Indiana's Coal Economy:
Employment Impacts of a Challenged Industry

A Report from:
Strategic Development Group, Inc.,
The Economic Development Coalition of Southwest Indiana, &
The Grow Southwest Indiana Workforce Board (representing Region 11)

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Introduction

For the past two months the Economic Development Coalition of Southwest Indiana (EDCSI) and Strategic Development Group, Inc. (SDG) have been studying the recent and future potential impacts on employment in the coal economy of Indiana – in particular Southwest Indiana. SDG president, Thayr Richey, led the research effort. Working on the research as subcontractors to SDG were Jim Wheeler, Ph.D., of PQR, LLC and Lee Rigsby, of Rigsby Consulting. Brief bios of each researcher can be found in the appendix to this report.

Executive Summary

Indiana coal production peaked in 2014 at 39,266,977 short tons. In 2015, production declined to 34,295,444 short tons. Based on its research, SDG estimates that production will continue to decline in 2016 to approximately 28,373,508 short tons. This downward trend is projected to continue.

The coal industry lost almost 1,000 jobs between 2014 and the second quarter of 2016.[1] These were all lost in 10 counties across Southwest Indiana, with the bulk of those jobs lost located in four counties – Gibson, Pike, Knox, and Warrick. We estimate that coal mines are holding on to another 162 employees that will likely have to be released, possibly by the end of 2016, giving us a total of some 1,143 potentially displaced workers by the end of 2016.

Indiana coal mining is part of a three-state coal region in Kentucky, Illinois, and Indiana that focuses on Illinois Basin Coal, grades 5 and 6. There are Indiana residents that work in the coal industry in the other two states and vice versa.

Total coal cluster employment (including coal mining) may see a decline of 3,500 (ignoring the displaced Indiana miners working in Illinois and Kentucky and vice versa). This includes coal related transportation (rail, trucking, truck and rail support activities and freight arrangement) and coal mining support activities, but not industrial based jobs such as tool repair or equipment and supplies sales. Nor does it include the impact on coal-related jobs among coal consumers (e.g., closed power plants). The employment losses we did not estimate may total conservatively on the order of 500 jobs. This would boost the total impacted jobs to 4,000 potentially displaced workers.

It is impossible to predict the future accurately. However the fact that 97 percent of Indiana mined coal is consumed by electric power plants, combined with the fact that no new Indiana coal-fired plants are being built despite having an aging fleet of existing coal-fired generation operations does not create a good scenario for future coal production. It is likely that within the next few years more coal-fired electric generation plants will close, bringing additional significant future employment risks across the coal cluster.

Cost will determine which coal mines survive. Consolidation and privatization will likely prevail. Coal companies probably will become larger, more efficient and owned by private equity as opposed to publicly traded companies. This will possibly mean fewer employees, more technical jobs, higher salaries and more outsourcing. Conceivably, coal companies will strive for the two-employee model; miner and billing clerk. All else might be outsourced.

[1] Source: EIA, *Quarterly Coal Report*, various; the data in the first three quarters is sometimes not provided by the coal companies until the end of the year.

Looking ahead, by the end of 2017 and into 2018, market conditions will drive electric utility decisions concerning base load investments/closures. So, while this report cannot provide a hard forecast, it does provide an assessment of potential closures based on the utilities' own published scenarios under conditions of low natural gas prices and no easing of existing environmental rules. Implementation of the US Environmental Protection Agency's Clean Power Plan (CPP) or other more stringent environmental rules could accelerate the closure timelines suggested below.

Based on the SDG team's risk analysis, the next wave of coal unit closures should begin no later than 2019, with one or two potentially pulled forward into 2018. This wave presents a strong possibility of job losses by 2020 in the 1,500-2,200 position range, with an additional 900-1,200 job losses during 2021- 2025. [2]

Research Methodology

In studying the coal economy, the SDG team focused on three major components: coal mining companies, electric utilities that use coal to generate power, and related industries that provide services to the coal industry. The team analyzed statistics from the past ten years of coal production, coal-fired electric power generation, and employment changes in the coal industry.

The most complete data on coal production and employment is from the U.S. Mine Safety and Health Administration. Mines must report quarterly on a variety of items including average employees and coal production. This data must true up annually; however, there is often under-reporting early in the year. The U.S. Energy Information Administration (EIA) leverages this data and combines it with reports from utilities and other sources to generate detailed state level data on coal deliveries to electric power plants. Some of this data is only available through 2014. As with any large federal data set, revisions and updates often are introduced for the most recent periods (here 2015 through 2016Q2).

The research team also examined occupational data in the coal industry and related business sectors to understand how employment was structured in the coal economy and assess the potential occupational mix of displaced workers.

The research team leveraged the data analysis with interviews of coal producers, coal consumers, and affiliated industries.

The interviews focused on their views on:

- The current state of coal production in Indiana
- Potential unemployment in the coal industry
- Likely industrial trends in the next 18 months and five years
- Major threats to the industry that would impact employment
- Likelihood that negative scenarios will occur
- Opportunities for employment growth
- Workforce training and education needs for the coal industry in the next five years

SDG also interviewed economic development professionals in Indiana Growth Region 11 to hear how professionals responsible for maintaining and growing local economies viewed production and employment – both direct and indirect – in the coal economy in Southwest Indiana. These conversations provided the research team local perspectives about the impacts of the changes in the coal economy on each county. This included information on closed or downsized mining operations as well as dislocated workers from manufacturing and service operations that serve the coal industry.

The SDG team's methodology for estimating employment change is discussed later in this report.

[2] Events have already overcome the projections in this report. Within days of completion, NIPSCO announced the probable closure of four of its seven coal-fired generating units over the next seven years – two as early as mid-2018 and the remaining two in 2023. Only one of these units was included in this report's projections, and it was in the 2021-2025 timeframe. See NIPSCO Press Release, Aug. 23, 2016, "NIPSCO Analyzes Future Plans for Electric Generation."

A Brief Overview of Indiana Coal and Its Markets

Coal in Indiana is part of the Illinois Basin (ILB) Coal Deposit. Although most of the coal is located in Illinois, historically production has been roughly shared between Illinois, Kentucky and Indiana. The map in Figure 1 below shows the three-state ILB region.

Figure 1

The geology of this regional coal field is such that coal in Illinois is extracted by the least cost method, underground longwall mining, while higher cost methods, underground conventional mining and surface mining techniques prevail in Kentucky and Indiana.

The Critical Importance of Coal-Fired Electric Power Generation: Indiana coal is used almost exclusively (97%) for steam generation for power production. Industrial use consumes the remaining 3%. As of August 1, 2016 Indiana had 14 active coal fired power plants. Half of the coal produced in Indiana in 2015 went to just 5 plants, Gibson, Petersburg, Warrick, Merom, and Cayuga. Reduced operations at Warrick in 2016 account for part of the reduced production.

Although costs differ from state to state and mine to mine, coal from the Illinois Basin is priced by demand as being from a common market. Basin coal competes with coal from northern Appalachia (NAPP), central Appalachia (CAPP), and the Powder River Basin (PRB).

Other regional markets are Alabama, Western Bituminous (Colorado, New Mexico and Utah), and the Kansas, Oklahoma and Arkansas deposits. These regional markets do not, for the most part, compete on a national or international scale with NAPP, CAPP, PRB and the ILB.

Indiana Coal into Local Markets: Most Indiana mined coal is sent to Indiana consumers (72.6%). Among the rest only Kentucky, Ohio and Florida have market shares of at least 5%. See Table 1 below.

Table 1: Destination of Indiana Origin Coal: 2014

Destination State	Coal Volume by State (short tons)	Share (%)
Alabama	1,235,586	3.2
Florida	2,191,848	5.6
Georgia	280,181	0.7
Illinois	222,007	0.6
Indiana	**28,222,625**	**72.6**
Kentucky	3,394,779	8.7
Louisiana	32,121	0.1
Michigan	59,812	0.2
Missouri	223,095	0.6
New York	116,943	0.3
Ohio	2,160,969	5.6
Tennessee	549,737	1.4
Wisconsin	162,000	0.4
Total	**38,851,703**	**100.0**

Source: U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, March 9, 2016

Customers for Indiana coal are dominated by the electric power sector (Table 2). Nearly 97% of Indiana origin coal is consumed in electric power generation. As a result, Indiana coal has been dependent upon this one market.

Table 2: Consumer Type of Indiana Origin Coal: 2014

Consumer Type	Volume by Customer Type (short tons)	Share (%)
Electric Power Sector	37,544,907	96.6
Industrial Plants, Excluding Coke	1,117,364	2.9
Coke Plant	11,277	0.0
Commercial/Institutional	178,155	0.5
Total	**38,851,703**	**100.0**

Source: U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, March 9, 2016

Shipment of Indiana mined coal is dominated by rail (Table 3). Since most Indiana coal is shipped within Indiana and some 30% of all Indiana rail volume is coal, this raises an important question about the impact of reduced coal volumes on the viability of Indiana short line railroad companies. These lines are an important economic development asset across Southwestern Indiana, and a large drop in coal volumes could have a particularly strong impact on the economic viability of some of these rail lines. At a minimum, shipping rates on other products would likely have to increase. Without much more detailed analysis, the potential negative impacts on unrelated freight dependent businesses in the region cannot be projected, but could be quite serious in specific locations. The coal volume decreases impact on trucking and barge jobs will be important to review, but do not have the same potential indirect economic side effects as the decreases in rail volumes.

Table 3: Transportation Mode of Indiana Origin Coal: 2014

Transportation Mode	Volume by Transportation Mode (short tons)	Share (%)
Railroad	28,420,306	73.2
River	4,660,285	12.0
Truck	5,771,112	14.9
Total	**38,851,703**	**100.0**

Source: U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, March 9, 2016

Indiana origin coal has both positives and negatives when competing with Illinois and Kentucky coals. It is lower in sulfur and chlorine, both contaminants that cost money to deal with when used for steam generation. It is also lower in heating value, requiring up to 106 short tons to achieve the heat of 100 short tons of competing Illinois Basin coals.

Indiana Coal into Indiana Markets: Coal is priced on delivered cost, since transportation cost is significant. Indiana benefits from having a number of collocated mines and power plants. This allows delivery from the mine to the power plant by truck or short line rail. Coal does not move easily from Kentucky into the Indiana market. CSX the main North-South line has many links to Kentucky mines but not to Indiana markets. Coal does not move easily from Illinois into the Indiana markets for a similar reason: it would require multiple railroads to deliver. Transportation advantage is the driving determinant into local markets. Indiana coal is the clear winner.

Table 4: Indiana Coal into Indiana Markets

ORIGIN	TRANSPORTATION	HEATING VALUE	ASH, SULFUR CHLORINE	MINING COST/ton approximate
IN	***+++++***	***++***	***++++***	***$40***
IL	+++	+++	++	$30
KY	+++	++	+++	$35
NAPP	++	+++++	+++	$50
CAPP	++	+++	+++	$55
PRB	+	+	+++++	$5

Origins are ranked from + (worst) to +++++ (best)

Table 4 above shows the main factors that are used by electric utilities in choosing which region's coal to use in their Indiana-based power plants. Indiana coal has several advantages. Close proximity makes it less expensive to ship. There is less ash, sulfur, and chlorine to deal with in comparison with other near- by regions. Slightly higher mining costs and lower heating value are offset by proximity and lower ash, sulfur, and chlorine amounts.

Indiana Coal into National Markets: The national market for coal - particularly in 2016 - is brutal. Supply and inventory greatly exceed demand. Prices are at historic lows. Competing fuels, notably natural gas, are at historic lows as well. Some energy sources, solar and renewables, are subsidized, allowing sales below cost of production. Transportation issues, lower heating values, and higher mining costs handicap Indiana coals. Potential ILB customers are more likely to buy Illinois origin coals if they want rail delivery or Kentucky origin coals if they want water borne deliveries. Illinois coals are the winner here.

