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Performance Evaluation of the Weekly Coal Production Report for 2011

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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 responsible for collecting actual coal production data. The agency collects coal production data on a quarterly basis, so the weekly EIA estimates need to be summed to compare with the quarterly data collected by MSHA. MSHA collects coal production data from individual mines on the 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 2011. Comparisons are also made at the State-level for the year. The top three coal producing States (Wyoming, West Virginia, and Kentucky) in 2011 are also compared in each individual quarter.

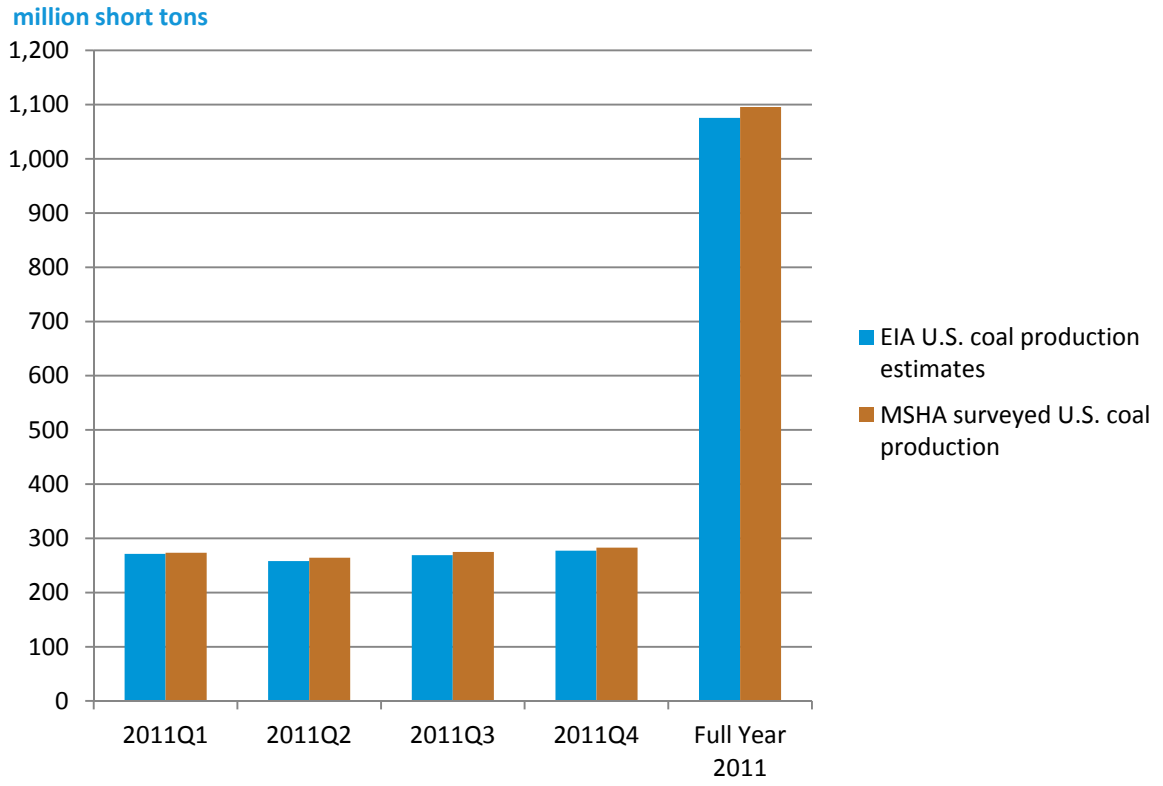
Performance

The WCPR relies on a statistically-based autoregressive model[1] for States east of the Mississippi River, with readily available regional weekly data of railcar loadings (RC), heating degree days (HDD), and cooling degree days (CDD) as inputs. For States west of the Mississippi River, 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) make publicly available the weekly HDD and CDD on the NOAA website.

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

Figure 1. EIA U.S. coal production estimates and MSHA surveyed U.S. coal production, 2011



Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).

