

Coal in Virginia:

Equity, economy, and environment

INTRODUCTION

Mining in the Appalachian coalfields began when European settlers arrived in the region in the 1700s. First used for simple home heating and cooking, coal quickly emerged as the preferred fuel for railroads, steamships and industrial processes. Coal now holds a predominant share of the electric power generation market in the United States and worldwide. To keep pace with increasing demand, methods of mining coal advanced from pick-and-shovel works to steam-powered equipment, mechanized deep mines and large-scale surface operations.

According to an Energy Information Administration report released in February 2010, coal-generated power currently accounts for percent of the electricity produced in the United States.¹

Virginia consistently ranks among the top 10 coal producing states in the United States. While surface mining methods now account for the majority of nationwide production – 69 percent in 2007, underground mining dominates Virginia’s coal production, comprising 62 percent of the combined production in 2007.² These percentages translate into 15.7 million tons of coal from underground mines and 9.6 million tons from surface mining operations in Virginia in 2007.³

DISTRIBUTION OF COALBEDS

More than 2.4 billion tons of coal have been extracted in Virginia since production began in 1748.⁴ Coal is Virginia’s most valuable mineral resource and accounts for about 72 percent (\$1.7 billion) of the revenues from all fossil fuels produced in the Commonwealth.⁵

The Southwest Virginia Coalfield, located within the vast Appalachian Coal Basin, occupies an area of approximately 1550 square miles and is currently the source of all of the



<http://www.dmme.virginia.gov/DMR3/images/swvacoalfield.gif>

PERCENTAGE OF TOTAL ELECTRICITY GENERATED BY SOURCE IN VIRGINIA

In Thousand Megawatthours

| Category | 2008 | 2007 | Change (%) |
|---------------|-------|-------|------------|
| Coal | 2,847 | 2,957 | -3.7 |
| Natural Gas | 656 | 764 | -14.2 |
| Petroleum | 173 | 34 | 402.4 |
| Hydroelectric | 107 | 64 | 66.4 |
| Nuclear | 2572 | 2404 | 7.0 |
| Renewable | 225 | 227 | -0.9 |

Source: Energy Information Administration - http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

Commonwealth’s coal production. This coal field stretches across six counties: Wise, Dickenson, Lee, Buchanan, Russell and Tazewell, with about 90 percent of the coal coming from Wise, Dickenson and Buchanan.^{6,7}

In 2007, recoverable reserves, as estimated by United States Department of Energy, were 767 million tons across Virginia, equivalent to about 30 more years of production at current rates.⁸ However, identification of in-ground coal resources as “recoverable” is affected by factors such as market price and production technology. Virginia’s Demonstrated Reserve Base – an estimate of the total amount of coal that is in seams that are potentially recoverable over the long term – is currently estimated at about 1.6 billion tons.⁹ The majority of economically mineable coal reserves are in deeper seams that can be accessed only by underground mines such as room-and-pillar mining and longwall mining.

METHODS OF EXTRACTION

Mining methods are often determined by the type and location of the coal deposit. Coal is mined either by underground mining or by surface mining, which occurs by removing the covering rocks and debris, which are known as ‘overburden’. The amount of overburden that would need to be removed to access each mineable ton of coal, and the cost of moving and reclaiming that overburden, generally determines whether underground or surface mining will be used.

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Underground Mining

- **Room-and-Pillar Mining:** Most underground coal is mined by the room and pillar method, whereby rooms are cut into the coal bed leaving a series of pillars, or columns of coal, to help support the mine roof and control the flow of air. When mining reaches the end of the coal seam, retreat mining begins where workers mine as much coal as possible from the pillars while leaving enough material in place to support the overlying rock and allow the mining to proceed safely. Depending on the size of the pillars that are left, the abandoned mine may or may not collapse, causing a decline in overlying ground surface elevation, or “subsidence”, over time.
- **Longwall Mining:** This method is popular where coal reserves are suitable because of higher levels of safety, efficiency and lower costs. In this method, a rotating shear on a mining machine moves back and forth to shave coal from vertical blocks or panels. As the mining machine advances, the roof behind it caves in.

