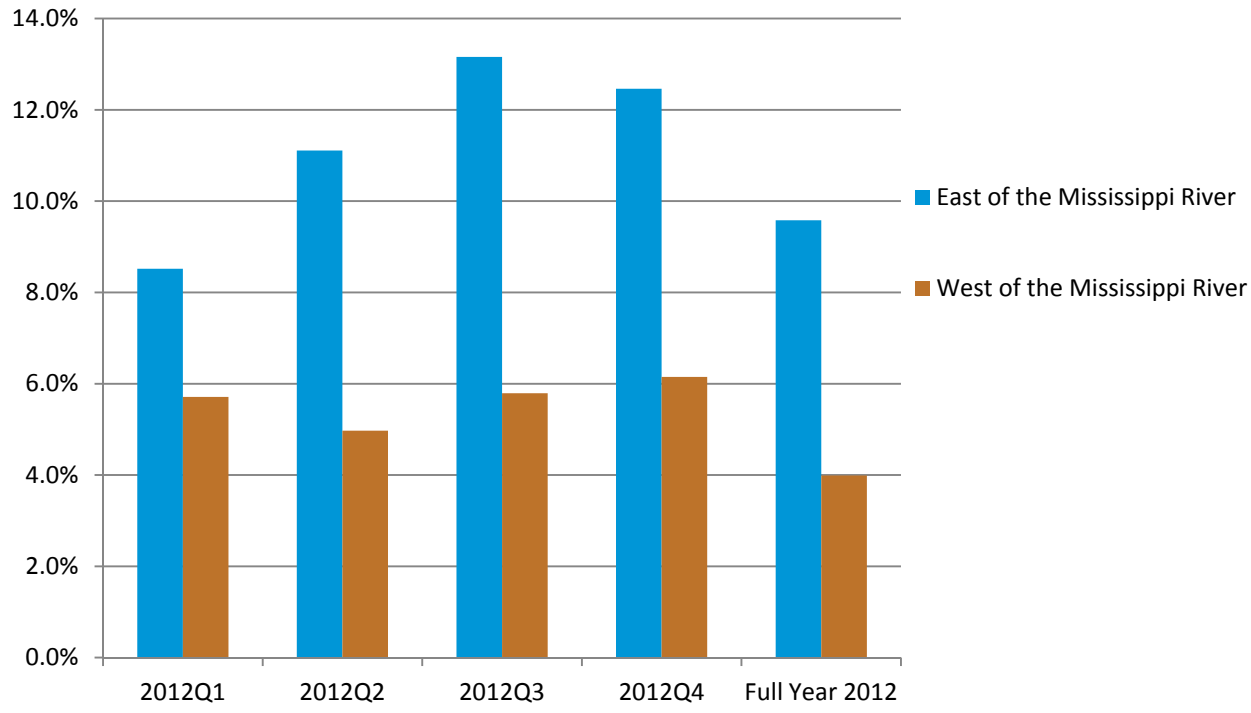
Table 1. Difference, absolute difference, and percent difference between state level coal production using EIA WCPR estimates and surveyed MSHA data, 2012

