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The Economic Impact of the Coal Industry in Pennsylvania

Prepared for
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by the
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The Economic Impact of the Coal Industry in Pennsylvania

Executive Summary

Families Organized to Represent the Coal Economy, Inc. (F.O.R.C.E.) is an organization that recognizes and promotes the importance of the Pennsylvania Coal Industry and its contribution to Pennsylvania's economy. The organization asked the Pennsylvania Economy League of Southwestern Pennsylvania, LLC (Economy League) to perform an economic impact study of the Coal Industry in Pennsylvania. This study looks at the industry's annual impact on the Commonwealth's economy, using 2008 as a baseline year unless otherwise stated.

Measuring the current economic impact of the Coal Industry

Pennsylvania's economy benefits from the direct employment, compensation and output of the Coal Industry, as well as from the impacts of the industry's supply chain. The current jobs within the industry, and many more in the broader economy, would not exist without the activity of the Coal Industry. Similarly, the wages paid to industry employees have an effect on the broader economy, as employees use their compensation to buy goods and services. In this report, the Economy League measures the direct, indirect and induced employment created by the Coal Industry as well as the more than $7 billion in economic output stimulated by the activity of the industry.

The Coal Industry generates more than 41,500 jobs in Pennsylvania

Pennsylvania's Coal Industry is a vital contributor to the state's economy, with direct, indirect and induced impacts responsible for:

- **Approximately 41,500 full- and part-time jobs,** close to 9,000 of these directly in the Coal Industry. For each direct Coal Industry job an additional 3.77 jobs are generated throughout the state.
- **Approximately $7.5 billion in economic output created in Pennsylvania,** $3.2 billion of this directly by the Coal Industry.

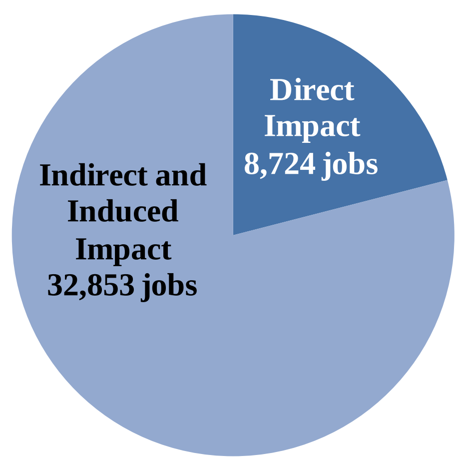

Figure 1 - The Pennsylvania Coal Industry supports 41,500 full- and part-time jobs across the whole economy

The Coal Industry creates economic value in communities across Pennsylvania, with multiple company locations in more than half of Pennsylvania's counties.

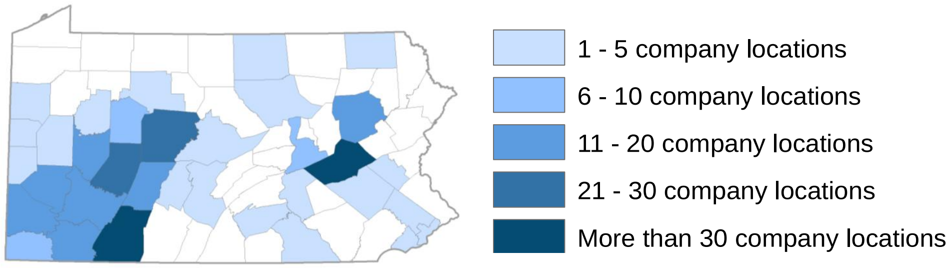

Figure 2 - Coal Industry business locations are spread across Pennsylvania

The industry makes substantial capital investments that increase coal's economic impact on the region by utilizing advanced mining machinery that costs millions of dollars to purchase, operate and maintain while also investing in a multitude of other goods and services.

Pennsylvania has a strong concentration of manufacturers producing machinery and equipment for the industry. Pennsylvania has the largest mining machinery and equipment manufacturing industry in the country, accounting for 27 percent of the country's sector employment.

Coal is a crucial energy resource

In 2008, Pennsylvania produced more than 76 million tons of coal from 535 mines and refuse sites, making it the fourth largest producer of coal in the nation. This coal was shipped to 30 different states. Nearly $1 billion worth of coal and mining products produced in Pennsylvania were exported abroad – representing a 709 percent increase since 2003.

Coal is responsible for more than 54 percent of Pennsylvania's electricity generation. In 2007, Pennsylvania generated 226 million megawatts of electricity which made it the second largest producer of electricity in the United States, and the largest net exporter of electricity among the states.

The industry has made significant progress on addressing its challenges

The Coal Industry has made substantial investments to improve the health and safety of its workforce and workplace. For example, the Coal Industry has made significant safety improvements over its history, while at the same time improving its productivity. Production has nearly tripled over the last 50 years and current accident incident rates are low and below the national average for underground mining (6.51 in Pennsylvania compared to 6.71 nationwide).

The Coal Industry has also made progress in addressing legacy environmental issues by its participation in remining activities. Remining is the active mining of areas that were mined and abandoned without adequate reclamation prior to enactment of the current federal and state mining laws. Under current law, mine operators engaged in remining must reclaim the area using modern environmental management practices which include contemporaneous reclamation, acid mine drainage treatment or elimination, and other techniques to ensure compliance with today's standards. Remining results in significant abandoned mine reclamation and pollution abatement at no cost to taxpayers or charge to the industry-supported Abandoned Mine Land Reclamation Trust Fund.

1 Introduction

1.1 Origins of this report

Families Organized to Represent the Coal Economy, Inc. (F.O.R.C.E.) is an organization that recognizes and promotes the importance of the Pennsylvania Coal Industry and its contribution to Pennsylvania's economy. Its membership includes the owners, executives, employees and families of coal and coal related businesses whose livelihoods depend upon a healthy Coal Industry. The organization asked the Pennsylvania Economy League of Southwestern Pennsylvania, LLC (Economy League) to perform an economic impact study of the Coal Industry in Pennsylvania. This study looks at the industry's annual impact on the Commonwealth's economy, using 2008 as a baseline year, unless otherwise stated.

The Economy League has been a force for positive change since its founding in 1936. It is widely recognized and well-regarded as a nonpartisan research organization committed to sound public policy which enhances the competitiveness of the Commonwealth. The Economy League is the research affiliate of the Allegheny Conference on Community Development and provides research and analysis on specific public policy priorities for southwestern Pennsylvania.

1.2 The Coal Industry's rich history in Pennsylvania

Coal is a combustible black rock composed primarily of carbon and hydrocarbons from compressed plant material that was buried under a large amount of dirt and mud. Over many millions of years, the materials altered to form a solid rock in layers within the surface of the Earth. The elements in coal (carbon, hydrogen, and oxygen with smaller amounts of sulfur, nitrogen, phosphorus, and calcium) release energy when they break down during combustion.[i] This makes coal an excellent source of energy.

Coal has a long history in Pennsylvania, dating back to the mid-18th century. It powered the American Industrial Revolution and helped Pennsylvania's industrial center flourish. Figure 3 on the next page shows a historical timeline of the Pennsylvania Coal Industry.

Today, Pennsylvania coal is primarily used to generate electricity; is an essential part of manufacturing including steel making; and is exported to other states and nations for similar purposes. The extraction, processing, transportation and use of coal in Pennsylvania create economic activity that contributes to the vitality of Pennsylvania's economy. These economic impacts are explored in this report.

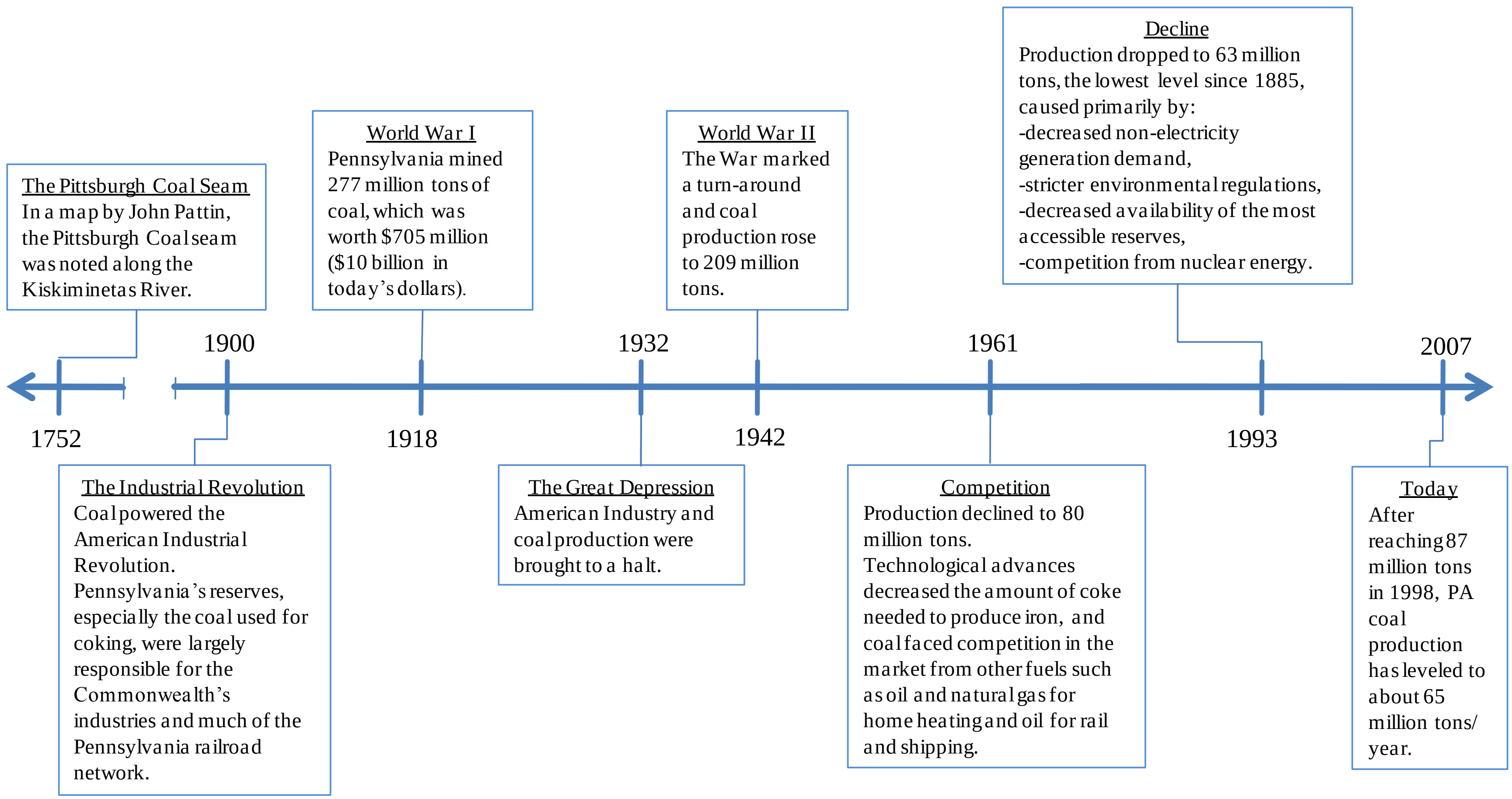

Figure 3 - History of coal in Pennsylvania

2 Overview of the Coal Industry

2.1 Background

Four types of coal are mined in the United States – lignite, subbituminous, bituminous and anthracite coal. Bituminous and anthracite coal are mined in Pennsylvania. Types of coal differ based on their rank, which is a result of the amount of pressure and depth of the plant material from millions of years ago. Greater pressure and exposure to higher temperatures results in denser coal and higher heating values.

Lignite and subbituminous are the two lowest ranked types of coal and contain the least amount of carbon. Bituminous coal is the second highest ranked coal and contains 45-86 percent carbon, which results in two to three times the heating value of lignite. It is the most abundant rank of coal found in the United States, accounting for about half of U.S. coal production. Anthracite is the highest ranked coal (when graphite is excluded). Anthracite contains 86-97 percent carbon and the highest heat content of all of the ranks of coal. It accounts for 1-2 percent of U.S. reserves and is only located in Pennsylvania. Figure 4[ii] shows the average heat content for each type of coal. Figure 5[iii] shows coal production in the United States from 1969 to 2008 by type of coal.

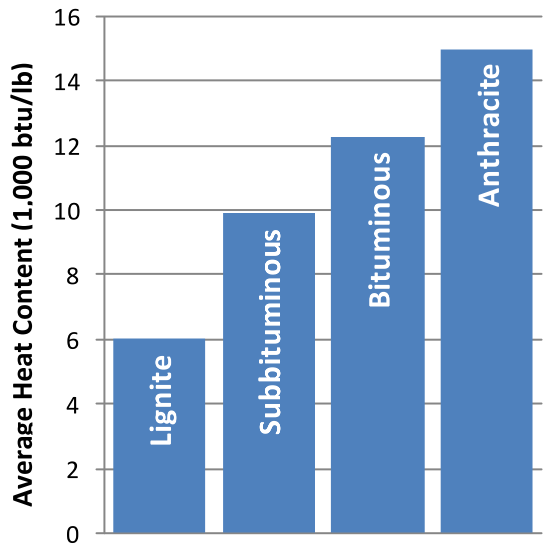

Figure 4 - Average Heat Content by Type of Coal (1,000 btu/lb)[ii]

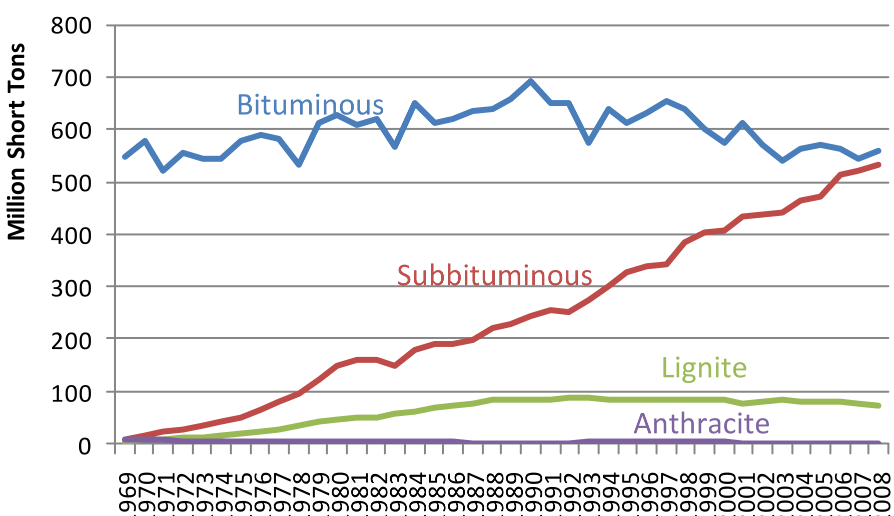

Figure 5 - US Coal Production by Type, 1969 - 2008 (Million Short Tons)[iii]

The bituminous coal seams are located in the southwestern portion of the state and transition into higher density anthracite fields toward the northeast. Figure 6[iv] shows the location of coal seams in the Commonwealth.

