One Step Back Toward “Almost Heaven”

A Production-Based Proposal for the Elimination of Mountaintop Removal Coal Mining in West Virginia

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"To know about strip-mining or Mountaintop Removal is like knowing about the nuclear bomb. It is to know beyond doubt that some human beings have, and are willing to use, the power of absolute destruction."
– Wendell Berry[1]

"They're blowin' up my damn home, and they just expect me to sit around like a good little hillbilly and let 'em do it? If they wanna shut me up, they're gonna have to kill me, because I ain't gonna stop fightin' until I'm lyin' in the ground. "
-- Maria Gunnoe, Boone County, WV, 2007

"There is no wise answer to strip-mining, but to phase it out as quickly as we can."
-- Reverend Lloyd, 1977[2]

[1] Direct quote by Wendell Berry from the Prologue to: Goodell, Jeff, Big Coal, p. xv. (2006)
[2] Montrie, Chad. To Save the Land and People: A history of Opposition to Surface Coal-Mining in Appalachia, p. 175. (2003)

I. An Introduction to Mountaintop Removal and Its Impacts on the Land and Communities in Southern West Virginia

Overview

The average American consumes about twenty pounds of coal a day for their electricity.[3] One pound of that comes from Mountaintop Removal coal mining. Mountaintop Removal (MTR) is the most destructive method of mining coal being practiced today. It is used most extensively in the coalfields of eastern Kentucky and southern West Virginia, though in the last decade MTR has extended into the mountains of eastern Tennessee and southwestern Virginia. As a result, these areas have come to comprise what is known as the Mountaintop Removal region.

Until the mid-1970s, the primary form of surface mining being used for coal extraction was what is known as contour mining, whereas coal mine operators would follow a coal seam just along the contour of a mountain, blasting away the surface rock and extracting the coal as they went. Contour mining was, in itself, not a method of mining that had a minimal impact on the land and nearby communities. However, relative to preferred mining methods in use today, contour mining merely left a scar on the landscape, leaving the topography of an area intact. By comparison, Mountaintop Removal has altered the topography of the land in the region by leveling hundreds of mountains and filling in nearby valleys with the excess waste and rubble associated with the mining process.

Advances in mining technology in the 1970s led to the first Mountaintop Removal mines. However, MTR mines that existed in the 1970s most often removed only the very top of the mountain, in order to extract the highest and easiest to reach seams. Advances in the mechanization of the mining process through the 1980s and 1990s resulted in the expansion of MTR mines in both size and depth. After the passage of the Clean Air Act of 1990 sparked a rise in demand for West Virginia's low-sulfur coal, MTR mines expanded in number as well. As this occurred, coal mining took on a whole new meaning for the land and people of southern West Virginia.

Mountaintop Removal coal mining is characterized by just what the name implies, the removal of a large portion of a mountain in order to extract multiple seams of coal. MTR is utilized as a means of extracting the maximum amount of coal from a mountain in the cheapest, fastest and easiest way possible. The process begins when coal companies purchase or lease lands to be mined from large land-holding companies. The coal company must then obtain a permit for the mining operation from the permitting agency. In West Virginia's case, the permitting agency is the Department of Environmental Protection. Once the permit is approved, all of the vegetation on the mountain is bulldozed and clear-cut and all of the topsoil removed. The trees are then either, sold for lumber, dumped into a nearby valley or burned on site. Then, the cap rock, or 'overburden' is broken apart using an ammonium nitrate and petroleum mixture until each coal seam is exposed. Because the rock that is removed expands in volume when it is broken up, any excess rock not necessary for reclamation purposes is then bulldozed into nearby valleys with the topsoil, forming what are known as 'valley fills.'

There are two regulated methods for constructing valley fills. The first is to construct terraces with proper drainage structures built in to ensure maximum stability and to control erosion. The second method is known as "gravity placement," which essentially translates into dumping the excess spoil

[3] Goodell, Jeff. Big Coal, p. xii (2006).

over the edge of the mountain and into the valley below.[4] These valley fills can eventually reach 600 feet in height and extend more than a mile long, often burying headwaters or stream segments. It is the permitting of valley fills that makes MTR mining possible. Without a convenient way to dispose of the resulting waste rock, removing mountains would be too costly a manner of extracting coal.

Once the mining 'spoil,' or 'overburden' is disposed of, large earth-moving machines, or draglines, with scoops that can carry 130 tons of coal at a time dig out the coal and load it into massive dump trucks to be hauled away to processing plants. At the processing plant, the coal is then washed with acids and other chemicals in order to remove excess rock, muds and surface impurities. This process creates a toxic coal sludge, which is either injected into abandoned underground mines or pumped into large billion-gallon earthen dams. Once all of the recoverable coal has been removed from the mountain, the mine site is then required to be 'reclaimed' to a condition consistent with the pre-mining land use that was specified in the permit. In West Virginia, this can be anything from Forest or Wildlife Habitat, to Pasture or Grassland. To do this, the excess rock that was not dumped into a valley is smoothed over the site and compacted with trucks and bulldozers, and the reclaimed land is hydro-seeded with non-native scrub grasses.

Overall, the Mountaintop Removal process drastically alters the landscape, replacing mountains and temperate rainforest with grasslands and burying streams with mining spoil. In the process, the natural cycles that once served to maintain an ecological balance in the central Appalachian mountains are severely disrupted, and the surrounding ecosystems and communities are forced to bear the costs of that disruption. The pace at which MTR mining has expanded has only been possible due to the pace at which machines used in the mining process have gotten bigger, and as the machines got bigger, the impact on the land and communities worsened. However, even though the size of the machines has dictated the maximum size of the mining operations, economic factors are ultimately culpable for the growth in the scale and quantity of MTR mines to the levels that exist today.

Economic Drivers of MTR

The main reason coal companies employ surface mining and Mountaintop Removal is that it is the most efficient mode of producing coal, in terms of speed and cost. Millions of tons of coal can be extracted in much less time compared to smaller surface and underground mining. The primary driver of MTR is demand for low-sulfur coal. The passage of the 1990 Clean Air Act (CAA) required power plants to reduce their emissions of sulfur dioxide and nitrogen oxides – the two chemical compounds responsible for acid rain formation. This had the direct impact of raising demand for Central Appalachian low-sulfur coal. The increase in demand required a more efficient means of extraction to be employed, and simply removing the mountain from the coal seams was the best option available to coal companies.

After 1990, as the internet and the modern consumer consciousness evolved, energy demand rose at an exponential rate, thus requiring greater amounts of coal to be burned in order to keep up with demand. At the same time, while the CAA was well-intentioned and necessary, it also led to the funneling of coal production into a smaller geographical range. In hindsight, the flaw of the CAA was that it failed to legislate how coal-fired power plants were to reduce their emissions. It left that

[4] http://geocities.com/RainForest/Vines/9638/valleys.html

decision to the individual plant. In order to meet the new requirements, power plants could either pay vast sums of money to install the best emissions-capture technology available at the time, or they could merely buy more low-sulfur coal. In the spirit of cost-efficiency, most power plants chose just to buy more low-sulfur coal. In West Virginia, coal in the northern part of the state is relatively high in sulfur compared to southern coal, so after the CAA was implemented, a substantial proportion of West Virginia's coal production moved south.

A second major drawback was that power plants were also allowed to forego installing scrubber technology unless a new plant was built after 1990, or unless an existing plant performed a major upgrade. Again, in order to minimize costs, power companies decided to forego upgrading their smokestacks, while making only minor repairs and upgrades on their plants instead of building new ones. The end result was that power companies decided to prop up aging, inefficient plants as long as they could, even while these older, more inefficient plants required a greater amount of coal to be burned, per kilowatt-hour produced, than new plants would have. In combination, these two flaws in the Clean Air Act and the rising demand for cheap energy not only pushed West Virginia coal production southward, they also required higher levels of production, and it was this combination of demand pressures for southern West Virginian coal that led to the rapid expansion of surface mining and Mountaintop Removal. In effect, the enactment of the Clean Air Act, coupled with the failure to foresee and regulate the onslaught of MTR mining, exemplifies a case of one well-intentioned environmental protection leading to the exacerbation of other environmental and social abuses. As the nation proceeded in its pursuit for continuous economic expansion, it blindly came to depend on the destruction of mountains.

Another enabling factor in the expansion of MTR in West Virginia is that Coal is King in West Virginia, and it knows it. Under the "You Need to Know" section of its annual *Coal Facts* publication, the West Virginia Coal Association notes that total 2006 coal sales equaled more than 3.5 billion dollars, nearly 13% of the gross state product, and coal companies and utilities paid almost 60% of all state business taxes.[5] Coal mining also stimulates the creation of jobs in other industries such as power generation, steelmaking, machinery and manufacturing, and the wage of a coal miner is almost double that of the average West Virginia worker.[6] Further, coal revenues are based on how much coal is exported. In 2004, 79.1% of all coal produced in West Virginia was produced for export, meaning that 79.1% of all coal produced by MTR was exported.[7] Only 17% of coal production is used for in-state electricity generation, and of all electricity generated in-state, only 33% is actually consumed by West Virginian residents and businesses.[8] Thus, overall, only 5.9% of all coal produced in West Virginia, by any method, is actually consumed for the benefit of West Virginians.

While this fact supports historical descriptions of the coalfields as 'sacrifice zones,' it also portrays the extent to which West Virginia is economically dependent on coal production and exports. Therefore, following the mantra that increased growth will bring greater prosperity (aside from the historical reality that coal has yet to bring prosperity after over a century of coal mining), it stands

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[5] West Virginia Coal Association, *Coal Facts 2007*, p. 22. Online: http://www.wvcoal.com/

[6] Ohio Valley Environmental Coalition (OVEC), "Reforming Mountaintop Removal Mining." Online: (www.ohvec.org/old_site/mountains10.htm)

[7] Calculated using data provided by the Energy Information Administration (EIA), *Annual Coal Report*, published each year and available online: www.eia.doe.gov/fuelcoal. No page number, the page numbers where the data are found change every year.

[8] Calculated with data provided by the Energy Information Administration, *Electric Power Annual,* Online: http://www.eia.doe.gov/cneaf/electricity/esr/esr_sum.html

that West Virginia depends heavily on keeping production levels high, so there is a lot of economic incentive for West Virginian regulators to turn the other cheek on Mountaintop Removal. At the same time, coal companies benefit from being allowed to mine coal as cheaply as possible.

In the context of the negative impacts of the Clean Air Act as described above, recent increases in the price of southern West Virginia coal, coupled with the relatively low-cost of Western low-sulfur coal, have all but eliminated West Virginia's competitive advantage on the Eastern coal market. Western coal, such as from the Powder River Basin (PRB) in Wyoming, is more than three times cheaper than southern West Virginia coal, while being lower in sulfur. However, PRB coal only possesses 67% of the heat content that West Virginia's coal does, so more of it has to be burned in order to produce an equal amount of electricity per-ton. This and the higher cost of transporting PRB coal to the East coast have assisted in keeping West Virginia relatively competitive in the coal market, but only Mountaintop Removal mining has kept the cost of West Virginia coal low enough to allow that to happen. However, this is not the story that coal companies give to the public.

In shifting attention away from their desire to maintain profit margins, coal companies employing surface mining and Mountaintop Removal publicly state that surface mining is necessary to keep energy cheap. For electricity consumers on the East coast as a whole, this is largely true. Compared to a ton of southern West Virginia coal mined by underground methods, a ton of surface mined coal is $6 cheaper. When all the tons are added up, that accounts for a significant strip-mining discount. However, per customer in the South Atlantic region, that discount amounts to only $1.70 a month, based just on mine mouth prices for southern West Virginia coal. In 2006, comparing average prices for underground and surface mined coal for the whole state, underground coal was actually 91 cents cheaper, per ton, than surface mined coal. This was the first time since 1990 that surface mined coal, statewide, cost more than underground coal. From year to year, though, underground coal has only cost an average of $2 more than all surface coal produced in West Virginia. The average difference in cost between underground and surface mined coal produced in the South averaged around $3 per year, until 2003 when prices experienced a rapid spike (**see Tables I and II**).[9]

In any case, as Erik Reece correctly points out in his book, *Lost Mountain*, coal is only cheap "because it is extracted with the least concern for the land that offers it up. The current price of coal tells nothing near the truth about the cost of air-pollution, water pollution, forest fragmentation, species extinction, and the destruction of homes. Natural capital is destroyed and monetary capital is removed as quickly as the coal."[10] Nor does the current price of coal factor in the cost of lost resources for future generations of Appalachians. If the environmental and social costs of Mountaintop Removal were transmitted onto the average customers' monthly electricity bill, it is likely that the mountains of Central Appalachia and the citizens inhabiting them would have been spared decades of devastation and hardship.

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[9] EIA, *Annual Coal Report*
[10] Reece, Erik. Lost Mountain: A Year in the Vanishing Wilderness, Radical Strip-Mining and the Devastation of Appalachia, pp. 186-187 (2006).

Table I: Annual Mine Mouth Prices for West Virginia Coal, by Mine Type (1990-2006)					
Year	Underground $/ton	% Coal Production Underground	Surface $/ton	% Coal Production Surface	Avg. $/ton
1990	$29.75	72.9%	$25.55	27.1%	$28.62
1994	$27.93	69.0%	$26.29	31.0%	$27.42
1997	$27.64	67.1%	$24.60	32.9%	$26.64
2001	$27.21	61.3%	$26.75	38.7%	$27.03
2002	$30.20	58.6%	$28.77	41.4%	$29.59
2003	$30.72	62.1%	$29.00	37.9%	$30.02
2004	$35.63	61.4%	$35.09	38.6%	$35.41
2005	$41.99	59.2%	$42.33	40.8%	$42.14
2006	$45.53	55.5%	$46.44	44.5%	**$45.94**

Table II: Annual Mine Mouth Prices for S. West Virginia Coal, by Mine Type (1990-2006)					
Year	Underground $/ton	% Coal Production Underground	Surface $/ton	% Coal Production Surface	Avg. $/ton
1990	$29.75	72.9%	$25.55	27.1%	$28.62
1994	$28.31	60.4%	$26.79	39.6%	$27.71
1997	$28.22	60.7%	$24.86	39.3%	$26.90
2001	$29.51	53.8%	$26.48	46.2%	$28.11
2002	$33.03	51.0%	$28.84	49.0%	$30.98
2003	$32.96	54.2%	$29.25	45.8%	$31.26
2004	$40.13	51.1%	$35.41	48.9%	$37.82
2005	$49.06	48.1%	$42.66	51.9%	$45.74
2006	$53.44	44.1%	$47.30	55.8%	**$49.96**

***Note: Average Price for S. WV Coal is higher than the state average shown in Table I.*

Environmental Impacts of MTR

At recent count, a total of 470 mountains have been leveled across Central Appalachia, and if Mountaintop Removal is allowed to continue, it is estimated that another 700 mountains will be gone by the end of the next decade.[11] Further, a mapping study conducted by the author and Appalachian Voices identified 2,500 total peaks that have been reduced in elevation due to MTR. Over 1 million acres have already been mined, and at current rates, MTR will result in the mining of over 1.4 million total acres by 2010, and almost every one of these acres is currently forested.