State	WCPR	MSHA	WCPR-MSHA	Absolute WCPR-MSHA	Percent Difference
Alabama	18,848,219	19,454,594	-606,375	606,375	-3.12
Alaska	2,085,770	2,052,086	33,684	33,684	1.64
Arizona	7,060,209	7,493,276	-433,067	433,067	-5.78
Arkansas	64,389	98,121	-33,732	33,732	-34.38
Colorado	31,380,111	28,566,094	2,814,017	2,814,017	9.85
Illinois	36,683,147	48,762,691	-12,079,544	12,079,544	-24.77
Indiana	35,560,700	36,720,174	-1,159,474	1,159,474	-3.16
Kansas	71,482	15,864	55,618	55,618	350.59
Kentucky East	60,826,083	48,878,918	11,947,165	11,947,165	24.44
Kentucky West	40,303,211	42,063,490	-1,760,279	1,760,279	-4.18
Louisiana	3,353,437	3,971,129	-617,692	617,692	-15.55
Maryland	1,821,298	2,283,341	-462,043	462,043	-20.24
Mississippi	2,786,220	2,952,818	-166,598	166,598	-5.64
Missouri	429,357	421,587	7,770	7,770	1.84
Montana	36,983,867	36,693,982	289,885	289,885	0.79
New Mexico	21,469,733	22,452,275	-982,542	982,542	-4.38
North Dakota	28,028,942	27,528,666	500,276	500,276	1.82
Ohio	27,543,505	26,339,516	1,203,989	1,203,989	4.57
Oklahoma	1,041,227	1,053,973	-12,746	12,746	-1.21
Pennsylvania Anthracite	2,076,654	2,367,915	-291,261	291,261	-12.30
Pennsylvania Bituminous	54,762,743	53,137,648	1,625,095	1,625,095	3.06
Tennessee	1,477,829	1,090,247	387,582	387,582	35.55
Texas	40,008,311	44,178,225	-4,169,914	4,169,914	-9.44
Utah	12,997,926	17,015,919	-4,017,993	4,017,993	-23.61
Virginia	19,486,919	18,975,705	511,214	511,214	2.69
West Virginia North	41,052,753	41,489,430	-436,677	436,677	-1.05
West Virginia South	86,897,836	78,959,123	7,938,713	7,938,713	10.05
Wyoming	391,757,793	401,441,611	-9,683,818	9,683,818	-2.41
U.S. Total	**1,006,859,671**	**1,016,458,418**	**-9,598,747**	**64,228,763**	**-0.94**

Note: MSHA data include refuse coal.
Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.

Regionally, the estimates for states west of the Mississippi river performed better than estimates for states east of the Mississippi River in every quarter (Figure 3). The same aggregate absolute percent difference method as referenced above is used for the states exclusively in either of the two regions.

Figure 3. Aggregate absolute percent difference between EIA estimated regional coal production and MSHA surveyed regional coal production, 2012



Note: The full year 2012 aggregate absolute percent difference is calculated on annual data, not the individual quarterly differences. MSHA data include refuse coal.
Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.

Revisions

When MSHA production becomes available for a given quarter, EIA revises the weekly estimates for that quarter. Once revised, the sum of the weekly estimates in that quarter will match the quarterly MSHA production in any state. This is done using the following formula:

Revised weekly estimate in state A =
(EIA weekly estimate in state A**) X (**(MSHA quarterly data in state A) ÷ (Sum of EIA estimates in state A for all weeks in the quarter)**)**

A similar calculation is done for the monthly estimates. However, there is no official weekly coal production amount that either the original weekly EIA estimates or revised weekly EIA estimates can be compared with. Official coal production data are only collected quarterly.

Limitations

The WCPR uses readily available weekly data that correlate with coal production: regional railcar loadings of coal, regional population weighted heating degree days, and regional population weighted cooling degree days for the east, and state level train loadings of coal for the west. As can be seen in the previous figures, these variables do a reasonably good job in estimating the production. However, important parts of the coal supply chain are left out in the estimation, namely barge loadings and truck loadings of coal, with mainly all of the barge loadings occurring in the eastern half of the United States. In 2012, 23.2% of all domestically originated coal delivered in the United States was by barge or truck, according to the EIA *Annual Coal Distribution Report* for 2012. In the case of Illinois, 59.7% of delivered coal that originated in the state was transported by barge or truck. In a given week, the WCPR cannot directly account for any coal that is put on barges or trucks. EIA has not been able to obtain an aggregated source for this weekly information similar to the AAR.

In North Dakota, Texas, and Utah in 2012, a majority of delivered coal that originated in these states was transported by conveyor belt or truck (91.5% for North Dakota, 66.0% for Texas, and 57.1% for Utah). This production cannot be accounted for in train loads, and is a source of error in the estimation. Any coal that is mined but put into stockpile holdings in a given week is also a source of error.