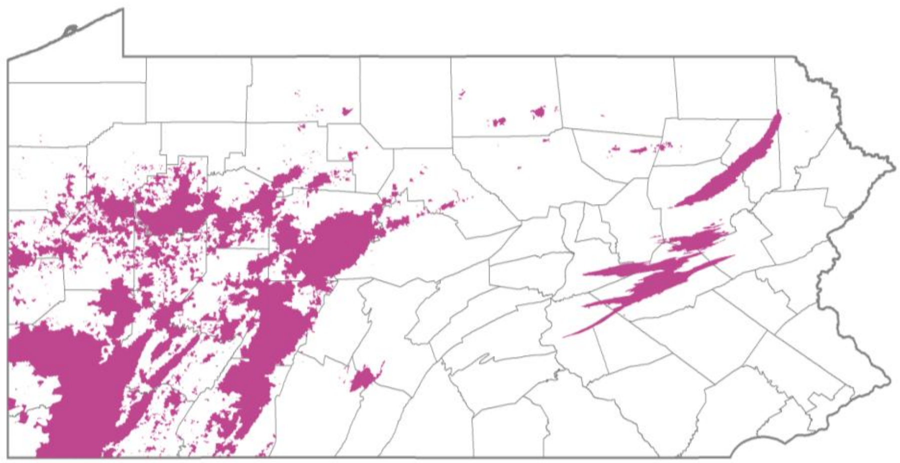

Figure 6 - Bituminous coal is found in the southwest, anthracite coal in the northeast of Pennsylvania[iv]

2.2 Production

There are various underground and surface methods used to extract coal, and the use of each method is dependent on a number of factors including the surface topography, nature of the coal seam, property ownership, and the economics of each situation. Below, Figure 7[v] shows Pennsylvania mining production by type of mining from 1980 to 2008 and Figure 8 shows U.S. mining production by type of mining from 1949 to 2008.[vi]

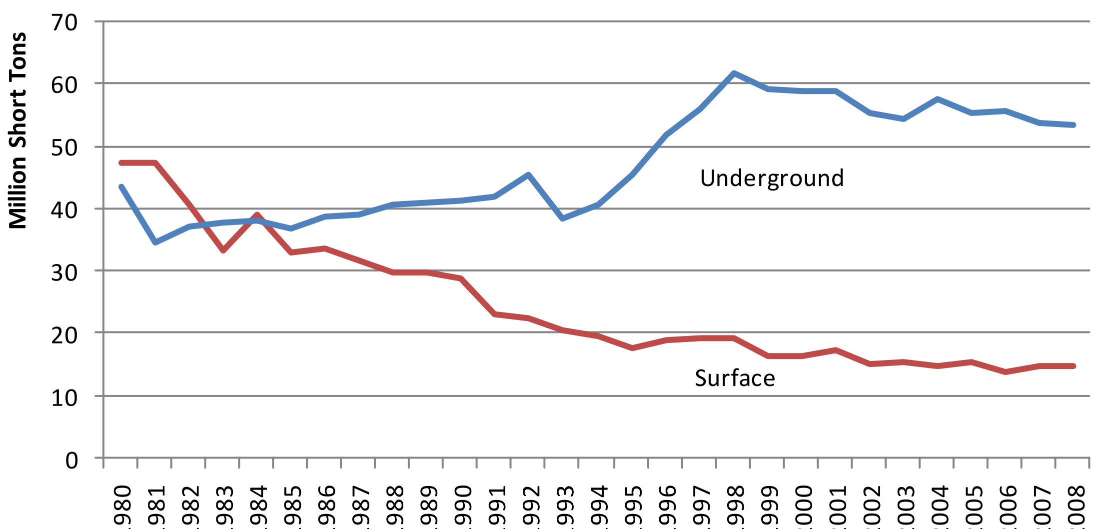

Figure 7 - Pennsylvania Coal Production by Mining Method[v]

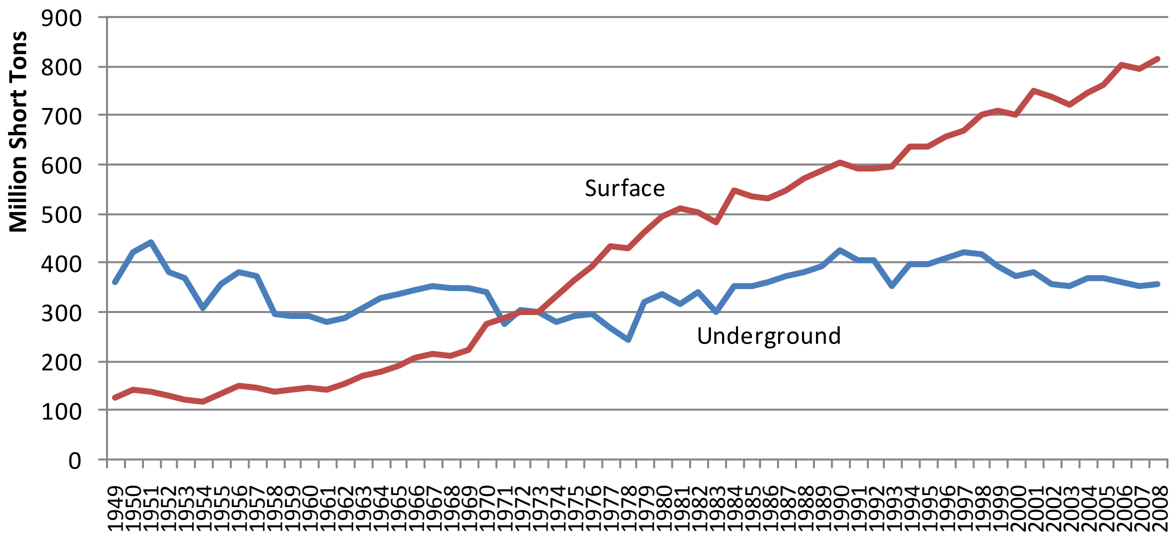

Figure 8 – U.S. Coal Production by Mining Method[vi]

Table 1[vii] shows Pennsylvania's 2008 coal production by general extraction type. Pennsylvania is currently the fourth largest coal producing state in the country. Coal production from underground mining in Pennsylvania is several times the production from surface mining. Pennsylvania is home to the nation's two largest underground bituminous coal mines.

Table 1 - 2008 Coal Production in Pennsylvania [viii]

	Anthracite	Bituminous	Total
Underground Mines			
Production (short tons)	235,899	53,260,861	53,496,760
Mines Reporting Production	12	39	51
Companies Reporting Production	12	15	27
Surface Mines			
Production (short tons)	2,316,715	12,493,369	14,810,084
Mines Reporting Production	58	347	405
Companies Reporting Production	47	129	176
Coal Refuse Sites			
Production (short tons)	5,444,504	2,373,039	7,817,543
Sites Reporting Production	56	23	79
Companies Reporting Production	42	17	59
Total Production (short tons)	**7,997,118**	**68,127,269**	**76,124,387**

2.2.1 Underground Mining

Underground mining is the most commonly used method for extracting coal in Pennsylvania. Conventional and continuous room-and-pillar mining, and longwall mining are all employed in Pennsylvania, and Figure 9[ix] shows the amount of underground coal production for each method in 2008.

In underground mining, access to the coal seam is created by tunneling either horizontally through a hillside (a drift entry), at an incline from the surface (a slope entry) or through a shaft that is driven vertically from the surface to the coal seam.

In the room-and-pillar method of mining (conventional and continuous), large rooms of coal are excavated while pillars or mechanical roof-support systems support the ceiling.

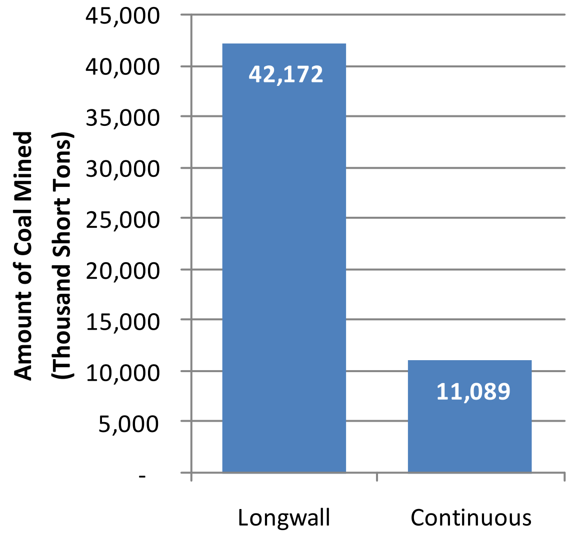

Figure 9 -Underground Coal Production in Pennsylvania by Mining Method, 2008[ix]

Coal Industry Capital Investments: Longwall Systems
Equipment for a complete longwall system represents an investment of $100 million before installation and includes a longwall shearer, roof support system, stageloader, and armored face conveyer. The complete capital expenditure for a installation longwall system comes to $300 - $400 million.

Since the 1970's the longwall method has been increasingly used. Here, a single large block of coal, up to 1,500 feet wide by 15,000 feet long, is isolated and mined by equipment that sheers off the face of the block, advances forward, then lets the ceiling collapse behind it in a controlled manner. Once the machinery separates the coal from the seam, it is placed on conveyors that carry it from the mine up to the surface where it is transported to the processing plant by additional conveyors or trucks.[x] As can be seen from Figure 9, the longwall method accounted for approximately 80 percent of the states underground production.[xi]

Figure 10[xii] shows the location of all of the active underground mines in Pennsylvania.

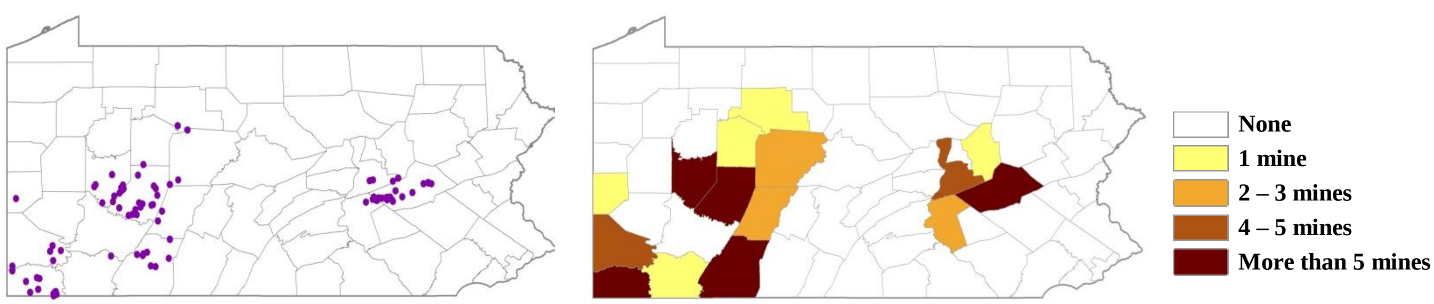

Figure 10 - Location of Active Underground Mines in Pennsylvania[xii]

2.2.2 Surface Mining

Two dominant methods of surface mining are contour mining and area mining.[xiii] Auger mining is sometimes employed as a secondary mining method. The locations and concentration of active surface mines are shown in Figure 11.[xiv]

Contour mining involves the removal of a coal seam located through a hillside. The rock covering the coal seam (called the overburden) is removed, and the coal is extracted using bulldozers, draglines, front-loaders and transportation equipment. Once mining is complete, the overburden is returned to the site to recreate the original topography.

Area mining is usually used for larger surface mines where the overburden is thin and the terrain is relatively flat. Topsoil is removed and stored; the overburden rock is broken up with a blasting operation and the loose rock is removed with shovels or draglines and then relocated using heavy equipment as in contour mining. Once the coal seam is extracted, the overburden and topsoil are replaced.

Coal Industry Capital Investments: Draglines
Draglines are used in surface mining to remove the overburden of rock and soil that lies above the coal being mined. They are essentially large buckets, nine to 152 cubic yards in size, and can cost $200 million plus required after-market servicing.