The mixed-mesophytic forests of Central Appalachia are home to some of the best forest habitat in the United States. They are also some of the most bio-diverse forests in the world, home to nearly eighty species of tree.[12] An Environmental Impact Study conducted by the U.S. Environmental Protection Agency on 'Mountaintop Mining' estimated that at current rates of mining, 2,200 square miles (nearly equal to the 1.4+ million acres of mountains noted above) will be cut for MTR by 2012, and that "full reforestation across a large mine site may not occur for hundreds of years."[13]

[11] http://ilovemountains.org/memorial; www.700mountains.org
[12] Reece, 4.
[13] Environmental Protection Agency, Mountaintop Mining/Valley Fill Environmental Impact Statement, Online: http://www.epa.gov/html/issue-valley.html

The Surface Mining Control and Reclamation Act passed in 1977, for the purpose of regulating the environmental and social impacts of surface mining, requires that for a variance to be granted allowing companies to forego restoring a mountain back to its 'Approximate Original Contour,' coal operators must design a plan for a post-mining land use that leaves the land in an equal or more productive condition than it was in before mining occurred.

In their permit applications, it is often the case that coal companies check the boxes for "Forest" and "Wildlife Habitat" as post-mining land uses. However, regarding reclamation and reforestation, one of the EIS studies had this to say: "Given that most land surface-mined for coal in the Appalachians was originally forested, forestry is a logical land use for most of the reclaimed mine land in the region. However, since the implementation of SMCRA, fewer forests are being restored in eastern coalfield regions. Region-wide, the majority of mined land that was originally forested is not being reclaimed in a way that favors tree establishment, timber production, carbon sequestration and long-term forest productivity."[14] The authors of the study cite excessive competing vegetation from the hydro-seeded scrub grasses, soil compaction from the heavy machinery that compacts the loose rubble, and unfavorable soil chemistry as the main reasons that reforestation has not occurred on reclaimed lands. Even with this information being available to the DEP, they continue to grant mining permits with "Forest" as their planned post-mining land use. Because of this, more than 500,000 acres of the mixed mesophytic have already been lost to MTR in West Virginia.[15]

Valley fills associated with MTR destroy the natural landscape by burying streams and degrading the stream ecosystem. According to the Citizens Coal Council, one MTR mine can strip up to 10 square miles and dump hundreds of millions of pounds of mining waste into as many as 12 valley fills, each 1,000 feet wide and 1 mile long.[16] Estimates vary, but it is generally noted that, across Central Appalachia, nearly 2,000 miles of streams have already been filled in by valley fills, and for West Virginia the estimated direct stream impact of MTR is 800 miles.[17] The Coal River watershed alone has been impacted by at least 239 strip-mines since 1980. As a result, in 1999, American Rivers gave the Coal River the designation of being one of America's ten most endangered rivers.

Damage to West Virginia's watersheds is not merely a result of the direct impacts of valley fills. The 'overburden' the valley fills are composed of, in Reece's words, is "the pine-oak forest, the topsoil, and the two-hundred feet of sandstone that stand between the coal operator and the coal seam."[18] Add to that the ammonium-nitrate and petroleum used for breaking up the rock, and the heavy metals such as arsenic, selenium, lead, copper, chromium and mercury that are released from the coal during the blasting, and that is what a valley fill is made of. As rains wash these chemicals and metals out of a fill, they wash downstream, affecting the water quality for up to 2 to 3 miles.[19]

[14] Torbert and Burger, National Energy Technology Laboratory, "Restoring Sustainable Forests on Appalachian Mined Lands for Ecosystem Services," p. 7.
[15] Citizens Coal Council, Online: http://www.citizenscoalcouncil.org/facts/mtntop.htm
[16] Citizens Coal Council, online
[17] Citizens Coal Council, online
[18] Reece, p. 37.
[19] Citizens Coal Council, online

The groundwater tables are impacted by MTR as well. Blasting at the mines occurs several times a day, and each day across West Virginia nearly 3 million pounds of explosives are set off. This has inevitably led to the cracking and subsequent reduction of water levels in the groundwater tables. In addition to that, the coal slurry that remains from the washing of coal is either injected into abandoned underground mines or stored in large earthen dams. The slurry, also composed of heavy metals, has leaked into the soils, streams and the groundwater.

Overall, Mountaintop Removal amounts to nothing less than a complete devastation of the land and waters and the complete disruption of vital ecosystem processes. In rural Appalachia, the citizens living adjacent to streams and drawing their water from groundwater wells depend for their very survival on the interconnected workings of the many natural elements making up the mountains. Not surprisingly, then, a 1998 study by West Virginia University found that environmental concern in West Virginia was highest in "the most rural, low-educated, non-professional population in the state." The study noted that "This type of result reflects not only a reaction to the mining industries, but also a concern for their livelihood."[20] This is an understatement. For some people living below an MTR mine or downstream from a valley fill, every day could result in a fight for their very lives.

Social Impacts of MTR

> "As a result of the nation's demand for cheap, low-sulfur coal…the residents in the small mountain communities are losing their way of life. Many small towns are losing their populations and economies because of the negative effects that Mountaintop Removal mining has on jobs and the environment. In many instances, citizens are being forced to abandon their family lands due to the intense water pollution and danger of living in the vicinity of the blasting."[21]

Maria Gunnoe is a resident of Boone County, WV, and, by necessity, a long-time activist against Mountaintop Removal. She lives in the shadow of Jupiter Coal Company's sprawling 1,000-plus acre MTR mine, and just up the hollow from her house is an enormous valley fill. One day in the Spring of 2007, as she sat on her porch with her daughter, a blast went off just over the head of the valley fill, and above the ridge rose a mushroom cloud of rock dust and debris that, from the videotape that she made of the incident, appeared to rise over 100 feet into the air. As the cloud grew, and as she looked on, all of the airborne debris began to rush down the valley toward her home, and the next thing someone watching the videotape sees is a mad rush to safety. This was an easy day for Maria compared to a few others. Between 2003 and 2006, Maria's land was flooded seven times. One of the floods wiped out her bridge and dragged the family dog out of its collar and swept him away, while Maria and her children could only watch from the porch.

Floods are one of the most common side-effects of MTR. Without the forests to absorb excess rainfall, runoff from surface mines can cause five inches of rain to have the same effect as fifteen.[22] According to Judy Bonds, co-founder of Coal River Mountain Watch and winner of the 2003 Goldman Environmental Prize, resulting floods from the loss of vegetation and the flattening of the natural contours of the mountains due to MTR mining have killed a dozen people, destroyed thousands of homes, and damaged millions of dollars' worth of property.[23]

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[20] EPA, Mountaintop Mining/Valley Fill Environmental Impact Statement, "Culture and Environment" section
[21] OVEC, http://www.ohvec.org
[22] Goodell, p. 38.
[23] Bonds, Judy, 14.

The blasting has had similar impacts. Blasting is allowed within up to 300 feet of residents' homes, and results in the shaking and cracking of the foundation of houses, the depletion and contamination of water wells, and the hurling of huge rocks and debris into peoples' homes and yards. This makes it extremely dangerous for people living near a mine. The blasting often occurs nearly 24 hours a day, beginning before sunrise and lasting until after midnight. As if that were not nuisance enough, residents also have to contend with sharing local roads with overloaded coal trucks, the breathing of fine coal particles released into the air, and the loss of the surrounding tranquility that had existed before mining began.

On the rare yet severe occasion, they have also had to deal with massive spills of toxic coal sludge from the impoundments upstream. The most recent sludge spill happened on October 11, 2000, near Inez, Kentucky. The impoundment failed, breaking through an underground mine lying below and spilling 306 million gallons of sludge and waste water down two tributaries of the Tug Fork River. The end result was the pollution of hundreds of miles of waterways, the loss of aquatic life in more than 70 miles of Kentucky and West Virginia streams, and a contaminated water supply for over 27,000 residents. This spill was designated by the EPA as the worst environmental disaster in the history of the United States.

Today, 45 out of a total of over 300 impoundments in West Virginia are considered at high risk for failure, and another 32 at moderate risk. Many of these at-risk impoundments exceed 500 million gallons. One of the most notorious is a 7 billion gallon sludge impoundment situated below a Massey Energy-operated 1,849 acre MTR mine, and only 400 yards above Marsh Fork Elementary in Raleigh County. According to Coal River Mountain Watch, this impoundment, known as the Brushy Fork impoundment, has been cited numerous times for leakage, and there is also a coal silo less than 150 feet from the school which loads powdered coal onto trains and sprays it with a chemical binding agent.[24] This is not a rare case of unnecessary risk; impoundments can be hundreds of feet high, containing over a billion gallons of toxic sludge, and are often in close proximity to schools or residences.

With all of the contamination of water supplies and the risk to the health and lives of residents that these impoundments create, they continue to be built; and the toxins that they release are bio-accumulates and cannot be removed from the ecosystem once they enter the soil and groundwater. MTR is not solely responsible for the creation of sludge impoundments or the injection of toxic waste into abandoned mines, however. That is the consequence of the general consumption of coal and the demand for coal to be washed before it is burned. It is a disregard on the part of the coal companies for the health of the environment and safety of West Virginia's valley inhabitants that is responsible for southern West Virginia being turned into an industrial disposal site. As coal production continues and MTR expands, more of the land will be rendered inhabitable. Most residents fear that such a fate is not far off if something is not done soon to stop the destruction of their mountains. In addressing this, Jeff Goodell has quoted Maria Gunnoe as saying, "It will literally depopulate the little bit that is left of our home. Mountaintop Removal is illegally polluting life-giving streams and de-populating communities for a few outside jobs and profits for coal companies. Nothing but devastation comes back to the mountains where this coal is mined."[25]

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[24] Coal River Mountain Watch, "Marsh Fork Elementary School." Online: http://www.crmw.net/campaigns.php?camp=mfe
[25] Goodell, 28.

From beginning to end, the process of removing mountains to extract coal, transporting and washing the coal, and the burning of coal imposes devastating consequences on the mountains and the inhabitants living in West Virginia's southern valleys. Where the company buyout of people homes, the contamination of their "life-giving streams," or the fear of being crushed by fly rock has failed to drive residents away, the economic devastation that coal mining and especially MTR has wrought on southern West Virginia has largely succeeded.

Economic Impacts of MTR

Jeff Goodell observed that "Nearly 150 years and some 13 billion tons of coal later, it is strikingly obvious that the great wealth of natural resources in West Virginia has been anything but a blessing. Rather than bring riches, it has brought poverty, sickness, environmental devastation and despair. By virtually every indicator of a state's economic and social well-being – educational achievement, employment rate, income level – West Virginia remains at or near the bottom of the list ."[26] Indeed, in 2000, West Virginia ranked 50th among all states in household income, 50th in median value of housing, 48th in the percent of adults with a high school diploma, and 2nd in the percent of people still living in poverty.[27] West Virginian's were generally not much better off before the mechanization and expansion of surface mining, but the impact that MTR has had on local economies and employment rates is undeniable (**see Graphics 1-3**). Between 1990 and 2003, direct mining employment fell by 15,000, a 50% loss in only 13 years. Further, in 1950, coal mining employed 22% of the state's workforce. By 1990 this had dropped to 4.8%, and by 2006, 2.6%, while between these two years production at underground mines dropped by almost 40 million tons while surface production rose by 22 million tons.

In combination with the negative social and environmental impacts that MTR has brought to southern West Virginian counties, the reduced employment opportunities resulting from the expanded use of this method has further impoverished an area that was already mired in poverty. The counties that host MTR are often the poorest in Appalachia. In McDowell County, which produces the most coal of any county in West Virginia, over 37% of residents live below the poverty line.[28]

The reason for the rapid decline in mine employment is that, as production moved southward and MTR expanded in use, underground mines in the southern counties were rapidly replaced by surface mines. On average, southern surface mines have produced twice as much coal, per mine, as southern underground mines; so, for every surface mine that was opened, two underground mines were closed. The employment losses stemming from this trend were negatively compounded by the fact that surface mines also replaced labor with heavy machinery. Recent trends, though, actually show a rebound in coal mining employment as new underground mines have been opened and surface mines now require a greater number of miners. This is more the result of the expansion of the size of MTR mines than it is a surge in the productivity of the mines, a fact that raises additional concern about the rising impacts of MTR. Also, since mines still employ so little of the population, a small rise in employment has done nothing to revive fading communities, as residents still find themselves surrounded by empty homes, businesses, and a decimated infrastructure.[29]

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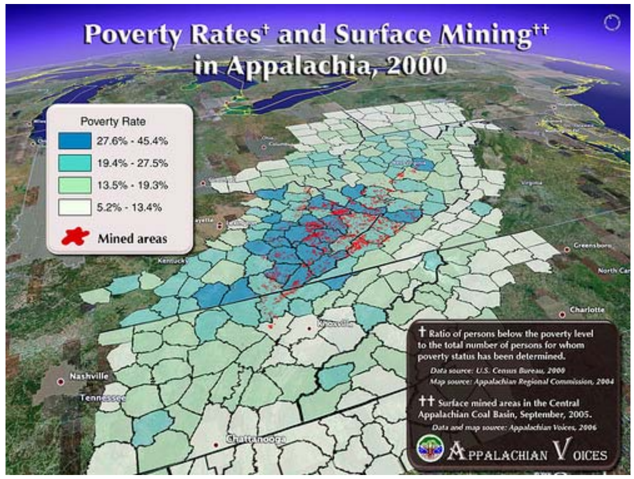
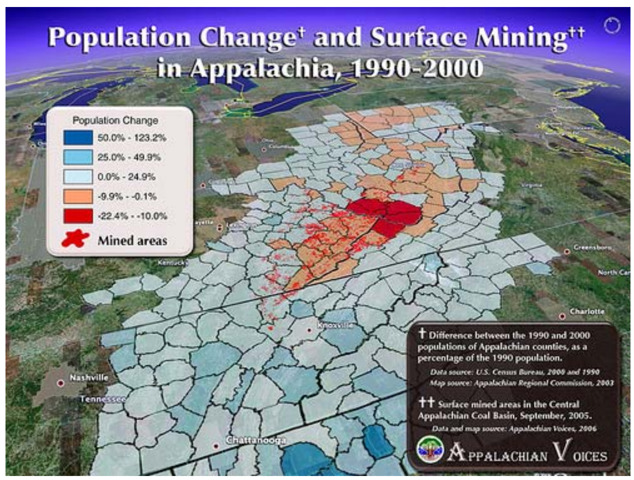
[26] Goodell, 28.
[27] "West Virginia," *National Journal*, http://election.nationaljournal.com/states/wv.htm
[28] Appalachian Voices, "What are the Economic Consequences of Mountaintop Removal?" Online: http://www.appvoices.org/index.php?mtr/economics/
[29] Zellmer, Sandi, Center for Progressive Reform. Online: http://progressivereform.org/perspectives/mt_top.cfm

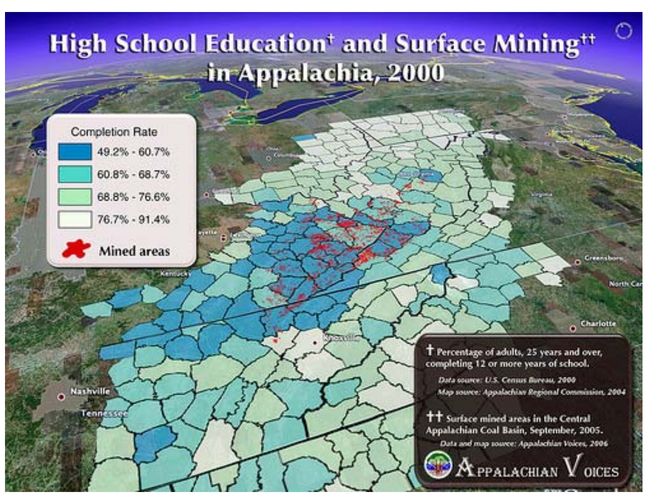
Graphic 1: Overlay of Surface Mines (scattered red) onto County-level Poverty Rates, 2000[30]



Graphic 2: Overlay of Surface Mines (scattered red) onto County-level Population Change, 2000



Graphic 3: Overlay of Surface Mines (scattered red) onto County-level High School Education Rates, 2000



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30 Appalachian Voices image archive, "National Memorial for the Mountains." Online: http://flickr.com/nationalmemorial

The more MTR expands in scope, the more it will degrade the land and resources that citizens in the coalfields depend on. As for any possibilities for present or future development, as Judy Bonds explains, "Despite coal industry claims that the region needs mountaintop removal for economic development, less than 5% of this land has had any development, and is normally of little or no benefit to the community. You can't have development on sites without clean water."[31] The problem with coal is that 150 years of its extraction has failed to create a self-sustaining economy. Indeed, the coal industry depends on an impoverished populace in order to sustain a pool of cheap labor and passive inhabitants.