Table 5: Indiana Coal into National Steam Coal Markets

ORIGIN	TRANSPORTATION	HEATING VALUE	ASH, SULFUR CHLORINE	MINING COST/ton approximate
IN	++	++	+++	$40
IL	***++++***	***+++***	***++***	***$30***
KY	++	++	++	$35
NAPP	+++	+++++	+++	$50
CAPP	++++	++++	++++	$55
PRB	+	+	+++++	$5

Origins are ranked from + (worst) to +++++ (best)

Table 5 above shows the main factors that are used by electric utilities in choosing which region's coal to use in power plants across the U.S. In this market Indiana coal has several disadvantages. Slightly higher average mining costs makes Indiana more expensive to ship in comparison with IBC from Illinois or Kentucky.

Indiana Coal into International Markets: The international market for coal is worse than the national market. Supply and inventory again greatly exceed demand. The only real market for Indiana coals for export is the API2 index,[3] which is the benchmark price reference for coal imported into northwest Europe.[4] API2 Prices are based on coals that are about 10,400 Btu/lb. and <1.0% Sulfur. Indiana coals get a premium for higher Btu/lb. (+5% pro rata) but a substantial penalty (-10%) for higher sulfur.

The August 2016 closing price for API2 coal was $60.75/ metric ton or $55.11 per short ton. Since export coal from Indiana can only go by barge to the Gulf, the netback at the mine is $55.11 less net of premium/penalty (-$2.75), truck to barge cost (-$5), barge to New Orleans cost (-$10), and loading cost in New Orleans (-$4). These charges result in a net price of $33.36 at the mine.

That price is better than the ILB spot price of $30.64 for Indiana coal but requires willing sellers, willing buyers, and access to barge loading. While willing buyers might be found, a $2.72/ton arbitrage is there for simultaneous buy/sell, there is simply no free space for barge loading and no willing sellers since $33.36 is below current average mining costs. Coals that trade in international markets are often subsidized either directly or by currency manipulations. Consequently the net cost of those coals is often hard to discern. The U.S. is not currently a steam coal exporter. Table 6 shows the main factors that enter into decisions that would lead to exports of Indiana coal into API2.

The idea of transporting Indiana coal by rail to the Great Lakes, where it would be loaded onto ocean vessels for transport through the St Lawrence Seaway, has been entertained. The limits of the Seaway, 28,500 tons, would make shipments more expensive than shipments through the U.S. Gulf that has the ability to load vessels nearly three times the capacity.

[3] API2 is the name given to a physical trade unit of 1000 metric tons of coal of a certain quality delivered into Amsterdam, Rotterdam or Antwerp. The API2 instrument (the trade certificate) allows for hedging, swaps and trades of the underlying physical commodity.

[4] IHS McCloskey website

Table 6: Indiana Coal into International Steam Coal Markets

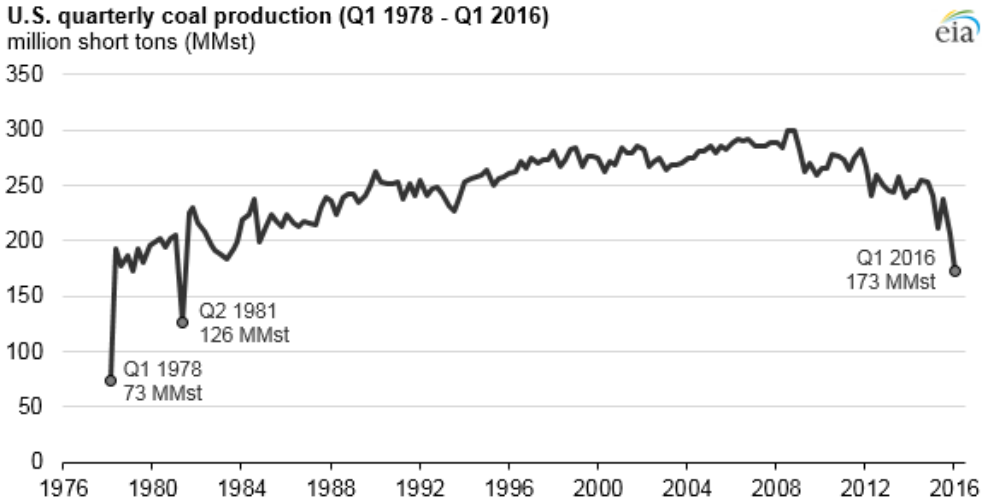
ORIGIN	TRANSPORTATION	HEATING VALUE	ASH, SULFUR CHLORINE	MINING COST/ton approximate
IN	+	++	+++	$40
IL	+++	+++	++	$30
KY	++	+++	++	$35
NAPP	+++	+++++	++	$50
CAPP	++++	++++	++++	$60
PRB	+	+	+++++	$5
AUSTRALIA	***+++++ (Asia)***	***++++***	***+++++***	***<$25***
COLOMBIA	***+++++(Europe)***	***+++***	***+++++***	***<$20***
S AFRICA	***++++(Europe)***	***+++***	***+++++***	***<$20***
INDONESIA	***+++++(Asia)***	***+***	***+++++***	***<$10***
REST OF WORLD	++++	+++	++++	??

Origins are ranked from + (worst) to +++++ (best)

Coal Production

After rising for decades, national coal production began to slump in the mid-2000s, reaching an abnormally low volume in first quarter 2016 (See Figure 2 below). The unusually mild 2015-2016 winter was a major contributor, resulting in very high coal inventories. However, the trend remains downward in the face of a wide array of challenges facing the coal industry, primarily very low prices for natural gas and an increasingly stringent and hostile policy environment facing coal mining and coal consumption (especially by electric utilities).

Figure 2 US Quarterly Coal Production



Source: U.S. Energy Information Administration, *Weekly Coal Report*, and U.S. Mine Safety and Health Administration.

Contrary to recent national declines in coal production from the mid-2000s to 2014, ILB coal (the type of coal found in Illinois, western Kentucky, and southwest Indiana) production expanded even as production in other basins declined. In part, this reflected some cost/location advantages of ILB mines compared to

other regions. In part, it reflected installation of scrubbers on Midwest power plants, permitting greater use of higher sulfur coals.

However, in 2014, the Illinois Basin joined in the decline in production. Most of this decline was concentrated in 2015, although it started in Indiana and Western Kentucky in 2014 (Table 7). Indiana coal production is down some 28% in the past 18 months (using mid-year 2016 estimates).

Current Impact on Indiana Employment

The impact on mine employment in Indiana has been significant, with average employment in that industry falling 557 between 2014 and 2015.[5] Assuming the 2016 second quarter data is reasonably accurate, then average employment has fallen another 424, giving an approximate total decline of some 981 workers. Second quarter productivity data (short tons per worker) suggest that mines are holding onto excess workers. To return to average productivity, in mid-2016 mines appear to be holding some 162 excess workers. See Table 8. With the spate of mining company bankruptcies and continued pressure on coal prices and demand, these excess workers likely will be released.

Coal mining related jobs in transportation, support, suppliers, and customers are not included, and will be addressed separately below. Coal mine employment losses are highly concentrated in Indiana's 10 coal producing counties (Table 9), of which four counties accounted for over 88% of production in 2015 (Gibson, Pike, Knox, and Warrick). The county level employment declines have been quite dramatic. Of the estimated 966 net job losses from 2014 through first quarter 2016 (second quarter 2016 county level data was limited), 926 were in Pike, Sullivan and Gibson counties.

Another factor impacting long term Indiana coal mine employment is the shift from surface towards underground mining. This shift is the result of a combination of factors, among which are fewer quality shallow seams in easily mined areas, and lower political opposition to underground versus surface mining operations. This shows up in the steady decline in tons per employee of >12,000 from the early 2000s to >10,000 tons per employee today. See Table 8.

One challenge for the analyst is to determine how much of production and employment declines reflect short term fluctuation and how much is part of the transition to a *new normal* as demand continues to shift away from coal towards other primary fuels.

Table 7: Coal Production by Illinois Basin & State (thousand short tons, percent)

Region & State	2016Q1	2015Q1	% Change	2015Q1	2014Q1	% Change	2015	2014	% Change
Illinois	11,312	16,779	(32.6)	16,779	14,152	18.6	55,991	57,969	(3.4)
Indiana	7,224	9,463	(23.7)	9,463	9,872	(4.1)	33,424	39,945	(16.3)
Western Kentucky	6,763	9,150	(26.1)	9,150	9,696	(13.1)	34,429	39,927	(12.3)
Illinois Basin	25,299	35,391	(28.5)	35,391	34,549	2.4	123,844	137,181	(9.7)
U.S. Total	**173,028**	**240,189**	**(28.0)**	**240,189**	**245,186**	**(2.0)**	**895,936**	**1,000,049**	**(10.4)**

Source: EIA, *Quarterly Coal Report*, various.

[5] Average employment is reported quarterly by mine. Annual mine employment data is the average of the four quarters.

Table 8: Indiana Coal Production and Employment

2000-2016

Year	Coal Production (short tons)	Average Employees*	Ton per Employee
2000	28,446,934	2,191	12,984
2001	37,028,214	2,666	13,889
2002	35,512,865	2,807	12,652
2003	35,576,994	2,873	12,383
2004	35,546,376	2,938	12,099
2005	34,488,907	2,800	12,317
2006	35,237,923	3,052	11,546
2007	35,183,889	3,087	11,397
2008	36,429,762	3,158	11,536
2009	35,780,359	3,486	10,264
2010	36,027,275	3,481	10,350
2011	37,950,717	3,679	10,315
2012	36,723,741	3,943	9,314
2013	39,109,529	3,757	10,410
2014	39,266,977	3,926	10,002
2015	34,295,444	3,369	10,180
2016(1/2 yr)	14,186,754	2,945	9,634
2016 est.**	28,373,508		

*Average of Quarterly Averages.
**Assumes first half year production stays constant.
Source: DOL, Mine Safety and Health Administration, Employment/Production Data Set (Yearly), http://arlweb.msha.gov/OpenGovernmentData/OGIMSHA.asp#msha-datasets

Table 9: Indiana Coal Mine Production (short tons) and Employment, 2014-2016Q1

	2016Q1		2015		2014		Employment Change, 2014-2016Q1	
County	Production*	Average Employees	Production	Average Employees	Production	Average Employees	Change	Percent
Clay	74,311	39	289,527	39	334,528	32	7	21.9
Daviess	252,847	107	1,013,954	93	1,128,263	124	(17)	(13.7)
Dubois	321,532	144	1,368,577	134	1,401,759	142	2	1.4
Gibson	1,920,729	866	10,316,369	1,089	10,251,678	1,084	(218)	(20.1)
Green	4,126	32	3,022	29	96,244	64	(32)	(50.0)
Knox	1,570,990	727	6,386,123	699	6,273,481	652	75	11.5
Pike	2,190,725	717	9,529,317	759	11,552,959	1,087	(370)	(34.0)
Sullivan	3,957	34	1,334,038	205	3,049,522	372	(338)	(90.9)
Vigo	0	29	0	38	4,325	43	(14)	(32.6)
Warrick	884,693	265	4,054,517	284	5,174,218	326	(61)	(18.7)
TOTAL	**7,223,910***	**2,960**	**34,295,444**	**3,369**	**39,266,977**	**3,926**	**(966)**	**(24.6)**

Source: DOL, Mine Safety and Health Administration, Employment/Production Data Set (Yearly), http://arlweb.msha.gov/OpenGovernmentData/OGIMSHA.asp#msha-datasets
*Assuming first quarter production stays constant, annual production would be four time the quarterly amount

Sources and Uses of Coal in Indiana

To help understand market dynamics and the potential outlook for Indiana coal, it is useful to review sources and uses of coal across the state. The most recent data on sources and uses of coal in Indiana is from 2014. The drop in production from 2014 will surely impact the data, but the general patterns should hold. Indiana origin coal was discussed above. In this section Indiana origin coal is compared to Indiana destination coal.

Indiana Destination Coal: The first observation of particular note from the coal destination data is that the state consumes more coal than it produces – by over 8 million tons in 2014 (Table 10 compared to Table 1 above). Although some of the coal inflows are not a direct competitor to Indiana's bituminous coal, many of these consumers (electric power, steam, district heat) are potential customers. With the forced adoption of scrubbers on power plants, those using Powder River Basin coal potentially could use Indiana coal (depending on the specifics of the scrubber technology adopted, and depending upon transportation availability). The technology exists to economically use some Indiana coals in coking operations. With the market pressure on iron and steel, the investment required appears unlikely, but coking may be a viable customer at some future time, although volumes would likely be modest.