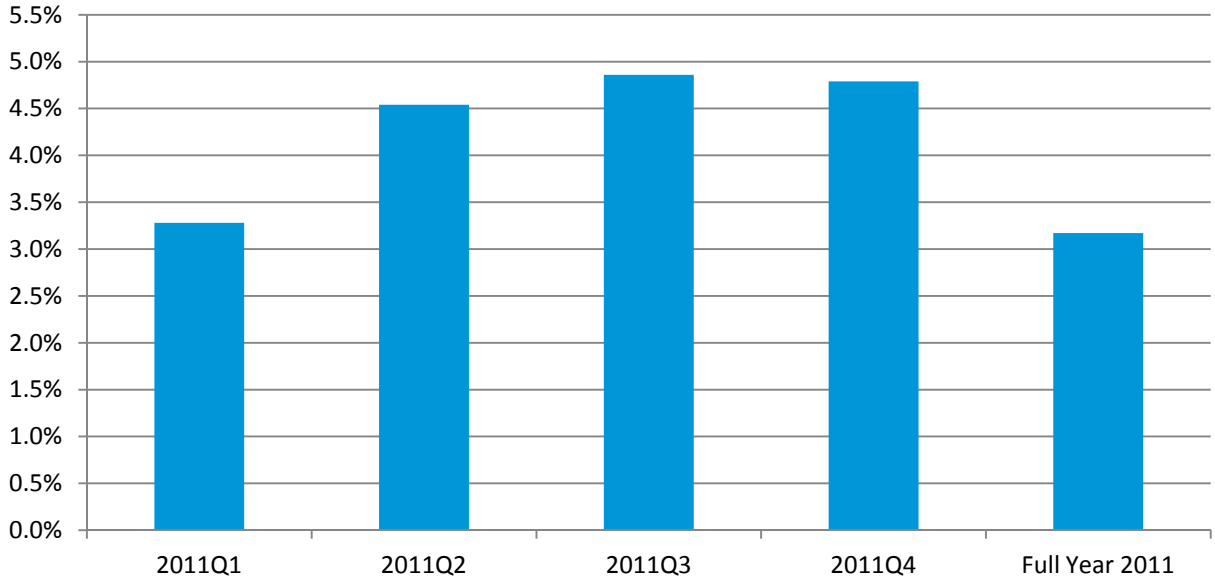
[1] For description of multiple regression and autoregression, see Stock, J.H. and Watson, M.W., *Introduction to Econometrics, Second Edition* (Pearson Education: 2007).

Figure 1 compares the estimated U.S. production from the WCPR with the actual U.S. production as surveyed by MSHA for each quarter in 2011 and for the full year. In each quarter, the estimates are slightly lower than the actual production, with a percent difference range of -0.82 percent to -2.33 percent. The full year estimate has a -1.83 percent difference from the actual production. A metric that takes the differences between the WCPR and the actual production at the State-level is called the absolute aggregate percent difference (1). This metric accounts for the differences in every State, and 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.

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

Figure 2 displays aggregate absolute percent differences between EIA estimates and MSHA surveyed data for 2011. Kentucky East, Kentucky West, Pennsylvania Anthracite, Pennsylvania Bituminous, West Virginia North, and West Virginia South are all treated as separate "States" in the absolute aggregate 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, 2011



Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).
Note: The full year 2011 aggregate absolute percent difference is calculated on annual data, not the individual quarterly differences.