The problem for the industry, though, is that it has only persisted because it needed local workers and provided scant but real benefits to the communities, while imposing a relatively low impact on the land. However, current mining practices have reduced community dependence on coal mining for employment, while subsequently enraging a substantial proportion of the populace by degrading their quality of life and threatening their homes and families. As a result, companies that employ Mountaintop Removal are facing a growing number of lawsuits challenging the practice, while support for community action against MTR has expanded to the national level. Therefore, it is in the best interests of the industry and state regulators to begin imagining an end to Mountaintop Removal.

For communities in southern West Virginia, one only has to drive through towns in the northern part of the state that have been revived since 1990, towns that were spared the widespread degradation of their mountains, and have since diversified their economic base, to believe that a loss in regional coal production can have a positive economic impact. Residents realize that all aspects of surface mining and Mountaintop Removal are resulting in the loss of abundant and clean resources any future self-sustaining economy would necessarily rely on in the rural counties of southern West Virginia. They also understand that the first step toward creating any such alternative economy for the southern coalfields is to get rid of large surface mining and Mountaintop Removal. In a federal case challenging valley fill permits associated with MTR mines in October of 2007, residents proclaimed that "(The) state government needs to diversify our economy so that people can have jobs that don't threaten communities and sacrifice our precious streams and life-giving waters."[32] As of yet, the state has received these comments with closed minds and cold hearts. The only economy they seem to understand is a state economy based heavily on coal production.

It is for this reason that the research and proposals presented in this study focus primarily on coal production. The aim of the research was to analyze production and employment data in order to illustrate how surface mining and Mountaintop Removal have impacted state-wide coal production and mining employment since the passage of the 1990 Clean Air Act, and to use the information gained from the analysis in order to propose a production-based alternative that would result in the elimination of Mountaintop Removal in West Virginia. That is the direct objective of this study. The overall purpose, however, is to argue that a production shift away from MTR is not only viable, but is an immediate necessity given current trends in surface mining.

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[31] Bonds, 13

[32] Environmental News Service, "West Virginia Residents in Court to Stop Mountaintop Removal," October 1, 2007. Online: http://ww.ens-newswire.com/ens/oct2007/2007-10-01-094.asp

Already, so many of the valuable natural resources that comprise the southern West Virginia mountain ecosystem have been destroyed or contaminated by MTR, and every year the impact worsens. Each additional mountain lost to Mountaintop Removal results only in the further impoverishment of future opportunities for resource-based economic development in the southern coalfields. Whether it be based on wind energy, the sustainable harvesting of forest products, hydro-power, or local craft-making, future economic development for southern West Virginia's communities will rely on a preservation of the integrity of the mountain ecosystem. Coal will likely remain a vital factor, but if so it should only be produced at underground mines and small surface mines that do not require the burial of valuable headwater streams. The end result will be a diverse and integrated economy based on various forms of energy production and locally-owned commerce. As the conclusions in this study will show, such a future is possible for southern West Virginia, and it begins with eliminating Mountaintop Removal.

West Virginia. Photo by Daniel Shea, www.dsheaphoto.com. Flight courtesy of SouthWings.

II. An Analysis of Coal Production and Employment in West Virginia

Overview

The West Virginia Coal Association reports in its annual publication of *Coal Facts* that, since 1863, 13 billion tons of coal have been mined in West Virginia.[33] Strikingly, the same report estimated in 2007 that remaining 'economically recoverable' coal reserves in West Virginia amount to nearly 53 billion tons. This estimate is a reflection of the optimism that characterizes public statements made by coal industry officials, who often assert that the United States holds 250 years of coal reserves. In contrast, recent studies undertaken by the National Academy of Sciences (NAS) and the United States Geologic Survey (USGS) conclude that this estimate was based on a flawed study produced in 1974 using data collected in the 1970s and even the early 1900s. According to the NAS study, recent data show that "there is probably sufficient coal to meet the nation's needs for more than 100 years *at current rates of consumption*," and further, that "it is not possible to confirm the often-quoted assumption that there is a sufficient supply of coal for the next 250 years."[34] The same study concludes that, in the likely scenario where coal demand in the United States increases by 25%, recoverable reserves will last for only 60-70 years. This may or may not justify the claims that the United States is the "Saudi Arabia of coal." On the other hand, while there is significantly less coal than previously believed, there are still vast amounts of recoverable coal in the United States, even if the reserves are increasingly difficult to mine. Unless measures are taken to promote the rapid development and use of renewable energy, and to reduce overall levels of energy consumption and the contribution of coal to our energy portfolio, it can be assumed that the greater proportion of these coal reserves will be extracted, and that West Virginia will continue to be a major contributor to the nation's production and consumption of our dirtiest natural resource.

Since West Virginia stands as the second leading producer of coal in this country, it is likely that there are indeed tens of billions of tons of coal that can still be mined. Given the rise in questionable forms of surface mining as the preferred methods of extraction in West Virginia, this possibility raises concerns as to how that coal will be mined. Even the NAS study recognizes that "as mining extracts coal from deeper and operationally more difficult seams, new environmental [and social] concerns will arise, and existing problems will be exacerbated."[35] For this reason, it is the objective of the following analysis to present trends in West Virginia coal production since the enactment of the 1990 Clean Air Act, in order to determine the extent to which surface mining methods, particularly Mountaintop Removal, have contributed to overall coal production, to exports of West Virginia coal, and to the in-state generation of electricity. Additionally, this section will analyze the impacts that the rise in surface mining – as a proportion of total mining - has had on two mutually-dependent variables: underground coal production and total mining employment. Collectively, these variables can be used as an aid for presenting the economic and environmental impact that the expansion of strip-mining and Mountaintop Removal is having on West Virginia's citizens and communities. More importantly, coal production and employment figures provide vital information for analyzing the feasibility and potential benefits of any proposed alternatives, such as the one put forth in this report.

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[33] West Virginia Coal Association, *Coal Facts 2007*, Online: http://www.wvcoal.com/

[34] National Academy of Sciences (NAS), Summary, *Coal: Research and Development to Support National Energy Policy*, p.3. Online: http://national-academies.org

[35] NAS, p.5

Data Collection and Calculation Methods

Unless otherwise noted, the data reflecting production, employment and distribution used herein was taken from the *Annual Coal Report,*[36] published annually by the Energy Information Administration (EIA), and available under the heading 'Coal' on the Administration's home website. Data concerning electricity generation and the contribution of coal for this purpose were taken from the EIA's *State Level Spreadsheets* for each year included in the analysis. These are found under the heading of 'Electricity.' EIA data was chosen for use in this study primarily because it represents a middle ground when compared to other available sources of data. Data obtainable from the West Virginia Coal Association (WVCA) tends to reflect an upper range, while data available from the Office of Surface Mining (OSM), for most variables, tends to reflect a lower range. The EIA data approximates an average of the two for all variables other than the number of operating mines, which are reported by the OSM and the WVCA as being somewhat higher than those reported by the EIA. This difference proved difficult to reconcile, and so, in order to maintain consistency in the analysis, it was decided to use only EIA data. Further, while the EIA provides both coal- and electricity-related data, the other two organizations only provide data related to coal.

A secondary reason for using EIA data was that coal companies and electric power companies are required by federal law to report certain data to the EIA. The same is not true for the West Virginia Coal Association. The same *is* true for the Office of Surface Mining. However, given that department's repeated displays of preference to the coal industry in matters of litigation and the enforcement of federal mining and environmental regulations, and a perceived neutrality on the part of the EIA, skepticism of the accuracy of OSM data prevented its inclusion in this analysis.

All calculations performed for this study are verifiable and were repeatedly checked for consistency. For calculations which required conversions, Standard conversion methods and variables were used. In cases where only estimates could be used, care was taken to consult professionals before the calculations were performed. All other matters of calculation are explained in their respective sections of this study.

Also, any analysis relating to surface mining in southern West Virginia can be understood as a reflection of Mountaintop Removal (MTR). MTR constitutes a large proportion of all surface mine production in the southern region. However, since the EIA data does not differentiate between the various methods of surface mining, the term "Surface Mining" will be used most often, except for where the use of "Mountaintop Removal" is specifically required.

Finally, this study and its conclusions recognize that data do not necessarily provide for explanations or assertions of causality. The political economy within which the coal industry is situated makes for a complex system, and decisions made in regard to production, employment, distribution and consumption are dependent on many social, economic and political factors not included in this analysis. On the other hand, analyzing and comparing the trends for each of these sectors over a period of time allows for the drawing of informative conclusions, which can then be enhanced or modified by placing them in the context of real events. For this study, the most informative events are the three major federal court decisions that have been handed down since 1998, each of which had a substantial impact on surface mining and the West Virginia coal industry in general.

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[36] The *Annual Coal Report* was simultaneously published as the *Coal Industry Annual* for a number of years during the 1990s. These are the same report.

Litigation Battles Related to Surface Mining in Central Appalachia

Bragg v. Robertson[37]

The first major federal court case questioning the legality of practices related to surface mining was the 1999 *Bragg v. Robertson* case. In this case, Patricia Bragg, a resident of Mingo County, WV, alleged that state agencies had failed to enforce environmental laws restricting Mountaintop Removal (MTR). According to the Ohio Valley Environmental Coalition, other plaintiffs in the case along with the West Virginia Highlands Conservancy further asserted that mining permits were regularly being issued without the required NPDES (National Pollutant Discharge Elimination System) permits, thereby allowing pollutants, including mine waste, to be discharged into navigable waters from point sources – the valley fills associated with MTR mines.[38]

The two points of contention in the case were associated with violations of both the Clean Water Act (CWA) and the Surface Mine Control and Reclamation Act (SMCRA) by the Army Corps. On the first point, the plaintiffs argued that the Corps had no authority to issue dredge-and-fill permits for valley fills because mining spoil was waste material, not dredge-and-fill material which would be legally subject to the Army Corps' authority under Section 404 of the CWA. On the second point, intermittent (seasonal) and perennial (continuously flowing) streams are further protected from surface mining by an article in the CWA known as the 'stream buffer zone rule.' The article states that no land within 100 feet of an intermittent or perennial stream shall be disturbed by surface mine operations.[39] However, it was shown that the Corps was regularly issuing permits allowing the creation of valley fills composed of mining waste within substantial parts of these types of streams.

On March 3, 1999, Judge Charles Haden of the 2nd District Court in West Virginia issued a preliminary injunction halting further permitting actions by the West Virginia Department of Environmental Protection (DEP) – the agency charged with issuing mining permits. Judge Haden also issued an injunction against the continuation of pre-construction or mining activities for the mine in question, the Arch Coal Mine in Mingo County. In June, the OSM attempted to undermine the case, stating that the buffer zone rule did not apply to valley fills. Then, two months later the OSM, DEP, EPA and the Army Corps entered into a "Memorandum of Understanding" (MOU), agreeing that valley fills could be constructed in intermittent and perennial streams, and that buffer zone variances could be authorized. These attempts at legalizing MTR failed.

On October 20th, Judge Haden ruled that valley fills, and the Army Corps' permitting of them, clearly violated the buffer zone rule and the Clean Water Act. Haden further ruled that the DEP director had "to deny variances for valley fills in intermittent and perennial streams because they necessarily affect stream flow, stream gradient, fish migration, related environmental values, water quality and quantity, and violated federal water quality standards." In relation to mine permits, Judge Haden issued a permanent injunction against the DEP director, preventing him from "further violations of…non-discretionary duties…and from approving any further surface mining permits under current law that would authorize placement of excess spoil in intermittent and perennial streams for the primary purpose of waste disposal."[40] As for the MOU, the Court ruled that the document held no legal standing and so had no effect on the buffer zone requirement.

[37] *Bragg v. Robertson*, 72 F.Supp. 2d 642 (S.D. W. Va. 1999).
[38] OVEC, "Valley Fills." Online: http://www.ohvec.org/old_site/streams13.htm. Sept. 4, 2001.
[39] Clean Water Act, *30 CFR sec. 816.57.*
[40] *Id.*

The *Bragg* decision was a major victory for community members and environmental groups in southern West Virginia, but it was a short-lived victory. Only nine days after the decision was passed down, and under public pressure from elected state officials, Judge Haden stayed his ruling. The decision had ignited a massive outcry based on its real and perceived implications for West Virginia's economy, and it inadvertently led to a public battle characterized by labor groups and industry officials on one side, and "environmental" groups on the other, with Senator Robert Byrd and Governor Cecil Underwood claiming that the decision had created an economic 'crisis.' Many miners were laid off, including over 300 at the Arch Coal mine in Mingo County; but, according to EIA data, most of the employment losses were due to the closing of *underground* mines, not surface mines, which brings into question the validity of the claims of an economic crisis as resulting from the decision since it had no relevance to underground mining operations.

In any case, the victory was eventually overturned in early 2001 by the conservative 4th Circuit of Appeals, which, rather than ruling on the merits of the complaint as expected, only concluded that West Virginia could not be prosecuted in federal court under the doctrine of sovereign immunity, and that the case belonged in state court.[41] Even though the original decision was overturned, Judge Haden's injunctions had a significant impact on coal production and the permitting of surface mines in West Virginia between 1998 and 2000, and this information proved useful in analyzing the relevant data trends. Two other equally important court cases have occurred since the Bragg case, each having their unique impact on surface mining.