Some 60% of coal consumed in Indiana comes from in-state mines. Western coal (mostly Wyoming, but also Colorado and Utah) accounts for 9%, other Illinois basin (Western Kentucky and Illinois) for 14.2%, and the rest, some 17%, from five states (including Eastern Kentucky). Some of the later are metallurgical coals, but most is lower sulfur bituminous coals.

Table 10: Origin of Indiana Consumed Coal: 2014

Origin State	Volume from Origin State (short tons)	Share (%)
Alabama	626,467	1.3
Colorado	507,549	1.1
Illinois	4,955,806	10.5
Indiana	28,222,625	59.9
Kentucky (East)	1,268,485	2.7
Kentucky (West)	1,731,056	3.7
Pennsylvania (Bituminous)	703,083	1.5
Utah	109,102	0.2
Virginia	1,368,128	2.9
West Virginia (Southern)	4,043,605	8.6
Wyoming	3,613,405	7.7
Total	**47,149,311**	**100.0**

Source: U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, March 9, 2016

As with Indiana origin coal, electric power is the major coal consumer, taking 86.1% of all coal used in Indiana (Table 11). It is important to note that the electric power sector alone consumed more coal than was produced in Indiana in 2014, by 1.3 million tons. Despite closures and conversions, some room exists to substitute Indiana coal for out-of-state purchases.

Table 11: Consumer Type for Indiana Consumed Coal: 2014

Consumer Type	Volume by Consumer Type (short tons)	Share (%)
Coke Plant	4,543,400	9.6
Electric Power Sector	40,618,994	86.1
Industrial Plants Excluding Coke	1,857,122	3.9
Commercial/Institutional	129,795	0.3
Total	**47,149,311**	**100.0**

Source: U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, March 9, 2016

As with Indiana origin coal, Indiana destination coal is carried predominately by rail (Table 12). The truck and river volumes are important, but most of the out-of-state coal is delivered by rail.

Table 12: Transportation Mode of Indiana Consumed Coal: 2014

Transportation Mode	Volume by Transportation Mode (short tons)	Share (%)
Railroad	36,897,757	78.3
River	4,935,118	10.5
Truck	5,316,436	11.3
Total	**47,149,311**	**100.0**

Source: U.S. Energy Information Administration, *Quarterly Coal Distribution Report*, March 9, 2016

Basic Methodology for Employment Estimates for Coal Cluster Employment

In this report, the SDG team used research estimates of employment by occupation for various NAICS codes relevant to Coal Mining and Transportation drawn from US Department of Labor, Bureau of Labor Statistics, Occupational Employment Statistics (OES) Survey (only available for 2012-2015), annual coal production and employment data from the Mine Safety and Health Administration's MSHA-datasets, and coal transportation by mode data from the 2012 Commodity Flow Survey.

The OES data are benchmarked to May of each year and are based on surveys. The margin of error can be significant for smaller industries and occupations within industries. The OES total employment data for coal mining is consistent (but not identical) with the detailed data reported to MSHA. The MSHA annual employment data are the most accurate. There are a variety of weaknesses in each of these datasets, but are the best available for estimating coal cluster employment, and provide the basis for creating tools to calculate the potential impact of declines in Indiana coal volumes on both total employment and major occupation categories.

Coal Cluster (Partial) Employment Estimates: 2012-2015

This section includes employment estimates for coal mining, mining support activities, truck transportation, rail transportation, support activities for road and rail transport, and truck and rail shares of freight transportation arrangement and other support activities for transport. For each relevant NAICS code in the OES dataset, at the three digit level, the four digit industry components (if reported) were reviewed and adjusted to best align with the Commodity Flow Survey data on coal transportation modes. These adjusted coal relevant employment totals were multiplied by the shares of coal volume in total commodity volume for each mode (truck (9.0%) and rail (30.3%)) to estimate coal-related employment in each coal relevant NAICS code. This generated 2012-2015 employment estimates for a subset of the Indiana Coal Cluster (Table 13). Not included in this set of estimates are employees of direct suppliers to the coal mining industry (equipment, materials, fuels, etc.) and coal related employment of coal consumers (electric generating plants, industrial operations, etc.).

Table 13: Estimated Partial Coal Cluster Employment: 2012-2015

Relevant Indiana Employment by Major Transportation Subsector		**2012**	**2013**	**2014**	**2015**
Truck Transportation		51,840	52,320	52,990	54,700
Truck Share of Support Activities for Road Transportation		1,239	1,264	1,284	1,587
Truck Share of Freight Transportation Arrangement		1,269	1,367	1,164	1,254
Truck Share of Other Support Activities for Transportation		314	340	381	494
Rail Transportation		6,740	6,750	6,750	6,060
Support Activities for Rail Transportation		530	520	600	670
Rail Share of Freight Transportation Arrangement		165	176	148	139
Rail Share of Other Support Activities for Transportation		41	44	49	55
Estimated Indiana Coal-Related Employment by Major Transportation Subsector	Coal Share				
Truck Transportation	0.090	4,681	4,725	4,785	4,940
Truck Share of Support Activities for Road Transportation	0.090	112	114	116	143
Truck Share of Freight Transportation Arrangement	0.090	115	123	105	113
Truck Share of Other Support Activities for Transportation	0.090	28	31	34	45
Rail Transportation	0.303	2,041	2,044	2,044	1,835
Support Activities for Rail Transportation	0.303	161	158	182	203
Rail Share of Freight Transportation Arrangement	0.303	50	53	45	42
Rail Share of Other Support Activities for Transportation	0.303	12	13	15	17
Transportation Related Coal Cluster Employment		**7,201**	**7,262**	**7,326**	**7,338**
Coal Mining and Mining Support Employment					
Coal Mining Employment		3,943	3,757	3,926	3,369
Coal Share of Mining Support Activities Employment		250	258	364	340
Partial Coal Cluster Employment		**11,394**	**11,277**	**11,616**	**11,047**

Projecting the Impact of Coal Volume Changes on Coal Cluster Employment

Assuming that the relative relationships among the coal relevant NAICS industries remain stable and that the coal transportation by mode volume shares remain constant, we can calculate a set of simple factors (ratios of tons of coal per employee in each coal related employment group), which can be used to estimate employment impacts of projected changes in coal volume. In order to smooth out annual variation, the most recent three years were averaged to calculate the projection factors. Table 14 presents the calculated projection factors and a sample calculation for a 1,000,000 short ton decline in coal volumes.

Table 14: Estimated Change in Partial Coal Cluster Employment due to a Projected Change in Coal Volume

Projected change in Coal Volume = (1,000,000)

	Coal Mine Employ	Coal Mining Support Activities Employ	Coal Share of Total Truck Employ	Coal Share of Total Rail Employ	Truck Share of Support Activities for Road Transport	Support Activities for Rail Transport	Truck Share of Freight Transport Arrange	Rail Share Of Freight Transport Arrange	Truck Share of Other Support Activities for Transport	Rail Share of Other Support Activities for Transport	Total Employ change
Adjustment factor (tons of coal per job)	10,197	120,111	7,809	19,011	307,134	210,741	331,811	809,024	1,059,543	2,547,868	
Employ Change Impact	(98.1)	(8.3)	(128.1)	(52.6)	(3.3)	(4.7)	(3.0)	(1.2)	(0.9)	(0.4)	(300.6)

Coal Cluster Employment Losses to Date (Mid 2016)

From 2014 to mid-2016 Indiana's coal mine employment declined by 981 jobs. These were all lost in 10 counties across Southwest Indiana, with the bulk of those job losses occurring in four counties – Gibson, Pike, Knox, and Warrick. We estimate that coal mines are holding on to another 162 employees that will likely have to be released, possibly by the end of 2016, giving us a total of some 1,143 potentially displaced workers.

Expert opinion suggests that there may be another 400-500 jobs lost that were held by Indiana residents working in IL and KY. There may be a similar number of Illinois and Kentucky miners displaced in Indiana mines. However, the SDG team is using only the 1,143 estimate above, and do not include the cross border dislocation, but these potential dislocations should remain under consideration in developing any regional responses. For example, we ignore the ripple effects on coal support and especially coal transportation of this cross border dislocation. We do not have a reliable method to estimate the magnitude.

Using the analysis above on coal-related support jobs, total coal cluster employment (including coal mining) may see a decline of 3,502 (ignoring the un-measured ripple impacts of the displaced Indiana miners working in Illinois and Kentucky and vice versa). This includes coal related transportation (rail, trucking, truck and rail support activities and freight arrangement) and other coal mining support activities.

However, this estimate does not include industrial-based jobs such as tool repair or equipment and supplies sales. Nor does it include the impact on coal-related jobs among coal consumers (e.g., closed power plants). A conservative estimate of these potential employment losses the SDG team did not address may total on the order of 500 jobs. This would boost the total impacted jobs to some of 4,000 potentially displaced workers.

Most of these jobs, including trucking pay an above county average wage. Mining, in particular, is at or near the highest paying jobs in the coal counties (Table 15).[6] Perhaps one third of at-risk and already dislocated workers are skilled trades people (see the occupational distribution of coal mine employees in Table 19 in the Appendix below). If we include equipment operators, the skilled share is even larger. But many will lack appropriate certifications to qualify for work in manufacturing plants and elsewhere.

[6] The four counties with the highest employment in coal mining are highlighted.

Table 15

UI COVERED EMPLOYMENT, Indiana and 11 Coal Region Proximate Counties

(2015 Annual Average Wages, rounded to hundreds)