In auger mining, the coal is extracted by using large horizontal drills that pull the coal out of the coal seam. This method is typically used at the base of a contour mining or highwall mine, [xv]

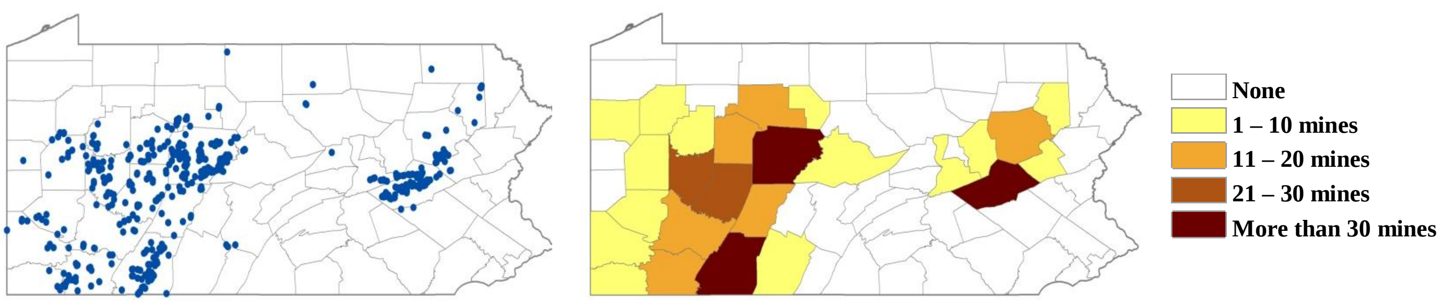

Figure 11 - Location of Active Surface Mines in Pennsylvania [xiv]

Remining is the reclamation of previously mined and abandoned surface and underground coal sites through surface mining (underground sites undergo 'daylighting' where the ceiling of the mine is opened up during extraction). The mine operator extracts the remaining viable coal reserves, sometimes made economically attractive through improved technology, then must reclaim the area once the remining is completed. This reclamation must comply with all standards and current state and federal laws and regulations. Under Subchapter F of 25 Pennsylvania Code Chapter 87 and Subchapter G of 25 Pennsylvania Code Chapter 88, mine operators in Pennsylvania are required to ensure that water quality at remined sites is as good as or better than the pre-existing discharges from the site. Remining is further discussed in Section 3.

2.3 Processing

After coal is extracted from the underground or surface mine, it can go through several steps in a processing plant before it is shipped to the customer. The coal is taken to the plant where it is moved via a series a conveyor belts, cleaned and screened for size. As part of this process the coal is sometimes washed to remove foreign materials in order to increase its heat content. Coarse rock and other reject materials are removed. Sorting is accomplished by a variety of methods including vibration and flotation. Reject material which is typically one-third of the originally mined coal, is transported to a permitted coal refuse disposal site. The remaining cleaned coal is sometimes dried by industrial dryers and stored in silos or ground storage where it stays until it can be transported to the customer.

Figure 12 - Coal conveyor system and storage silos at CONSOL Energy's Bailey Central Preparation Plant
Photo: "Harry Giglio for CONSOL Energy Inc"

Coal Industry Capital Investments: Off-Highway Trucks
In addition to the numerous conveyors and belts at the processing plant, a number of off-highway dump trucks are required to move coal and refuse. Multiple trucks are used at each site and each can cost upwards of $400,000.

2.4 Transportation

There are many ways that coal is transported to the end user. In the United States, the most common is by railroad, followed by trucks and barge transportation via rivers. Tramways, conveyors, and slurry pipelines (where the coal is mixed with water, pumped, and then separated at the destination) are used over smaller distances.
Figure 13[xvi] shows the various modes of coal transportation in the United States.

In Pennsylvania, the railroad is also the predominant method of transportation, accounting for almost 60 percent of all transported coal. Indeed, much of the original railroad network in Pennsylvania was built for this purpose. In addition to truck transportation, rivers – particularly the Allegheny, the Monongahela, and the Ohio, which meet in Pittsburgh – provide line operators with the ability to ship coal within the state, and south along the Ohio to the Mississippi River. The remaining methods make up a small portion of the activity. Figure 14[xvii] graphs each mode of transportation used to transport coal in Pennsylvania.

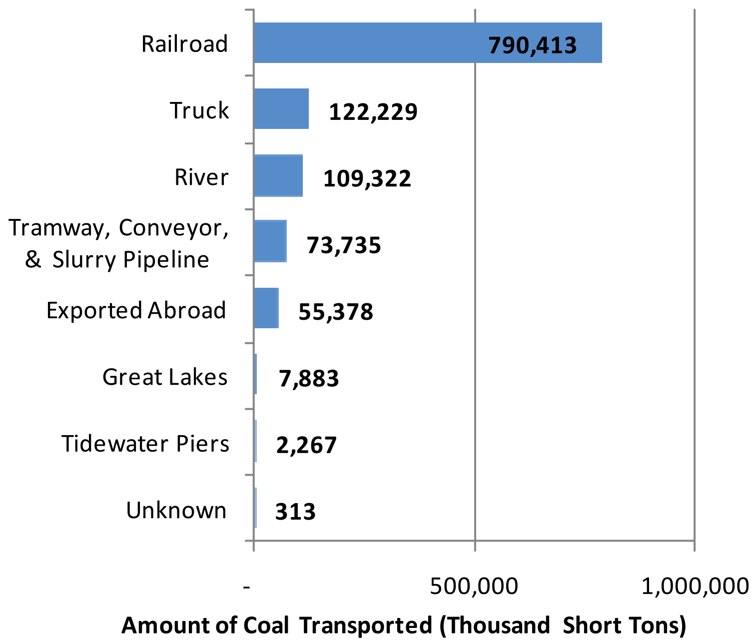

Figure 13– Mode of coal transportation in the United States, 2007[xvi]

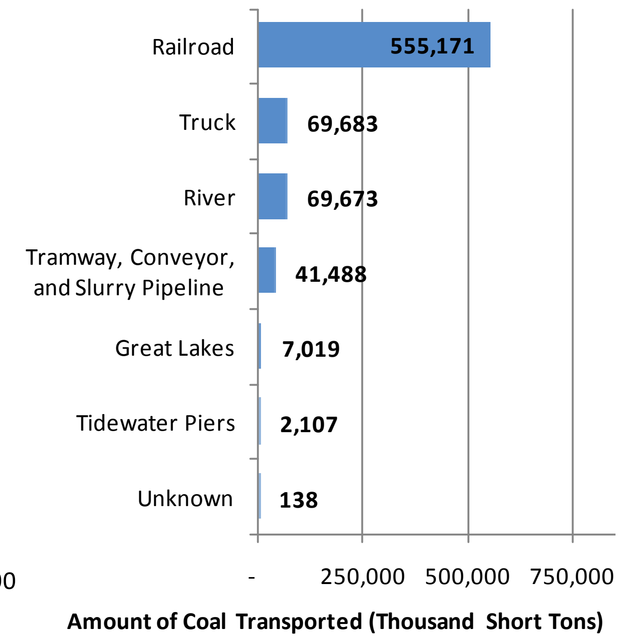

Figure 14- Mode of coal transportation in Pennsylvania, 2007[xvii]

2.5 National and International Exports

Pennsylvania coal is an important part of America's energy and manufacturing infrastructure and an important Pennsylvania export. Pennsylvania coal is shipped to 30 states and abroad. Figure 15[xviii] shows the net exports to other states in the United States. Pennsylvania is a large net exporter of coal, exporting more than 11,000,000 tons of coal a year, with net exports to 25 states. It is a net-importer from only six states in the nation.

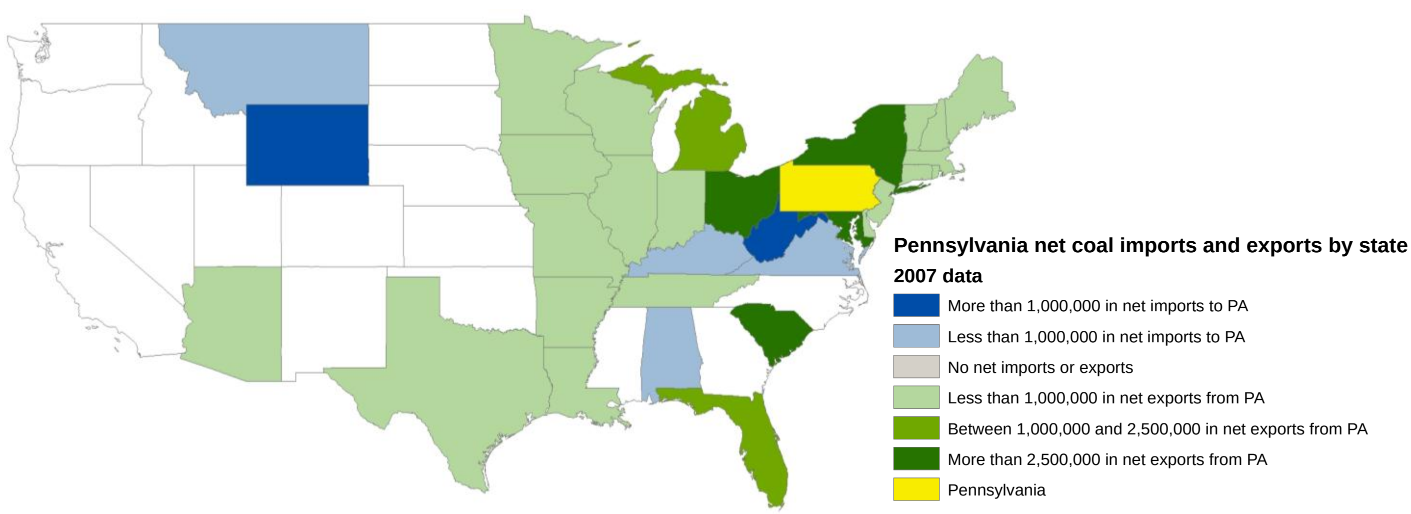

Figure 15 - Net coal exports from Pennsylvania[xviii]

Coal is also an important international export from Pennsylvania. As seen in Table 2,[xix] $984 million in mining products (predominantly coal) was exported from Pennsylvania in 2008.

Rising energy prices in 2008 caused the price of Northern Appalachian coal (found in Pennsylvania, Ohio, Maryland, and Northern West Virginia) to nearly triple (the largest increase of any type of coal), consequently the dollar value of mining exports more than doubled over the previous year. The growth in the value of coal exported from Pennsylvania has been remarkable. From 2003 to 2007, when energy prices were more stable, mining exports increased 222 percent from $139 million to $448 million, making it the second-fastest growing export in the state.

Table 2 - Pennsylvania mining exports show growth[xix]

	2003	2004	2005	2006	2007	2008	2003 - 2008	2007 - 2008	2003 - 2007
Total Exports ($mil)	$16,216	$18,539	$22,334	$26,359	$29,195	$34,448	112%	18%	80%
Mining Exports ($mil)	**$139**	**$206**	**$353**	**$416**	**$448**	**$984**	**607%**	**119%**	**222%**
Mining Share	0.86%	1.11%	1.58%	1.58%	1.54%	2.86%			
Mining Rank	19	18	13	14	14	12			

2.6 Uses

Today, coal is primarily used for electric power generation. It is also used by the general industry sector for the production of materials such as calcium carbide, refractory bricks, graphite electrodes and various food and paper products as well as by the iron and steel manufacturers for producing coke a primary ingredient in steel. In 2006, coal accounted for 27 percent of world energy consumption. Sixty-two percent of all coal consumed was for electricity generation, 34 percent for industrial users, and the remaining four percent mostly by residential and commercial consumers. International coal consumption is projected to increase by 49 percent from 127.5 quadrillion Btu (British thermal units) in 2006 to 190.2 quadrillion Btu in 2030.[xx] Increased use of coal in developing countries accounts for 94 percent of the total growth over the period.[xxi] Pennsylvania Coal use is shown in Figure 16.[xxii]

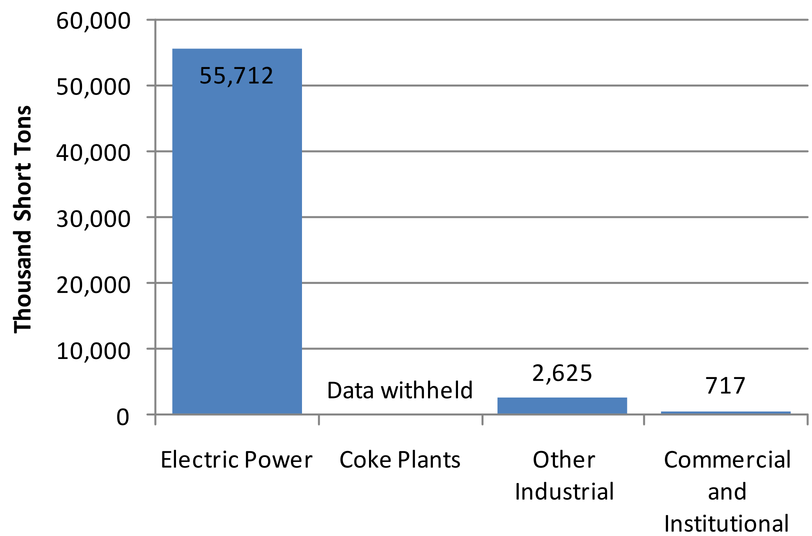

Figure 16 - Amount of coal by end use in Pennsylvania[xxii]

2.6.1 Electricity power generation from coal

Coal is predominantly used for electricity generation with the majority of the world's and more than 90 percent of the United States' coal production going toward this use. Coal is the most important resource in electricity generation – 42 percent of the world's,[xxiii] 48 percent of the United States' and 53 percent of Pennsylvania's electricity generation comes from coal. When coal is converted into electricity it typically goes through multiple steps. First, a pulverizer grinds the coal into a fine powder; the powder is mixed with hot air (this helps the coal burn more efficiently) and the mixture is blown into a furnace. The burning coal heats water in a boiler, creating steam. The steam, at tremendous pressure, spins a turbine, which spins a generator to produce electricity. The steam is cooled, condensed back into water and returned back into the boiler to start the process over. Figure 16 shows that in 2007, 55.7 million tons of coal were used to generate electric power from coal in Pennsylvania[xxiv].