Surface Mining

- **Contour Mining:** This is the most common form of surface mining that occurs in Virginia and throughout Appalachia. Contour mines operate on hillsides where flat-lying coal seams “outcrop,” or come close to the hillside’s sloping surface. The mining operation begins by removing the overburden on top of the coal, working from the coal seam’s outcropping edge into the mountain. The mine advances by moving along the mountainside laterally, sometimes for miles. Today, most of the overburden material from contour mining is replaced in adjacent pits excavated by prior coal removal. However, the removal process causes the overburden material to “swell,” or increase in volume, so some of the material is often placed off site in adjacent valleys or hollows, producing the “valley fills” that are a subject of current public controversy (See ‘Valley Fills’).
- **Open Pit Mining:** This type of mining generally occurs in relatively flat terrain. Large earth-moving equipment, is used to remove overburden from the coal. Coal is then generally broken up, sometimes by blasting it with explosives, and then extracted. The overburden from one cut is generally used as fill for the preceding cut. Open pit mining of this type occurs only rarely in Virginia, where the mining areas are generally mountainous and better suited to other mining methods.

2010 EPA SURFACE MINING BENCHMARKS

In April of 2010, the Environmental Protection Agency, in conjunction with the Obama Administration and the Army Corps of Engineers issued a comprehensive set of guiding criteria for their regional offices reviewing mining permits intended to further mitigate the environmental impacts of surface mining in Appalachia. Aimed at protecting 95% of the aquatic organisms living in Appalachian streams effected by coal mining practices, the new guidance is largely an extension of the Clean Water Act and is primarily based on two new scientific reports, currently in draft phases awaiting external review, prepared by the EPA’s Office of Research and Development.

The reports explore the the impact of surface mining and valley fills and propose pollution benchmarks at which aquatic life is threatened by these practices. Using stream salinity, an indicator of the abundance and health of aquatic life- and one that is impacted by mining materials and runoff entering these streams- as a metric, the draft reports identify 500 microSiemens (roughly 5 times above normal levels for relatively undisturbed streams) as an unacceptable benchmark. These new regulations are expected to significantly diminish the environmental impacts associated with coal mining and will likely result in the issuance of fewer surface mining permits in the future.

Source: <http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/4145e96189a17239852576f8005867bd!OpenDocument>



*Williams Mountain, a mountaintop removal site in West Virginia.
Photos by Chuck Wyrostock.*

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- Mountaintop Removal Mining: In this method of surface mining, mountaintops are blasted with explosives to reach coal seams. Once the rock surrounding the coal is fractured, the overburden is removed by large earth moving machines. Seams of coal are then exposed and extracted by large machines and draglines. The process is repeated through several hundred feet to expose multiple seams of coal. Up through the early-2000s, it was common for mountaintop removal mines to push the majority of mine spoils into adjacent valleys, often producing large expanses of flattened mountains and huge valley fills. However, because of regulatory processes which began in the late 1990s and culminated with the release of a Programmatic Environmental Impact Statement in 2005, mining operations today are required to “minimize” the quantities of overburden that are placed in valley fills.¹⁰

COAL COMMUNITIES AND EMPLOYMENT

Although Virginia mines employed 20,000 workers as recently as 1977, coal mine employment has declined to fewer than 5,000 workers in recent years.¹¹ Mechanization of mining operations and, in Virginia, declining production, continues to displace workers since the latter half of the 20th century. According to researchers in Virginia Tech’s Department of Mining and Minerals Engineering, the coal industry’s mechanization has been driven by declining real prices in world and national markets.