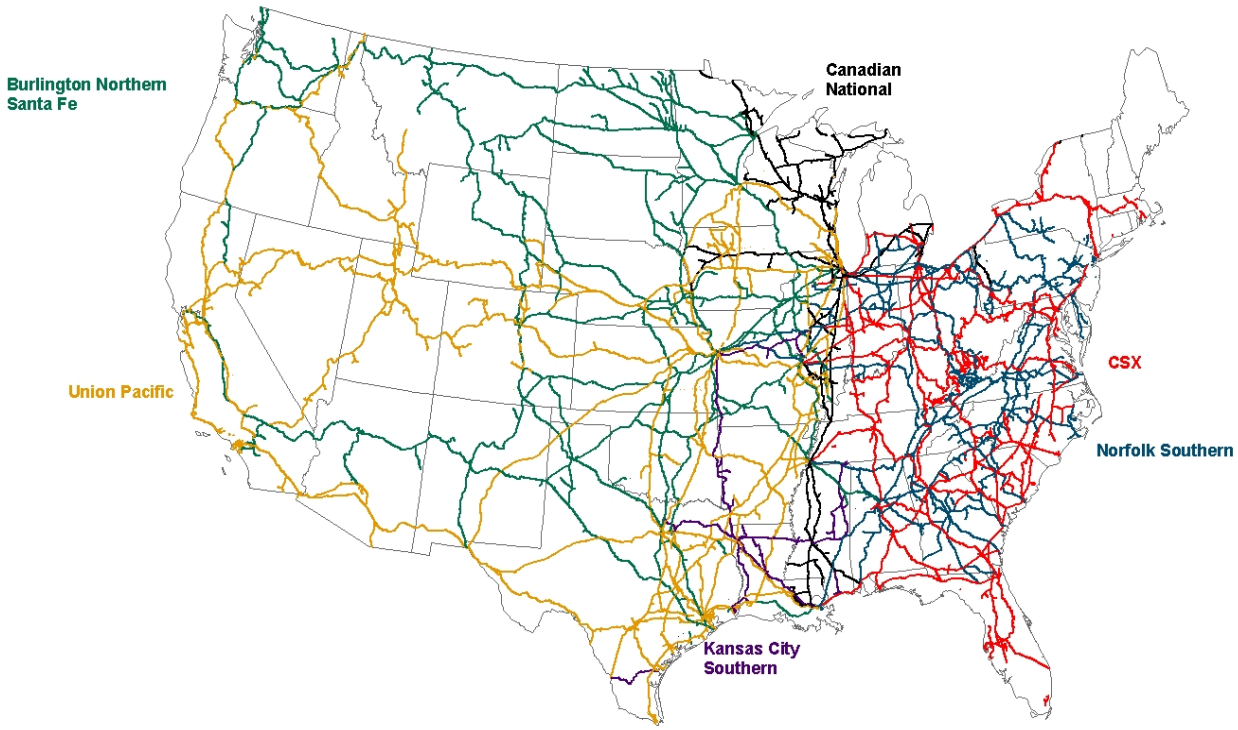
The WCPR model gets re-fitted every quarter with the most current quarterly MSHA production available. The most current quarterly MSHA production available is always two quarters behind the quarter that is being fitted. Because of this lag in data used, the model cannot accurately predict production when a state has a large increase or decrease in production from one quarter to the next. Illinois and Kentucky East are examples of this in 2012. From 2011 to 2012, the actual annual coal production in Illinois increased by 28.4%, and the actual annual coal production in Kentucky East decreased by 28.2%, according to the EIA *Annual Coal Report* for 2012. During 2012, there were individual quarter changes in actual production for both states that were more than a 10% absolute change. Because of the large swings in production in a short amount of time, Illinois and Kentucky East had the greatest absolute differences between the WCPR and MSHA production. These swings in production caused the aggregate absolute percent difference between EIA estimated U.S. coal production and MSHA U.S. coal production to almost double from 2011 to 2012.

Conclusions

The WCPR model was very close to MSHA in 2012 at the national level; at the state level, there was variation. In the past, a weekly survey of either all producing coal mines, or the largest and most significant coal mines in each state, has been considered. With aggregate absolute percent differences between EIA estimates and MSHA data of no more than 8.7% for any quarter in 2012, the model is a cost-effective alternative to a survey. However, EIA is researching ways to reduce the difference between the WCPR and MSHA. Particularly, ratio estimation methods are being evaluated, which would lessen the time needed each week to produce the estimates, and would reduce the burden of maintaining the WCPR model.