For 2011, 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, 2011

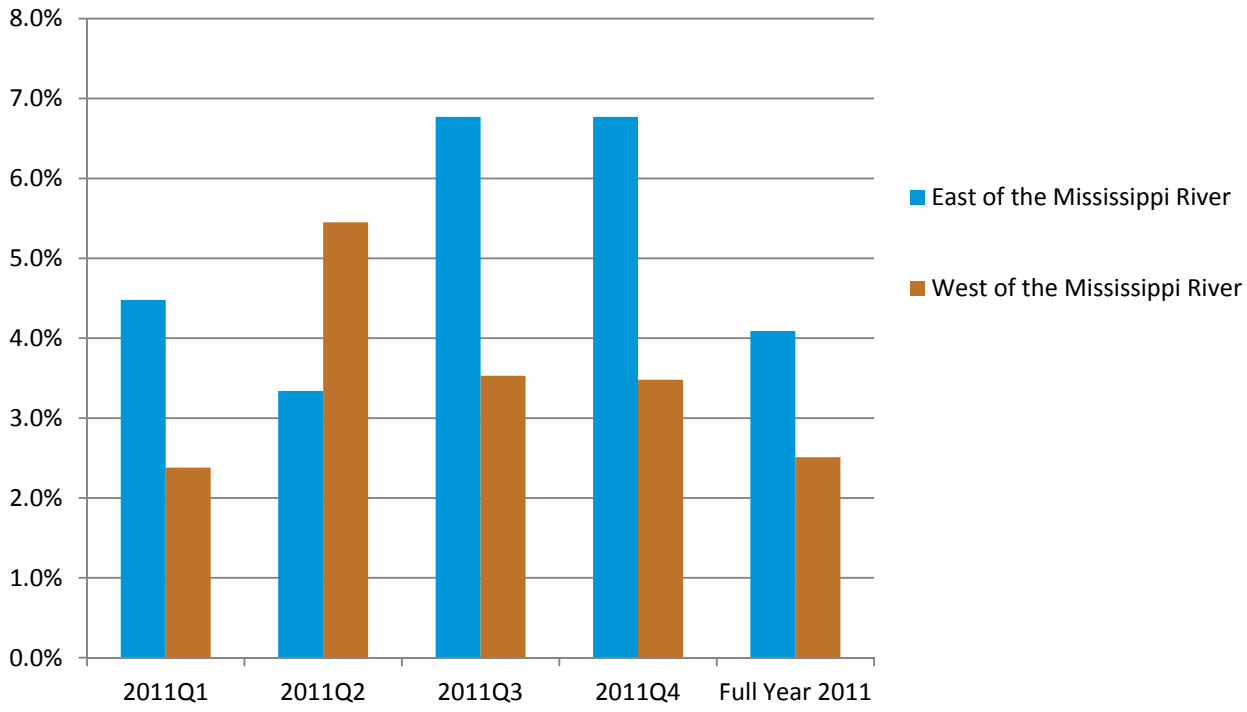
State	WCPR	MSHA	WCPR-MSHA	Absolute WCPR-MSHA	Percent Difference
Alabama	20,316,268	19,381,009	935,259	935,259	4.83
Alaska	1,932,274	2,148,926	-216,652	216,652	-10.08
Arizona	6,888,430	8,110,942	-1,222,512	1,222,512	-15.07
Arkansas	73,207	133,347	-60,140	60,140	-45.10
Colorado	26,543,461	26,889,632	-346,171	346,171	-1.29
Illinois	33,352,516	37,937,509	-4,584,993	4,584,993	-12.09
Indiana	35,939,268	37,544,247	-1,604,979	1,604,979	-4.27
Kansas	138,481	37,257	101,224	101,224	271.69
Kentucky East	68,618,845	67,984,999	633,846	633,846	0.93
Kentucky West	38,080,998	40,985,971	-2,904,973	2,904,973	-7.09
Louisiana	3,772,465	3,864,700	-92,235	92,235	-2.39
Maryland	2,068,078	2,936,758	-868,680	868,680	-29.58
Mississippi	2,750,186	2,746,744	3,442	3,442	0.13
Missouri	433,892	464,738	-30,846	30,846	-6.64
Montana	43,515,563	42,008,238	1,507,325	1,507,325	3.59
New Mexico	21,768,409	21,922,457	-154,048	154,048	-0.70
North Dakota	28,852,482	28,231,419	621,063	621,063	2.20
Ohio	27,119,672	28,175,454	-1,055,782	1,055,782	-3.75
Oklahoma	1,065,200	1,144,665	-79,465	79,465	-6.94
Pennsylvania Anthracite	1,817,417	2,234,725	-417,308	417,308	-18.67
Pennsylvania Bituminous	56,884,967	57,663,618	-778,651	778,651	-1.35
Tennessee	1,708,521	1,484,029	224,492	224,492	15.13
Texas	38,890,153	45,903,597	-7,013,444	7,013,444	-15.28
Utah	19,765,214	19,648,020	117,194	117,194	0.60
Virginia	21,133,524	22,586,468	-1,452,944	1,452,944	-6.43
West Virginia North	42,459,363	41,848,752	610,611	610,611	1.46
West Virginia South	95,515,642	92,935,927	2,579,715	2,579,715	2.78
Wyoming	434,178,562	438,673,388	-4,494,826	4,494,826	-1.02
U.S. Total	**1,075,583,058**	**1,095,627,536**	**-20,044,478**	**34,784,679**	**-1.83**

Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).

As can be seen in Table 1, with the exception of Illinois and Texas, the States with double digit percent differences were small coal producers. The smaller States tend to use trucks for transporting coal, in addition to rail, and sometimes use trucks for a majority of the coal transportation. Other sources of error come into the estimation for Illinois and Texas, which will be discussed in later sections.