MINED LAND RECLAMATION

Mined land reclamation practices are mandated by the Surface Mining Control and Reclamation Act of 1977 (SMCRA). In Virginia, DMME’s Division of Mined Land Reclamation is responsible for enforcing SMCRA under oversight by the Department of Interior’s Office of Surface Mining. Reclamation begins by placing overburden materials back into the mined area after the coal has been removed. Mining firms are required to restore vegetation so as to control erosion. In order to meet this requirement, they must replace either topsoil or use a “topsoil substitute” such as an overburden material selected because of its chemical and physical properties. These materials are shaped to a final configuration of the land’s pre-mining “approximate original contour,” unless a variance has been obtained. Herbaceous vegetation to control erosion is generally established with a hydroseeder, in a manner similar to what is done after highway construction. In Virginia, forestry is a common post-mining land use. Up through the mid-2000s, it was common for mining firms to establish pines as the post-mining forest vegetation, because pine species are not as sensitive as native

MOUNTAINTOP REMOVAL MINING DEBATE

Mountaintop Removal (MTR) mining sites are generally hundreds of acres in size, and some exceed 1000 acres. MTR is common in southern West Virginia and eastern Kentucky and occurs in southwestern Virginia and eastern Tennessee. Where conditions are favorable, MTR allows for faster extraction of coal due to the highly mechanized process. Additionally, this mining method can achieve essentially 100 percent extraction of coal reserves due to fully exposed coal seams.

MTR is economically efficient on lands for which it is well suited, however, this form of mining has many environmental impacts. During coal extraction, some of the overburden is pushed into the valleys below, producing “valley fills”. In some cases, mountaintop removal mining and associated valley fills have been alleged to create flash floods. Studies have shown that hydrologic impacts of such mining operations vary from site to site, presumably in response to reclamation methods used.¹

Following a MTR operation, mining companies are required to restore the land to its “Approximate Original Contour” (AOC) through backfilling and grading of the overburden. This process, which attempts to mitigate environmental and aesthetic impacts, was not strictly enforced in some states until a few years ago when regulatory agencies began rigorously implementing their standards. While flat lands created by mining can create opportunities for industrial and commercial economic development that would not otherwise be possible in the Appalachian terrain, many such sites remain unused today.

Issues associated with widespread mountaintop removal mining continue to be addressed by regulatory agencies. A major activity was the preparation of a Programmatic Environmental Impact Statement to address mountaintop mining issues. The process was initiated in the late 1990s, concluded in 2005² and found that the AOC variance requirements for mountaintop removal mines were not being met in some states because a number of variances had been approved for post-mining land uses such as wildlife habitat (a post-mining land use that does not comply with SMCRA requirements for mountaintop removal mining) and agriculture on sites that were not used for agriculture after mining. In the aftermath of the Programmatic EIS process, widespread MTR mining continues, especially in southern West Virginia and to some extent in eastern Kentucky, but, because of new regulatory controls, the former practice of leveling mountaintops and placing the majority of spoil material in valley fills no longer occurs except on sites where the improved land uses are being established as required by SMCRA.

- 1 See US EPA. Draft Programmatic Environmental Impact Statement on Mountaintop Mining/Valley Fills in Appalachia. <http://www.epa.gov/Region3/mtntop/Appendix H. Hydrology and Flooding studies>.
- 2 See US EPA. Draft Programmatic Environmental Impact Statement on Mountaintop Mining/Valley Fills in Appalachia. <http://www.epa.gov/Region3/mtntop/>.

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hardwoods to soil conditions. However, with improved knowledge of reclamation practices and landowners' interest in post-mining land value, most mining firms that operate in Virginia, are now replanting native hardwoods using a new reforestation technique known as the "Forestry Reclamation Approach."¹²

A significant challenge to mined-land reclamation is Abandoned Mined Lands (AML), which are lands created by mining prior to SMCRA and that remain as environmental liabilities today. By federal law, active mining firms pay a tax for each ton of coal produced, and those "AML Fund" dollars are used by mining agencies to reclaim these lands. In Virginia, over 71,000 acres of land were affected by coal mining prior to SMCRA. Because the AML Fund is widely acknowledged to be inadequate for reclamation of all such lands in the near future, reclamation agencies are reducing regulatory obstacles and providing incentives for active mining firms to mine coal that remains on AML sites and to restore those lands to current environmental standards in accord with SMCRA.¹³