Kentuckians for the Commonwealth v. Martin County Coal Co. and the Army Corps of Engineers[42]

In 2002, another case against the permitting of valley fills was brought to court, again in Judge Haden's 2nd District. This case involved Martin County Coal Corporation's Mountaintop Removal operation in eastern Kentucky, which the Army Corps had approved under what is known as a Nationwide Permit – allowable under Section 404 of the Clean Water Act for activities that will have only "minimal" environmental impacts. The mine in question was designed to create twenty-seven valley fills impacting over six miles of streams. Kentuckians for the Commonwealth (KFTC) followed the lead of plaintiffs in the *Bragg* case and challenged the Corps' permitting of valley fills, alleging that the practice violated the Clean Water Act regulation that bans the issuance of Section 404 permits that govern the dumping of waste material.[43]

While the case was being argued, the Bush Administration issued a new rule that redefined the "waste" material associated with surface mining as "fill" under Section 404, thus undermining the pending case and legalizing the construction of valley fills in streams. Judge Haden still found for the plaintiffs, and in his decision he stated that the new rule change "effected so fundamental a change that it could only be enacted by amendment of the associated statute in the Clean Water Act," and therefore had to be brought to a vote before Congress.[44] However, as it did with the *Bragg* decision, the 4th District overturned Haden's ruling in May of 2003, upholding the Administration's rule change. The issue of the Nationwide Permit was not settled until 2004.

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[41] OHVEC, "Valley Fills," Sept. 2001.
[42] *Kentuckians for the Commw., Inc. v. Rivenburgh*, 204 F.Supp. 2d 27 (S.D. W. Va. 2002).
[43] OHVEC, "Valley Fills," Sept. 2001
[44] *Id.*

Appalachian Center for the Economy and the Environment v. the Army Corps of Engineers

In July of 2004, 2nd District Court Judge Joseph Goodwin struck down the Army Corps' issuance of the Nationwide Permit, deciding that the NWP undermines the primary purpose of the Clean Water Act and poses unnecessary risks to the Central Appalachian region.[45] The ruling forced coal companies to seek individual permits, which require greater scientific scrutiny in regard to environmental impact, as well as public participation in the permitting process. This ruling led to a slow-down in the permitting of large surface mines. It was not long after this decision that the Corps' issuance of even individual permits was challenged. In September of 2005, the Appalachian Center and EarthJustice – a non-profit environmental law firm – filed further litigation in the 2nd District Court on behalf of residents affected by valley fills for four large surface mines, fills that the Corps had permitted without conducting the impact and mitigation studies required by individual permits. The case was finally decided on June 13th, 2007, when Judge Robert Chambers declared that the Corps was again violating the CWA by improperly issuing permits connected to Mountaintop Removal mines.

While the *Bragg* decision focused solely on the valley fills themselves, this recent case was won on two related but separate issues. The first concerned the discharge of pollutants coming from valley fills; specifically, the construction of sedimentation ponds within the streams at the toe of the valley fills for the purpose of containing these pollutants. The ponds were determined illegal under Section 404 of the CWA, as was the Corps' issuance of the permits. The second portion of Judge Chambers' decision asserted that the Army Corps was illegally issuing individual permits on the grounds that the Corps had not shown, as is required, that the impact on streams by proposed mining activities would be sufficiently mitigated by the creation of a stream elsewhere. During the trial, the Army Corps could not provide evidence that a single attempt at mitigation had proven successful. The decision in this case still stands and has had an impact on the permitting of new surface mines and on the continuation of any existing surface mining activities that had yet to begin the construction of fills. In effect, no new valley fills could be constructed, and without having a place to dump the removed rock layers, companies cannot proceed with the mining. Following this decision, four other permitted surface mines have been added to the injunction imposed by Judge Chambers, including the highly publicized Jupiter Holdings Callisto Mine in Boone County, WV, and two large mines which were planned for Coal River Mountain in Raleigh County. Therefore, this recent decision has major implications for the preliminary case study on Coal River Mountain that is included in the final section of this report.

As was the case with the other lawsuits, this decision is being appealed to the 4th Circuit Court of Appeals, and at the time this report was written, the OSM was attempting yet again to undermine the District Court's decision by proposing another rule change that will effectively legalize all aspects of Mountaintop Removal mining related to stream impact. The OSM is discussing a change in the buffer zone rule that will 'clarify' whether or not SMCRA specifically intended to protect streams from being impacted by surface mining operations. The impact of this case on future Mountaintop Removal Mining will not be known until the fate of the rule change and/or the appeal is decided. However, production numbers for the first two quarters of 2007 show that West Virginia was on pace to equal its total coal production from 2006, meaning that, until June 2007, surface mining was at least as productive as it had been in 2006.[46]

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[45] Appalachian Center for the Economy and the Environment, "Coal Issues." Online: http://www.appalachian-center.org/issues/coal
[46] Data from the Mining Safety and Health Adminstration, "Data Retrieval System." Online: http://www.msha.gov/drs/drshome.htm

These court cases are useful for interpreting the data regarding surface mine permitting, and thus coal production and employment, not only for West Virginia but for Kentucky as well. Aside from their use in interpreting data trends, these cases provide for a better understanding of the social and environmental impacts of Mountaintop Removal mining, as well as of the legal aspects of the permitting process. Overall, the rising opposition to this method of coal extraction offers the initial conclusion that, both individually and cumulatively, the impact of Mountaintop Removal mining operations have expanded at a rapid pace, thereby impacting more communities more intensely. This trend has had the unintended consequence (on the part of the coal companies) of provoking both legal and public opposition, resulting in a hindrance of coal production and, therefore, coal-related employment in southern West Virginia.

By supporting these conclusions with an analysis of available data, it is possible to present the increased preference for Mountaintop Removal mining in the extraction of coal as a failed economics for West Virginia. In doing so, it is also possible to propose alternatives to that economics, supported by data analysis and based on both a reverse shift in coal extraction methods from surface mining back to underground mining, and on long-term strategies for the diversification of economic opportunities in the southern West Virginia "coalfields." Summarizing all of this, Judy Bonds of Coal River Mountain Watch commented during the recent case that "The Corps is ignoring both the law and the science when it issues these permits. Our state government needs to diversify our economy so that people can have jobs that don't threaten communities and sacrifice our precious streams and life-giving waters."[47] The whole process begins with permitting, and it is necessary to analyze trends in surface mine permitting in order to understand the growth of Mountaintop Removal mining and its impacts on the land, the communities, and the resources upon which future development opportunities for southern West Virginia will depend.

MTR mine at Eunice Mountain, WV. Valley fills shown in the left foreground and at the upper right.[48]

[47] Environment News Service, "West Virginia Residents in Court to Stop Mountaintop Removal," October 1, 2007. Online: http://www.ens-newswire.com/ens/oct2007/2007-10-01-094.asp.
[48] Credit to Daniel Shay, www.dsheaphoto.net

Greater Impact on the Land: Trends in Surface Mine Permitting

Rising concerns and community opposition related to the expansion of surface mining in Central Appalachia culminated in the passage of the Surface Mining Control and Reclamation Act in 1977. Known most commonly as SMCRA, the Act imposed the first federal regulations governing surface mining and related practices. Although surface mining at the time was becoming an increasingly favored method of extracting coal, its impact on land and communities, however real, was minimal by today's standards. Records of surface mine permits for the eight years leading up to the passage of SMCRA show that 163 permits were granted totaling 17,497 acres between 1970 and 1977 (roughly equaling that of 1997 alone). This resulted in a yearly average of 20 permits spanning 2,187 acres per year. The average permit size was 107 acres, and this statistic is skewed due to the fact that only two permits – one of them being the first MTR mine in West Virginia[49] – totaled 3,100 acres, representing approximately 18% of all acreage over these eight years, yet only 1.2% of all granted permits. Therefore, in an attempt to normalize the permit data, this analysis will focus only on permits exceeding 100 acres, which serves as a useful benchmark for separating small surface mine operations from large ones, while arbitrarily adjusting for the numerous permits of relatively insignificant acreage included in the permit file used for this study (many permits are for 1.0 acres).[50] As a final note, over 90% of surface mine permitting and production in West Virginia occurs in southern West Virginia. Permit data does not allow for the separation of the data into regions, so this knowledge is useful in approximating the impact on the southern counties.

Using the 100+ acres method, this study was able to make comparisons over different periods of time in order to illustrate the pace and expansion of surface mining in West Virginia. The proportion of all recorded permits that exceeded 100 acres ranged between 61% and 99% over the study period, and since 1990, permits over 100 acres comprised between 85% and 99% of all permits. Therefore, not much in the way of acreage is lost from the analysis. Further, key events that occurred over the study period were chosen as points of separation due to their significant impact on permitting and production, such as the passage of SMCRA in 1977 and the passage of the Clean Air Act in 1990.

Thus adjusted, surface mine permits on record since 1970 span a total of 268,265 acres, or almost 420 square miles, equaling the total land area of Logan County in southern West Virginia. Ninety-five percent of the total (253,845 acres) has been permitted since the passage of SMCRA, and 61% (164,266 acres) has been permitted since the 1990 Clean Air Act. This means that of the total acres permitted for surface mines of 100 acres or more since the beginning of 1970 – a span of 38 years – 61% of that has been permitted in just the past 17 years. Even more telling, 48% of the total has been permitted since 1995, which is when surface mining really began to expand in scope in West Virginia. This signifies that the total acres permitted per year has risen exponentially, leading to a subsequent expansion of the land impacts related to surface mining in West Virginia (**see Charts 1-4 for a graphical representation of these trends**). Charts 2 and 4 exclude data for litigation years in order, to the extent possible, to best represent the expansion or contraction of surface mine permitting that was not impacted by litigation. However, achieving a strong correction for this was not possible since litigation still slowed the processing of permits in the years between judicial decisions.

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[49] This first MTR mine was on Bullpush Mountain along the Fayette-Kanawha county line, permitted in 1970.

[50] All permit data used in this study were obtained from the West Virginia Department of Environmental Protection (DEP). Permit data in database and GIS form is updated daily, and can be found online at: http://gis/wvdep.org/data.html. The data are compiled by the Division of Mining and Reclamation (DMR). The DEP is the agency charged with the permitting of mining operations as well as the regulatory oversight of such operations.

Chart 1: Post-SMCRA Permitting of Surface Mines in West Virginia, post-SMCRA, 1977-2007

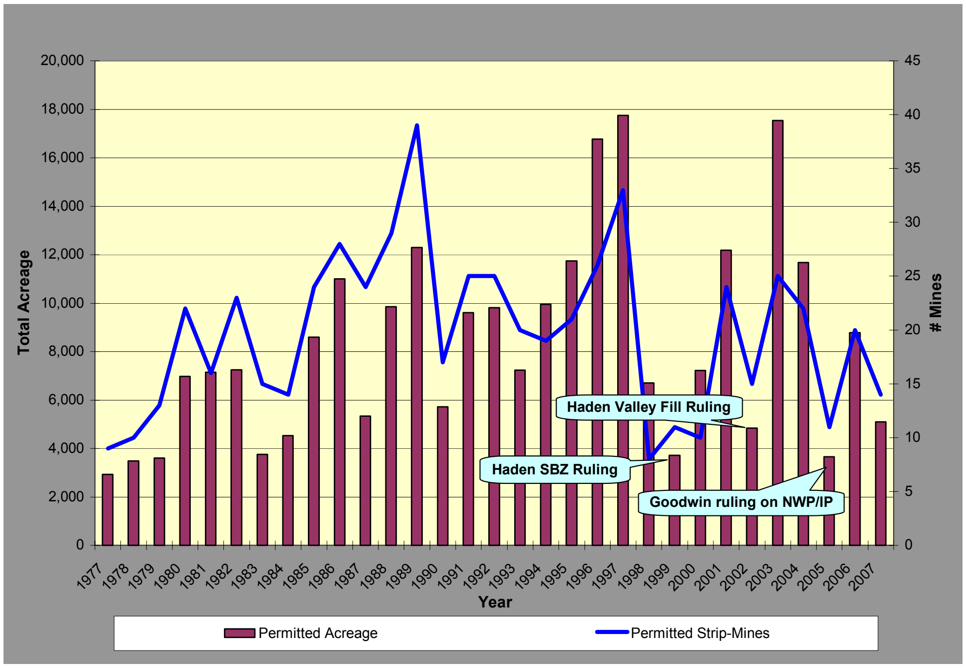
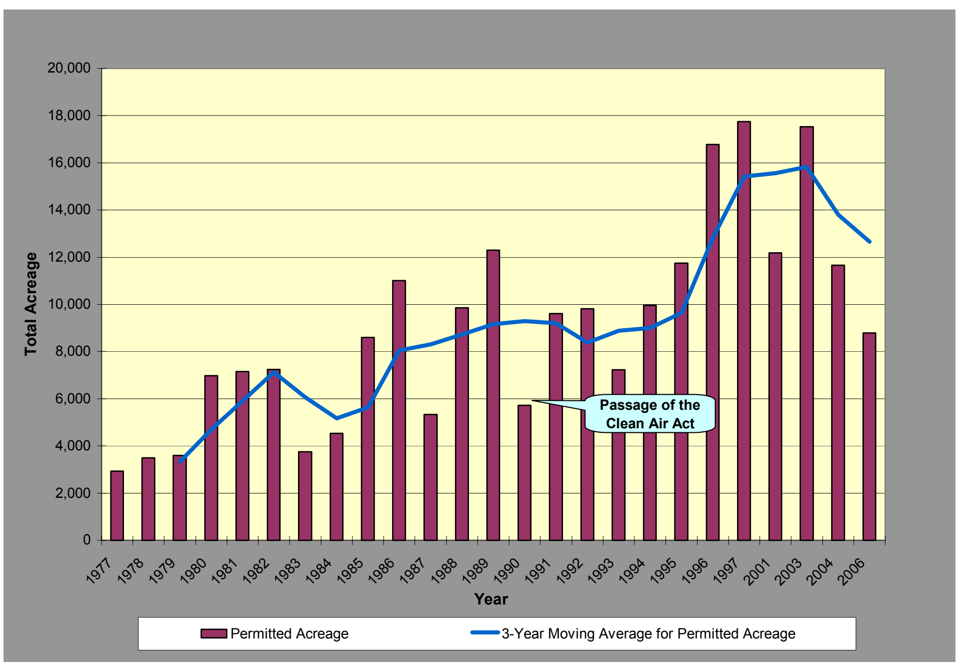


Chart 2: Strip-Mine Permitting in West Virginia, post-SMCRA, 1977-2007 (non-Litigation years)



Note: Chart 1 shows the annual number of permitted mines, which is useful for informative purposes only. Chart 2 does not show this, but does present a 3-year moving average of total permit acreage, in order to show the general expansion of land area permitted for surface mining. Further, Chart 1 notes the rulings that affected permitting, while Chart II notes the passage of the Clean Air Act (CAA) in 1990, beyond which average annual permitting expanded rapidly.