Regionally, the estimates for States west of the Mississippi river performed better than estimates for States east of the Mississippi River for three out of four quarters, as can be seen in 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, 2011



Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).
Note: The full year 2011 aggregate absolute percent difference is calculated on annual data, not the individual quarterly differences.

Revisions

When MSHA production becomes available for a given quarter, EIA revises the weekly estimates for that quarter so that when added up, the weekly estimates will match the 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)**)**

This revision process ensures the weekly estimates, once revised, will match the MSHA surveyed coal production data for the quarter when summed. A similar process 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 at the quarterly level.

Limitations

The WCPR uses readily available weekly data that correlate with coal production: regional railcar loadings of coal (RC), regional population weighted heating degree days (HDD), and regional population weighted cooling degree days (CDD) for the east, and total State level train loadings 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 2011, about 21 percent of all coal delivered in the United States was by barge or truck, according to the EIA *Annual Coal Distribution Report*. In the case of Illinois, 64 percent of the coal that was delivered from 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. There are hundreds of barge and trucking companies operating in the United States. Collecting barge and truck information would be difficult. However, if this information were available, the WCPR estimates would most likely improve.

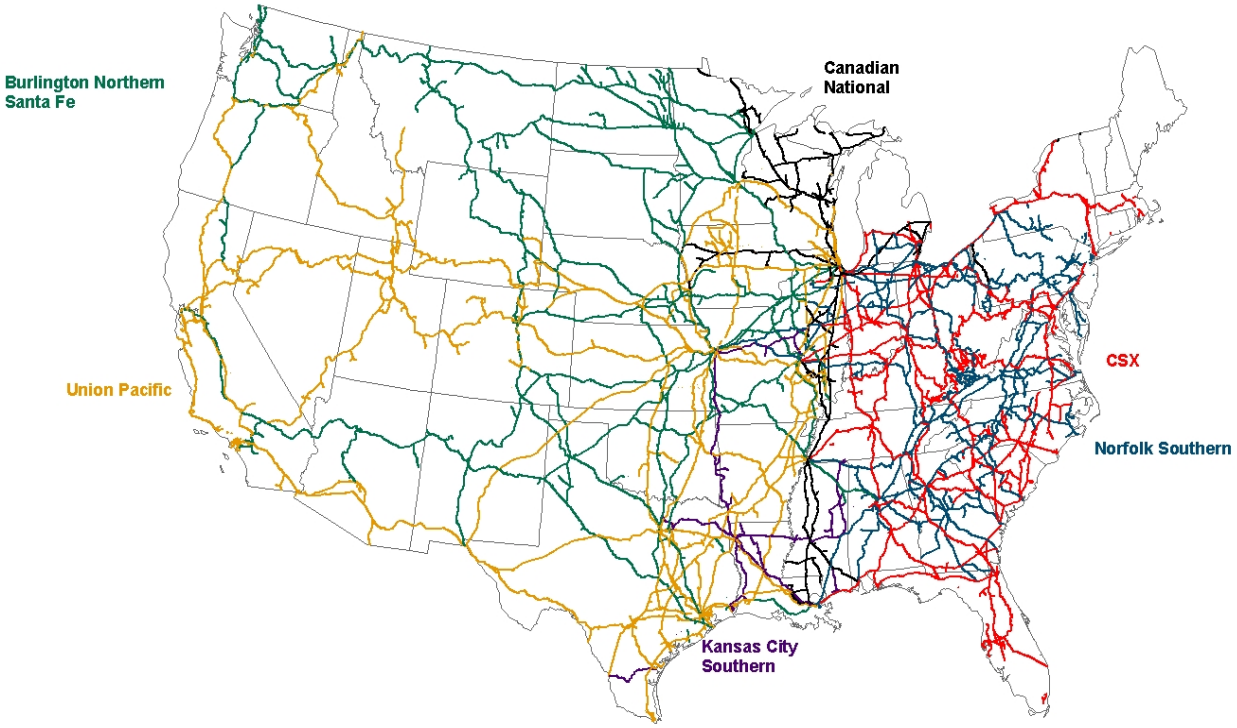
In both North Dakota and Texas in 2011, a significant amount of coal that was delivered from these States was transported by conveyor belt or truck (90 percent for North Dakota, 59 percent for Texas). This production cannot be accounted for in train load outs, and is a source of error in the estimation. Any coal that is mined but put into stockpile holdings is also a source of error.