IMPACTS OF MINING

Historically, coal mining has been one of the world's most hazardous occupations. Occupational hazards are especially acute for underground miners due to dangers such as atmospheric dust which, when breathed continuously, can lead to permanent lung impairments ("Black Lung Disease"); loosened rocks from the "ceiling" or rock materials above the mining cavity, which can cause death or injury if they fall on workers; and combustible gases such as methane which, if not properly vented, can accumulate in the underground cavity and create a danger of explosions. Although government laws and regulations intended to protect miners' health and safety have made underground coal mines much safer places to work today than they have been historically, coal mining remains a hazardous occupation. Between 1986 and March 2009, there were 990 coal industry related accidents in Virginia, including 90 fatalities.¹⁴

Example of a site returned to the Approximate Original Contour after mining. Credit-both photos: University of West Virginia



COAL CLEANING AND COAL SLURRY

Most "raw coal" produced by mines is sent to a "coal preparation plant" for "coal cleaning" so as to remove non-coal contaminants, such as earth and rock fragments, prior to shipping the coal to customers. This process includes separating the coal into fine and coarse particle sizes for cleaning processes that primarily involve use of fluids for gravity separation (i.e. heavier earth materials tend to settle out of suspension more rapidly than the lower-density coal fragments). A liquid byproduct of this process, coal slurry, contains water, coal processing chemicals, and small fragments of coal and coal-and soil-like materials. The coal wastes are commonly transmitted to disposal areas where the larger particles are used to construct coal "refuse piles." These disposal areas can be very large and cover hundreds of acres. The liquid wastes (coal slurry) are often transported to "slurry impoundments" that are constructed within the refuse fills or in nearby locations using refuse materials. The impoundments are designed to allow the solid particles to settle out of the slurry while the liquids are discharged from the impoundment to a secondary treatment facility, usually a pond. All waters leaving the pond are regulated by the Clean Water Act and must meet Clean Water Act standards.

Although the vast majority of coal refuse and coal slurry disposal facilities are managed without incident and in compliance with legal requirements, there have been problems. The most significant coal-slurry disaster in the United States occurred in Buffalo Creek, West Virginia in 1972 when a coal impoundment dam collapsed, killing 125 people and leaving 4,000 more homeless. In 2000, a 300-million-gallon slurry pond collapsed in Martin County, Kentucky; the coal slurry released by this event was twenty times larger than the Exxon Valdez spill. In 1996, two similar, but smaller, events occurred in Lee and Buchanan Counties in Virginia. These events caused the Virginia Department of Mines, Minerals and Energy to take additional enforcement measures intended to assure these facilities stability, and no similar events have happened in Virginia since.

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FORESTRY RECLAMATION APPROACH

The Forestry Reclamation Approach is a new method for reclaiming coal mines to forested land uses that is based on research conducted at Virginia Tech through Powell River Project, under leadership of Forestry Professor James Burger. The Forestry Reclamation Approach is usually described as entailing “five steps”: (1) Create a suitable rooting medium for good tree growth that is no less than 4 feet deep. (2) Loosely grade the rooting medium to create a non-compacted growth medium. (3) Use herbaceous ground covers that are compatible with growing trees. (4) Plant two types of trees – early succession species for wildlife and soil stability, and commercially valuable crop trees such as native hardwoods. (5) Use proper tree planting techniques

The Forestry Reclamation Approach is advocated for by regulatory agencies, including the US Office of Surface Mining and Virginia Department of Mines, Minerals and Energy.¹ All new surface mining permits approved in Virginia in 2007 and 2008 included the Forestry Reclamation Approach as a major component of the Reclamation Plan that is required by SMCRA,² and reclamation is proceeding according to plan on those mining permits.