NAICS Sectors/Ownership	Indiana	Clay	Davies	Dubois	Gibson	Greene	Knox	Pike	Spencer	Sullivan	Vigo	Warrick
Private Ownership Only												
AGRICULTURE, FORESTRY, FISHING AND	$36,700	$35,000	$36,000	$26,700	$33,000	$34,000	$31,800	$28,400	$35,400	$30,700	$31,800	$34,700
MINING, QUARRYING, AND OIL AND GAS	$68,700	Confidential	Confidential	Confidential	$80,000	$62,600	$74,200	$67,900	$20,500	$75,500	$84,900	$85,700
UTILITIES	$91,300	Confidential	$55,300	$52,200	$92,500	$63,700	$94,300	Confidential	Confidential	Confidential	$101,700	$84,300
CONSTRUCTION	$53,700	$28,700	$39,500	$42,100	$45,000	$43,900	$43,400	$76,500	$41,000	$35,900	$51,600	$45,900
MANUFACTURING	$59,000	$43,300	$35,000	$43,500	$67,100	$36,500	$39,000	$52,700	$50,600	$39,400	$50,800	$72,000
WHOLESALE TRADE	$62,600	$42,400	$51,500	$47,400	$45,700	$33,000	$44,200	$72,900	$40,400	$47,000	$47,600	$57,500
RETAIL TRADE	$26,100	$22,400	$26,000	$27,100	$24,700	$21,400	$23,000	$18,200	$23,200	$20,200	$23,000	$23,200
TRANSPORTATION AND WAREHOUSING	$43,400	$36,100	$34,100	$48,600	$44,400	$47,200	$34,200	$41,700	$43,800	$36,200	$41,700	$37,500
INFORMATION	$56,000	$36,300	$33,200	$36,400	$26,000	$23,800	$38,900	$32,000	$58,500	$40,500	$41,000	$27,700
FINANCE AND INSURANCE	$66,400	$37,900	$51,000	$56,400	$52,600	$43,700	$43,100	$48,000	$35,500	$42,700	$47,000	$51,400
REAL ESTATE AND RENTAL AND LEASIN	$41,500	$20,000	$21,500	$25,600	$26,000	$26,300	$26,200	Confidential	$26,200	$23,100	$41,500	$28,400
PROFESSIONAL AND TECHNICAL SERVICI	$63,500	$36,300	$44,800	$46,400	$40,700	$40,600	$36,400	$22,500	$28,500	$36,600	$45,900	$58,400
MANAGEMENT OF COMPANIES AND ENT	$91,500	Confidential	Confidential	$99,500	Confidential	$28,200	$46,000	Confidential	Confidential	$0	$48,600	$86,600
ADMINISTRATIVE AND WASTE SERVICES	$29,100	$40,300	$28,400	$21,800	$32,800	$30,000	$20,600	$28,100	$23,700	$20,300	$22,100	$23,400
EDUCATIONAL SERVICES	$37,700	$43,000	Confidential	Confidential	$25,900	Confidential	$23,800	$0	$33,100	$22,900	$48,600	$21,900
HEALTH CARE AND SOCIAL ASSISTANCE	$45,200	$32,000	$27,900	$48,000	$32,900	$28,100	$40,000	$25,900	$29,400	$23,000	$45,700	$42,200
ARTS, ENTERTAINMENT, AND RECREATI	$31,200	$9,300	$8,500	$12,300	$7,000	$11,700	$11,000	Confidential	Confidential	Confidential	$14,700	$20,000
ACCOMMODATION AND FOOD SERVICES	$15,000	$10,100	$11,500	$12,800	$12,700	$11,900	$13,000	$9,900	$13,000	$11,600	$14,100	$13,400
OTHER SERVICES, EXCEPT PUBLIC ADMIN	$30,300	$11,400	$26,100	$24,800	$26,500	$18,900	$21,800	$40,500	$52,300	$17,000	$29,200	$25,400
UNCLASSIFIED												
Local Government												
LOCAL GOVERNMENT	$37,300	$28,700	$36,300	$32,400	$30,900	$32,300	$34,900	$29,700	$27,300	$32,100	$36,000	$32,800
EDUCATIONAL SERVICES	$35,400	$29,200	$31,100	$31,000	$32,900	$29,000	$32,700	$33,900	$31,600	$30,800	$37,400	$34,500
HEALTH CARE AND SOCIAL ASSISTANCE	$50,100	$0	$43,300	$0	$0	$43,400	$39,400	$0	$0	$48,300	$0	$0
State Government												
STATE GOVERNMENT	$46,900	$36,500	$37,400	$39,400	$39,700	$40,800	$43,200	$41,100	$36,000	$37,600	$46,400	$41,500
EDUCATIONAL SERVICES	$49,900	$0	$0	$32,600	$0	*	$43,500	$0	$0	$0	$46,900	$0
HEALTH CARE AND SOCIAL ASSISTANCE	$39,200	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total UI Covered												
TOTAL UI COVERED	$43,600	$32,600	$33,300	$40,100	$49,000	$31,000	$36,300	$48,200	$35,400	$37,800	$37,200	$43,700
Federal Government												
FEDERAL GOVERNMENT	$69,800	$48,400	$53,700	$56,600	$49,500	$51,700	$61,000	$43,300	$42,300	$46,000	$67,800	$54,000

Note: We include Spencer County with the other 10 coal region counties. Its coal assets are minor, with only 10 employees reported, but is part of Region 11 and is the home to significant power assets.

These mining related wage data cover more than just coal mining and coal mining related transportation and support positions. However, the data will likely understate coal specific wages. For the seven counties reporting mining wage data, actual 2015 county coal miner totals is used to calculate a weighted average of mining related wages ($75,678). We don't have coal related transportation wages or employees by county. We do have average transportation and warehousing wages and employee count by county. Warehousing pulls this average down significantly. Nevertheless, we can use the same method to estimate a weighted average wage for the counties reported in Table 15. The 11-county weighted average wage for all Transportation and Warehousing, not just the coal related component is $40,944.

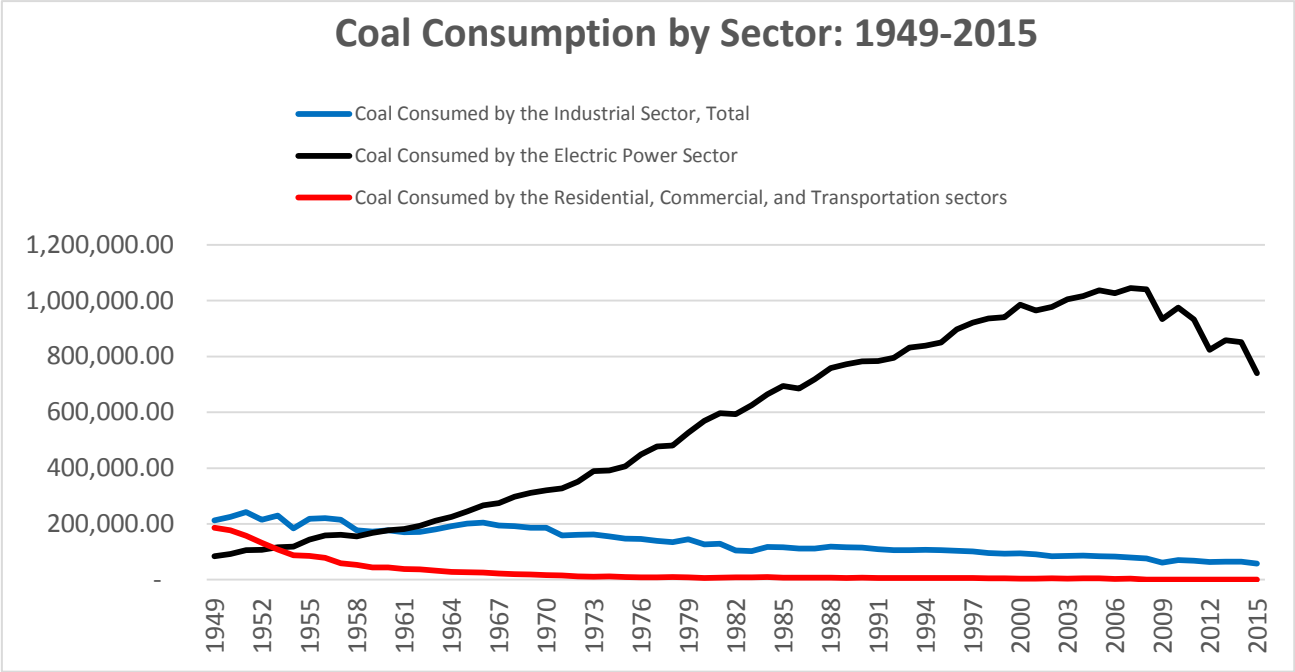
Using these average wages, the total annual wage impact of lost coal mining jobs, just through the end of 2016, is estimated to be a decline of some $186 million for 3,500 lost coal cluster jobs to $207 million for

4,000 lost jobs (of which $94 million is due to coal mining wages, and the remainder in due to declines in coal transportation and other coal cluster wages).

Coal Demand

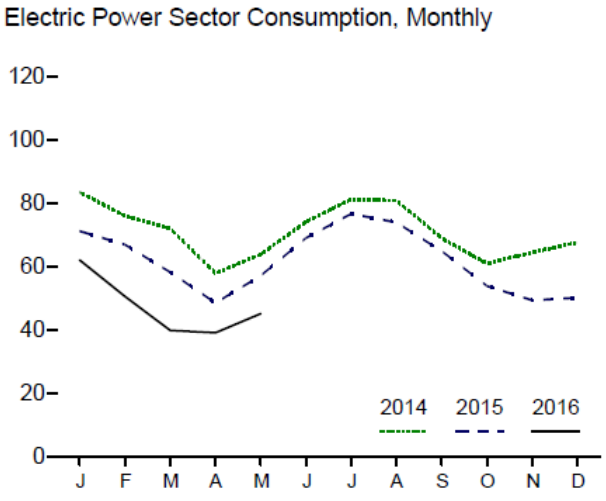
National demand for coal declined modestly since 2000 in all sectors except electricity production, where it expanded until 2008, and then began to fall rapidly (Figure 3). Looking at the last three years in detail, the electric power sector is showing what appears to be a negative structural shift in coal demand (Figure 4). Projections by the EIA and a range of independent analysts expect this shift in coal demand from the electric power sector to continue for many years to come.

Figure 3



Source: U.S. Energy Information Administration, *August 2016 Monthly Energy Review*, Release Date: August 26, 2016

Figure 4



Web Page: http://www.eia.gov/totalenergy/data/monthly/#coal.
Sources: Tables 6.1–6.2.

Responses from Coal Producers, Coal Consumers, and Affiliated Industries

To test SDG's analysis of secondary data, the team interviewed executives engaged in the coal economy in Indiana. We asked each interviewee a series of questions on the current and likely future state of the coal and electric generation industry and likely impacts on employment in Indiana. Table 16 below shows the responses from our interviews.

Table 16: SDG Team Interview Responses

Question	Producer Response	User Response	Affiliate Response
1. *The current state of coal production/use in Indiana?*	20 % or more ⇩	15 % or more ⇩	20 % or more ⇩
2. *Is coal employment stable, increasing, declining?*	Decreasing	Decreasing	Decreasing
3. Industry trends for the 18 months?	Decline then stable	Stable	Decline
4. *What are the threats to your industry that would affect employment?*	Competition, plant closures, Carbon dispatch[7]	CPP[8] marginal power sellers, low prices	Loss of coal production for any reason
5. *What is the likelihood that negative scenarios will occur?*	Equal likelihood	Not likely	Very likely
6. *What are the opportunities for employment growth in your industry?*	None for growth	None for growth	None for growth
7. Training and education to provide for your workforce needs in the next five years?	Replacement of aging workers	Replacement of aging workers	Basic job skills

The interviewees' responses generally supported the secondary data that the SDG team had reviewed. The coal industry in the US, encompassing production, consumption, transportation and affiliates is mature. Indiana coal production is nine companies located in ten counties. Agreement on most issues is common. Following are a few of the common concerns.

Current Excess Capacity: Coal producers all agreed that they have excess capacity that they would like to mine and sell. Indiana could produce more than 50 million tons per year with the existing workforce and infrastructure. Utilities agreed that the hazard of higher consumer prices, lower reliability and forced consolidation due to low revenues are ever present. Lower fuel prices are not providing much benefit to producers as they get passed through to the end-user.

Affiliates see a changing industry: Affiliates are concerned. By nature they react to industry needs and change when the needs change. During contractions, affiliates see their customers take work in-house or eliminate it. Volumes of work change, often bringing in national suppliers that had previously ignored the regional market.

An aging workforce: The workforce in coal related industries is aging out and will need extensive replacement in the next five years. This aging out could ease some of the dislocated worker challenges, but timing is a key issue. In uncertain economic times, workers often choose to work long past potential retirement dates. Job specific training for coal related jobs as well as training for displaced coal workers is

[7] Carbon dispatch – selecting the marginal power production by CO2 emissions in order from lowest to highest rather than by bid price of $/MWH

[8] Clean Power Plan – an EPA initiative, carrying force of law, that requires states to limit CO2 emissions so that a reduction of 32% below 2005 levels is achieved by 2030

needed. Displaced coal workers are drug free, hardworking, reliable, hardy workers. Any manufacturing, logistics, or repair facility would profit from their efforts.

Indiana's coal industry has the following characteristics:

- STRENGTHS - local, low cost, lower sulfur, lower chlorine
- WEAKNESSES - lower heating value, lack of barge access, no longwall mines
- OPPORTUNITIES – few, increase market share in Indiana and Ohio
- THREATS – subsidized renewables, Clean Air Plan, cheaper Illinois coal, cheaper Kentucky coal, loss of native load, marginal power sellers

Specific Electric Power Impacts

Electric power plants across the upper Midwest, plus Kentucky, have seen a substantial fall in coal receipts from 2008 through 2015 (Table 17). The drop in receipts over this length of time reflects a permanent decline in demand, driven by coal plant closures, conversion of coal plants to alternate fuels (primarily natural gas), and a decline in coal's competitiveness relative to natural gas and subsidized renewables in regional power dispatch markets. In light of the relatively stable production of Illinois Basin coal until 2014, most of the reductions in electric power coal receipts came from other basins (especially the Powder River Basin). However, electric power demand declines are now being felt by Illinois basin coal mines. A raft of power plant closures and conversions have been announced during 2015 and the first half of 2016, which will depress future coal demand even further. It is important to note that Indiana (and Ohio) electric power plants saw particularly large reductions in coal receipts over this period.