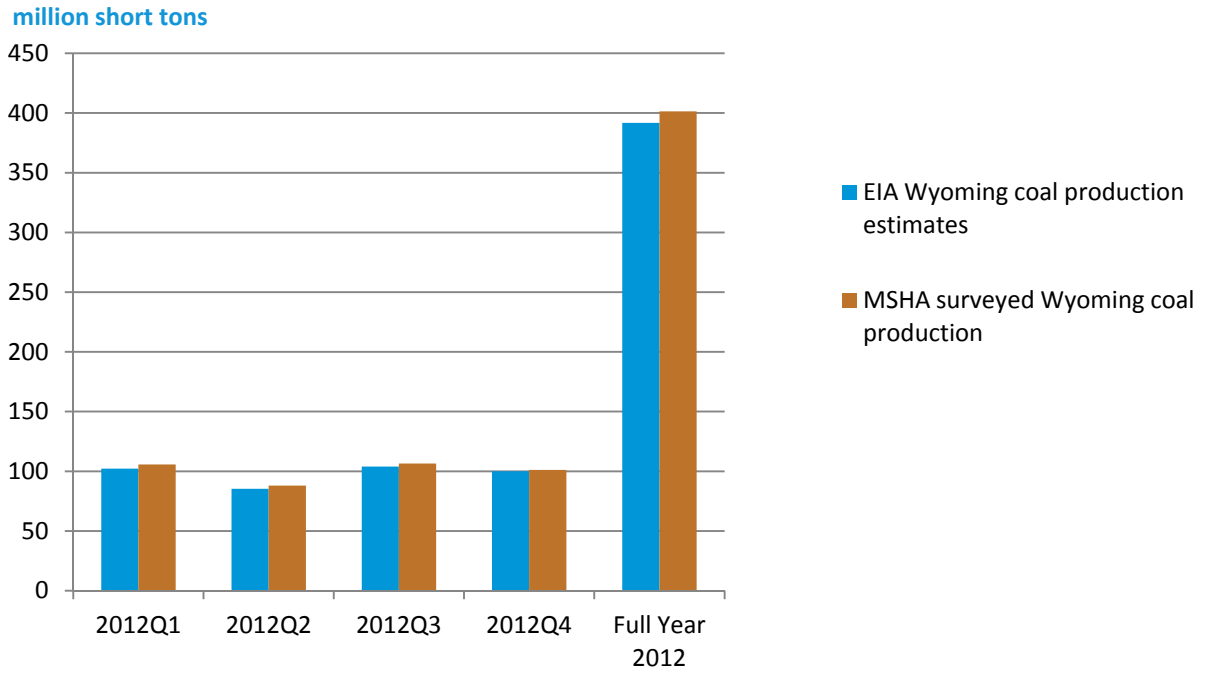
Appendix

Figure 1A. Major railroads throughout the United States



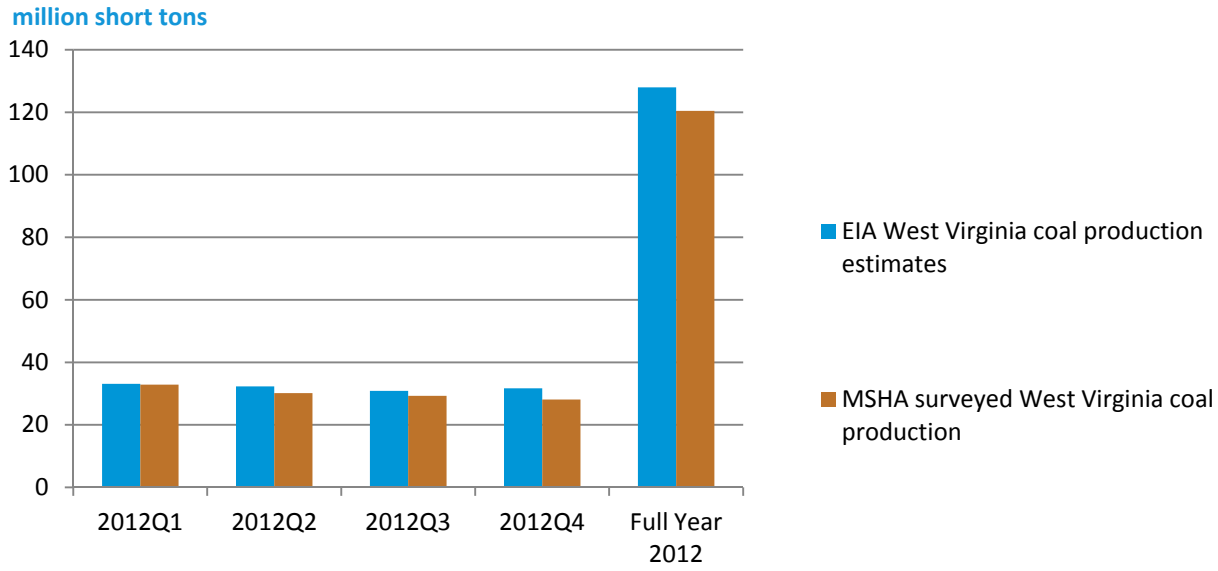
Source: U.S. Bureau of Transportation Statistics (BTS), Research and Innovative Technology Administration (RITA).