Forestry Reclamation Approach Photo Courtesy of Carl Zipper

In an effort to reduce mining accidents, new mine safety regulations were introduced to the Mine Improvement and New Emergency Response Act (MINER) in 2007. The legislation calls for stricter exposure standards to coal dust and asbestos, a ban on belt airways for ventilation, protection for whistleblowers and requires more monitoring systems for smoke and gas.¹⁵

The health and safety impacts of coal mining are not isolated to coal miners. Residents living in coal towns often contend with coal dust, contaminated water and flooding. Billions of gallons of liquid and solid wastes from coal processing facilities are stored in slurry impoundments, the vast majority of which are managed safely and in compliance with requirements of the law. However, several incidents involving slurry impoundments have been in the news and have engendered public concern. For example, in the town of Rock Creek, West Virginia, Marsh Fork

VALLEY FILL AND WATER QUALITY ISSUES

During surface coal mining operations, excess soil and rock overburden materials are commonly disposed of in valleys below the mining operation, in facilities known as “valley fills” or “hollow fills.” Excess spoil occurs commonly during mining for two different reasons. One is the fact that overburden rock materials commonly “swell” by a factor of 20% to 30% as a result of the disturbance caused by the mining process. The other is that post-mining landforms, in some cases, differ from the pre-mining landforms and occupy smaller volumes. Such differences may occur because the post-mining landform is intended to serve a certain land use that cannot be accommodated by the pre-mining landform, or because of a need to alter extremely steep pre-mining contours so as to assure post-mining landform stability.

Valley fills have become an issue of controversy associated with modern coal mining. The valley fill issue entered the public arena in association with the mountaintop removal mining controversy, but valley fills are associated with all types of surface mining.

Valley fills are the primary structure that “bury streams,” a widely cited effect of coal surface mining that has become a public controversy. Between 1985 and 2001 there were 6,700 “valley fills” approved in central Appalachia; of these, about 4500 were constructed or were considered as having the potential to be constructed as of 2001.¹ Primarily as a result of these valley fills but also because of associated mining, US EPA estimated that 1208 miles of ephemeral, intermittent, and permanent streams were subject to “direct effects” by mining (a term that includes both filling and direct disturbance) in Kentucky, Tennessee, Virginia, and West Virginia over a 10-year period.²

As well as causing direct effects due to filling, valley fills also have downstream impacts on biotic communities but the full extent of and mechanisms for those impacts is unknown.³ Discharges from the base of valley fills, as are other mining discharges, are permitted as point sources under the Clean Water Act and must meet Clean Water Act standards. However, a number of research studies have shown that biotic communities directly below valley fills are commonly impaired.⁴ Researchers suspect that reasons for impairment include elevated conductivity, caused by dissolved minerals, in the waters emerging from the valley fills; reduced quantities of biodegradable organic materials, such as leaves and woody debris, entering the streams from the mined watersheds; and possibly other mechanisms.

1 US EPA. Draft Programmatic Environmental Impact Statement on Mountaintop Mining/Valley Fills in Appalachia. <http://www.epa.gov/Region3/mtntop/>. Chapter 3, p. III.K-22

2 US EPA. Draft Programmatic Environmental Impact Statement on Mountaintop Mining/Valley Fills in Appalachia. <http://www.epa.gov/Region3/mtntop/>. Appendix I, Section III-B, Aquatic Metric Results.

3 Zipper, C. personal correspondence

4 For example, see G. Pond *et al.* 2008. Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. *J. North American Benthological Society* 27:717–737

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Elementary School is located directly beneath a Massey Energy subsidiary's processing plant where almost 3 billion gallons of coal slurry is stored behind a 385-foot earthen dam. The slurry, which contains extremely high levels of mercury, cadmium and nickel, has been found to be leaking into the creek and groundwater around the school. A marked increase in student illnesses, including respiratory problems, was documented to have occurred at the school since establishment of the coal processing operations which produce the slurry and are near the school, leading to claims by members of the community that the coal processing activities have contributed to student health problems.¹⁶

CLEAN COAL TECHNOLOGY

Advances in technology have the potential to dramatically reduce pollution from coal-fired power plants. Two modern plants in the U.S. and two more in Europe are using a technology known as integrated gasification combined cycle (IGCC) to separate pollutants prior to combustion. The process involves using a coal gasifier to convert the coal into gas, while also separating out pollutants such as sulfur, mercury and ash materials from coal, leaving a clean burning fuel comprised primarily of carbon monoxide and hydrogen gas. Installation of additional equipment would substitute hydrogen for carbon, extract the carbon as CO₂ and direct it to geologic disposal. This technology would allow the plants to produce electricity while emitting a combustion exhaust gas comprised primarily of H₂O. This technology, however, has not been installed in existing plants.