The State of Coal-Fired Power Plants: In a stable market for coal-fired generation, power plants are replaced on a 30-year schedule. Time and the heating/cooling cycles age the equipment. Necessary capital improvements increase with technology and with age, accelerating after year 25. Pollution control has mandated additional capital costs. The average age of coal fired plants in MISO[9], the Indiana electricity-generating region, is 44 years.

Utilities have stopped building coal-fired generation. The list[10] of 236 projects nationally shows 17 active, 30 progressing and 189 cancelled. Factors that have influenced that decision are: emission regulations from the U.S. Environmental Protection Agency, comparative cost, the future of carbon emissions, lack of available capital, and availability of alternatives. As utilities have moved to a deregulated environment, beginning in 1992, pricing of uncertainty into CAPEX[11] decisions has caused coal-fired generation to become less desirable. If coal fired plants are not base loaded, that is provided with a native load that causes operation to exceed 85% of capacity, the economics of coal power collapses.

Coal fired generation economics are best when large units (boiler/turbine) are operated at near capacity. Near capacity operation allows optimization of coal logistics and handling; using design features (component redundancy, built-in excess design) keeps the units near peak capacity. Any reduction in heating/cooling cycles lengthens the life of the unit and reduces operating and maintenance costs. When required to compete with wind/solar/natural gas, coal's unit cost rises dramatically. Solar and wind power subsidized and natural gas has a $5.50/MW advantage due to no handling costs and low O&M[12] costs.

No new coal fired plants and an aging fleet of existing coal fired generation is not a good scenario for future coal production. Although the large wave of coal plant retirements based on recent conditions

[9] Mid-Continent System Operator Inc. – Independent, member owned organization that administers wholesale electricity markets
[10] Sierra Club – "Stopping the Coal Rush" October 2015
[11] CAPEX – Capital expenditures – the trading of cash for assets by a company. Building something of lasting value, which then becomes part of the asset base that is depreciated according to a schedule set by the IRS.
[12] O&M – Operating and Maintenance

appears to have paused after 2016,[13] much of the damage is done. The last six years saw nearly 70,000 MW of coal fired generation retired. The next 18 years forecast another 46,000 MW of coal fired generation to retire. The future year reduction in coal consumption (11.25 mm tpy[14]) is more balanced with the forward supply dynamics (mine closures due to depletion). The last six years saw a potential market shrinkage of 318 million tons of coal. The future of coal in Indiana will mimic the future of coal in Kentucky more than in Illinois. Illinois mines are larger and more efficient as a general rule and lower in cost. Cost will determine who survives.

Consolidation and privatization will likely prevail. Coal companies will probably be larger, more efficient and owned by private equity as opposed to publicly traded companies. This likely means fewer employees, more technical jobs, higher salaries and more outsourcing. It is conceivable that coal companies will strive for the two-employee model; miner and billing clerk. All else will likely be outsourced.

How future reduced demand for coal by electric power plants will be allocated among basins, and within the Illinois Basin among states, will be determined by a range of coal mine company decisions, market price trends, and, of course, federal and state policies. It is difficult to make a plausible case for a return to robust Indiana coal production at previous levels. Indeed, we fully anticipate a new and lower equilibrium volume to reestablish over the next two to three years as high cost mines are closed, mining company bankruptcies are resolved, and federal environmental and energy policies become clearer.

Table 17: Coal Receipts by Electric Power Plants by State, 2008-2015 (thousand short tons, %)

	2008	2009	2010	2011	2012	2013	2014	2015	Change 2008-15 (%)
Illinois	57,397.5	52,320.3	55,603.5	63,559.7	58,844.2	57,315.3	60,499.9	53,382.8	-7.0%
Indiana	60,620.7	57,886.7	54,086.9	43,615.1	36,671.8	36,386.5	40,628.4	34,855.7	-42.5%
Kentucky	41,399.4	41,003.0	40,770.8	41,473.4	39,483.1	39,160.8	38,741.3	40,529.2	-2.1%
Michigan	37,259.5	35,881.6	35,627.2	33,215.5	29,432.2	29,181.1	30,660.5	28,613.4	-23.2%
Ohio	57,992.1	50,578.9	50,814.0	44,497.0	34,736.0	37,589.7	39,614.8	31,288.5	-46.0%
Wisconsin	25,077.2	22,382.4	23,262.9	22,841.2	19,356.9	21,994.1	21,304.7	22,528.5	-10.2%
6 State Totals	279,746.4	260,052.9	260,165.1	249,201.4	218,524.3	221,627.5	231,449.6	211,198.1	-24.5%

Coal Demand Impact of Recent Indiana Coal-based Power Plant Closures

In 2008, the EIA reported 26 active Indiana-based coal-using electric power plants (excludes industrial, commercial and institutional, and plants used exclusively for heat). By the beginning of 2015, only 19 were still in operation. The seven closed facilities were shut down in the 2011-12 time-frame. An eighth plant closed two of its four generating units in 2012. Of the 19 remaining active plants at the beginning of 2015, two plants were shut down in early 2015, and three were shut down in early 2016.[15] (Table 18).

Using an average of 2009 and 2010 coal receipts as a benchmark for coal demand by the 2011-12 plant closures and 2013 and 2014 coal receipts as a benchmark for coal demand by the five 2015/16 closures, the closed plants represent 3.1 and 3.9 million tons per year respectively, or about 12.3% of 2008-10 average demand for coal by Indiana electric power plants. These are not capacity values, many plants in the Indiana fleet (open or closed) have or had the capacity to run at much higher levels than they average over a year. However, assuming past average behavior and ignoring all other variables, we can assume that

[13] John Hanou, Hanou Energy Consulting, LLC

[14] Tons per year

[15] This analysis ignores the closure of the original Edwardsport coal plant and its replacement with a new IGCC plant by treating it as one coal consuming location.

we have seen at least a seven million ton per year permanent decline in Indiana's coal demand, based on closures alone.

It is important to note that this seven million tons is only a fraction of the decline in coal receipts by Indiana electric power plants. Recall that receipts have fallen from 60.6 million tons in 2008 to 34.9 million tons in 2015 – some 25.8 million tons. Every operating plant except the new IGCC at Edwardsport and the Alcoa/Vectren operation at Warrick saw a significant decline in coal receipts from 2008-2015. These declines primarily reflect failures to clear in their respective electric power markets with competitive prices against natural gas and subsidized renewables.

Table 18: Coal Receipts by Indiana-Based Electric Utility Plants: 2008-2015 (short tons)

Plant Name	2008	2009	2010	2011	2012	2013	2014	2015	Change 2008-15	%
State Line Energy*	1,923,268	1,700,050	1,920,826	1,856,888					(1,923,268)	(100)
Clifty Creek	4,803,852	6,138,896	3,868,689	5,349,473	3,762,538	2,300,723	2,893,013	2,795,810	(2,008,042)	(42)
Tanners Creek*	2,197,700	1,345,600	1,843,795	436,785	395,732	538,539	597,506	132,493	(2,065,207)	(94)
Harding Street*	1,711,672	1,648,487	1,619,422	1,701,019	1,535,151	1,933,894	1,727,695	1,391,607	(320,065)	(19)
Eagle Valley (IN)*	658,398	541,336	664,420	585,894	96,533	305,785	370,630	118,307	(540,091)	(82)
CC Perry K*	184,948	161,741	187,899	172,294					(184,948)	(100)
AES	5,368,573	5,540,569	5,143,047	4,792,537	4,576,898	4,948,846	5,066,265	4,687,727	(680,846)	(13)
Petersburg										
Bailly	1,106,904	1,124,441	1,005,757	1,138,082	967,675	1,044,534	1,062,758	879,533	(227,371)	(21)
Michigan City	1,292,209	1,072,544	1,344,835	1,454,915	1,225,781	1,114,660	1,530,533	1,001,995	(290,214)	(22)
Cayuga	2,977,872	2,558,764	2,454,258	2,707,958	2,231,202	2,439,989	2,322,914	2,199,339	(778,533)	(26)
Edwardsport	193,608	12,286	83,701	19,202		453,572	1,101,837	1,126,764	933,156	482
R Gallagher**	1,313,415	706,236	1,157,305	351,001	168,616	244,354	664,596	170,301	(1,143,114)	(87)
Wabash River*	2,268,341	1,618,503	1,377,464	1,780,221	878,497	1,087,989	986,298	936,583	(1,331,758)	(59)
F B Culley	1,196,880	820,596	886,010	739,765	735,090	800,235	825,787	803,085	(393,795)	(33)
Crawfordsville Power Plant*	19,798	356		375					(19,798)	(100)
Logansport*	99,144	81,509	79,046	89,650					(99,144)	(100)
Peru (IN)*	29,455	4,514	224	537					(29,455)	(100)
Whitewater Valley*	228,907	155,018	118,825	87,595		9,462	18,983		(228,907)	(100)
Frank E Ratts	768,480	758,253	625,144	426,362	472,924	136,908	178,805	5,013	(763,467)	(99)
R M Schahfer	5,416,434	4,576,029	5,080,113	4,452,292	3,687,603	3,616,867	4,658,960	3,627,402	(1,789,032)	(33)
Gibson	10,066,755	9,488,620	8,681,275	7,732,811	7,996,236	8,429,119	8,185,671	7,602,125	(2,464,630)	(24)
A B Brown	1,546,921	1,275,096	1,011,409	1,038,441	1,042,667	909,957	1,652,743	1,216,945	(329,976)	(21)
Rockport	10,517,200	10,816,500	8,582,606	825,279	1,028,303	993,991	1,209,133	771,911	(9,745,289)	(93)
Merom	2,644,928	3,551,390	3,462,497	3,017,198	3,141,704	2,492,499	2,716,189	2,531,100	(113,828)	(4)
Jasper 2*	39,425	4,026	217	199					(39,425)	(100)
Warrick	2,045,632	2,185,314	2,888,120	2,858,356	2,728,607	2,584,542	2,858,132	2,857,637	812,005	40
TOTAL	**60,620,719**	**57,886,674**	**54,086,904**	**43,615,129**	**36,671,757**	**36,386,465**	**40,628,448**	**34,855,677**	**(25,765,042)**	**(43)**

Source: U.S. Energy Information Administration. http://www.eia.gov/beta/coal/data/browser/

Note: Includes only Electric Utility power plants that use any type of coal from any source. These plants may use other fuels as well. Note: 2015 data may include preliminary values.

*Closed as of June 2016.

**Two of four units closed.

Demand Impact of Prospective Indiana Coal-based Power Plant Closures

Indiana plant closures due to existing regulatory and other factors are largely complete in 2016. However, under a range of conditions, publically released scenarios by Indiana-based utilities suggest that the next potential wave of closures in Indiana fall in the 2018-2020 and 2021-2025 time frames.

Major drivers and uncertainties include:

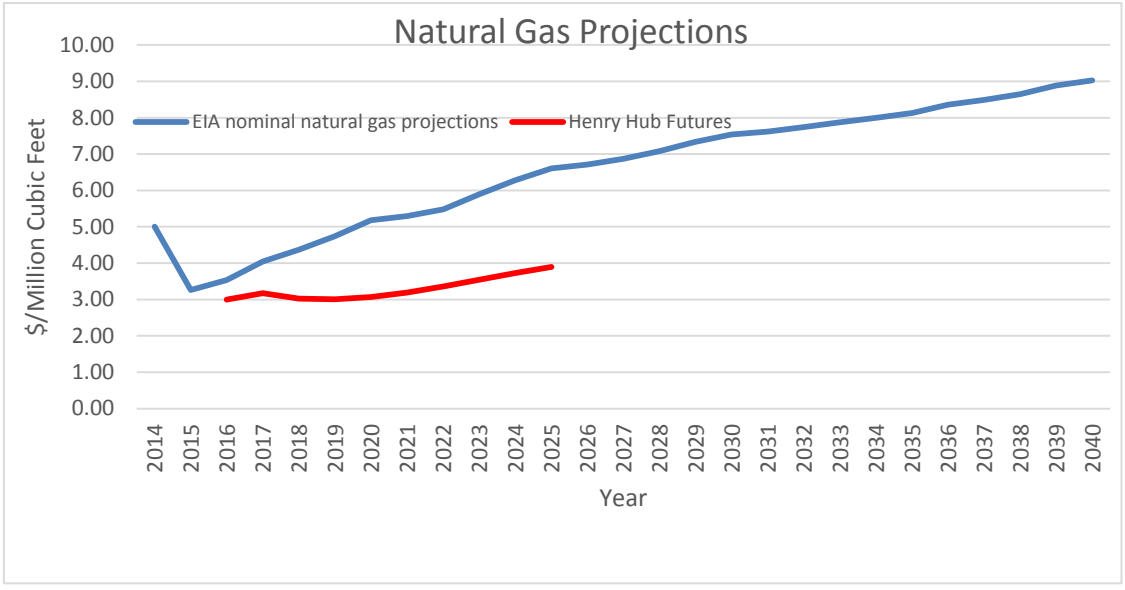
- New environmental regulations - especially CO2 rules
- Price of natural gas
- Electric power dispatching rules (utilities no longer produce to demand in their service territories, but in response to market clearing auctions)
- Slow growth in electric power demand

As noted above, closures account for only a modest share of the recent decline in coal receipts by Indiana coal-fired electric power plants. Most is due to the inability of coal plants to clear in the regional electricity auctions against competing sources. This is partly due to the cost burden of recent environmental investments, aging coal-based power plants, and the growth of subsidized renewables in the supply mix. More importantly, the price of natural gas has been so low that gas-powered plants are the new low cost producers (even plants designed primarily for peaking are being used for baseload).