Conclusions

The WCPR model is a quick method for estimating weekly coal production. Overall, its results compare favorably with the actual coal production as surveyed by MSHA. In the past, a weekly survey of either all producing mines or the largest and most significant mines has been considered. With aggregate absolute percent differences between EIA estimates and MSHA data of no more than 4.9 percent for any quarter in 2011, the model is a cost-effective alternative to a survey. EIA is looking at ways to reduce the difference between the WCPR and MSHA further.

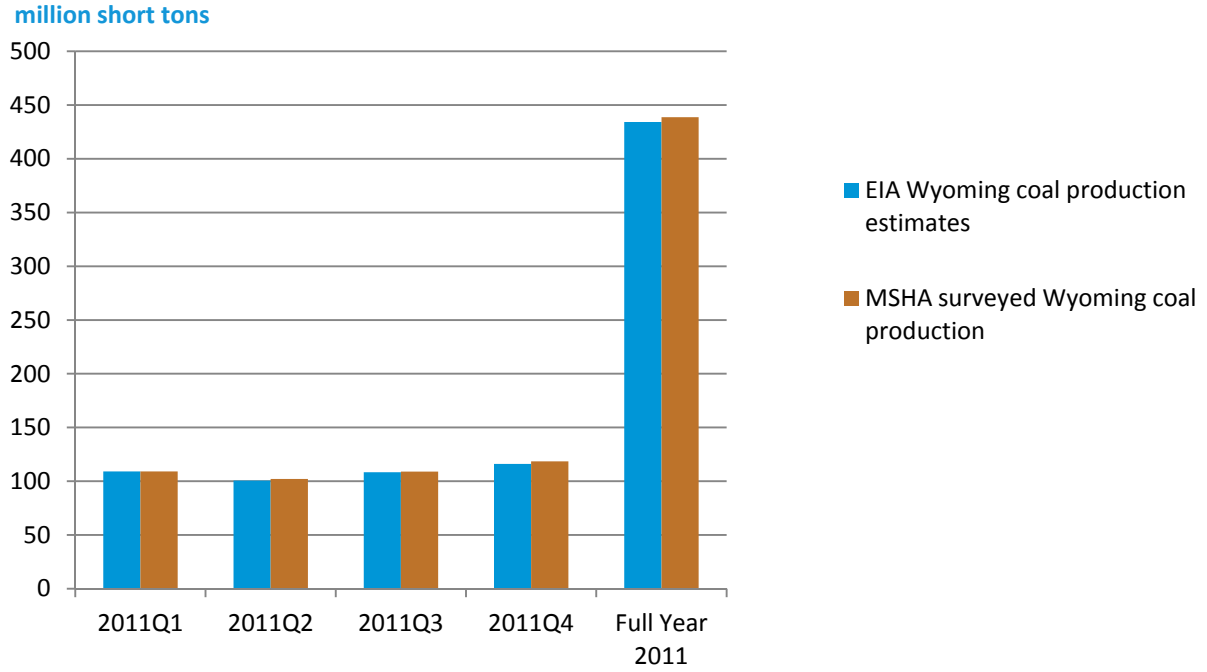
Appendix

Figure 1A. Major railroads throughout the United States



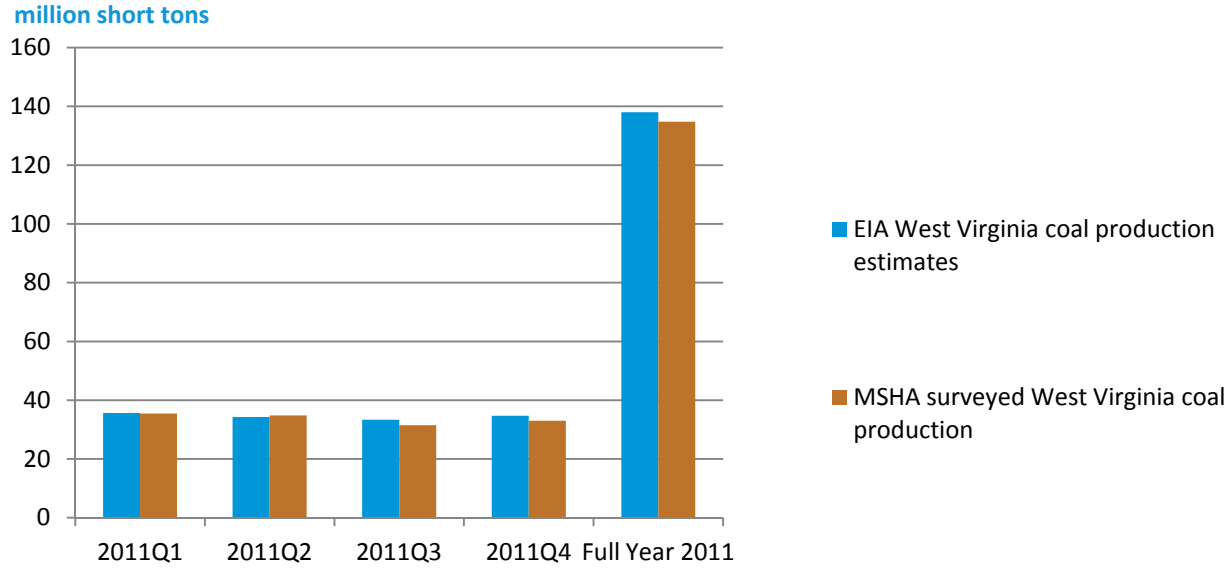