Some of the pollutants that would be removed from the coal-gas are actually valuable commodities, such as ammonia and ammonium sulfate, which can be used to make fertilizers. Disposing of CO₂ is more difficult and, because the United States does not impose limits on carbon emissions, companies have less incentive to reduce these emissions. However, recent experiments with sequestering carbon several miles below the earth's surface have proved hopeful. Initial tests indicate that the carbon could remain for thousands or even millions of years. Current research is testing methods for causing the injected CO₂ to be converted into a solid-phase mineral form for, essentially, permanent storage.

UNDERSTANDING THE NUMBERS



1 Coal Car
=
100 tons x \$50 per ton
=
\$5,000



1 unit train
=
100 cars
=
\$500,000



VEPCO - Chesterfield
and Clover Plants
2.4 million tons per year
240 unit trains per year.
4 unit trains every 3 days



VA Coal Production
=
10 million tons per year
surface
+
25 million tons per year
deep mining
30% exported

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Virginia Dominion Wise County Coal-Fired Power Plant



One of the most contentious environmental issues in Virginia over the last five years has been the approval and construction of the Virginia City Hybrid Energy Center, a coal-fired power plant located in Wise County. Upon its completion in the summer of 2012, the plant will generate 585 net megawatts of energy, enough to power 146,000 homes. Over the course of its forty-five to fifty year lifespan, the plant will consume 2.85 million tons of coal and up to 537,000 tons of biomass per year.¹⁷ According to Virginia Dominion Power, the owner and future operator of the plant, the plant will not only meet projected increases in energy demand, but will also generate significant benefits for the community even after plant construction.¹⁸ A 2007 study by the Virginia Tech Office of Economic Development, commissioned by the Wise County government, predicted that the operation of the plant will result in \$258.5 million per year of added value to the Wise County economy as well as 528 new jobs, primarily in the mining and trucking sectors.¹⁹

Virginia Dominion initially filed with state utility regulators for construction and operation permits for the plant in July 2007.²⁰ Soon after, a coalition of environmental groups, including the Sierra Club and Southern Appalachian Mountain Stewards, announced its opposition to the plan. Because Virginia Dominion committed to using coal mined in Virginia at the plant, the coalition claimed that the plant's operation would accelerate mountaintop removal in the state as well as exacerbate air quality problems.²¹ The coalition eventually commissioned its own study, which concluded that investments in energy-efficient technologies designed to reduce future energy demand would be significantly more beneficial for the Commonwealth than building the plant.²² Opponents of the plant went on to collect roughly 45,000 signatures on a petition to forestall construction.²³

Nevertheless, on June 25, 2008, the Virginia Air Pollution Control Board voted unanimously to grant air permits for the plant, although the Board set emissions limits that were significantly lower than initially proposed.²⁴ Construction of the plant began later that month.²⁵ The Board's decision to grant the air permits was followed by a series of legal challenges by the Charlottesville-based Southern Environmental Law Center ("SELC") on behalf of the environmental coalition. SELC's first claim, rejected by the Virginia Supreme Court on April 17, 2009, was that a state law authorizing the construction the plant violated the Commerce Clause of the U.S. Constitution by favoring the use of Virginia coal over coal mined in other states.²⁶ On August 10, 2009, a Virginia circuit court found SELC's second challenge more persuasive and struck down one of the plant's air permits for failing to set concrete mercury emission standards.²⁷