Detailed competitive data are very difficult to uncover, are plant specific, and are viewed as proprietary by the utilities. In general, at $6/million per cubic feet (MMCF) for natural gas, coal is very competitive; at $3/MMCF, coal is challenged, with many plants operating marginally or at a loss. Most of the publically available projections (in rate cases and Integrated Resource Plans) by Indiana utilities rely on EIA or other more-or-less official projections of natural gas prices. Unfortunately, these projections have proven to be much higher than what the market is creating. Even though futures markets are very thin beyond 2020, the gap between market prices and EIA/utility projections is wide and growing (Figure 5).

Natural gas futures prices are around $3/MMBTU out through 2020 (the spot price week ending July 20, was $2.72/MMBtu), rising towards $4/MMBtu in 2025.

Figure 5



Source: EIA, *Annual Energy Outlook 2016*, May 2016; Henry Hub Futures, CME Globex

If these market forces persist, a range of power plants will face significant economic pressure, compounded by whatever new environmental rules may emerge, resulting in even further declines in demand for coal. MISO anticipates that dispatching of coal plants across the region will continue to decline from current levels, by 20% or even as much as 50%. This decline in projected coal power dispatching is inconsistent with the more or less flat EIA coal production projections for Illinois Basin coal assuming the CPP is not implemented. With CPP implemented, dispatching of coal power will decline even further and we will see an acceleration of coal based power plant closures. Note that the EIA projects Illinois Basin coal production will suffer far less than Western and Appalachian coal basins.[16]

Key drivers and Wild cards

Exports: For a number of years the industry has explored the potential of exporting of Indiana coal (Illinois basin coal in general), whether via the Gulf or a new rail link connecting to Port of Indiana - Burns Harbor for shipment via the St. Lawrence Seaway. As discussed above, considerable skepticism exists about this prospect generating a significant boost to Indiana's coal production.

Substitution of Illinois Basin coals in scrubbed power plants: With scrubbers required on all coal plants, some now using PRB coal can use Illinois Basin coal. Some boiler designs limit the amount of Illinois Basin coal that can be blended. This substitution of Illinois Basin coal for coal from other basins seems to be one of the key factors in the EIA's forecast of coal production, in which all basins face dramatic declines except the Illinois basin. The degree of substitution of Illinois Basin coals for PRB or Eastern coals will be driven by mine production cost, transportation cost, and technical considerations for blending or substitution.

Accelerated closure of nuclear power plants: Many of the market pressures impacting baseload coal are also impacting nuclear power. Announced nuclear plant closures are far above those included in the EIA's long term outlook. This puts particular pressure on MISO's need for reliable baseload. How this plays out in the demand for coal-based power remains to be seen.

Dispatching Rules: MISO, and other regional authorities, are exploring and modifying market rules that currently appear to be biased against long-term baseload stability and reliability. This could help coal dispatching. At the same time, the CPP and other efforts to regulate CO2 could result in dispatching rules based more on CO2 emissions than least cost – hurting coal. How this sorts out could significantly impact dispatching of coal based electricity production.

Potential Near-Term Power Plant Closures

In light of the very low actual and anticipated natural gas prices compared to those assumed in the baseline projections by Indiana utilities in their respective integrated resource plans (IRPs), the team reviewed the alternative scenarios that assumed lower natural gas prices. Longer term, utilities plan to extend the use of their coal assets as long as economically and politically feasible, but do not include new coal investments in any of their most likely scenarios through 2035. For this analysis, we focused on the 2019-2025 closure risks, not the longer term decline in the use of coal for U.S. electric power production.

The SDG team discussed these scenarios with a range of utility executives, to ensure that we did not misinterpret their published analyses. However, these discussions cannot be assumed to be a confirmation of SDG's risk analysis. Each utility continuously evaluates the value of all producing assets in light of current and anticipated market conditions. Closure and investment decisions are never taken lightly, and Indiana utilities are in a window during which past closures are being absorbed and decisions on future closures do not have to be locked in until roughly 2018, unless conditions change significantly.

So, this report does not provide a hard forecast, but rather an assessment of potential closures based on the utilities' own published scenarios under conditions of low natural gas prices and no easing of existing

[16] EIA, *Annual Energy Outlook 2016 Early Release: Annotated Summary of Two Cases*, May 17, 2016, pp. 36-37.

environmental rules. Implementation of the CPP or other more stringent environmental rules could accelerate the closure timelines suggested below.

Including those units at risk of closure incorporated in the respective utilities' baseline projections, SDG's analysis suggests a number of additional coal-fired units are at risk of closure in the 2019-2020, and 2021-2025 time frames. Low natural gas prices make these prospective closures more likely and, indeed, could accelerate the closure window. These risks range from highly probable, to significant risk, to increasingly likely. It is important to note that events have already overcome the projections in this report. Within days of completion, NIPSCO announced the probable closure of four of its coal-fired generating units over the next seven years – two as early as mid-2018 and the remaining two in 2023. Only one of these units was included in this report's projections, and it was in the 2021-2025 timeframe.[17]

2019-2020

- F B Culley 2
- R Gallagher 2&4
- Gibson 5 (maybe Gibson 1)
- Cayuga (both units)
- AES Petersburg 1 (maybe Petersburg 2)

2021-2025

- Whitewater Valley (used for peaking only)
- Bailly 7
- Trimble County 1 (across border in KY)
- AES Petersburg 2 (maybe Petersburg 4)

Those plants that face strong potential for closure represent significant coal demand (even at current lower dispatch levels), which will ripple through the coal value chain. Table 19 provides a summary of the potential coal unit closures identified in the two planning windows and the associated decline in demand for Illinois Basin coals. One plant just over the border in Kentucky, partly owned by IMPA is included in this list. Estimated impact on coal mining and other coal cluster employment is also provided based on the modeling factors estimated above.

If these closures come to fruition in the 2019-2025 time frame, they will result in a decline of some 785-1,090 coal mining jobs, and at least another 1,620-2,250 coal related jobs, totaling some 2,400-3,340 dislocated workers (ignoring cross-state impacts, equipment related support and sales, and coal customer related dislocations, e.g., power plant closures). Of this total some 61%-64% would occur by 2020.

It is important to recall that this estimate does not account for any declines in the dispatching of coal-based power plants beyond the potential closures. The potential closures represent some 23%-32% of 2015 coal receipts. If one assumes that coal receipts roughly reflect dispatched coal-based power, this is in the range of reduced coal dispatching mentioned in MISO public statements for their region as a whole, absent implementation of the CPP. Without more detailed information, SDG has assumed that dispatching rates more or less align with the potential closures, and indeed, probably force the closures.

In summary, estimated current coal cluster job displacements total some 3,500-4,000 workers. Some of these adjustments are still being felt, but will play out over the rest of 2016 into 2017 and beyond as dispatching of coal power remains challenged and employers are forced to release excess workers that coal demand can no longer support. By the end of 2017 and into 2018, market conditions will drive utility decisions on base load investments/closures. Even without implementation of the CPP, continued low natural gas prices will drive many if not most of the potential closures identified above.

[17] See NIPSCO Press Release, Aug. 23, 2016, "NIPSCO Analyzes Future Plans for Electric Generation."

Based on this risk analysis, the next wave of coal unit closures should begin no later than 2019, with one or two potentially pulled forward into 2018. This wave could result in job losses by 2020 in the 1,500- 2,200 position range, with an additional 900-1200 job losses during 2021-2025.

Table 19

Coal fired electric power units at risk of closure, based on 2014/15 IRPs and interviews*

	At Risk Unit % of Plant capacity Baseline	At Risk Unit % of Plant capacity High	Illinois Basin Coal Share	Average coal receipts, total plant, 2013-15 (short tons)	Coal Demand Decline due to closures, Baseline	Coal Demand Decline due to closures, High (short
2019/20						
F B Culley 2	22.1%		100%	809,702	179,070	179,070
R Gallagher 2&4	100.0%		100%	359,750	359,750	359,750
Gibson 5 (maybe Gibson 1)	20.1%	39.9%	100%	8,072,305	1,623,666	3,221,763
Cayuga (both units)	100.0%		100%	2,320,747	2,320,747	2,320,747
AES Petersburg 1	13.5%		100%	4,900,946	663,089	663,089
2021/25						
Whitewater Valley (peaking only)	100.0%		100%	9,482	9,482	9,482
Bailly 7	31.5%		70%	995,608	219,595	219,595
Trimble County 1 (KY side of border)	40.3%		100%	3,462,800	1,397,079	1,397,079
Petersburg 2 (maybe 4)	25.1%	55.8%	100%	4,900,946	1,232,498	2,735,047
Total coal demand losses in planning horizon					**8,004,978**	**11,105,623**
Implied coal mine Employment decline					**785**	**1,089**
Implied coal related employment decline					**1,621**	**2,249**
Implied total coal cluster employment decline					**2,406**	**3,338**

*Based on multiple scenarios, some planned, others highly likely or with significant probability.

**Not all Indiana coals.

Appendix Materials

Estimating Occupational Mix of Projected Job Losses due to Coal Volume Declines

It is possible to create a rough estimate of the occupational mix of dislocated coal cluster workers. This section provides the methodology and adjustment factors for creating these estimates.

The data used for this analysis is the OES research estimates for the occupation mix of the relevant coal related NAICS codes. For simplicity, SDG uses the 2015 CES-Research Estimates of occupation distribution to estimate the types of individuals that may be dislocated due to coal mine closures and decreases in output.

The approach is to take the employment impact estimated above (say for a 1,000,000 ton decline in coal mining, resulting in a decline of 98.1 employees) and allocate them to the 2015 occupational distribution ("pct tot") for coal mining in Table 20. The final column provides an estimate of the distribution of the dislocated workers by occupation code. Using the factors calculated in Table 14 above, any change in projected coal production can be translated into job changes in each of the calculated coal cluster subsectors. Those total job impacts by subsector can then be distributed as estimated in the 1,000,000 ton example for coal mining jobs.

The following tables provide occupational distributions for each of the coal cluster subsectors for which we have data. We do not carry the 1,000,000 ton example through each table. The coal mining occupational distribution clearly reveals the high skill levels among potentially displaced mining employees. This skill mix differs across the coal cluster, but each sub-cluster contains a significant share of highly skilled technical workers. They might lack appropriate certifications to qualify for work in manufacturing plants and elsewhere but have the skills to transition. These dislocated workers should be highly desirable by basic employers: a large share will have strong technical skills (that will likely require training for new certifications) and most of them will be able to pass a drug test, have high work ethic, and have worked under strenuous and dangerous conditions.