Source: U.S. Bureau of Transportation Statistics (BTS), Research and Innovative Technology Administration (RITA).

Figure 2A. EIA Wyoming coal production estimates and MSHA surveyed Wyoming coal production, 2011



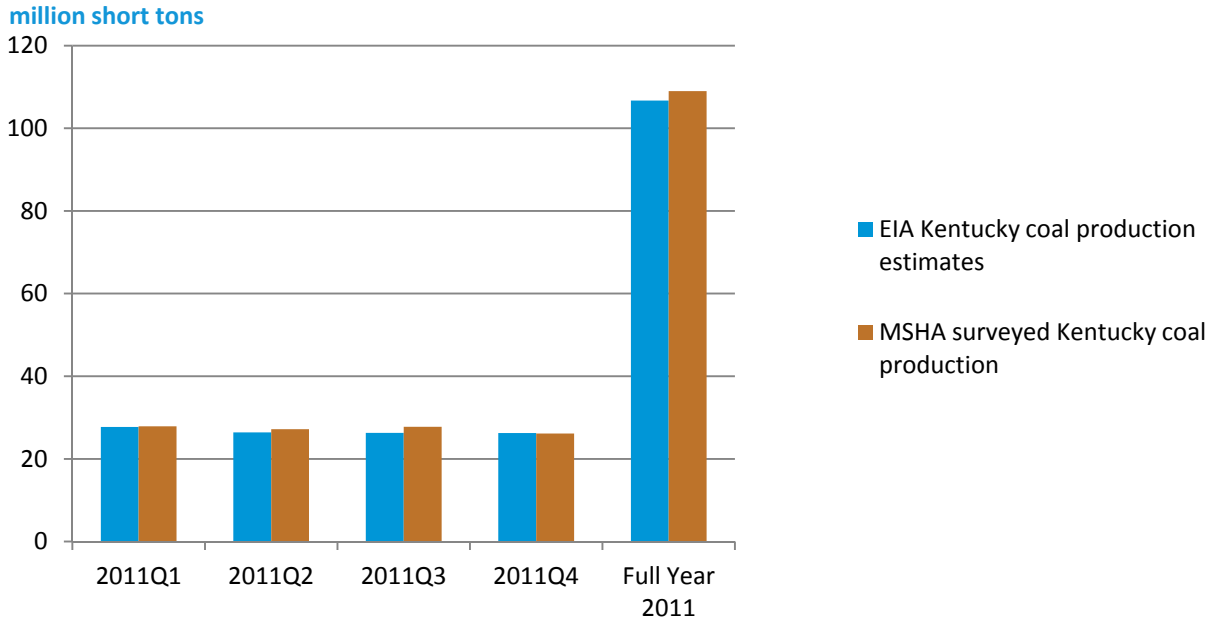
Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).

Figure 3A. EIA West Virginia coal production estimates and MSHA surveyed West Virginia coal production, 2011



Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).

Figure 4A. EIA Kentucky coal production estimates and MSHA surveyed Kentucky coal production, 2011



Sources: U.S. Energy Information Administration (EIA) and U.S. Mine Safety and Health Administration (MSHA).