In 2008, Pennsylvania generators produced 223 million megawatt hours of electricity, which ranked first in the nation.[xxv] Coal's role in electricity generation is vital, as six of the top ten largest plants in the state are coal fired, including the Bruce Mansfield Plant in Midland which had the highest net summer capacity of all Pennsylvania generating plants. Fifty-three percent of Pennsylvania's 2008 electric generation came from coal, with nuclear a distant second at 35 percent. Coal is also the cheapest fuel source for electric generation. Table 3[xxvi] shows the Pennsylvania Public Utility Commission 2007 estimates for the installed Plant Costs by fuel type in Pennsylvania.

Table 3 - Estimated Installed Plant Cost by KWH in Pennsylvania (2007)[xxvi]

Fuel Type	Installed Plant Cost (per KWH)
Coal	$5.70
Natural Gas	$7.20
Wind	$7.46
Nuclear	$7.51
Solar Thermal	$27.63
Solar PVs	$41.24

In the PJM Interconnection area, the regional transmission organization that coordinates the movement of wholesale electricity in Pennsylvania and several neighboring states, coal set the market price 78 percent of the time in 2008 resulting in lower prices for electricity in the market.[xxvii]

Pennsylvania exports electricity to neighboring states, and is the largest net exporter of electricity in the nation. The electric power generation, transmission and distribution industry employs more than 15,000 in the state,[xxviii] which is not included in this report's employment.

There are 40 coal-fired power plants generating electricity in Pennsylvania, many operating several boilers. Figure 17[xxix] shows their location.

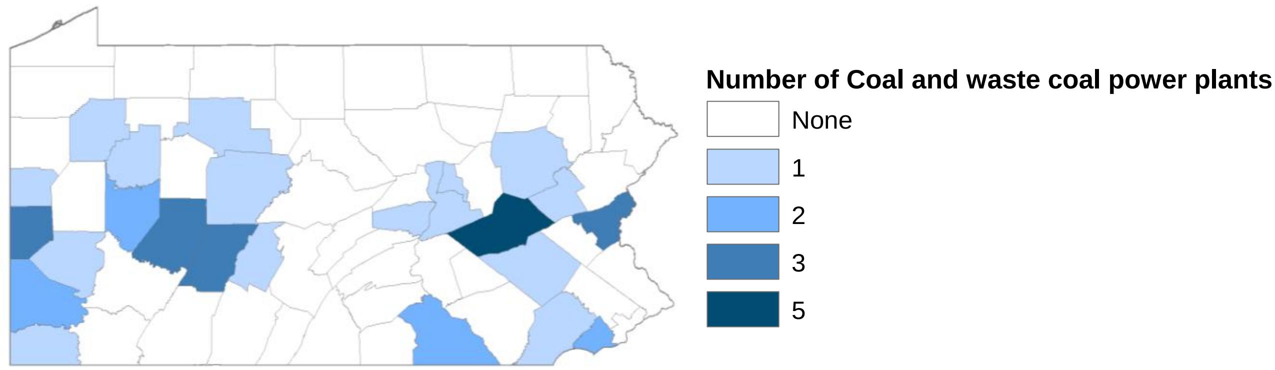

Figure 17 - Coal and waste coal power plants in Pennsylvania[xxix]

Figure 18[xxx] demonstrates coal's dominance as a source of electricity generation in the United States, and Pennsylvania in particular.

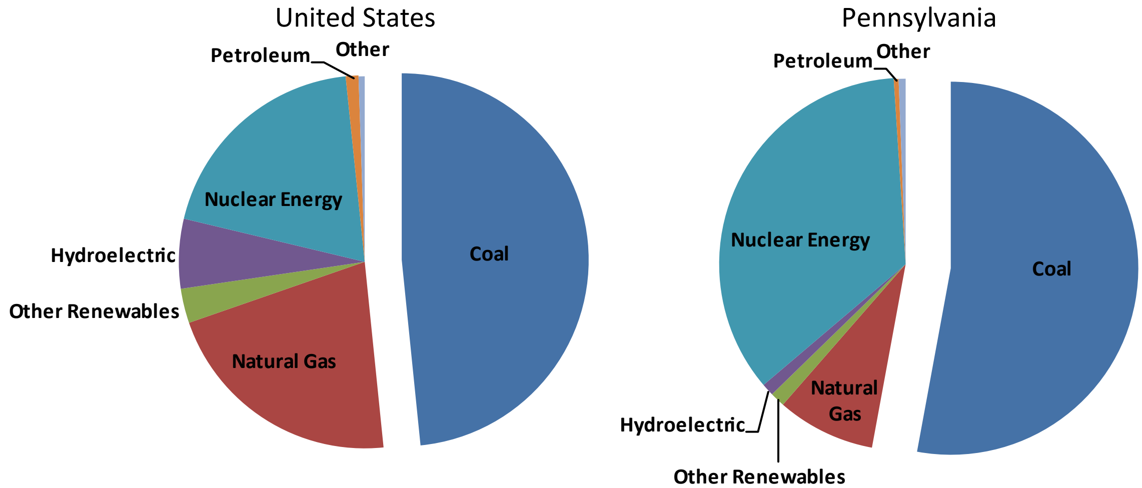

Figure 18 - Sources of electricity generation in the United States (left) and Pennsylvania (right)[xxx]

2.6.2 Coke production

Two percent of U.S. coal consumption, mostly bituminous coal, is used for the manufacturing of coke, which is used as a reducing agent in the production of iron and ultimately steel. The percentage of coal used to manufacture coke in Pennsylvania is not disclosed by the Energy Information Administration due to data confidentiality. Coke is made by burning coal in an oven without oxygen at temperatures as high as 2,000 degrees Celsius.

2.6.3 Other industrial uses

Other industrial sales of coal make up less than one percent of coal's end uses in the United States. Approximately 2.6 million tons of coal were used by this sector in Pennsylvania in 2007 as shown in Figure 16.[xxxi] Some examples of other industries that consume coal are metal producing companies that use coal in combination with coke, as well as the cement, chemical and paper industries among others.

2.6.4 Commercial and institutional uses

In the United States, the remaining 0.2 percent of use is from commercially and institutionally consumed coal, which includes residential and commercial coal powered heating units. In Pennsylvania, more than 0.7 million tons were used by these sectors, shown in Figure 16.[xxxii] Historically, it was not uncommon to use coal for heating and even today some large buildings or complexes use coal to heat their facilities. However this use is fading with time.

3 Industry Context

The Pennsylvania Coal Industry faces a number of challenges arising from the extraction of a natural resource. In addition to concerns that are common to most industries, such as taxation and safety, the modern Coal Industry must also contend with a number of environmental issues associated with extracting this resource. Many environmental impacts still evident today are the result of practices in place before changes in modern laws and regulations. Current regulations mandate that mining operations be planned and conducted to minimize and eliminate long term environmental impacts. There are new environmental challenges such as those arising from growing concern over greenhouse gas emissions, where policy is still being developed. Where clarity on regulations exists, the industry has implemented changes and made improvements. Although targeted at the industry's customers rather than at the Coal Industry itself, uncertainty over tighter air emissions restrictions and possible new carbon regulations has the potential to significantly affect the industry. The Coal Industry is innovating solutions to meet these new challenges.

As an example of the improvements in industry practices, in 2007-2008, 91 percent of all permitted mines had no off-site impacts, and a further 6 percent had minor off-site impacts, defined as those that would have no effect on the public, only disturb a small area, or have negligible effect on a receiving stream.[xxxiii]

This section discusses six challenges currently faced by the Coal Industry and the ways they are being addressed.

3.1 Taxation

In Pennsylvania, coal can be taxed as local property before it is extracted. Rates of taxation on coal vary from county to county, but in some locations it represents a substantial portion of the local property tax revenue. As the coal is extracted, the value of the associated property decreases accordingly and the local tax base is reduced. As many coal companies own not just the subsurface rights to the coal, but also the land above it, they may also pay substantial property taxes on their landholdings.

Coal companies also pay state corporation taxes in Pennsylvania, federal and state black lung fees, federal and state reclamation fees, and make mandatory contributions to trust funds to treat acid mine drainage.

The industry workforce also contributes significant tax revenue. The National Mining Association estimates that in 2007, the Coal Industry generated approximately $750 million in federal, state and local personal income and payroll tax revenues in Pennsylvania.[xxxiv]

3.2 Safety

Safety is a top priority for the Coal Industry as it is in many industries. During the last century, significant progress has been made in the Coal Industry to improve the safety of the workers and operations. Investment in training, improvements in technology, and changes in regulations have all contributed to significant improvements in safety. The Pennsylvania Coal Industry has been successful in reducing the incidence of the most serious injuries. Incidence rates for all injuries at underground mines in Pennsylvania are below the national average[xxxv]. Efforts to improve safety are not limited to mining sites. In order to improve the safety of future mining projects, the University of Pittsburgh and Indiana University of Pennsylvania are working with state government and industry partners to centralize, index and digitize maps of previously mined areas. The centralized repositories of mine maps not only allow better risk assessment when planning new underground mines, but also serves as reference point in case of an emergency.

In the early part of the twentieth century, across the United States fatalities regularly exceeded 1,000 annually, reaching more than 3,200 in 1907. Since 1925, there has been a steady decrease in mining fatalities, falling to an all-time low of 23 fatalities nationwide in 2005. Levels of coal production increased significantly over the same period. Figure 19[xxxvi] graphs coal-related fatalities and production in the United States since 1949, when reliable production data became available.

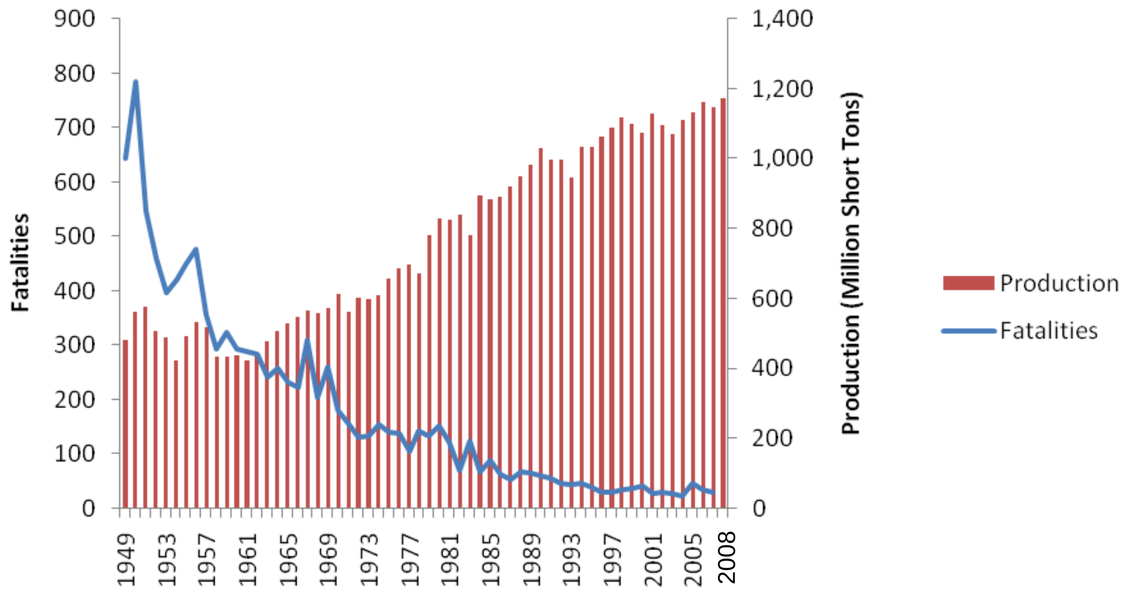

Figure 19 – United States coal mining fatalities and production from 1949 to 2008[xxxvi]

A similar trend of improved safety can be observed in Pennsylvania. The number of fatal accidents in the Coal Mining Industry has declined significantly despite production remaining steady in recent years, as can be seen in Figure 20.[xxxvii]

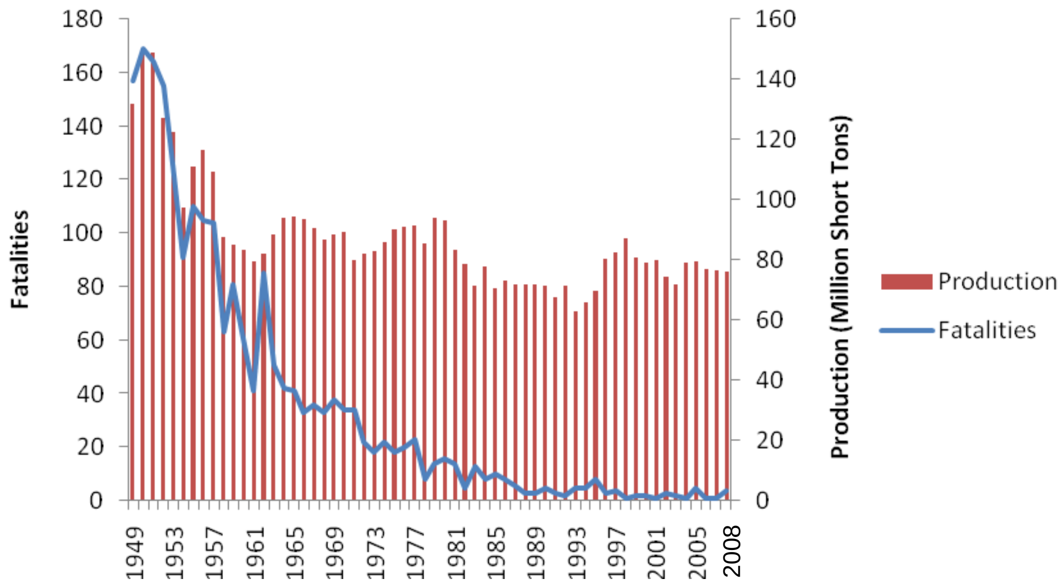

Figure 20 - Pennsylvania coal mining fatalities and production from 1949 to 2008[xxxvii]