Table 20: Indiana Coal Mining (NAICS 212100): Occupational Distribution, 2015

occ code	occ title	group	tot_emp	pct_tot	jobs / 1mil ton coal change
00-0000	All Occupations	total	3,540	100.00	98.1
11-0000	Management Occupations	major	140	3.95	3.9
11-1021	General and Operations Managers		80	2.26	2.2
13-0000	Business and Financial Operations Occupations	major	70	1.98	1.9
17-0000	Architecture and Engineering Occupations	major	160	4.52	4.4
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers		30	0.85	0.8
43-0000	Office and Administrative Support Occupations	major	140	3.95	3.9
47-0000	Construction and Extraction Occupations	major	1,430	40.40	39.6
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers		80	2.26	2.2
47-2073	Operating Engineers and Other Construction Equipment Operators		570	16.10	15.8
47-2111	Electricians		120	3.39	3.3
47-5021	Earth Drillers, Except Oil and Gas		**	**	**
47-5041	Continuous Mining Machine Operators		130	3.67	3.6
47-5061	Roof Bolters, Mining		200	5.65	5.5
47-5081	Helpers--Extraction Workers		270	7.63	7.5
49-0000	Installation, Maintenance, and Repair Occupations	major	500	14.12	13.9
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers		50	1.41	1.4
49-3042	Mobile Heavy Equipment Mechanics, Except Engines		120	3.39	3.3
49-9043	Maintenance Workers, Machinery		70	1.98	1.9
49-9071	Maintenance and Repair Workers, General		110	3.11	3.1
51-0000	Production Occupations	major	270	7.63	7.5
51-1011	First-Line Supervisors of Production and Operating Workers		60	1.69	1.7
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders		70	1.98	1.9
53-0000	Transportation and Material Moving Occupations	major	770	21.75	21.3
53-7011	Conveyor Operators and Tenders		70	1.98	1.9
53-7032	Excavating and Loading Machine and Dragline Operators		**	**	**
53-7033	Loading Machine Operators, Underground Mining		130	3.67	3.6
53-7051	Industrial Truck and Tractor Operators		**	**	**

Note: Total and Major Categories include items not displayed

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Coal Mining Support: Mining Support Activities (NAICS 213000) are not identified by commodity mined in the OES estimates. If we assume that coal support activities share the same ratio that coal mining does to total mining (ex oil & gas), then total employment can be estimated as in Table 21. These are the values incorporated into Table 13 above.

Table 21: Allocation of Mining Support Activities (NAICS 213000) to Coal Cluster Indiana, 2012-2015

Year	Coal mining share of all Mining (ex Oil & Gas)	Total Employment Mining Support Activities	Coal share of Mining Support Activities Employment
2012	0.582	430	250
2013	0.586	440	258
2014	0.596	610	364
2015	0.587	580	340

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

As above, one can estimate the change in Coal Mining Support Activities employment based on a projected change in coal output. That estimate can then be used to project the occupational distribution of dislocated workers in Mining Support Activities, based on the OES research estimates (Table 13 above). The process is the same as described for coal mining above, with some caveats. First SDG is assuming that the general coal related occupation mix is the same as for the entire NAICS 213000 (Table 22). Second, an adjustment will need to be made for certain oil and gas workers explicitly identified. These subcategories will not be used in the distribution estimates, but will reduce the major category 47-0000 by 80 and allocate that 80 proportionally to the other major categories.

Table 22: Indiana Mining Support Activities (NAICS 213000): Occupational Distribution, 2015

occ code	occ title	group	tot_emp	pct_tot
00-0000	All Occupations	total	580	100.00
11-0000	Management Occupations	major	50	8.62
43-0000	Office and Administrative Support Occupations	major	90	15.52
43-9061	Office Clerks, General		40	6.90
47-0000	Construction and Extraction Occupations	major	310	53.45
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers		**	**
47-5011	Derrick Operators, Oil and Gas		40	6.90
47-5012	Rotary Drill Operators, Oil and Gas		40	6.90
47-5071	Roustabouts, Oil and Gas		**	**
49-0000	Installation, Maintenance, and Repair Occupations	major	70	12.07
49-9041	Industrial Machinery Mechanics		50	8.62
53-0000	Transportation and Material Moving Occupations	major	**	**

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Coal Transportation

Transportation Analysis: There is no obvious source for identifying employees involved in coal transportation. Most transportation employment data is reported by transportation mode, rail, air, truck, etc. The most recent detailed transportation analysis by state and by commodity was the 2012 Commodity Flow Survey. The survey does not address employment, but does provide useful information concerning coal transport in Indiana that we used to estimate employment impacts (Table 13).
Though relatively small in terms of total value of shipments, coal represented nearly 12% of the tonnage shipped of all commodities – some 9% of trucking, over 30% of rail, and almost 40% of multimodal truck/rail. These shares were used to allocate transportation sector employees to the coal cluster, as reported in Table 13 above.

Since the 2012 survey focused on shipping of all commodities by mode, the proper comparisons from the OES research estimates is all truck transportation, all rail, and all multimodal. For the latter, we choose to be conservative and allocate coal tonnage 64% rail/36% truck, ignoring the multimodal component. For any change in coal volume demand, we can then translate it to tonnage carried by rail or truck. (Table 23) The tonnage share can then be translated into jobs in the various components of the coal transportation sector reported in the *CES Estimates*.

Table 23: Indiana Shipping Values and Volumes, All Commodities and Coal by Mode: 2012
($ Millions, Short tons, %)

Mode	All Commodities		Coal		Coal Share of All Commodities	
	Value	Volume	Value	Volum	Value	Volume
All modes	$393,998	324,668	$1,723	38,233	0.4%	11.8%
Single modes	$346,036	316,081	$1,563	34,810	0.5%	11.0%
Truck	$302,165	246,671	$967	22,275	0.3%	9.0%
For-hire truck	$226,205	162,078	$909	21,451	0.4%	13.2%
Private truck	$75,960	84,593	$0	0		
Rail	$17,975	41,382	$596	12,534	3.3%	30.3%
Water	$1,217	9,234				
Inland water	$169	5,617				
Multiple Waterways	$1,048	3,618				
Air (incl. truck and air)	$7,489	0				
Pipeline	$0	18,708				
Multiple modes	$47,962	8,588	$161	3,424	0.3%	39.9%
Parcel, U.S.P.S. or courier	$40,853	461				
Truck and rail	$6,900	7,508	$137	2,973	2.0%	39.6%
Truck and water	$191	0	$0	0		
Rail and water	$0	0	$0	0		

Source: 2012 Commodity Flow Survey (CFS), *Shipment Characteristics by Origin Geography by Commodity by Mode: 2012*

Coal Transportation: Trucking*:* Table 24 displays the occupational distribution of truck transportation for 2015. Assuming the 2012 volume distribution holds in 2015 and that volume share is the appropriate benchmark for allocating employees, then 9 percent of 54,700 employees can be allocated to the coal transportation sector, some 4,926 employees in 2015 (reported in Table 13 above for 2012 to 2015). Using the same methodology, this coal truck transportation employment can then be allocated among occupations according to the distribution in the pct_tot column.

Table 24: Indiana Occupational Distribution: Truck Transportation: 2015

occ code	occ title	group	tot_em	pct_to
00-0000	All Occupations	total	54,700	100.00
11-0000	Management Occupations	major	1,770	3.24
11-1011	Chief Executives		80	0.15
11-1021	General and Operations Managers		720	1.32
11-2022	Sales Managers		40	0.07
11-3011	Administrative Services Managers		50	0.09
11-3021	Computer and Information Systems Managers		50	0.09
11-3031	Financial Managers		100	0.18
11-3071	Transportation, Storage, and Distribution Managers		640	1.17
11-9199	Managers, All Other		40	0.07
13-0000	Business and Financial Operations Occupations	major	1,170	2.14
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products		30	0.05
13-1051	Cost Estimators		80	0.15

13-1071	Human Resources Specialists		270	0.49
13-1081	Logisticians		170	0.31
13-1111	Management Analysts		40	0.07
13-1151	Training and Development Specialists		190	0.35
13-1161	Market Research Analysts and Marketing Specialists		30	0.05
13-1199	Business Operations Specialists, All Other		50	0.09
13-2011	Accountants and Auditors		240	0.44
15-0000	Computer and Mathematical Occupations	major	420	0.77
15-1121	Computer Systems Analysts		50	0.09
15-1131	Computer Programmers		60	0.11
15-1142	Network and Computer Systems Administrators		60	0.11
15-1151	Computer User Support Specialists		100	0.18
15-1199	Computer Occupations, All Other		**	**
29-0000	Healthcare Practitioners and Technical Occupations	major	170	0.31
29-9011	Occupational Health and Safety Specialists		130	0.24
29-9012	Occupational Health and Safety Technicians		**	**
37-0000	Building and Grounds Cleaning and Maintenance Occupations	major	160	0.29
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners		150	0.27
41-0000	Sales and Related Occupations	major	660	1.21
41-3099	Sales Representatives, Services, All Other		550	1.01
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and		40	0.07
43-0000	Office and Administrative Support Occupations	major	7,190	13.14
43-1011	First-Line Supervisors of Office and Administrative Support Workers		310	0.57
43-3011	Bill and Account Collectors		150	0.27
43-3021	Billing and Posting Clerks		310	0.57
43-3031	Bookkeeping, Accounting, and Auditing Clerks		830	1.52
43-3051	Payroll and Timekeeping Clerks		50	0.09
43-4051	Customer Service Representatives		810	1.48
43-4151	Order Clerks		**	**
43-4161	Human Resources Assistants, Except Payroll and Timekeeping		40	0.07
43-4171	Receptionists and Information Clerks		90	0.16
43-5011	Cargo and Freight Agents		90	0.16
43-5032	Dispatchers, Except Police, Fire, and Ambulance		2,060	3.77
43-5061	Production, Planning, and Expediting Clerks		80	0.15
43-5071	Shipping, Receiving, and Traffic Clerks		150	0.27
43-5081	Stock Clerks and Order Fillers		220	0.40
43-6011	Executive Secretaries and Executive Administrative Assistants		60	0.11
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive		480	0.88
43-9061	Office Clerks, General		1,270	2.32
47-0000	Construction and Extraction Occupations	major	60	0.11
47-2073	Operating Engineers and Other Construction Equipment Operators		**	**
49-0000	Installation, Maintenance, and Repair Occupations	major	3,380	6.18
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers		250	0.46
49-3021	Automotive Body and Related Repairers		60	0.11
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists		2,780	5.08
49-9071	Maintenance and Repair Workers, General		150	0.27
49-9098	Helpers--Installation, Maintenance, and Repair Workers		90	0.16
51-0000	Production Occupations	major	**	**
53-0000	Transportation and Material Moving Occupations	major	39,260	71.77

53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	350	0.64
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle	1,280	2.34
53-3031	Driver/Sales Workers	1,040	1.90
53-3032	Heavy and Tractor-Trailer Truck Drivers	30,990	56.65
53-3033	Light Truck or Delivery Services Drivers	690	1.26
53-6051	Transportation Inspectors	60	0.11
53-7051	Industrial Truck and Tractor Operators	1,220	2.23
53-7061	Cleaners of Vehicles and Equipment	50	0.09
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	3,440	6.29

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Coal Transportation - Rail: An analogous process applies to rail transportation. Assuming the 2012 volume distribution holds in 2015 and that volume share is the appropriate benchmark for allocating employees, then 30.3 percent of 6,060 employees can be allocated to the coal transportation sector in 2015 --some 1,836 employees. Total rail transportation employment estimates for 2012-2015 are reported in Table 13 above. These can then be allocated among occupations according to the distribution in the pct_tot column in Table 25. The projection adjustment factor is calculated and reported as above.