In response to the circuit court's decision, the Air Pollution Control Board endorsed an amended air permit on September 3, 2009.²⁸ The new permit retained the 4.45 pound-per-year mercury emission limit found in the old permit, but removed a provision that allowed the limit to be loosened if the plant had trouble meeting the standard. The revised limit, accepted by both environmentalists and Virginia Dominion, was touted by an SELC attorney as "the most stringent mercury limit for a coal-fired power plant in the country, bar none."²⁹ SELC's final legal challenge to the Wise County plant, based on the claim that the plant's second air permit was deficient for failing to set limits for carbon dioxide, was rejected by the Virginia Court of Appeals on May 25, 2010, and the plant currently holds all permits necessary to begin operations once construction is complete.³⁰

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IMPACTS OF COAL COMBUSTION

Appalachian communities benefit from coal mining's economic impacts and employment, but they also bear the brunt of problems that result from coal mining and processing activities. The impacts of coal-burning power plants, however, reach further. Atmospheric emissions from burning coal include sulfur dioxide (SO₂), carbon dioxide (CO₂), particulate matter, nitrogen oxides (NO_x) and mercury. Emissions of NO_x from coal, and other sources such as automobiles, combine with atmospheric hydrocarbons to form ground-level ozone, a highly corrosive gas that contributes to respiratory and coronary distress, low birth weight and increased infant mortality. Coal-burning is the nation's leading emission source for SO₂, which can also be harmful to human health when it exceeds health-based concentration limits, which rarely occurs in the United States today. However, the primary impacts of SO₂ are secondary in nature; along with NO_x, SO₂ contributes to the formation of fine particulate pollutants, which are the second-leading air-pollutant danger to human health in the United States today, after ozone.³¹

Although virtually all commercial coal-burning facilities are outfitted with some level of pollution controls, coal burning still releases more air pollution per unit of energy than other sources. Despite improvements to air quality throughout the U.S. since the Clean Air Act's passage in 1970, in 2007, 158.5 million people lived in counties that exceeded any national ambient air quality standard (NAAQS)³² due to emissions from coal and other air-pollution sources. Ground-level ozone and particle pollution still present challenges in many areas of the country.³³ Effects are particularly acute in urban and ex-urban areas, especially in the eastern United States, but they are also felt in the Southern Appalachians.

Research by Abt. Associates, in a report prepared for the Clean Air Task Force, estimates that 24,000 deaths were caused by air particulates resulting from coal burning power plants.³⁴ The study also found that as many as 22,000 deaths, along with tens of thousands of asthma attacks and many nonfatal heart attacks, could be prevented if plants installed pollution control technology required to meet legal limits included under various policy proposals. The study has been embraced by a number of organizations with scientific and medical credentials including Physicians for Social Responsibility, a 1985 Nobel Prize winner.

Globally, in 2004, coal combustion accounted for approximately 40 percent of anthropogenic energy-related emissions of carbon dioxide, an infrared-radiation absorbing "greenhouse gas" that contributes to global climate change. Additionally, the Intergovernmental Panel for Climate Change has estimated that 57 percent of the global emissions of infrared-absorbing greenhouse gases, expressed on a CO₂-equivalent basis, was due to CO₂ released by fossil fuel combustion. Based on these two figures, we can calculate that approximately 22 percent of annual global infrared-absorbing gas emissions due to human activity are caused by coal combustion. In the United States in 2007, coal combustion was responsible for 36 percent of energy-related CO₂ emissions.

ADDITIONAL RESOURCES

Informative special on coal and mountaintop removal (Bill Moyers special): <http://www.pbs.org/now/science/coalmountain.html>

Coal River Mountain Watch: <http://crmw.net>

Virginia Department of Mines, Mineral and Energy (DMME): www.dmme.virginia.gov

Office of Surface Mines: www.osmre.gov

Clean Air Act: www.epa.gov/air/caa/peg

National Air Trends: www.epa.gov/airtrends

Virginia's 2007 Air Monitoring Report: www.deq.state.va.us/airmon/publications.html

Powell River Project, Virginia Tech. <http://www.cses.vt.edu/PRP/>

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“Virginia Dominion Wise County Coal-Fired Power Plant”

Photo courtesy of Virginia Dominion Power, <http://www.dom.com/about/stations/fossil/virginia-city-hybrid-energy-center.jsp>

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