Chart 3: Strip-Mine Permitting in West Virginia, post-CAA, 1990-2007 (all Years)

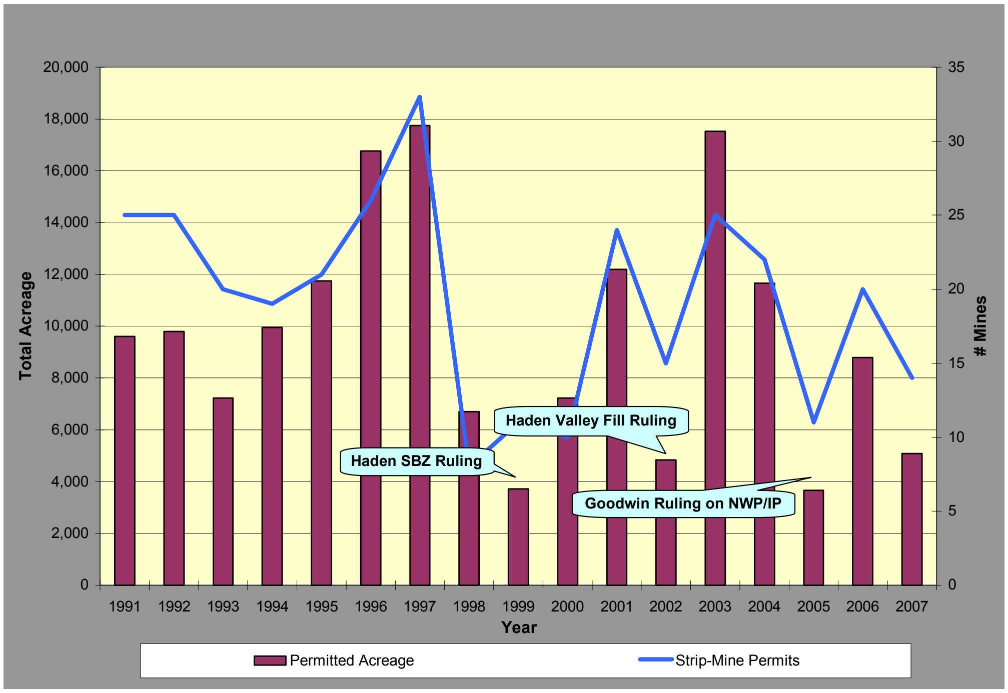
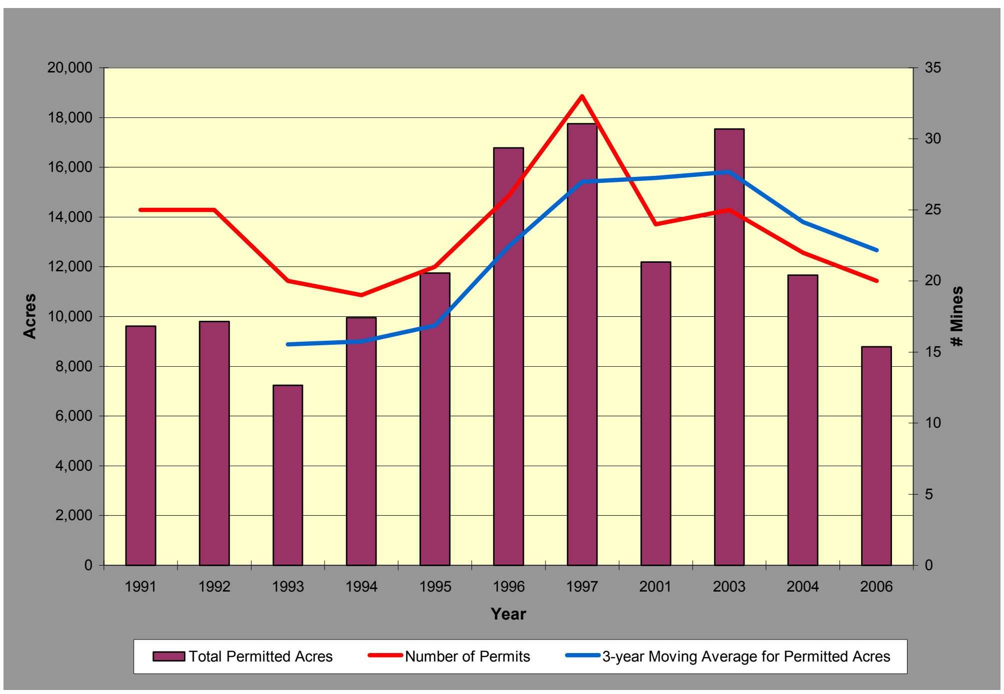


Chart 4: Strip-Mine Permitting in West Virginia, post-CAA, 1990-2007 (non-Litigation years)



Notes: A comparison of the two charts above shows the effect that litigation had on surface mine permitting between 1998 and 2007. Even in the years between cases (2001, 2004, 2006), acreage numbers were down due to trials extending into these years, to the stricter requirements for processing permits, or to general recovery.

Analysis: DEP Data

Between 1977 and 2007, total annual acres permitted for surface mining increased from just under 3,000 acres to almost 18,000 acres in a single year, representing a six-fold increase. A moving 3-year average shows a steady increase in average annual permitted acreage following the passage of SMCRA. An unexplained "low" data entry for 1990 (perhaps due to industry speculation over the pending requirements of the Clean Air Act) impacted this average, a fact that made it useful to separate post-CAA data from the rest. Charts III and IV present the rapid rise in the annual acreage permitted for surface mining, which nearly doubled between 1994 and 1997. Finally, a comparison of 1997 and 2003 (years which represent permitting before the *Bragg* case and after the Bush Administration effected their first rule change) shows that when permitting proceeds in an unfettered, "illegal" manner, the West Virginia Department of 'Environmental Protection' is willing to permit acreage for surface mining in excess of 17,500 acres. In these two years alone, the DEP permitted a total of over 55 square miles, which is an area roughly equal to that of Washington, D.C.

While absolute acreage data is useful for illustrating the total area impacted by surface mining (annually and over time), thus offering an idea of the rising total impact of surface mining on communities and the environment, it fails to describe how large individual mines are becoming. For this purpose it was useful to calculate the average size of surface mine permits over different time periods, selected according to the occurrence of litigation or to observable trends in the absolute data. This was necessary in order to move toward gaining a more complete picture of the expansion of surface mining in West Virginia. Table III separates out this data accordingly.

Table III: Comparative Permit Data, non-Litigation vs. Litigation Years

Time Period	*# Permits*	*% Total Permits*	*Total Acreage*	*% Total Acres*	*Acres/Permit*	*Permits/Year*	*Acres/Year*
1978-1990	274	36.6%	89,579	85.3%	327	21	6,891
1991-1994	89	51.7%	36,598	89.4%	411	22	9,149
1995-1997	80	70.2%	46,262	96.7%	578	27	15,421
2001/03/04/06	91	75.2%	50,175	96.9%	551	23	12,544
1998-2000	29	61.7%	17,639	95.0%	608	10	5,880
2002/05/07	40	80.0%	13,592	95.8%	340	13	4,531

As this table shows, the average permit size ("acres/permit") before the passage of the Clean Air Act was 327 acres. For purposes of accuracy in comparing pre-1990 data to time periods after 1990, the average permit size for 1988-1990 was 328 acres. Therefore, any question about the validity of comparing data from short periods in the 1990s to data spanning a range of 13 years between SMCRA and the CAA are put to rest. Continuing, the average permit acreage rose to 578 acres-per-permit for the 1995 to 1997 time period, and remained just under that at 551 acres for the years after 2000 that did not experience direct effects from litigation. Average permit sizes between 1995 and 1997 represented a 76.8% increase over pre-1990 levels, and a 31% increase over 1991-1994 levels. More recent data for 2001/03/04/06 are only slightly lower than the 1995-1997 period, signifying again that under 'normal' permitting patterns, the DEP is willing to permit surface mining operations totaling over 12,500 acres (18 sq. mi.) per year. To show a sense of scale, the total acres permitted in non-litigation years after 2000 cover a span of 78 square miles, which is 17 square miles larger than all of Washington, D.C. As a general note, this table also shows that of the total permitted acres recorded in the DEP permit file, 85-97% of those acres are reflected in this analysis.

Finally, the table presents the average impact of litigation on permitting trends. The two periods shown in italics in the table represent periods affected by litigation, and these are separated primarily for the stark difference in the average size of permits that were granted. The history of the 1999 *Bragg* case offers a couple of interpretations. The decision appears to have affected the total number of permits granted each year, but the only year in which average permit sizes were reduced was 1999, when the average dropped to 338 acres-per-permit. The average permit size was 838 acres in 1998, perhaps reflecting an attempt on the part of coal companies to pre-empt the case and grandfather in a few last permits. The average permit size in 2000 was 722 acres, also well above the average for previous years. As Judge Haden stayed his decision shortly after the October 1999 ruling, the increase in permit sizes may reflect a scramble to catch up for lost time. In any case, knowing the history of the case has helped to interpret the data, and separating out the data for litigation-impacted years helps to understand the expansion of surface mining and its impacts on southern West Virginia.

Table IV is a frequency table for large surface and/or MTR mine permits that can be used in conjunction with Tables III and V to get a complete picture of the increasing scale of surface mining. Table IV shows how many individual permitted mines exceeded acre thresholds. Before the passage of the Clean Air Act, 1000 acre mines were rare. However, now one out of every seven permits exceeds this threshold. Many of these mines also run tangent to other large surface mines, thus creating one large mine of many thousands of acres. One highly publicized mine, the Hobet 21 "Mining Complex" in Boone County, WV, covers more than 12,000 acres of contiguous mining, and is composed of at least one of the 2000+ acre permits listed in the 1995-1997 range in Table IV. On average, for each year between 1995 and 1997, one such mine was permitted. As a preliminary note, planned surface mining operations for Coal River Mountain include two 2000+ acre mines (one of which, if approved, will stand as the second largest MTR mine ever permitted in West Virginia) and a third mine of 1320 acres, for a total of 5772 acres of contiguous MTR mining. Finally, Table V shows the area impacted, cumulatively and as an average, by the ten largest surface mines per time period, data which is represented annually, for non-litigation years, in Chart 5.

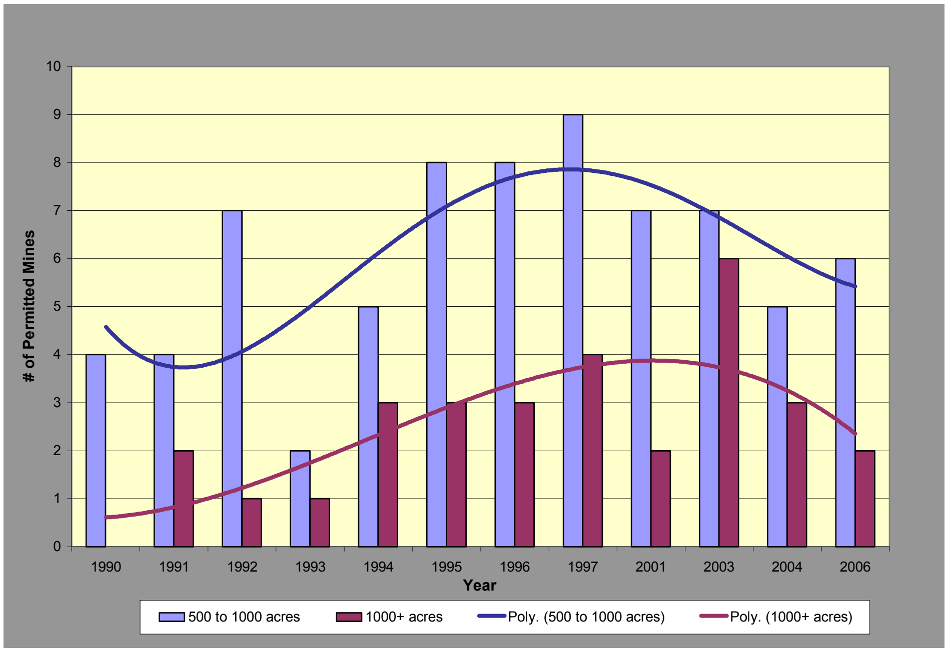
Table IV: Number of Permits by Acre Range

Time Period	*100-500*	*500-1000*	*1000-2000*	*2000+*	*Total, 500+*	*% Total Permits*
1978-1990	225	39	10	0	49	17.9%
1991-1994	64	18	6	1	25	28.1%
1995-1997	45	25	7	3	35	43.8%
01/03/04/06	53	25	13	0	38	41.8%
1998-2000	18	5	4	2	11	37.9%
02/05/07	31	9	0	0	9	22.5%

Table V: Comparative Data for the Ten Largest Mines

Time Period	*Total Acreage*	*% Total Acres*	*% Permits 100+*	*Acres/Permit*
1978-1990	63,122	60.1%	47.4%	486
1991-1994	28,307	77.3%	44.9%	708
1995-1997	32,215	69.6%	37.5%	1074
01/03/04/06	35,309	68.2%	44.0%	883
1998-2000	17,529	94.4%	96.6%	626
02/05/07	12,077	85.1%	75.0%	403

Chart 5: Frequency of Large Permitted Surface Mines, by Area Range, 1990-2007 (non-Litigation Years)



Data on Mountaintop Removal Permits

The Center for Progressive Reform (CPR) reports that between 1996 and 1998, the West Virginia Department of Environmental Protection approved permits for thirty-eight Mountaintop Removal mines impacting over 27,000 acres.[51] As a proportion of permitted acreage, this represents 66% of all acres permitted for surface mining over this time period. Per year this amounts to 9,000 permitted MTR acres, and the average MTR mine size according to the CPR study was 711 acres. This is being presented for purposes of comparing my analysis with other studies done on MTR permitting trends, and validates the methods used in this study.

The calculations performed for this study use a 500-acre threshold for assuming MTR permits,[52] and show that, over the same period used in the CPR study, the DEP permitted twenty-nine MTR mines totaling 30,414 acres – 74% of the total - for an average of 10,138 acres-per-year, and an average 1,049 acres-per-mine. More recently, in 2003 (the last year that permitting truly continued as it had before 1998), 14,885 acres were permitted for MTR mines, representing 85% of total permit acreage. Fourteen MTR mines were permitted averaging 1,063 acres per mine. As a comparison to earlier years, data for 1991-1994 show that 27 of 89 surface mining permits were for MTR mines, and totaled 23,744 acres (65% of all permitted acres), for an average of just under 6,000 MTR acres-per-year, and an average mine size of 879 acres. Table VI below compares the above data, with an extra line included for 1995-1998 (since MTR really began expanding in 1995).

[51] Zellmer, Sandi. Center for Progressive Reform, "Mountaintop Removal," 2004. Online: www.progressivereform.org/perspectives/mt_top.cfm

[52] The 500-acre threshold is arbitrary. However, many Mountaintop Removal mines in the past have been permitted at half that size. Additionally, other forms of surface mining such as Auger, Highwall and Contour mining disturb far less acreage than MTR mines do; so, for the purposes of this study, the choice of a 500-acre threshold for estimating MTR surface impacts stands as a conservative one.