Since 2000, there have been 13 fatalities from Coal Mining accidents in Pennsylvania (see Table 4).[xxxviii] The mining industry in Pennsylvania (which includes other mining along with Coal Mining) had five fatal occupational injuries in 2008, out of a total of 240 fatal occupational injuries across all industries.[xxxix] For comparison, there were 42 fatal occupational injuries in construction, 23 in manufacturing and 23 in agriculture, forestry, fishing and hunting in Pennsylvania in 2008. Looking at all injuries, Pennsylvania has incidence rates lower than the national average in underground mining (6.51 in Pennsylvania, 6.71 nationwide), and higher than the national average in surface mining (2.84 in Pennsylvania, 1.94 nationwide).[xl]

Table 4 - Coal Mining accidents in Pennsylvania (2000 - 2008)[xxxviii]

	2000	2001	2002	2003	2004	2005	2006	2007	2008	**Total**
Fatal Accidents	1	1	1	1	1	2	1	1	4	**13**
Non-fatal Injury Accidents	28	18	14	17	10	16	19	24	23	**169**
Non-injury Accidents	98	76	83	53	56	39	45	64	38	**552**
Total Accidents	**127**	**95**	**98**	**71**	**67**	**57**	**65**	**89**	**65**	**734**

In addition to the quantifiable accidents outlined above, long-latency diseases brought about from workplace exposure can cause death. Specifically, Coal Workers Pneumoconiosis, or Black Lung, was responsible for more than 250 deaths in Pennsylvania in 2004 (declining steadily from 730 in 1993 and even higher levels in earlier years). Tighter dust control has resulted in a marked decrease in cases[xli] and the geometric mean of exposures to respirable coal mine dust in Pennsylvania was below the 1979-2003 national average.[xlii] Positive x-rays (i.e. those indicating the presence of the disease) in miners with 20-24 years experience decreased from 23.2% in the 1970s to 2.2% in the late 1990s.[xliii]

The Federal Mine Safety and Health Act of 1977 established the Mine Safety and Health Administration (MSHA) of the Department of Labor, which oversees the mining industry. In addition to regulations, MSHA inspects underground and surface mines twice and four times a year, respectively. Unlike its sister administration, the Occupational Safety and Health Administration (OSHA), it has the power to immediately shut down unsafe operations. The Mine Improvement and New Emergency Response Act (MINER) and the Supplemental Mine Improvement and New Emergency Response Act (S-MINER), have mandated new protections including wireless communications to a tracking center on the surface, lifelines that guide miners to primary and secondary exits, individual 20-minute self-contained self-rescuers (SCSRs) for each miner, and additional SCSRs at designated stations that last for sixty minutes among myriad other measures.[xliv] Investments continue to be made by the industry to improve the safety of Coal Industry workers.

In additional to federal laws and safety standards, Pennsylvania's coal operators are also regulated by a state safety law and state regulations. The Pennsylvania Mine Safety Law was comprehensively amended in 2008 following months of discussions among the state legislature, the Governor's office, industry and labor.

3.3 Mine Subsidence

Mine subsidence occurs when the ground moves as a result of underground mining activities. Room and pillar mining, where 'pillars' of coal remain to support the mine roof, does not result in any immediate subsidence. However, as the remaining coal pillars deteriorate over time, subsidence can occur and create sinkholes or troughs, which are localized depressions on the surface. These localized occurrences of subsidence can and do cause severe damage to surface features including structures and roadways. This type of subsidence is likely to occur over older room and pillar mines although pillars left in any underground mine can eventually deteriorate and lead to subsidence. The Pennsylvania legislature recognized this problem and passed legislation in the 1960's to establish a mine subsidence insurance program. This program provides low cost insurance for homes in the event they are damaged by unplanned subsidence from old underground mines.

By design, longwall mining causes subsidence – it is planned subsidence. This method purposefully allows the roof of the mine to collapse behind the coal removal area, concurrently creating a large trough of subsidence on the surface. Though damage to some structures is inevitable, the predictable nature of the subsidence allows mining companies to take steps on the surface to minimize the impacts and to ultimately repair any damages. Mining companies are required by law to repair or compensate for any damage caused by subsidence and to replace any water supplies impacted by their operations. Some companies compensate landowners beyond their legal obligations with upfront inconvenience payments and other steps taken through company initiated programs.

3.4 *Water Quality*

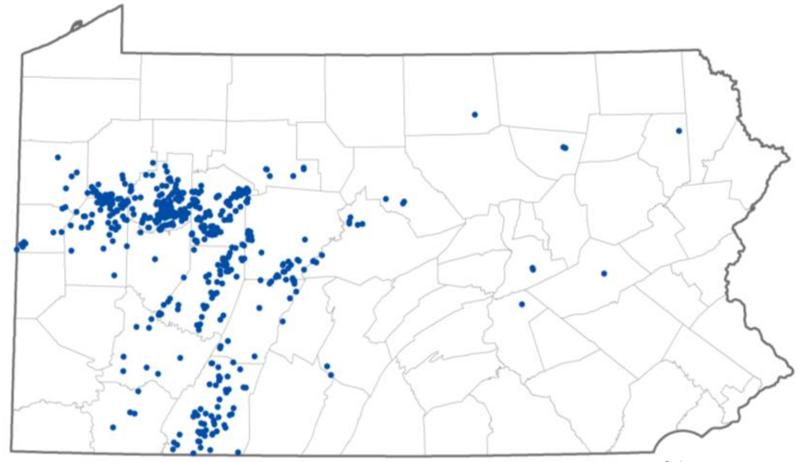

Figure 21 - Location of abandoned mines in Pennsylvania[xlvi]

Large amounts of water are required for coal mining and preparation. Sophisticated programs to regulate and manage these water streams are now in place in Pennsylvania. But impacts from acid mine drainage from abandoned mines are a legacy of historical practices. In Pennsylvania, there are 250,000 acres of abandoned mine lands. In more recent years, increased regulation and legislation, specifically the federal Surface Mining Control and Reclamation Act of 1977, have mandated lands be returned to their original condition, also known as reclaiming, after mining is completed. Unfortunately, there are still open mine shafts, large water-filled pits, and other hazards at abandoned mine lands throughout the state. Today's mining industry and the Pennsylvania DEP are working to correct these relics of the past, shown in Figure 21.[xlv] The cost to reclaim all of Pennsylvania's abandoned mines is estimated at $15 billion.[xlvi]

The most notable effect of abandoned mine lands is acid mine drainage (AMD). Acid mine drainage is produced when old abandoned underground mines flood and discharge to the surface or from old surface mines and refuse disposal sites that were not properly reclaimed. The combination of water and oxygen interacts with naturally occurring acidic materials in the rock and coal forming iron and other metallic compounds that lower pH levels of any receiving stream and form iron based deposits that coat the stream bottom. At high loads, it can kill fish and living organisms and pose risks to human health if the water is consumed. There are 3,129 miles of AMD impaired streams in Pennsylvania.[xlvii]

Title V of The Surface Mining Control and Reclamation Act of 1977 requires that all mining operations restore the land to its pre-mining condition and no mine is allowed to be permitted if it will have a post-mining discharge. In addition to the Federal regulations, Pennsylvania imposes a more stringent set of standards on the Coal Industry. In 2007-2008, more than 16,500 acres were in the process of being restored or had completed restoration[xlviii] as part of the routine operation of the Coal Industry after a mine is no longer active.

State and federal regulatory bodies, environmental and conservation groups, and the industry itself are making significant efforts to ameliorate problems from the past. The federal Abandoned Mine Reclamation Fund, which is funded by a tax on each ton of mined coal, has been used extensively in Pennsylvania. To supplement Pennsylvania's share of these funds, the Pennsylvania DEP has sought additional funding sources and estimates that $950 million in combined federal and state money has been spent on this issue. Pennsylvania has also implemented a Comprehensive Plan for Abandoned Mine Reclamation, placing a high priority on mine reclamation. Beyond the myriad laws and government funds, today's mining industry voluntarily reclaims thousands of acres annually.[xlix] As a result of the remining incentive programs created by the 1992 amendment to the Pennsylvania Surface Conservation and Reclamation act, more than 4,500 acres of abandoned mine lands have been reclaimed by the Pennsylvania Coal Industry at no cost to the Pennsylvania taxpayer.[l] The Office of Surface Mining Reclamation and Enforcement at the U.S. Department of the Interior estimates that this represents more than $24 million in value. The Pennsylvania DEP estimates that remining reclaims close to three times as much land as the state contracts funded by the federal and state programs[li] and allows the Pennsylvania DEP to focus on addressing the sites that represent the most serious hazard to health.

In December 2006, the United State Congress passed legislation[lii] extending and revamping the federal law that mandates a reclamation fee on each ton of coal produced in the country. The new law will do a much better job of directing AML funding to abandoned mine land problem areas, where funding is needed the most. Pennsylvania, for example, will receive $1.4 billion over the life of this funding stream.

3.5 Local air quality and global carbon

Although not directly affecting the activity of the coal extraction and support industries, air quality and global carbon emission concerns stemming from electric power generation from coal can affect demand for output from the Coal Industry. Over time, increased regulation and improvements in technology have been implemented to address a number of air quality issues. The private sector has a long history of innovating to improve environmental performance. Solutions have been implemented for mercury, sulfur-dioxide, and nitrogen oxide emissions that improve local air quality, and investment is occurring to develop means to reduce carbon loading in the global atmosphere. From 1970 to 2007, coal use has increased by 225%, while regulated emissions have dropped by more than 70 percent (sulfur dioxide emissions decreased by 79 percent, nitrogen oxide emissions decreased by 70 percent)[liii].

Concern over acid rain is one example of successful local air quality improvements. Acid rain is the wet or dry distribution of acidic compounds. Although natural causes of acid rain exist, the overwhelming source of acid rain are the emissions of sulfur dioxide, and to a smaller extent nitrogen oxide, that come from burning fossil fuels, especially coal. The compounds mix with natural atmospheric compounds to form acid, which is eventually deposited to the surface locally and downwind.

Over time, the coal-burning electric power plant industry has invested in making dramatic improvement in this area. Most plants now use flue gas desulfurization to remove sulfur, typically with wet scrubbers where limestone slurry neutralizes the acid. Also, a cap-and-trade program that allows emitters to efficiently trade emission credits, established by the 1990 amendments of the Clean Air Act, provides economic incentives to reduce pollution. This Act set out to reduce sulfur dioxide emissions to half of 1980 levels, capping them in 2010, and to reduce nitrogen oxide to 2 million tons lower than the forecasted level for 2000, reducing annual emissions to a level of 6.1 million tons in 2000. In 2006, there was nearly 100 percent compliance with the EPA Acid Rain Program, and the Agency estimated there would be a 40:1 benefit to cost ratio in 2010.[liv]

In addition to the local issues of air quality, concern over global climate change and its potential impacts is driving public attention to energy use and carbon-dioxide, which is the most commonly emitted greenhouse gas. In 2007, the use of coal was responsible for emitting 2,086 teragrams (Tg) of carbon-dioxide. The use of petroleum and natural gas was responsible for 2,432 Tg and 1,216 Tg respectively.[lv] Debates over national and international controls on emissions, the feasibility and costs of installing carbon capture technology, and the associated increased costs of inputs have are now occurring throughout our state and federal governments. Ultimately, the regulation of carbon emissions is inseparable from coal and electricity prices.

To mitigate the potential warming effects of carbon emissions, a number of carbon capture and storage techniques that seek to retain and store carbon before it enters the atmosphere are being developed. These can be biological processes such as increasing plankton and algae in the ocean, increasing forestry, and increasing the soil's absorption capabilities; physical processes that include biomass burial in landfills or the ocean, and capture and storage, which includes capturing carbon and injecting it into aquifers or wells; and chemical processes that break down the carbon dioxide into non-greenhouse gas compounds. Although each of these techniques holds promise, each varies in terms of cost, effectiveness, and certainty of results. Additional research is being conducted to try to successfully pilot the technologies in demonstration projects before they can be implemented on a broad scale, and some key questions around liability for the stored carbon-dioxide remain unanswered. If the cost of implementation of carbon capture and storage falls on the industries that consume coal, such as the electricity industry and its customers, it will increase both electricity prices and the input costs of other industries that use coal as a feedstock. As such, it is important that policy makers weigh the environmental benefits against the adverse effects of increased costs for electricity and other goods when policy is being developed. Given the prominence of coal in the nation's energy supply and its relationship to the health of Pennsylvania's economy, it is crucial that target dates for implementation are realistic given the current stage of technology development.

4 The Coal Industry in Pennsylvania - Profiles

The impacts of the Coal Industry reach across the entire state. It creates wealth in rural areas through extraction, which provides work for miners and support companies where mines are located. The industry also creates wealth in metropolitan and more urban areas where company headquarters and offices are located. The widespread impact of the Coal Industry is displayed in Figure 22,[lvi] in which counties are shaded by the number of core Coal Industry company locations found in each. Figure 23[lvii] is a histogram of the number of employees in each company location. The overwhelming majority of businesses are small in terms of the number of employees at each site. One-third of the business locations have two to four employees and more than 80 percent have fewer than 25 employees.