Figure 2A. EIA Wyoming coal production estimates and MSHA surveyed Wyoming coal production, 2012



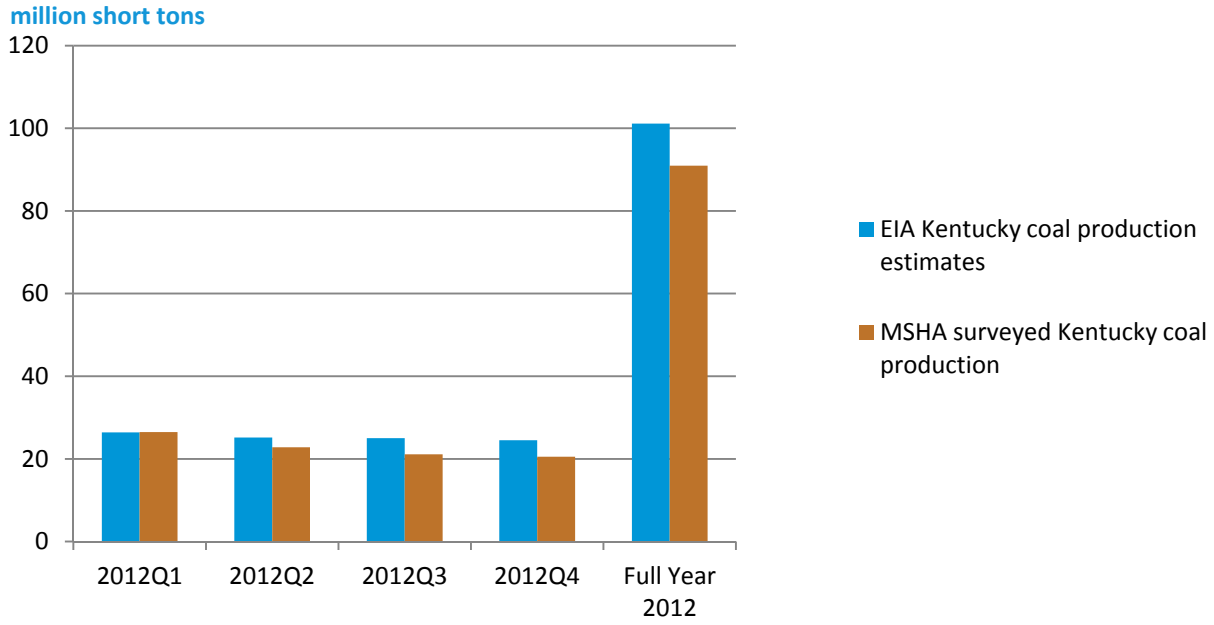
eia Note: MSHA data include refuse coal.
Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.

Figure 3A. EIA West Virginia coal production estimates and MSHA surveyed West Virginia coal production, 2012



eia Note: MSHA data include refuse coal.
Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.

Figure 4A. EIA Kentucky coal production estimates and MSHA surveyed Kentucky coal production, 2012



Note: MSHA data include refuse coal.

Source: U.S. Energy Information Administration and U.S. Mine Safety and Health Administration.