Table VI: Comparative Analysis of MTR Permitting						
Time Period	# MTR Permits	MTR Acres	% Total Acres	Permits/Year	Acres/Year	Avg. Mine Size
1991-1994	27	23744	65%	7	5,936	879
1996-1998	29	30414	74%	10	10,138	1,049
1996-1998 (CPR)	38	27000	66%	13	9,000	711
1995-1998	40	39708	75%	10	9,927	993
2003	14	14885	85%	14	14,885	1,063

What this analysis shows is that the number of Mountaintop Removal operations being permitted each year is increasing. Both the number of acres approved to be mined through the leveling of mountains each year and the average size of permitted MTR operations are increasing, as is the proportion of all surface mining identifiable as Mountaintop Removal, which has risen from 65% in the early '90s, to 75% in the mid- to late '90s, to 85% in 2003. Overall, the permit data does well to illustrate trends in surface mine permitting and the expansion of Mountaintop Removal. However, a mapping study conducted by Appalachian Voices found that the DEP's permit files under-report the actual acreage that has been impacted by surface coal extraction methods in southern West Virginia.

Analysis: GIS Mapping

Permit data stands as the most useful measure for *predicting* the land impacts from surface mining in West Virginia. Further, and to re-state an important point, ninety percent of this data reflects the impact on southern West Virginia alone. The DEP data, however, does not offer a true picture of *actual* impact. By the DEP's own admission,[53] many permits had yet to be entered into either the database file or the GIS shapefile (used in the next part of the permit analyis). Also, the boundaries of many permits may have been revised after the initial permit was granted and, according to the DEP, these revisions are not sufficiently reflected in the permit files either. In order to determine the true extent of surface mining in southern West Virginia, Appalachian Voices, with the aide of GIS specialist Ross Geredien and the author of this report, conducted a continuous mapping study of strip-mining across the Central Appalachian coalfields, including those in southern West Virginia. The study utilized ArcGIS software with the aide of 2003 aerial imagery, 2005 LandSat imagery (for the purpose of updating the extent of mining operations), DRG topographical maps, and permit data provided by the DEP. Analysis of the digitized surface mines produced the following:

<u>Area Data as of 2003:</u>[54]

- Total Surface Mined Area, historical: 457,204 acres
    - % of total S. WV land area: 9.5%
- Total Area identified as Mountaintop Removal (MTR): 255,765 acres
    - % of total S. WV land area: 5.3%
- **Proportion of Surface Mining identified as MTR:**[55] **57%**

[53] Phone conversations with DEP employees charged with the collection and publication of permit date revealed that not all permits had yet to be entered into GIS form or the database file, as there was a backlog of data from earlier years that was still in the process of compilation.

[54] This data was also normalized with data from a similar GIS study conducted by SkyTruth, which primarily utilized satellite imagery in its mapping.

[55] MTR activities are often permitted under many different classifications, such as "Steep Slope," "Area," and "Mountaintop Removal." These designations are not provided for in the DEP permit data, which only differentiates between 'Coal Underground' and 'Coal Surface,' yet they are the designations used in the individual permits themselves. The determination used for the mapping

As the above data describes, the Appalachian Voices comprehensive mapping study shows that over 450,000 acres have been surface mined in southern West Virginia alone, with over 250,000 acres being mined by MTR methods. However, when permits for approved mines that had yet to begin mining operations by 2003 are added to the total, the total surface mined and permitted area increases to 503,940 acres, *nearly 800 square miles!!* This is equal to the combined land area covered by Los Angeles (469 sq. mi.) and New York City (322 sq. mi.), and constitutes 10.5% of the total land area of southern West Virginia. By adding the total acreage of permits exceeding 500 acres since 2003 to the total MTR area, it was estimated that existing and potential land area impacted by MTR, through 2007 permitting, will total 289,430 acres (roughly the size of Los Angeles).

Concluding Comments on Trends in Surface Mine Permitting

These numbers represent only the direct land impacts of Mountaintop Removal. For every 100-feet of altitude that is blasted away, potential energy from wind power is lost. For each acre that is mined, nearly an acre of bio-diverse, native hardwood forest is cleared (on average) – and often burned on site. For each inch of soil that is scraped away, one-hundred years of nutrients for forest re-generation ends up in a valley, buried by mine waste. For each mile of stream that is filled, two to three more miles of stream are contaminated. Homes outside of the permit boundary are damaged from either blasting or floods, and their inhabitants are forced to breathe airborne coal dust, or drink well water contaminated by chemicals running off the mine.

These impacts are not delineated in mining permits, nor are they included in the cost of the coal. So they continue on as externalities. In the scenario where the OSM is successful in undermining the application of the stream buffer zone rule to valley fills – thus removing the last legal tool that community members and environmental groups have for challenging surface mine permits - it can be expected that Mountaintop Removal mines will continue to be permitted at or above 2003 levels. Should this occur, this destructive form of surface mining will impose increasingly negative impacts on the land and communities in southern West Virginia. In light of this, questions remain as to the 'justifiability' of MTR, to which answers tend to be situated in the realm of economics. The next section will analyze trends related to coal extraction and use in West Virginia, and in conjunction with the conclusions drawn from the permit data, will offer a more complete picture of the reasons for, and costs or benefits related to, the use and expansion of Mountaintop Removal mining.

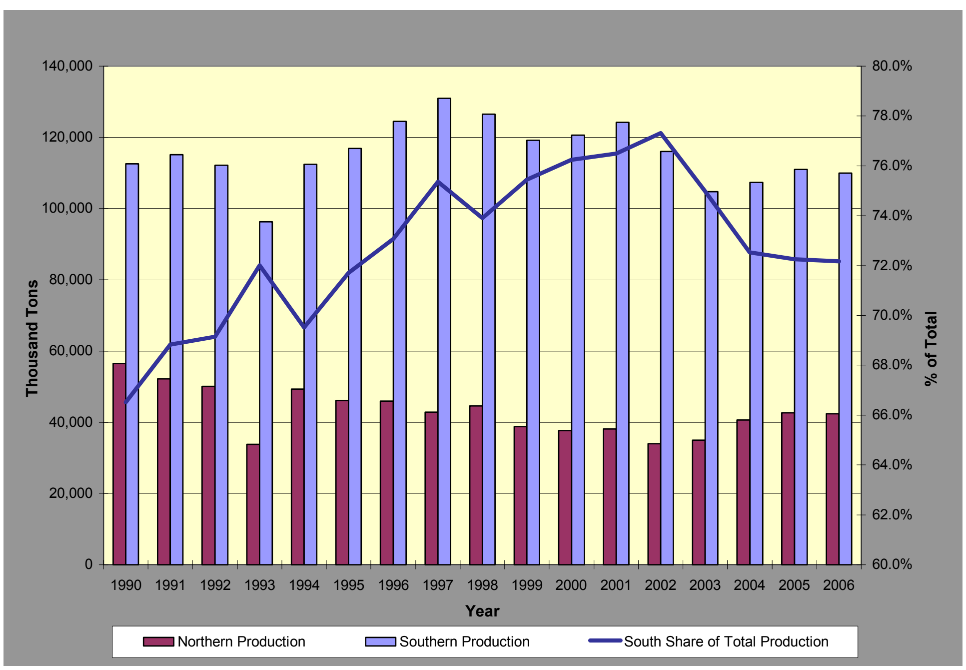
study of what constitutes Mountaintop Removal is based upon an acceptable definition of MTR as 'any surface mining operation that crosses a peak or high-altitude ridge,' thus reducing the maximum altitude for that area. In regard to ridges, those conducting the mapping study were careful not to include operations that clearly existed as contour mines.

Coal Production[56]

Overview of Influences on Production Trends

West Virginia's coal economy is driven by a geographical accident. There is a geologic line running through the state separating high-sulfur coal to the north from low-sulfur coal to the south. This line has determined not only regional trends in coal production, but also trends in the methods used to extract the coal. The passage of the Clean Air Act in 1990 led to an increase in regional demand for low-sulfur coal, which in turn led to a southern push in West Virginia coal production. Since 1990, production from southern mines as a share of the total rose from 66.5% to 72.2% in 2006,[57] reaching a peak of 77.3% in 2002 (**See Chart 6**). As demand increased for exports of West Virginia's low-sulfur coal, the pressure to meet that demand led to a subsequent increase in surface mining, as such extraction methods offered the fastest and most cost-efficient way of getting the coal out of the ground. As a result, the proportion of total production coming from surface mines has risen steadily since 1990, increasing from 27.1% to 44.5% by 2006 (**See Chart 7**). In terms of tons of coal produced, surface mine production increased by 35% over the study period from 45.9 million tons in 1990 to 67.7 million tons by 2006, with 70% of that production occurring at Mountaintop Removal mines.[58] The rise in surface mining as a share of production in the southern counties was slightly more dramatic, increasing from 39.6% in 1994 to 55.8% by 2006, marked by a 38.1% increase in southern surface mine production.

Chart 6: West Virginia Coal Production by Region, 1990-2006



[56] All data regarding coal production was taken from the *Annual Coal Report*, published by the Energy Information Administration each year. The report can be found on-line at http://tonto.eia.doe.gov/reports/reportsD.asp?type=Coal. Production and mine data are found in Table 3 under the heading "Production."

[57] EIA production data is only available through 2006.

[58] Britton, J.Q.; Blake, B.M. Jr.; McColloch, G.H., "West Virginia," *Mining Engineering*, May 2007, p. 125. Britton and others report that 70% of surface mine production results from MTR, while the WV Coal Association data indicate a slightly lower proportion, at 65% .

The southern shift and the rise in surface mining have not prevented the sharp decline in total annual coal production that West Virginia has experienced over the study period. Annual coal production peaked at 173.7 million tons in 1997, up from 169.2 million tons in 1990. Since then, however, production has fallen dramatically to 152.4 million tons in 2006, representing a 10% decrease since 1990 and a 12.3% decrease since 1997. As was the case with permitted acreage, the sharpest yearly declines have occurred coincidentally with the lawsuits that affected the permitting of valley fills.

The 1999 decision for the *Bragg c*ase affected the permitting of valley fills, as well as any pre-construction or existing mining operations on the Arch Coal mine that was the focal point of the case. As previously discussed, issues with underground mining had no part in the case, and Judge Haden even stayed his ruling nine days after it was handed down. Further, the suit halted mining on only the one surface mine. Judge Haden did issue an injunction in early March of that year against further permitting by the DEP, but halting the permitting of surface mines does not immediately affect production since there is a one- to two-year lag between permit approval and production. The conclusion here is that coal production should only have been reduced by the lost production at the Arch Coal mine. In actuality though, total coal production dropped dramatically from 171.2 million tons in 1998 to 158 million tons in 1999 and 2000, and rebounded slightly after the 4th Circuit overturned the decision in early 2001, to 162.4 million tons. While it would be reasonable to assume that this decrease was the result of speculation over the outcome of the case by other surface mine operators fearing future inclusion in the lawsuit, in reality the entirety of the decline was not experienced by surface mines, but rather by underground mines.

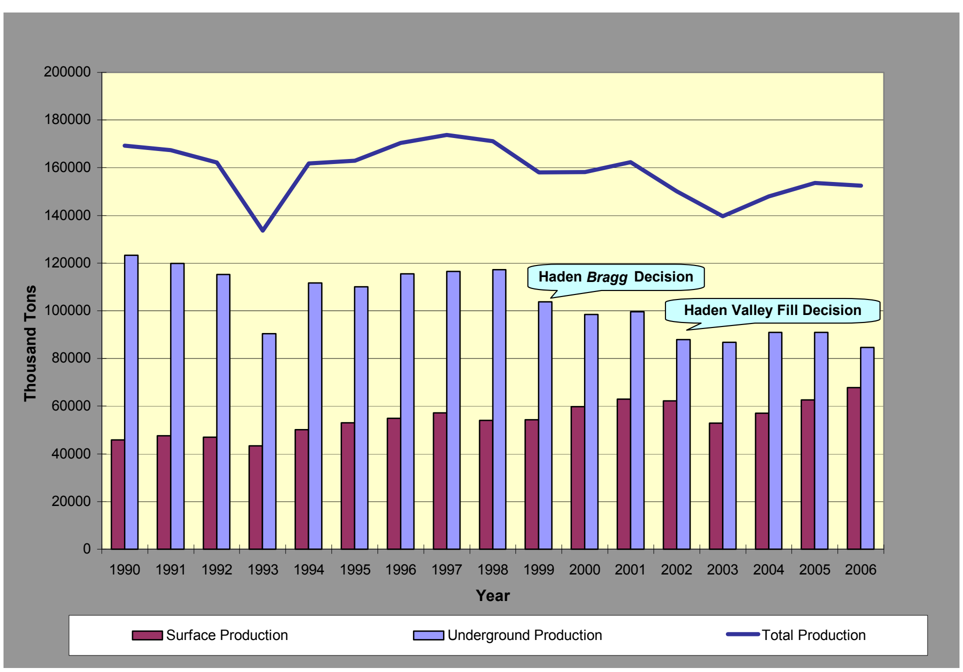
The decline in total coal production from 1998 to 1999 was 13.2 million tons, while production from underground mines dropped by 13.4 million tons – with the loss spread almost equally between northern and southern underground mines. In contrast, annual surface mine production actually *increased* by 300,000 tons. Half of the lost underground production was due to northern underground mines being less productive, in terms of tons-per-mine, than they were in 1998, as the number of operating mines in 1999 and 2000 was the same as in 1998. However, 46 southern underground mines were shut down after 1998, causing the decline of 6.5 million tons of production. The interesting thing is that the mines that were shut down were less productive than the mines that remained in operation, and so for political purposes were 'expendable.'

When Judge Haden ruled in October of 1999, there was a public and political uproar over the impact the decision would have on West Virginia's economy. As an apparent indication of the economic crisis to come, almost 2,300 miners lost their jobs between 1998 and 1999, only 225 of which were surface miners. In total, underground mining employment declined by 2,060 – of which 1,759 resulted from the closure of the 46 southern underground mines. While it is true that other economic factors may have contributed to the closure of these mines, and thus the decline in underground employment, the fact remains that surface mine employment dropped by a total of only 165 miners in 1999. This does not even equal the 300 miners laid off for a span of nine days at the Arch Coal mine in 1998. The tentative conclusion to be drawn here is that lower producing southern underground mines were closed, and their employees rendered unemployed, for political purposes. In sum, politicians created and relied upon a false causal nexus between Judge Haden's decision and its economic effect in West Virginia, while diverting attention from the fact that surface mine production proceeded and was unaffected by the *Bragg* case. The same was not true with the 2002 lawsuit brought by Kentuckians for the Commonwealth against the Army Corps and the Martin County Coal Company.

The 2002 case succeeded in challenging the Corps' permitting of valley fills under the Nationwide Permit (NWP). Judge Haden decided that since valley fills did not constitute activities having only a minimal environmental impact, the permit for the fills had been approved illegally, and Haden issued an injunction blocking all valley fills. The part of this decision relating to the filling in of stream segments with waste material was overturned by the 4th Circuit in January of 2003, and so did not have any direct impact on surface production. However, the fact that the permitting process had been slowed by the injunction against the issuance of NWPs appears to have caused enough of a slow-down to reduce surface mine production by 9.2 million tons between 2002 and 2003.