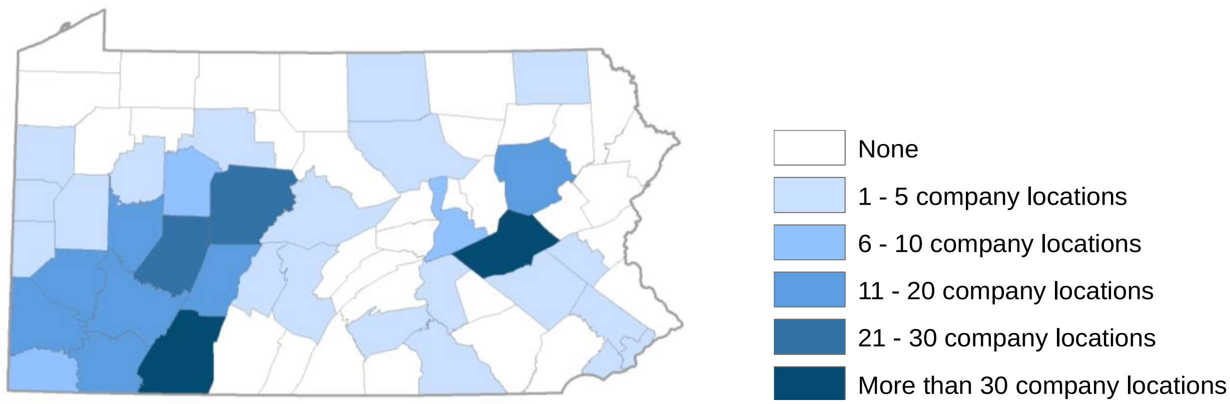

Figure 22 - Coal Industry business locations are spread across Pennsylvania with a concentration in the West[lvi]

Figure 23 - Number of employees per business site[lvii]

Companies in industry sectors that provide services primarily to the Coal Industry are more widely spread across the Commonwealth than the core coal mining companies. Although the support industry is also concentrated in the coal producing part of the state, as shown in Figure 24. [lviii]

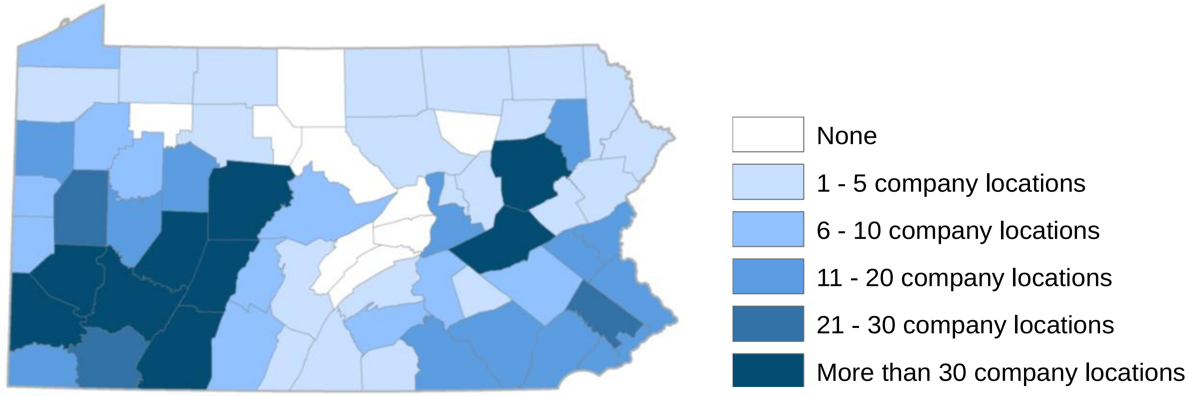

Figure 24 - Coal Industry support industry locations are also concentrated in the west[lviii]

The next section describes nine of the major players in Pennsylvania's Coal Industry. CONSOL Energy and Alpha Natural Resources (formerly Foundation Coal) account for 60 percent of the state's production through their five major underground facilities. Beyond them are dozens of smaller companies operating both surface and underground mines. Pennsylvania's major coal producers mine more than 1 million tons of coal annually.

Company data was collected from Securities and Exchange Commission Filings, company Web sites and the Pennsylvania DEP Bureau of Mining and Reclamation lists of anthracite and bituminous coal operators in Pennsylvania. Geographic presence was based on data from the Pennsylvania DEP Bureau of Mining and Reclamation.

4.1 Alpha Natural Resources

www.alphanr.com

Headquarters: Abingdon, VA
Pennsylvania Affiliated Operations: Two preparation plants, 1 blending facility, 1 transloading facility, 6 underground mines, 9 company surface mines, 9 contract surface mines.
% of Reserves in Pennsylvania: 12%
% of Production in Pennsylvania: 15%
2008 Pennsylvania Production: 3,295,210 tons

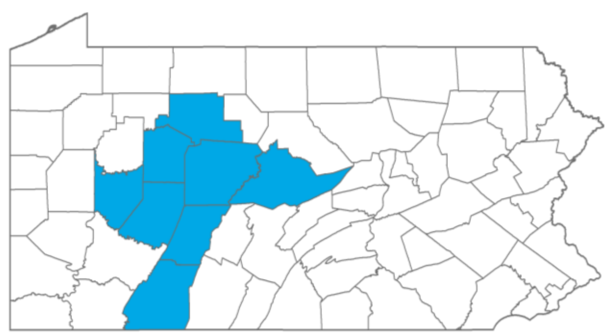

Figure 25 - Location of Alpha Natural Resources mining activity

In 2008 Alpha Natural Resources through its affiliates sold 28.3 million tons of steam and metallurgical coal. The company is organized into eight regional business units in Virginia, West Virginia, Kentucky, and Pennsylvania (AMFIRE) employing approximately 3,800 people. Through its affiliates in 2008, Alpha Natural Resources operated 34 active underground mines, 27 active surface mines and 11 preparation plants located throughout Virginia, West Virginia, Kentucky and Pennsylvania. In Pennsylvania AMFIRE employed 442 people. In 2008, Alpha affiliates owned or leased 599.7 million tons of proven and probable coal reserves.

In May 2009, Alpha Natural Resources announced plans to merge with Foundation Coal. The merger was completed at the end of July 2009. The combined company retains the Alpha name and headquarters in Abingdon, VA. With affiliate coal production capacity of more than 90 million tons a year, Alpha is the nation's leading supplier and exporter of metallurgical coal used in the steel-making process and is a major supplier of thermal coal to electric utilities and manufacturing industries across the country. The company, through its affiliates, employs approximately 6,200 people and operates more than 60 mines and 14 coal preparation facilities in the regions of Northern and Central Appalachia and the Powder River Basin.

4.2 Alliance Resources Partners L.P.

www.arlp.com

Headquarters: Tulsa, OK
Pennsylvania Operations: One underground mine under construction, one underground mine in permitting
% of Reserves in Pennsylvania: 15%
% of Production in Pennsylvania: N/A
2008 Pennsylvania Production: N/A

Figure 26 - Location of future Alliance Resources mining activity

The twelfth-largest U.S. coal producer, Alliance Resource Partners, L.P. produced 24.2 million tons of coal in 2007. The company currently operates nine underground mines in Illinois, Indiana, Kentucky, Maryland, and West Virginia, along with two mines under development in Pennsylvania. The Tunnel Ridge Complex is scheduled to open in late 2010, straddling the Pennsylvania/West Virginia line in Washington County. The $285 million facility includes 70.5 million tons of reserves that will be mined at a rate of approximately six million tons annually. Employment is projected to be 320. Meanwhile, the Penn Ridge Complex, also in Washington County, consists of 57 million tons of reserves. It is still in the permitting process.

4.3 Amerikohl Mining, Inc.

www.amerikohl.com

Headquarters: Butler, PA
Pennsylvania Operations: Corporate headquarters, 9 surface mines
% of Reserves in Pennsylvania: N/A
% of Production in Pennsylvania: 90%
2008 Pennsylvania Production: 1,177,045 tons

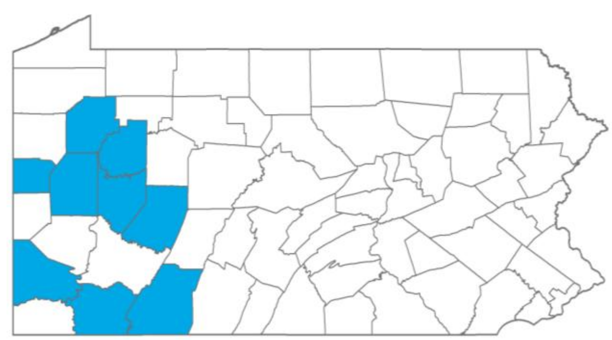

Figure 27 - Location of Amerikohl Mining mining activity

Amerikohl Mining Inc. is one of the top surface mining coal producers in Pennsylvania, producing nearly 1.2 million tons of coal annually. Its principal business is the mining and preparation of steam coal sold primarily to electric utilities. The company employs more than 100 people, including field engineers, geologists, foremen, and laborers. Amerikohl has mined and reclaimed over 200 separate mine sites in Pennsylvania, Ohio, and West Virginia since opening for business in 1978.

4.4 CONSOL Energy Inc.

www.consolenergy.com

Headquarters: Canonsburg, PA
Pennsylvania Operations: Corporate headquarters, research and development center, four underground mines (including one split between West Virginia and Pennsylvania), natural gas and supply division headquarters, river transportation facilities
% of Reserves in Pennsylvania: 41%
% of Production in Pennsylvania: 44%
2008 Pennsylvania Production: 28,507,581 tons

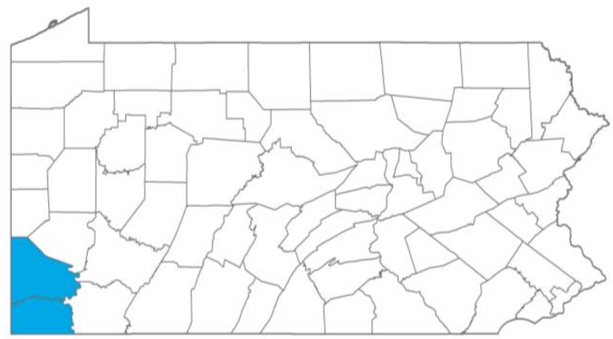

Figure 28 - Location of CONSOL Energy mining activity

CONSOL Energy Inc. is the largest producer of high-Btu bituminous coal in the United States and a leader in the production of coalbed methane gas. The company ranked fifth in total production in 2007 and has the second-largest amount of proven recoverable reserves among U.S. coal producers. With revenues of $4.6 billion, the company recently made the Fortune 500. CONSOL Energy employs 8,000 people across six states, including more than 2,300 in Pennsylvania. In 2008 the company's Pennsylvania operation spent $358 million in wages and benefits and $191 million in state taxes. Its Bailey and Enlow Fork Mines represent the two largest underground mining complexes in the world, producing between nine and 11 million tons annually. CONSOL has plans for another underground mine located adjacent to these two facilities.

4.5 Dana Mining Company Inc.

Headquarters: Morgantown, WV
Pennsylvania Operations: Two underground mines
% of Reserves in Pennsylvania: N/A
% of Production in Pennsylvania: 55%
2008 Pennsylvania Production: 1,053,629 tons

Figure 29 - Location of Dana Mining Co. mining activity

Dana Mining Co. operates three underground mines including two in Greene County, with total annual production of approximately 1.5 million tons annually. The company's Four West mine began production in 2006 and is now the company's largest mine. More than 160 people are employed at Dana's two Pennsylvania mines.

4.6 Foundation Coal

Headquarters: Linthicum Heights, MD
Pennsylvania Operations: Two underground mines, and associated preparation plants and loadout facilities
% of Reserves in Pennsylvania: N/A
% of Production in Pennsylvania: N/A
2008 Pennsylvania Production: 13,664,380 tons

Figure 30 - Location of Foundation Coal mining activity

In 2008, Foundation Coal through its affiliates operated 12 individual coal mines located in Wyoming, Pennsylvania and West Virginia employing more than 3,000 employees. Through its affiliates in 2008, Foundation Coal operated 4 surface mines, 8 underground mines along with preparation plants and loadout facilities. The affiliated operations sold 70.9 million tons of coal and had 1.8 billion tons of proven and probable coal reserves. Based on 2008 production, Foundation Coal was the fourth largest coal producer in the United States. In Pennsylvania in 2008, the Emerald and Cumberland underground mines shipped 14.4 million tons and employed approximately 1,420 salaried and hourly employees. Foundation Coal affiliated operations controlled approximately 730.5 million tons of contiguous reserves in Northern Appalachia. In 2007, Foundation Coal affiliates applied for permits for two new underground mines in Greene County, Pennsylvania.

4.7 Parkwood Resources

Headquarters: Homer City, PA
Pennsylvania Operations: Corporate Headquarters, One Underground Mine
% of Reserves in Pennsylvania: N/A
% of Production in Pennsylvania: 100%
2008 Pennsylvania Production: 1,038,220 tons

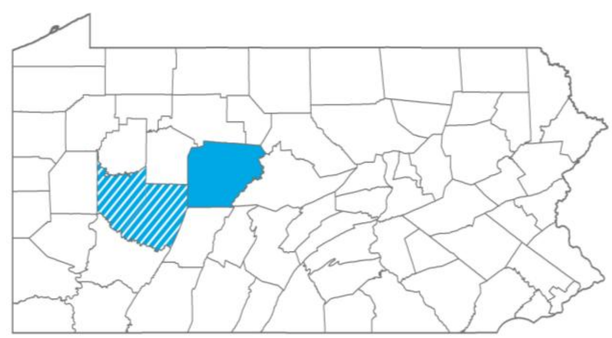

Figure 31 - Location of Parkwood Resources permitted and current mining activity

Currently operates the Cherry Tree Mine in Clearfield County which employs 105 and produces slightly more than 1 million tons annually. The company also has permits for mines in Armstrong and Indiana Counties.