Table 25: Indiana Rail Transportation (NAICS 482000): Occupational Distribution, 2015

Occ_code	occ title	group	tot_emp	pct_tot
00-0000	All Occupations	total	6,060	100.00
11-0000	Management Occupations	major	180	2.97
33-0000	Protective Service Occupations	major	40	0.66
43-0000	Office and Administrative Support	major	270	4.46
43-5032	Dispatchers, Except Police, Fire, and		70	1.16
47-0000	Construction and Extraction Occupations	major	380	6.27
47-1011	First-Line Supervisors of Construction Trades and Extraction		120	1.98
47-2111	Electricians		30	0.50
47-4061	Rail-Track Laying and Maintenance Equipment Operators		190	3.14
49-0000	Installation, Maintenance, and Repair	major	1,050	17.33
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers		130	2.15
49-3031	Bus and Truck Mechanics and Diesel Engine		130	2.15
49-3043	Rail Car Repairers		330	5.45
49-9071	Maintenance and Repair Workers, General		30	0.50
49-9097	Signal and Track Switch Repairers		120	1.98
51-0000	Production Occupations	major	140	2.31
51-4041	Machinists		90	1.49
53-0000	Transportation and Material Moving	major	3,940	65.02
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators		250	4.13
53-4011	Locomotive Engineers		1,690	27.89
53-4021	Railroad Brake, Signal, and Switch		280	4.62
53-4031	Railroad Conductors and Yardmasters		1,370	22.61
53-4099	Rail Transportation Workers, All Other		**	**
53-7062	Laborers and Freight, Stock, and Material Movers, Hand		70	1.16

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Support Activities for Coal Transportation - Trucking and Rail*:* Among the major subcategories of Support Activities for Transportation (NAICS 488000), we chose to work with a subset of Freight Transportation Arrangement (NAICS 488500) and Other Support Activities for Transportation (NAICS 488900) to allocate to trucking and rail transportation in the coal cluster. For trucking, we also allocated a subset of employees in Support Activities for Road Transportation (NAICS 488400) to trucking then to coal. For rail we worked with Support Activities for Rail Transportation (NAICS 488200). The methodology is the same as above – apply 9 percent to coal related truck employment and 30.3 percent to coal related rail transport to estimate coal cluster jobs, then calculate an adjustment factor for projecting employment impacts from coal volume changes, which could then be allocated among occupations. All of the estimates for 2012-2015 are summarized in Table 13 above. The Occupational distributions for these three coal related NAICS are provided in Tables 26-29.

Table 26

Indiana Freight Transportation Arrangement (NAICS 488500): Occupational Distribution, 2015

occ code	occ title	group	tot_emp	pct_tot
00-0000	All Occupations	total	2,040	100.00
11-0000	Management Occupations	major	170	8.33
11-1021	General and Operations Managers		60	2.94
11-3071	Transportation, Storage, and Distribution Managers		80	3.92
13-0000	Business and Financial Operations Occupations	major	70	3.43
41-0000	Sales and Related Occupations	major	320	15.69
41-3099	Sales Representatives, Services, All Other		280	13.73
43-0000	Office and Administrative Support Occupations	major	1,330	65.20
43-1011	First-Line Supervisors of Office and Administrative Support Workers		100	4.90
43-3021	Billing and Posting Clerks		40	1.96
43-3031	Bookkeeping, Accounting, and Auditing Clerks		70	3.43
43-4051	Customer Service Representatives		130	6.37
43-5011	Cargo and Freight Agents		610	29.90
43-5032	Dispatchers, Except Police, Fire, and Ambulance		200	9.80
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive		**	**
43-9061	Office Clerks, General		50	2.45
53-0000	Transportation and Material Moving Occupations	major	120	5.88

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Table 27: Indiana Support Activities for Rail Transportation (NAICS 488200): Occupational Distribution, 2015

occ code	occ title	group	tot_emp	pct_tot
00-0000	All Occupations	total	670	100.00
43-0000	Office and Administrative Support Occupations	major	70	10.45
43-9061	Office Clerks, General		40	5.97
49-0000	Installation, Maintenance, and Repair Occupations	major	290	43.28
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists		50	7.46
49-3043	Rail Car Repairers		190	28.36
51-0000	Production Occupations	major	40	5.97
51-4121	Welders, Cutters, Solderers, and Brazers		30	4.48
53-0000	Transportation and Material Moving Occupations	major	210	31.34
53-4021	Railroad Brake, Signal, and Switch Operators		**	**

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Table 28: Indiana Other Support Activities for Transportation (NAICS 488900): Occupational Distribution, 2015

occ code	occ title	group	tot_e	pct_tot
00-0000	All Occupations	total	900	100.00
43-0000	Office and Administrative Support Occupations	major	**	**
53-0000	Transportation and Material Moving Occupations	major	670	74.44
53-7064	Packers and Packagers, Hand		**	**

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Table 29: Indiana Support Activities for Road Transportation (NAICS 488400): Occupational Distribution, 2015

occ code	occ title	group	tot_emp	pct_tot
00-0000	All Occupations	total	2,410	100.00
11-0000	Management Occupations	major	80	3.32
11-1021	General and Operations Managers		60	2.49
43-0000	Office and Administrative Support Occupations	major	500	20.75
43-3031	Bookkeeping, Accounting, and Auditing Clerks		80	3.32
43-5032	Dispatchers, Except Police, Fire, and Ambulance		240	9.96
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive		**	**
43-9061	Office Clerks, General		80	3.32
49-0000	Installation, Maintenance, and Repair Occupations	major	280	11.62
49-3023	Automotive Service Technicians and Mechanics		110	4.56
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists		120	4.98
53-0000	Transportation and Material Moving Occupations	major	1,350	56.02
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators		110	4.56
53-3032	Heavy and Tractor-Trailer Truck Drivers		820	34.02
53-3033	Light Truck or Delivery Services Drivers		40	1.66
53-7062	Laborers and Freight, Stock, and Material Movers, Hand		**	**

Source: http://www.bls.gov/oes/current/oes_research_estimates.htm

Economic Development Coalition of Southwest Indiana: Profile and Experience

For nearly ten years, the Economic Development Coalition of Southwest Indiana (EDC) has been providing economic and community development services to Gibson, Posey, Vanderburgh and Warrick counties as well as the incorporated communities therein. Simply stated, the organization's mission is to foster a strong and dynamic economic and quality of life condition for the businesses and residents of the counties it serves.

The EDC is a 501(c)6 organization comprised of two divisions – the Economic Development Division and the Community Development Division. Greg Wathen serves as the President and CEO of the organization, as well as leading the Economic Development Division initiatives and staff. Carol Hagedorn serves as the Vice President of Community Development, overseeing the Community Development Division (CDD) staff of Karen Conia and Debbie Bennett-Stearsman.

Through the CDD, more than $73 million in total grant funding has been secured for the benefit of the counties served for the purposes of enhancing quality of life and economic development. It has done so, in part, by maintaining the staff services of Community Development Block Grant (CDBG) Accredited Grant Administrators. Maintenance of that certification (which is renewed every two years upon successfully completing required continuing education sessions) is necessary for the administration of Federal HUD funds that are distributed by the Indiana Office of Community and Rural Affairs (OCRA) via annual, competitive grant cycles.

The role of the CDD is to work with the communities beginning with the project development stage (which includes executing the federally approved process for conducting income studies and environmental reviews), through the grant application phase (which includes the composition of that application), through the procurement process, adherence to Federal Labor Standards initiatives, the oversight of the awarded funds and, finally, through the close-out of the grant contract.

The CDD's activities have not been limited to CDBG-funded grant applications. The organization has worked to help the City of Princeton achieve its State-designated Stellar status through the Indiana Stellar Communities Program (ISCP). Through cross-collaboration with the ISCP the CDD administered for the City two Indiana Housing and Community Development Authority (IHCDA) grants and one OCRA grant associated with that program. Currently the CDD is administering the IHCDA's Blight Elimination Program (which is funded by the U. S. Department of the Treasury's Hardest Hit Fund) in Gibson, Posey and Warrick counties. Also at present, the CDD is executing its Environmental Protection Agency Brownfields Assessment Program grant award (which was secured by the CDD) for use in Gibson, Posey, Vanderburgh and Warrick counties.

As the head of the CDD, Carol Hagedorn brings a unique blend of economic development, workforce development and grant administration to the organization. A Certified Grant Administrator since 2009 and a Certified Economic Developer (CEcD) since 2011, Hagedorn has previously worked with the Perry County Learning Partnership to secure grant funds and administer a workforce training program for unemployed and underemployed individuals in that community. As the former Vice President of the Perry County Development Corporation, she worked with Southern Indiana Power (formerly Southern Indiana REC) to secure a USDA Rural Economic Development Loan that was utilized by the Perry County Port Authority for Hoosier

Southern Railroad infrastructure upgrades. Hagedorn has served on the I-69 Brainpower Task Force, whose focus is to transform the workforce skill-sets of communities along the new I-69 corridor to improve the region's global competitiveness. In addition, Hagedorn served as an executive committee member of the Perry County College Success Coalition who's focus is to, through grassroots initiatives, create and implement programs in that county to encourage youth to pursue post-secondary education that correlates with the area's workforce needs. (See EDC Resume in Exhibits section)

Strategic Development Group, Inc.: Profile and Experience

Since 1991 Strategic Development Group, Inc. (SDG) has been helping clients with research, analysis, evaluation, and planning services. SDG provides a wide range of economic and community development services, including the fields of workforce development and utilities. SDG has created strategies for WIBs, other workforce development organizations, and utilities. In addition, SDG has undertaken statewide research for the Indiana Department of Workforce Development.

SDG will serve as a subcontractor to the EDC. Thayr Richey, Ph.D., President of SDG, will serve as the project lead for his company. Thayr has had a wide range of experience in both the government and the private sector. He has served as executive director of the Indiana Department of Commerce, the director of economic development for Hoosier Energy, the executive director of the Bloomington Economic Development Corporation, and the director of the Governor's Initiative on Economic Development. Thayr has worked on projects throughout the United States, as well as in Europe and Japan.

Over the past three decades, Thayr has been involved with hundreds of successful business locations and expansions. Thayr has spoken on community and economic development to a variety of audiences in the United States and abroad. His writing on economic development includes the topics of planning, manufacturing innovation, workforce development, small business development, business retention & expansion and export promotion.

Thayr has helped develop SDG's approaches to research and tools for community and regional development. Thayr was a co-author (with Purdue University and the Indiana Business Research Center) on two studies funded by the U.S. Economic Development Administration on business cluster analysis.

He has extensive experience in regional development. Thayr led SDG in managing the Southern Indiana Rural Development Project for twelve years. SIRDP's projects ranged from basic employer recruitment to workforce development and from rural waste water treatment to entrepreneurial agriculture.

Thayr has received the Excellence in Leadership award from the Indiana Economic Development Association. He is a past president of the Indiana Area Development Council, and is the recent past president of the IEDA Foundation Board of Directors.

Working with SDG as subcontractors will be PQR Energy, LLC (PQR) and Lee S. Rigsby Consulting (Rigsby).

PQR: Profile and Experience

PQR Energy was formed to address critical energy challenges facing state and local governments, educational institutions, and other groups in need of implementing long-term energy reduction solutions. Founded over 10 years ago, PQR's management team collectively has over 50 years of experience in providing advice to executive management teams and policymakers.

PQR's main researcher on this project with be Jim Wheeler, Ph.D. Jim is a co-founder of PQR. Previously Jim served as senior vice president for Thomas P. Miller & Associates, executive vice president for TechPoint, Partner with Arthur Anderson, and director of international programs with the Hudson Institute. He has a deep understanding of workforce development and the utility industry.

Jim has wide ranging experience in economic development, strategic planning and implementation for a wide gamut of private, public and university clients. In the recent past he has been engaged to conduct University and University Technology park economic impact assessments, regional industry cluster analyses, and a range of market and feasibility studies for a variety of new and traditional energy technologies and projects. Currently Jim is working as a subcontractor to SDG on a regional analysis and plan for the Quad Cities region.

Jim's Ph.D. degree is in the field of Economics.

Lee Rigsby: Profile and Experience

Lee Rigsby is principle consultant and president of Vanguard Solutions, Inc.

Lee has provided technical, business and organizational services to Fortune 500 companies. His clients include the top coal producing companies worldwide and leading U.S. electric utilities. Lee is recognized as an authority on management systems, quality management, ASTM, and ISO standards, and coal properties.

He was previously the Director of the Technical Services Division of Standard Laboratories, Inc. and, before that the Manager of Technical Services for Ashland Coal, Inc. Lee holds a B.S. degree in Chemistry from Marshall University and a Master of Business Administration degree from Xavier University.