The 2004 *Appalachian Center for the Economy and the Environment* case against the Army Corps, which resulted only in a slowed permitting process, does not appear to have affected production in a negative manner. Neither did the 2005 decision against valley fill permits that the Corps had approved for four large surface mines (MTR mines). The only conclusion that can be drawn from these two decisions is that, without them, surface mine production may have been greater. As the data shows, however, surface production rose by approximately 5 million tons a year between 2004 and 2006. The true impact of the 2005 suit will only be known after one of two things occurs – (i) if the OSM succeeds in changing the stream buffer zone rule so that the rule does not apply to valley fills, then the 2005 decision will no longer affect the permitting of valley fills; or (ii) on the other hand, if the OSM is not successful, then it can be expected that more surface mines will be impacted by the 2005 ruling, and since Mountaintop Removal production accounts for 70% of all West Virginia surface production, annual surface production will begin to decline. Given the substantial decline in underground production since 1990, this may truly cause a crisis for West Virginia's coal economy unless a dramatic reversal of production methods occurs. By comparing trends in surface and underground mine production over time, it is possible to gain an understanding of how surface mining has impacted the overall production of coal in West Virginia. Further, with a sense of how litigation impacted production, litigation impacts can now essentially be controlled for in the following analyses. These impacts are observable in Chart 7 below.

Chart 7: West Virginia Coal Production by Mine Type, 1990-2006



Underground Mine Production

In order to create a backdrop against which any policy proposal for shifting production away from Mountaintop Removal can be measured, it is necessary to begin with an understanding of trends in underground production. Production data by region is not available for years before 1994.

Total underground coal production has fallen from 123.3 million tons in 1990 to 84.6 million tons in 2006, representing a 31.4% decline of 38.7 million tons. In regional terms, since 1994 the proportion of total northern coal production coming from underground mines has remained around 87%. However, the data illustrates the decline of the northern underground coal industry that occurred as demand for high-sulfur coal waned. Between 1994 and 2006, northern underground coal production fell 17.5% from 43.7 million tons to 36.1 million tons, while the number of operating mines dropped from 65 down to 29. Unfortunately for West Virginia's coal economy, these mines produce high-sulfur coal, because in terms of mine productivity – measured in annual production per mine – northern underground mines have been between two and four times as productive as southern underground mines. In 2006, northern underground mines were producing coal at an average of 1.24 million tons-per-mine, compared to 334,855 tons at southern mines. Northern underground mines also out-produced southern surface mines at a ratio of almost two-to-one, in per-mine productivity, for each year between 2004 and 2006, though this is likely due to the fact that it was the lesser-producing northern underground mines that were being closed, thus raising the average production for the remaining mines.

As a proportion of total West Virginia underground production, the contribution from northern mines declined from 39.1% of the total in 1994 to a low of 31.8% in 1997. Since then, the percent of underground production coming from the north has risen to a high of 42.6% of the total, though this was due to sharper decline in production at southern underground mines than that experienced by northern mines. Charts 8 and 9 compare northern and southern underground production trends.

Chart 8: West Virginia Underground Coal Production and Operating Mines, by Region, 1994-2006

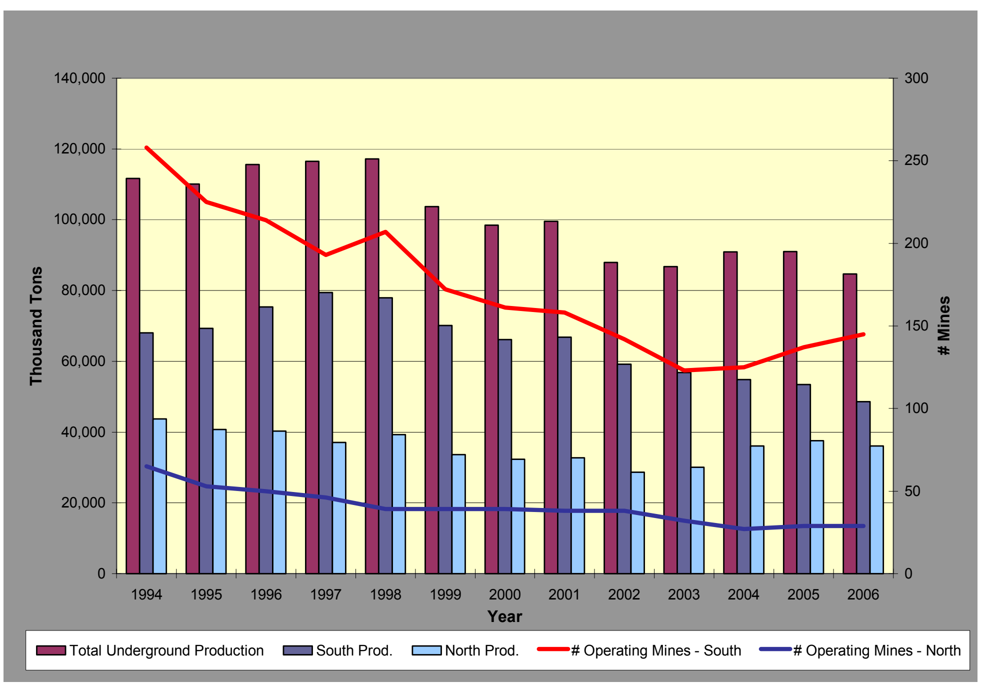
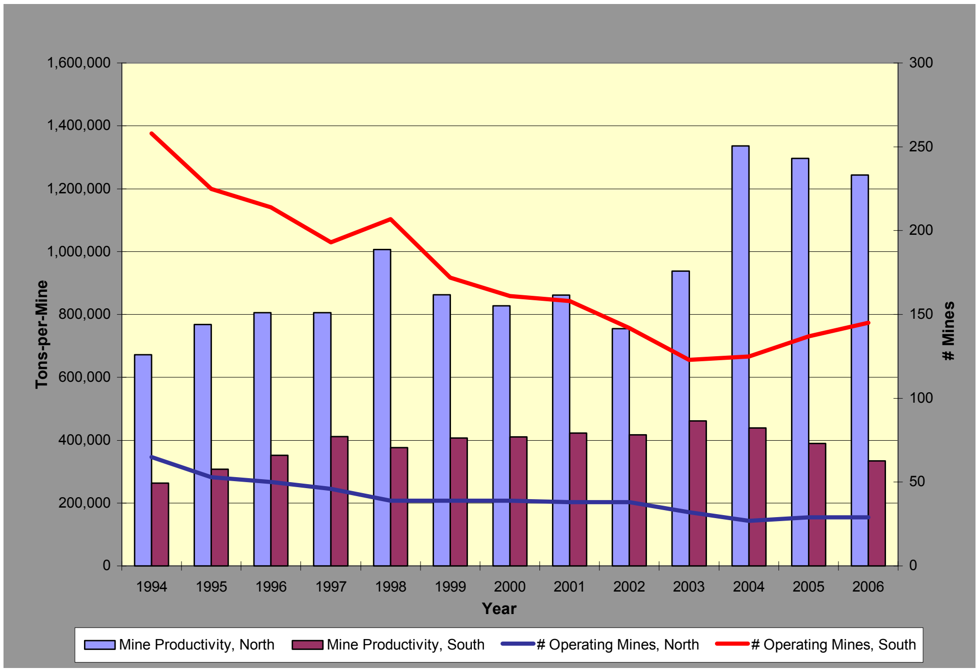


Chart 9: Regional Productivity of Underground Mines, 1994-2006



A few conclusions can be drawn from these charts. First of all, it is apparent from Chart 8 that total underground coal production in West Virginia is largely dominated by production at southern mines. Secondly, Chart 8 also shows that since 2004 there has been a resurgence in the operation of southern underground mines. This may be due in part to the overall recovery of southern coal production following the 2002 lawsuit, combined with a shift to underground mines due to the suspension of surface mine permits. On the other hand, the increase may be the result of the fact that underground mine productivity has fallen over the same period, thus requiring the operation of more underground mines in an attempt to maintain production levels. This attempt failed, though, as southern underground production still fell. The combination of an increase in southern mines and a decrease in mine productivity has resulted in a sharp increase in the price of southern underground coal, which has risen from $33 per-ton to over $53 per-ton in only three years. Chart 9 shows the difference in mine productivity between northern and southern underground mines. Overall, the trends in underground production stand in stark contrast to those for surface mining.

Surface Mine Production

Reflecting economic pressures and heightened demand for low-sulfur coal, West Virginia coal production depends heavily on southern production, and southern production has increasingly depended upon surface mining. Surface production levels in the north have remained more or less unchanged since 1994, with the only true annual increase occurring in 2006. Also, the southern region dominates the West Virginia surface mining industry, producing around 90% of all surface mined coal in the state since 1994. For these reasons, the analysis of surface mine production will focus only on southern trends.

As shown in Chart 10, surface production in the South has risen from 44.5 million tons to 61.4 million tons since 1994, representing a 38% increase. It is interesting to note that surface production in 2005 was approximately equal to 2001 production and, further, that, since 2003, surface production has risen by 5 million tons annually. This represents the greatest 3-year increase in surface mine production since 1994. Over the study period the percent of total southern coal production coming from surface mines has increased from 39.6% to 55.8%. The contribution from southern surface mines to total West Virginia coal production has increased from 27.5% to 40.3%, which illustrates the increasing reliance of West Virginia's coal economy on southern surface mining. However, excepting data for 2006, the greater proportion of this increase has not come by way of a rise in the number of annually operating mines, but rather by way of an increase in the average size of individual surface mines. This trend is reflected in the fact, according to the study undertaken by J.Q. Britton and others, that coal produced at Mountaintop Removal mines constituted 70% of all surface mine production between 2000 and 2006. Using this estimate in conjunction with EIA data, it was possible to estimate the contribution of MTR to total West Virginia and total southern West Virginia coal production. Table VII summarizes these results, with comparisons to contributions from all southern surface mining operations.

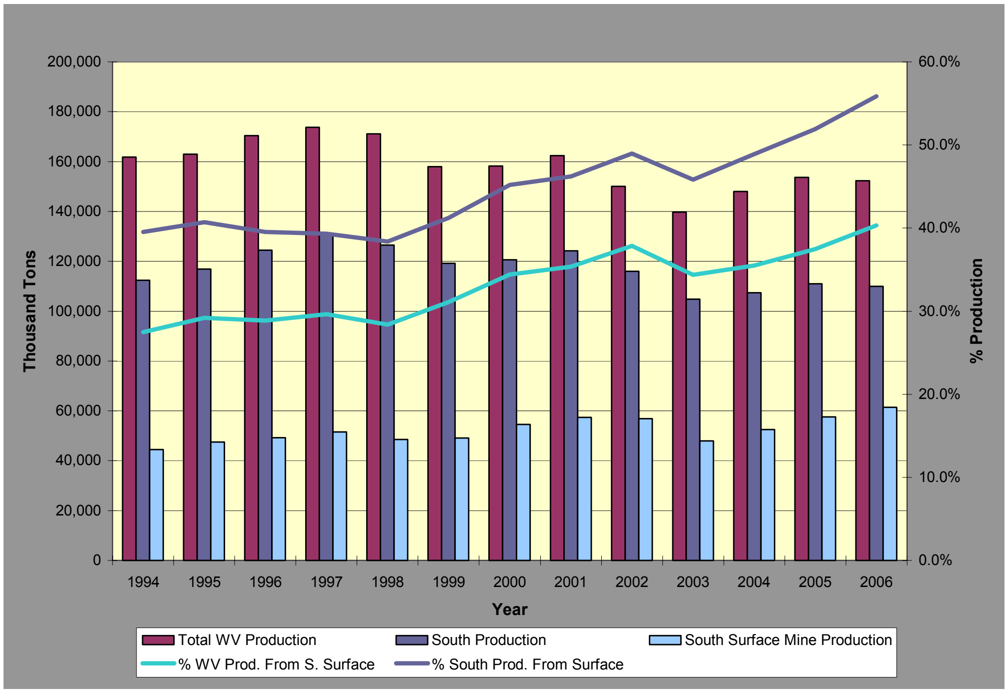
Table VII: Contribution of Mountaintop Removal to Total and Southern WV Coal Production (production is in 1000 tons**)**

Year	Total WV	Total South	Total Surface	MTR	% WV from Surface	% WV from MTR	% South from Surface	% South from MTR
2000	158,257	120,656	59,818	41,873	37.8%	26.5%	45.2%	34.7%
2001	162,415	124,245	62,865	44,006	38.7%	27.1%	46.2%	35.4%
2002	150,078	116,045	62,160	43,512	41.4%	29.0%	49.0%	37.5%
2003	139,712	104,762	52,919	37,043	37.9%	26.5%	45.8%	35.4%
2004	147,993	107,347	57,061	39,943	38.6%	27.0%	48.9%	37.2%
2005	153,650	111,022	62,641	43,849	40.8%	28.5%	51.9%	39.5%
2006	152,374	109,976	67,746	47,422	44.5%	31.1%	55.8%	43.1%
Totals	1,064,479	794,053	425,210	297,647	39.9%	28.0%	53.5%	37.5%

As the table shows, production from Mountaintop Removal has risen from an estimated 41.9 million tons in 2000 to 47.5 million tons in 2006, representing a 13.2% increase. Though the rise in MTR production is dependent upon the increase in surface mine production – since the MTR numbers represent a constant of 70% of annual surface mine production - surface production has only increased through the expansion of MTR. In 2006, MTR accounted for 31% of all coal produced in West Virginia, and for 43% of all coal produced in the South. Using the most recent data available, in this case, is more helpful than taking a six-year average since MTR production was affected by litigation in the middle years of this table. An important conclusion to be drawn from the fact that Mountaintop Removal production has been increasing is that this trend further supports the conclusion of an increase in the size and/or the number of MTR mines. Further analysis will help to strengthen this conclusion.

The number of operating surface mines in the South has fluctuated, but has leveled out at just above 1994 levels over the past two years when the number of southern surface mines stood at 90 and 96 in 2005 and 2006, respectively, compared to 88 in 1994. In comparison, the number of surface mines operating in the north dropped dramatically from 51 to 20, even though total production from northern surface mines increased over the study period. This reflects an improvement in mine productivity and, in all likelihood, the construction of larger surface mines in the north. See Charts 10 through 12 for graphical depictions of trends in southern surface mining.

Chart 10: Total Coal Production, Southern Production, and Southern Surface Production, 1994-2006



Focusing on individual mine production, the productivity of southern surface mines rose dramatically between 1994 and 2000, when the average surface mine was producing over 800,000 tons. Since then, however, the productivity of surface mines has stabilized, averaging around 650,000 tons-per-mine annually (**See Chart 12**).