4.8 PBS Coals Limited

www.pbscoals.com

Headquarters: Friedens, PA
Pennsylvania Operations: Corporate headquarters, six underground mines, six surface mines, two preparation plants
% of Reserves in Pennsylvania: 100%
% of Production in Pennsylvania: 100%
2008 Pennsylvania Production: 2,698,166 tons

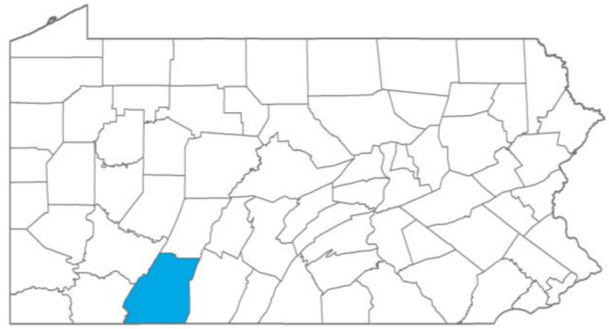

Figure 32 - Location of PBS Coals Limited mining activity

With operations centered in Somerset County, PBS Coals produces about 2.5 million tons annually and controls approximately 251 million tons of reserves. In 2008, PBS Coals was purchased for $1.3 billion by Russian steelmaker Severstal to give the company steady access to the company's metallurgical coal holdings.

4.9 Reading Anthracite Company

www.readinganthracite.com

Headquarters: Pottsville, PA
Pennsylvania Operations: Corporate headquarters, two active surface mines, three coal refuse reclamation sites
% of Reserves in Pennsylvania: 100%
% of Production in Pennsylvania: 100%
2008 Pennsylvania Production: 1,255,723 tons

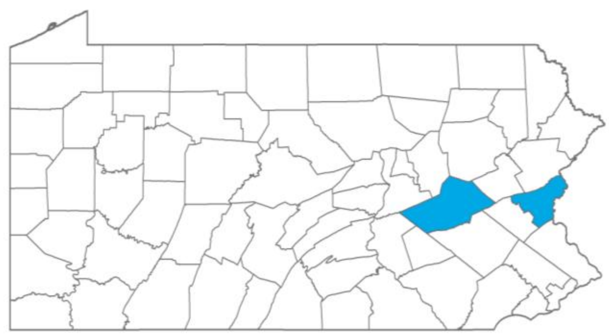

Figure 33 - Location of Reading Anthracite Company mining activity

Founded in 1871, Reading Anthracite Company is the largest anthracite producer in Pennsylvania with 2008 production of 1.25 million tons, 15.6 percent of total anthracite production in the state. The company employs more than 500 people and owns more than 20,000 acres in Northumberland and Schuylkill counties. While it is currently producing at five sites, it holds permits for a total of sixteen locations in Schuylkill and Northampton counties.

4.10 Rosebud Mining Company

www.rosebudmining.com

Headquarters: Kittanning, PA
Pennsylvania Operations: Corporate headquarters, 13 underground mines, 4 preparation plants, surface shop and trucking subsidiary.
% of Reserves in Pennsylvania: N/A
% of Production in Pennsylvania: 94.7%
2008 Pennsylvania Production: 4,840,000 tons

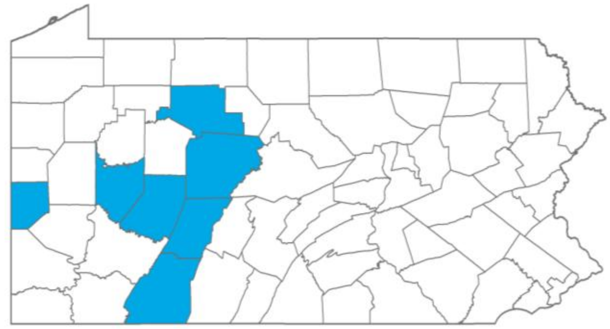

Figure 34 - Location of Rosebud Mining mining activity

With 5.2 million tons of production in 2008, Rosebud ranked as the 29th largest coal producer in the United States. Founded in 1979, the company now operates 14 mines (two of which opened in 2008) and five preparation plants in Armstrong, Beaver, Cambria, Clearfield, Elk, and Indiana counties in Pennsylvania and Tuscarawas County, Ohio. Two additional mines are under development in Pennsylvania. Currently, Rosebud Mining Company is the third largest underground coal producer in Pennsylvania, providing steam and metallurgical coals to domestic and international customers. In late 2008, total companywide employment was approximately 825.

5 Measuring the Economic Impact of the Coal Industry in Pennsylvania

The economic impact of the Coal Industry in Pennsylvania is not limited to the employment and compensation within the industry itself. Through its supply chain, the Coal Industry creates jobs in related industries. These jobs would not exist without the activity of the Coal Industry. Similarly, the wages paid to employees have an effect on the broader economy as employees use their compensation to buy goods and services for their personal use.

To estimate the overall economic impact of the Coal Industry in Pennsylvania, the Economy League used an input-output model for the state. There are several input-output models commonly used by economists to estimate multiplier effects. Because of the complexity of measuring multiplier effects, all of the models have limitations. Still, economists generally agree that the models can provide a reasonable approximation of the indirect and induced spending, and total jobs generated by a given amount of direct spending in a particular geographic area. The Economy League employed the RIMS II input-output model in developing the impact estimates of the construction of the Coal Industry on the Pennsylvania economy.[lix]

The RIMS II model organizes the economy into more than 400 separate industry sectors and has comprehensive data on every geographic area of the United States. It was initially developed and used in the 1970s by the Bureau of Economic Analysis as RIMS (Regional Industrial Multiplier System), and after being enhanced in the 1980s it became known as RIMS II (Regional Input-Output Modeling System). RIMS II was revised twice in the 1990s, most recently in 1997.

The model is a static equilibrium model based on national benchmark input-output accounts. Multipliers are based on the 1997 benchmark input-output table for the nation and 2006 regional data from the Bureau of Economic Analysis.[lx] RIMS II multipliers can be viewed as upper-bound estimates because of some of the assumptions made by the model to derive the multipliers. For this study, the Economy League focused on the economic impact that is expected inside Pennsylvania.

5.1 *Direct, indirect and induced economic impact*

The economic impact of the Coal Industry on the Pennsylvania economy is not limited to the employment and other economic activity directly related to the Coal Industry. Through its supply chain, the Coal Industry creates jobs in related industries, and some of these jobs would not exist without the activity of the Coal Industry. Similarly, the wages paid to employees working in the Coal Industry have an effect on the broader economy as employees use their compensation to buy goods and services.

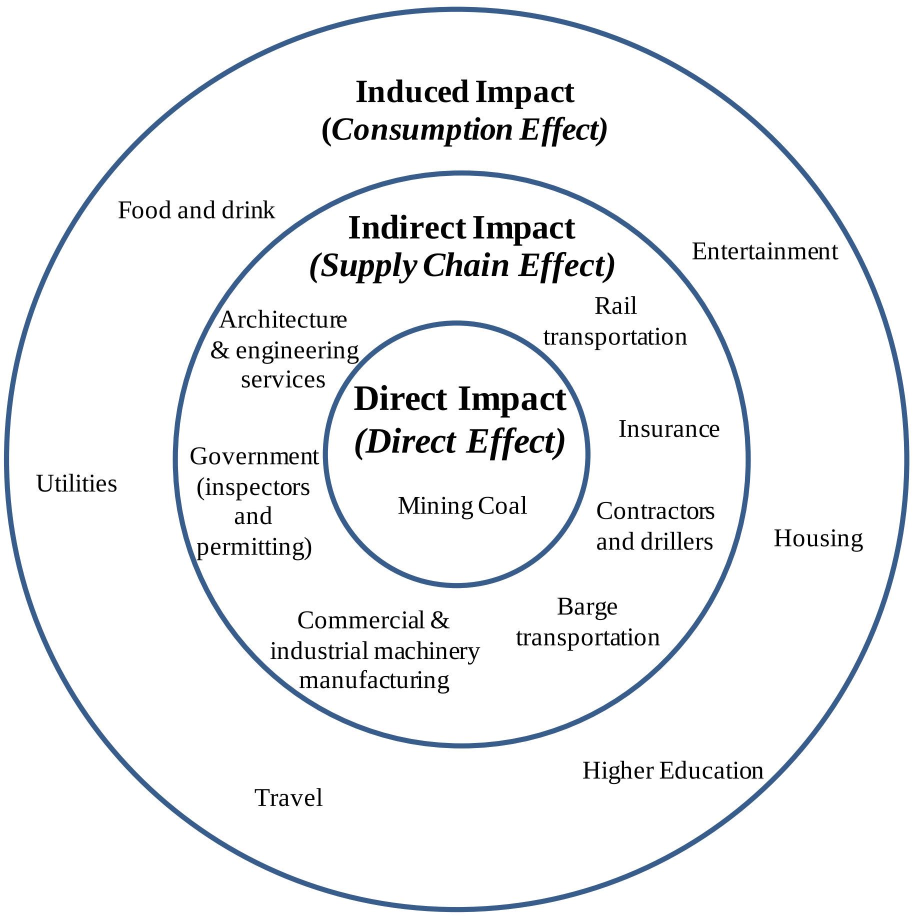

Figure 35 - The Coal Industry has an impact on the broader economy through indirect and induced spending

The ***Direct Spending*** of the Coal Industry in the Pennsylvania economy is the total the industry spends on payroll, goods (such as equipment) and services (such as engineering contracts). The money spent by the Coal Industry in its supply chain is spent again by local businesses. Businesses make their own purchases and pay employees – termed ***Indirect Spending***. Employees throughout the supply chain use their salaries and wages to purchase goods and services from other businesses for personal consumption – termed ***Induced Spending***. A chain reaction of indirect and induced spending continues, with subsequent rounds of additional spending gradually diminished through savings, taxes and expenditures made outside the state. This economic ripple effect is measured by RIMS II and other input-output economic models, using multipliers to provide estimates of the number of times each dollar of input, or direct spending, cycles through the economy in terms of indirect and induced output, or additional spending, personal income and employment. Figure 35 presents an illustration of some direct, indirect and induced impacts of the Coal Industry.

5.2 Methodology

To determine the economic impact of the Coal Industry in Pennsylvania in 2008, the Economy League identified the core industry as the '*Coal Mining'* industry sector as defined by the RIMS II model, choosing from more than 400 possible industries. The RIMS II Type II multiplier was applied, as this estimates the induced effects resulting from household spending in addition to the indirect effects, capturing the impact of the industry more comprehensively.

The RIMS II multiplier allows the user to estimate the impact that this industry sector has on the state, including employment and output, defined as follows:

- **Employment** – the number of full- and part-time workers supported in an industry sector[lxi]
- **Output –** the sales, or receipts, and other operating income, plus commodity taxes and changes in inventories of an industry sector[lxii]

6 The Economic Impact of the Coal Industry in Pennsylvania

As shown in Table 5, Pennsylvania's Coal Industry is a vital contributor to the state's economy, providing support through direct, indirect and induced impacts:

- **Approximately 41,500 full- and part-time jobs,** close to 9,000 of these directly in the Coal Industry. For each direct Coal Industry job an additional 3.77 jobs are generated throughout the Commonwealth of Pennsylvania.
- **Approximately $7.5 billion in economic output created in Pennsylvania,** $3.2 billion of this directly created by the Coal Industry in the Commonwealth.

Table 5- Summary of Coal Industry economic impact in Pennsylvania

Coal Industry	Direct	Indirect and Induced	Total
Employment Impact	8,724	32,853	**41,577**
Output Impact	$3,247,978,670	$4,229,193,026	**$7,477,171,696**

6.1 Employment: The Coal Industry generates approximately 41,500 full- and part-time jobs in Pennsylvania

Among the approximately 41,500 full- and part-time jobs supported by the Coal Industry, the core Coal Industry generates nearly 9,000 jobs directly. The close to 33,000 indirect and induced jobs are in industries that supply goods and services to the Coal Industry, as well as in industries across the entire economy as employees of the Coal Industry and its supply chain spend their income on various goods and services.

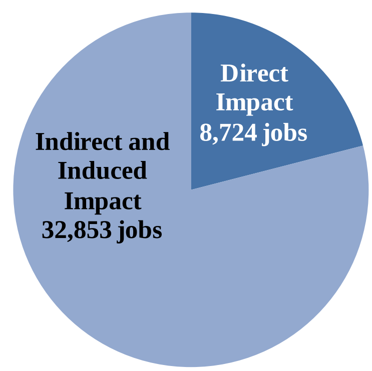

Figure 36 - Employment impact summary

Although both using the RIMS II multipliers, this estimate of the employment resulting from the activity of the Coal Industry differs from that found in *The Economic Contributions of U.S. Mining in 2007* report released by the National Mining Association (NMA) in 2009. The NMA report includes contractors in their count of direct industry employees, while the Economy League does not. This has knock-on effects on the overall employment impact numbers as the industry multiplier is applied to a lower base. The NMA report also considers out-of-state indirect employment, while the Economy League study is focused purely on the in-state effects of the in-state industry.

6.2 Output: The Coal Industry creates $7.5 billion in output across the economy in Pennsylvania

The Coal Industry created $3.2 billion in direct output in 2008 – the value of the bituminous and anthracite coal mined by the industry in Pennsylvania that year.[lxiii] This stimulated a further $4.2 billion in output across the Pennsylvania economy, including in companies that supply products to the Coal Industry and in companies that supply goods and services to the employees of the Coal Industry and its supply chain. In total, approximately $7.5 billion in output was created as a result of Coal Industry activity across the Pennsylvania economy.

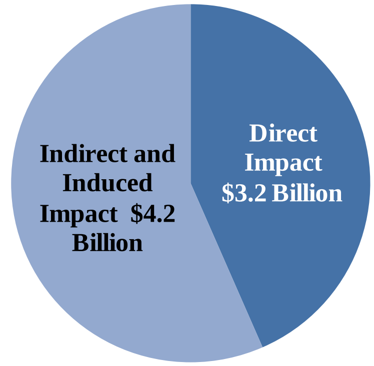

Figure 37 - Output impact summary

6.3 Average wages paid by the Pennsylvania Coal Industry

Average wages in the Pennsylvania Coal Industry, overall, are higher than in the private sector (see Table 6). Starting from this higher base, average wages for jobs covered by the unemployment insurance system in the *coal mining* industry have increased at the same rate as private sector wages. Average wages in the *support activities for coal mining* sector have increased at twice the rate of the private sector.

Table 6 - Pennsylvania average wages in the Coal Industry compared to Pennsylvania private sector[lxiv]

	2002	2003	2004	2005	2006	2007	2002-07 percent change
Coal mining	$53,163	$55,955	$59,553	$65,511	$65,366	$64,695	+22%
Support activities for coal mining	$35,010	$35,792	$42,016	$43,570	$45,920	$50,266	+44%
Total, all private sector industries	$35,277	$36,483	$38,066	$39,264	$41,019	$42,945	+22%

6.4 *Pennsylvania is a center of Coal Industry innovation*

Supporting its position as a hub of the Coal Industry, Pennsylvania is home to two of the largest coal research facilities in the country – the National Energy Technology Laboratory and CONSOL Energy Research & Development. Combined, they account for nearly $500 million in coal-related research and development annually (see Table 7).[lxv]

Table 7 - NETL and CONSOL Energy spending on coal-related research and development (2004 - 2008)[lxv]

	FY 2004	FY 2005	FY 2006**	FY 2007	FY 2008
National Energy Technology Laboratory (NETL)*	$411.6 Million	$317.6 Million	$323.2 Million	$414.4 Million	$493.4 Million
CONSOL Energy	$5.2 Million	$2.1 Million	$2.8 Million	$3.9 Million	$4.0 Million
Total	**$416.8 Million**	**$319.8 Million**	**$326.0 Million**	**$418.3 Million**	**$497.4 Million**

***** NETL includes coal-related research only. While the work is predominantly performed in Pittsburgh, figure also includes expenditures at Morgantown, WV and Albany, OR laboratories.
** FY 2006 expenditures for NETL represent requested appropriation.

6.4.1 National Energy Technology Laboratory

Part of the Department of Energy's national laboratory system, the National Energy Technology Laboratory (NETL), focuses on coal, natural gas, and oil technologies, contract and project management, analysis of energy systems, and international energy issues. Based outside Pittsburgh in South Park, PA, NETL conducts its research through five laboratories – South Park, Morgantown, WV; Tulsa, OK; Albany, OR and Fairbanks, AK. While South Park and Morgantown focus their efforts on coal research, Tulsa on petroleum, Albany on new materials and Fairbanks on arctic climates, research in any area can be conducted at any lab.

NETL's research is centered on six broad programmatic areas:

- Secure and Reliable Energy Supplies, involving advancing cost-effective technologies for finding and producing domestic fossil resources while meeting environmental requirements
- Clean Power Generation, focused on increasing efficiency of coal-fired power plants
- Hydrogen Fuel Cells
- Climate Change
- Energy Efficiency and Renewable Energy, investigating more efficient uses of energy in buildings, transportation, and industry, and accelerating development of renewable energy options
- Critical Infrastructure Assurance, involving disaster response and upgrading the nation's electricity transmission and distribution (T&D) system through the development of a nationally coordinated grid modernization framework and management of T&D research and development projects

Overall, the laboratory had a budget of $2.27 billion in FY 2008, approximately $500 million of which was devoted to specific coal-related research initiatives including clean-coal power, fuels and power systems and the FutureGen project.

An economic impact study conducted by NETL in 2006 indicated that the laboratory had a total impact (direct and indirect) on the Pennsylvania/West Virginia economy of 3,180 jobs and $283 million.

6.4.2 CONSOL Energy Research & Development

Canonsburg-based CONSOL Energy operates the largest private research and development facility in the country that is devoted exclusively to coal and energy utilization and production. While the facility's primary mission is to support the production of CONSOL Energy's coal and gas operations, it also focuses on energy development, improving energy efficiency and reducing pollution. As seen in the above table, CONSOL has steadily increased its research expenditures since 2005 from $2.2 million to $4.0 million.

Research conducted at the facility currently emphasizes five primary areas:

- Improving coal blends for making steel
- Liquid coal for fueling vehicles
- Reducing power plant emissions
- Producing electricity from by-products
- Storing carbon dioxide in unmineable coal seams

In addition to its own internal research, CONSOL Energy also conducts research for third party clients. Among the services offered are:

- Research project coordination and execution
- Analytical sampling, measurements and consulting
- Air sample testing and consulting
- Metallurgical coal testing and research
- Pilot plant design, construction and operation
- Pulverization for bulk shipment

6.5 The Mining Machinery and Equipment Manufacturing Industry in Pennsylvania

With such a heavy concentration of mining activity in Pennsylvania and adjacent states, it is no surprise that Pennsylvania also has a strong concentration of manufacturers producing machinery and equipment for the industry. Pennsylvania has the largest mining machinery and equipment manufacturing industry in the country, accounting for 27 percent of the country's sector employment. Companies such as Joy Mining Machinery, BUCYRUS, Brookville Equipment Corporation, Fenner Dunlop Conveyor Systems and Services, JENNMAR, all call Western Pennsylvania home.

Mining machinery and equipment manufacturing employment in Pennsylvania has a location quotient of 6.52 which indicates that the percent of people employed in the industry in Pennsylvania is more than six and a half times the national average. This indicates that the mining machinery and equipment industry is a traded sector and serves the national Coal Industry, not just the needs within Pennsylvania. This national market explains why the industry does not appear even more prominently in the economic impact analysis of Pennsylvania's Coal Industry – the Pennsylvania jobs in the mining manufacturing and equipment industry are supported by demand in the national and international Coal Industry.

Table 8 - Mining equipment manufacturing is an important contributor to Pennsylvania's manufacturing base

Year	2001	2002	2003	2004	2005	2006	2007
Mining Equipment Employment	2,825	2,751	2,574	2,705	2,787	3,118	3,166
Percent of Manufacturing Employment	0.34%	0.36%	0.36%	0.39%	0.41%	0.46%	0.48%
Location Quotient	4.78	5.23	5.46	5.85	6.35	6.62	6.52
Establishments	33	29	27	26	26	28	24
Total Wages (000)	$136,962	$130,834	$128,689	$147,477	$157,682	$185,799	$190,443
Average Annual Wage	$48,488	$47,556	$49,999	$54,523	$56,573	$59,597	$60,154
Percent of Manufacturing Average Wage	117.0%	111.0%	112.7%	118.6%	119.6%	122.3%	119.5%

While this sector represents a small part of total manufacturing (<0.5 percent), it is one of the few that is growing. Since 2001, Mining Machinery and Equipment manufacturing employment grew from 2,825 to 3,166, or 12.1 percent, despite a drop in establishments. During this period, total manufacturing employment in Pennsylvania decreased by -19.9 percent. Nationwide, Mining Equipment Employment fell by nearly 20 percent, performing worse than manufacturing as a whole.

In addition to being one of the healthier manufacturing sectors in Pennsylvania, it is also one of the higher paying sectors, with an average wage roughly 20 percent above the average manufacturing wage for the state. This average has increased 24 percent since 2001, slightly higher than the national growth rate.

Table 9 - Mining equipment and manufacturing changes from 2001 to 2007

	Percent Change for Mining Equipment (2001 – 2007)		Percent Change for Manufacturing (2001 – 2007)	
	PA	**U.S.**	**PA**	**U.S.**
Mining Equipment Employment	12.1%	-15.7%	-19.9%	-15.6%
Establishments	-27.3%	-19.0%	-18.7%	-9.1%
Total Wages (000)	39.0%	5.2%	-2.8%	5.1%
Average Annual Wage	24.1%	24.7%	21.4%	24.5%

[i] Pennsylvania Department of Community and Economic Development, *Coal in Pennsylvania*
[ii] Energy Information Administration
[iii] Energy Information Administration, *Coal Production, 1949-2008*
[iv] Pennsylvania State University Environmental Resources Research Institute, *Coal Mined Areas*
[v] Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation, *Anthracite Coal Mining Activities 1870 To 2008- Historical Summary*; and *Bituminous Coal Mining Activities 1870 To 2008- Historical Summary*
[vi] Energy Information Administration, *Annual Energy Review- Coal Production, 1949-2008*
[vii] Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation, *2008 Pennsylvania Coal Mining Production*
[viii] Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation
[ix] Pennsylvania Coal Association analysis based on PA Department of Environmental Protection, *2008 Underground mines reporting production*
[x] Allegheny Conference on Community Development Enlow Fork Mine Tour
[xi] The Energy Information Administration attributed all production for a mine to the predominant method of mining (i.e. if longwall was responsible for 90%, the 10% attributable to continuous mining was counted as longwall).
[xii] DEP, *Coal Mining Operations*
[xiii] DCNR and the Pennsylvania and Pittsburgh Geological Societies, *Geology of Pennsylvania* 1999
[xiv] DEP, *Coal Mining Operations*
[xv] *Coal in Pennsylvania*
[xvi] EIA, *Domestic Distribution of U.S. Coal by Destination State, Consumer, Origin and Method of Transportation, 2007*
[xvii] EIA, *Domestic Distribution of U.S. Coal by Destination State, Consumer, Origin and Method of Transportation, 2007*
[xviii] EIA, *Domestic Distribution of U.S. Coal by Destination State, Consumer, Origin and Method of Transportation, 2007*
[xix] Department of Commerce, *TradeStats*
[xx] Energy Information Administration, *International Energy Outlook 2009*
[xxi] Energy Information Administration *International Energy Outlook 2009* p. 49
[xxii] EIA, *U.S. Coal Consumption by End Use Sector, by Census Division and State, 2007*
[xxiii] 2006 Number
[xxiv] Energy Information Administration, *U.S. Coal Consumption by End Use Sector, by Census Division and State*
[xxv] Energy Information Administration, *Electric Power Monthly March 2009*
[xxvi] Pennsylvania Public Utility Commission, *2007 Annual Report Alternative Energy Portfolio Standards Act of 2004*
[xxvii] Monitoring Analytics, *Marginal Fuel Postings Annual Summary*
[xxviii] Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*
[xxix] National Energy Technology Laboratory, *Coal Plant Database 2009*
[xxx] EIA, *Net Generation by State by Type of Producer by Energy Source*
[xxxi] Energy Information Administration, *U.S. Coal Consumption by End Use Sector, by Census Division and State*
[xxxii] Energy Information Administration, *U.S. Coal Consumption by End Use Sector, by Census Division and State*
[xxxiii] Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, *2008 Pennsylvania Annual Evaluation Report*
[xxxiv] National Mining Association, *The Economic Contributions of U.S. Mining 2007*
[xxxv] U.S. Department of Labor Mine Safety and Health Administration, *Injury Experience in Coal Mining, 2009*
[xxxvi] Department of Labor, *Coal Fatalities for 1900 Through 2008*
[xxxvii] Pennsylvania Bureau of Mine Safety, *2008 Pennsylvania Coal Mining Production*
[xxxviii] Pennsylvania Bureau of Mine Safety, *Accident Reports (2000 – 2008)*
[xxxix] Bureau of Labor Statistics, *Fatal occupational injuries by selected industries and major events or exposures, Pennsylvania 2008*
[xl] U.S. Department of Labor Mine Safety and Health Administration, *Injury Experience in Coal Mining, 2009*
[xli] Coal Mine Safety and Health
[xlii] National Institute for Occupations Safety and Health, *Coal Workers' Pneumoconiosis: Coal Mine Dust Exposures*

[xliii] U.S. Department of Health and Human Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, *Work-Related Lung Disease Surveillance Report 2002*
[xliv] Coal Mine Safety and Health.
[xlv] Pennsylvania Department of Environmental Protection, *AML Inventory Sites*
[xlvi] Pennsylvania Department of Environmental Protection, Bureau of Mine Safety, *Stay out Stay Alive*
[xlvii] Pennsylvania Organization for Watersheds and Rivers , *Abandoned Mine Reclamation in Pennsylvania*
[xlviii] Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, *2008 Pennsylvania Annual Evaluation Report*
[xlix] Pennsylvania Organization for Watersheds and Rivers, *Abandoned Mine Reclamation in Pennsylvania*
[l] Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, *2008 Pennsylvania Annual Evaluation Report*
[li] Pennsylvania Department of Environmental Protection, *Pennsylvania's Remining Incentives Fact Sheet 2007*
[lii] Western Pennsylvania Coalition for Abandoned Mine Reclamation, *Congress passes monumental AML bill*
[liii] American Coalition for Clean Coal Electricity presentation, based on *EPA Clean Air Markets Database (2006)*, *EIA 2004 Annual Energy Outlook*
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[lv] Environmental Protection Agency, 2009 *U.S. Greenhouse Gas Inventory Report*
[lvi] Economy League Research, Dunn and Bradstreet
[lvii] Economy League Research, Dunn and Bradstreet
[lviii] Economy League Research, Dunn and Bradstreet
[lix] The RIMS II multipliers are designed to be used to measure the economic impact of a change in final demand, in earnings, or in employment on a region's economy, rather than to capture the impact of an already established industry in a region. RIMS II multipliers were used by the National Mining Association in their report *The Economic Contributions of U.S. Mining 2007* released in 2009, and RIMS II multipliers were used in this report to provide consistency across reports.
[lx] Bureau of Economic Analysis, *Regional Multipliers User Handbook*
[lxi] Note: Employment numbers do not capture full-time equivalents (FTEs)
[lxii] Bureau of Economic Analysis, *Glossary*
[lxiii] The value of the output of the Coal Industry in 2008 was calculated using data from the Energy Information Administration. The 2008 average open market sales price for Pennsylvania bituminous and anthracite coal was obtained from the Energy Information Administration table *Average Sales Price of U.S. Coal by State and Disposition, 2008*; the 2008 total Pennsylvania production of bituminous and anthracite coal was obtained from the Energy Information Administration table *Coal Production and Number of Mines by State and Mine Type, 2008-2007*
[lxiv] Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*
[lxv] Department of Energy; National Science Foundation; Securities and Exchange Commission