Chart 11: Surface Mine Production and Number of Operating Mines, by Region, 1994-2006

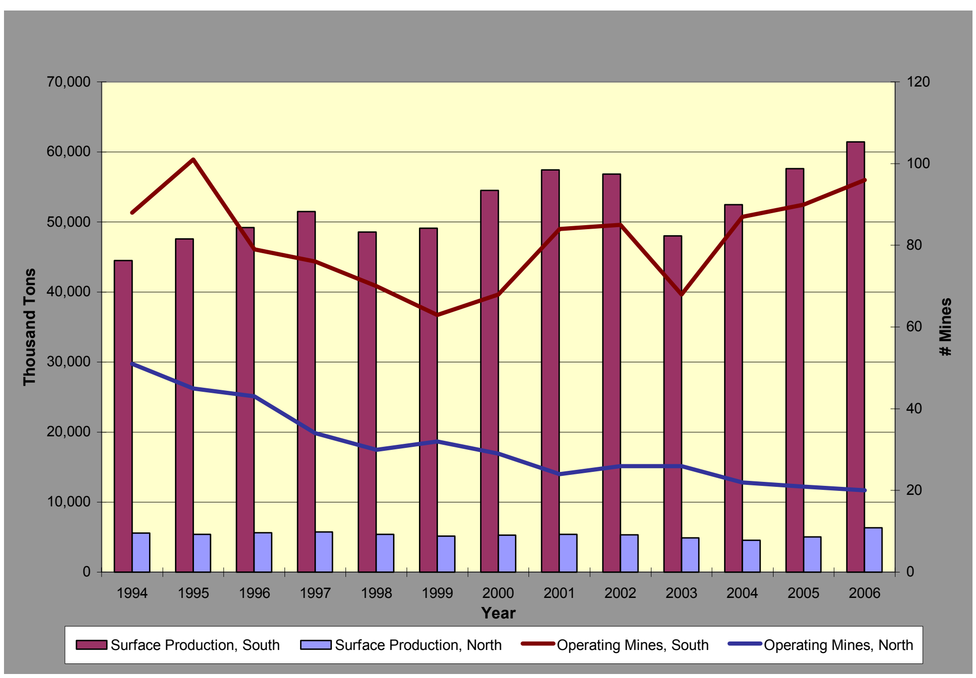


Chart 12: Surface Mine Productivity vs. Number of Operating Mines, by Region, 1994-2006

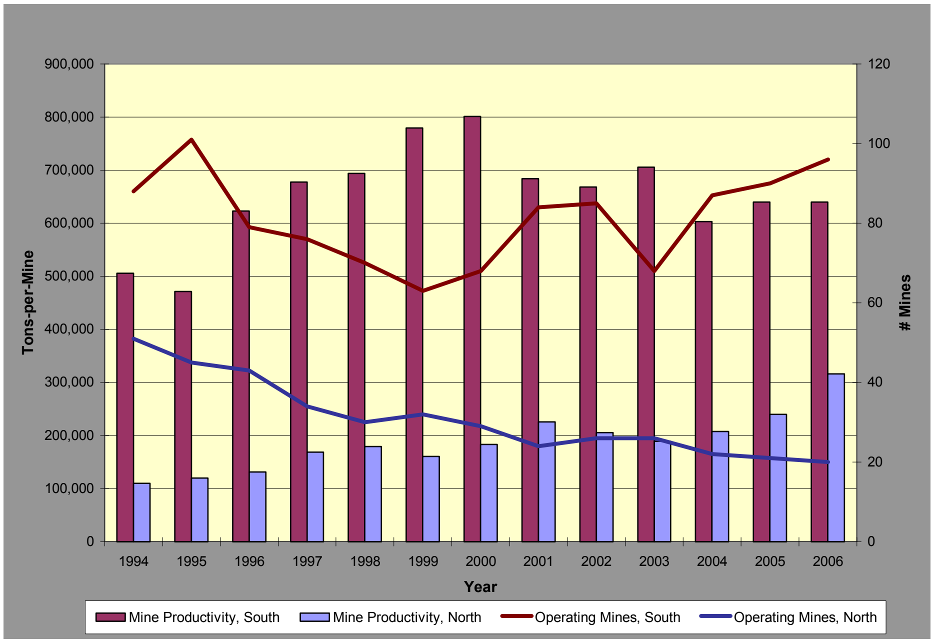


Chart 12 illustrates a couple of important trends that require consideration. The increasing use and scale of Mountaintop Removal and other expansive methods of surface mining between 1995 and 1998, and even as recently as 2003, resulted in a decrease in the number of operating mines coupled with a subsequent increase in per-mine productivity. Over the past few years, however, there has been an increase in the number of mines, yet only a slight increase in mine productivity. This signifies either that the economically recoverable coal reserves are beginning to dwindle, or that lawsuits have limited the size and, therefore, the productivity of surface mines. The notable conclusion to take from this is that Mountaintop Removal and other expansive methods of coal mining in southern West Virginia are facing restrictions of either a legal or geologic character. In the case that the legal reasoning holds true, even if the Office of Surface Mining is successful in altering the stream buffer zone rule to allow for the construction of valley fills in streams, it is not reasonable to expect that the rule change will last for very long, or that community and environmental groups will not find other means of challenging the legality of MTR mines. Therefore, this analysis serves to suggest that it would be wise for West Virginia to re-think the ways in which it permits the extraction of coal.

Final Production Comments

In percentage terms, since 1990, production from surface mining in West Virginia expanded by 47.6% from 45.9 million tons up to 67.7 million tons, while underground production shrank by 31.4%. In absolute terms, however, the 21.9 million ton increase in surface production since 1990 failed to make up for the 38.7 million ton decline in underground production, resulting in a net loss of approximately 16.8 million tons. Even worse, since West Virginia coal production peaked in 1997, surface production has risen by 10.5 million tons, while underground production has fallen by 32.5 million tons, for a net loss of 22 million tons in only ten years. This shows that neither the increase in total surface production, nor the increasing reliance on surface mining as a proportion of total WV production, has halted the decline in total West Virginia coal production.

Regionally, 95% of the surface production increase and 97% of the underground production decrease occurred in the South. This may signify that the lawsuits against surface mining impacted the size of surface mines, as well as production levels, to such an extent as to prevent a transition to surface mine production equal to the decline in underground production. It may also be the case that surface mines have not proven to be as productive as expected. In regard to the former, this study has sufficiently, and with a high level of confidence, concluded that litigation did indeed impact the size and production levels of operating surface mines. The following analysis of coal-related employment will, in part, help to address the issue of surface mine productivity.

Coal Mining Employment[59]

Overview – Total WV Mining Employment

It can be said that strip-mining in general, whether by design or not, has had the consequence of 'taking the miner out of the mines,' and the numbers prove this. The shift in West Virginia's coal extraction industry to surface mining, combined with an overall decline in coal production, the increased mechanization of coal mining (thus requiring fewer miners per mine than underground mines do), and the fact that fewer surface mines are needed in order to produce the same amount of coal as underground mines, has resulted in a 32% decline in direct coal-related employment. In 1990, there were 29,578 total miners directly employed at coal mines. In 2006, there were 20,076 mining employees. As surface mines grew increasingly larger, and fewer and fewer mines were required to produce greater amounts of coal, surface mining employment fell to a low of 3,900 employees in 1997 – the year when coal production in West Virginia peaked at 173.7 million tons for the study period. This represented a decline of 2,000 surface mine employees over a seven-year span, for an average loss of almost 300 employees-per-year just at surface mines due to the rise in mechanization (**Note of interest: the 300 lost jobs per year equals the number of miners laid off at the Arch Coal mine following the *Bragg* decision**).

While surface mine production as a share of total coal production rose from 27% to 45%, underground production and employment declined. Since 1990, total underground mine employment has fallen by 44%, from 23,584 to 13,190 miners. Only a resurgence in employment since 2001, resulting from an increase in average mine employment for both surface and underground mines, has softened the employment shocks related to the rise in surface mining. Looking at data for between 1990 and 2000 shows that total mining employment had fallen 49% by 2000, while total production had fallen by only 6.5%. Over these ten years, surface mine employment fell by 33% to go with a 30% increase in production, and underground employment fell 53.3%, coinciding with only a 20% drop in production. Since 2000, however, employment at surface mines has increased by 45%, rising from 4,739 to 6,886 total employees, as production rose by almost 15%. Underground mine employment has experienced a 19% increase, even as production dropped by 13%. In total, this resurgence has led to a 33% rise in total mining employment, and a subsequent 4% decline in total coal production. The fact remains, however, that since 1990, the expansion of surface mining and MTR has had the overall effect of reducing mining employment by 32%. See Charts 13 and 14 for illustrations of these employment trends. These charts depict the fact that coal mining-related employment in West Virginia depends heavily on the operation of underground mines.

[59] Employment data was also taken from the EIA's *Annual Coal Report*.

Chart 13: Coal Production and Employment in West Virginia, by Mine Type, 1990-2006

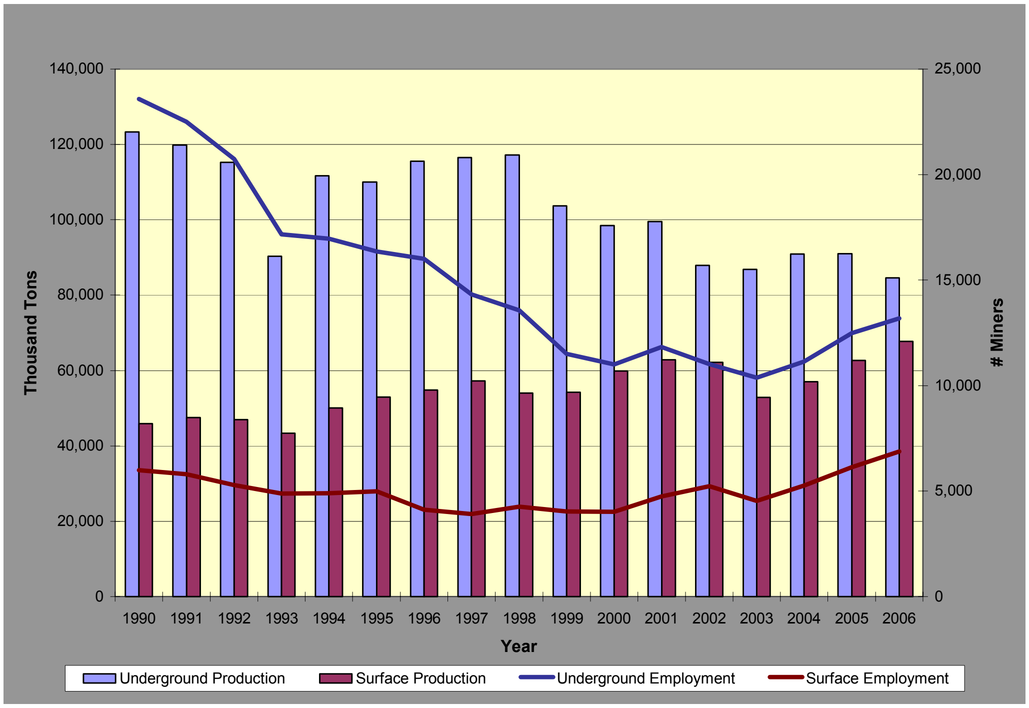
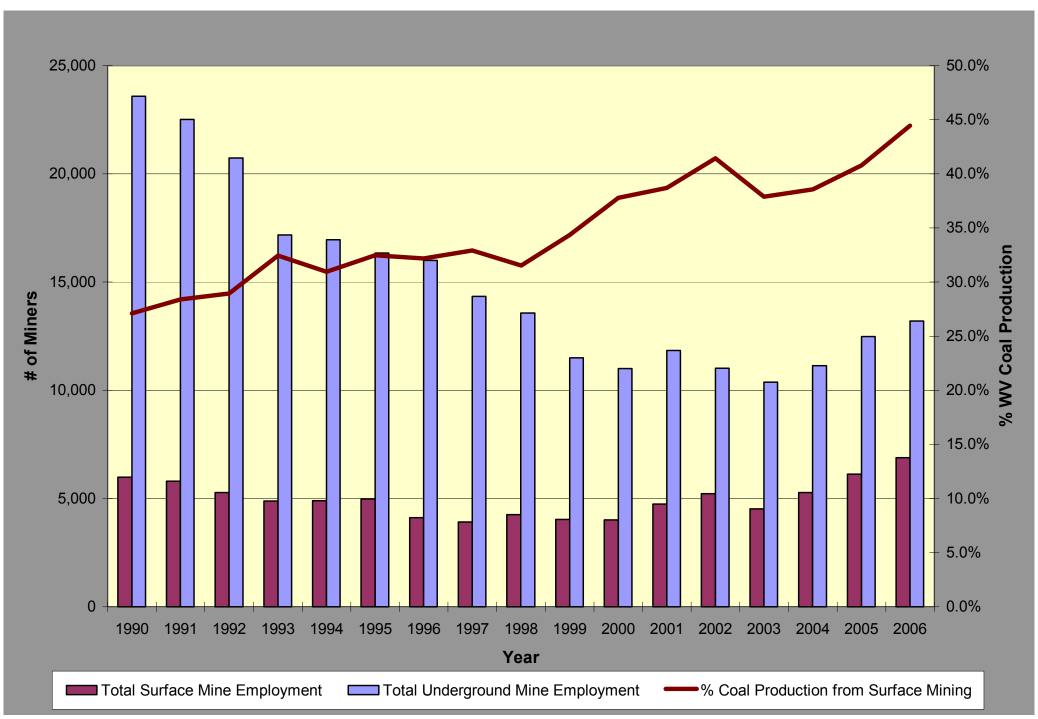


Chart 14: West Virginia Coal-Mining Employment, by Mine Type, and Surface Share of Production, 1990-2006



As a final note, the decline in mining employment has had the additional effect of reducing the contribution of coal mining to West Virginia's total work force.[60] Even as the coal industry has expanded its use of surface mining and reduced its need for mining labor, officials continue to claim that West Virginians need surface mining in order to provide jobs. However, the proportion of total West Virginia employment from coal mining has fallen from 4.3% down to 2.8% since 1990, while surface mining has contributed to only 0.8-1.0% of total employment over the same period.

While basic statistics are a useful aide in illustrating the overall employment effects of the rise in surface mining, they fail to provide evidence for the causal explanations mentioned in this study. A look at data regarding the number of operating mines, average mine employment, mine productivity and job productivity will be useful in this regard. As this study focuses on the impacts of surface mining, and since 90% of all surface mining production in West Virginia occurs in the South, the rest of this section will focus only on southern data. To an extent, a southern focus may be perceived as reflecting overall employment trends in West Virginia relating to coal mining, since 77% of all coal mining employment and 72% of all coal production occurs in the south. The same is true in terms of underground employment, for 70% of all underground employment occurs at southern mines, though southern mines only account for 57% of all underground production. This is the result not of just a decrease in southern underground production, but of a more rapid decrease in southern production relative to northern production. As recently as 2002, southern underground mines were accounting for 67% of total underground production in West Virginia.

Coal Mining Employment in Southern West Virginia

Leading overall mining employment trends for West Virginia, coal mining employment in the South fell from 19,525 to 10,991 between 1990 and 2003 - when both production and employment experienced lows for the study period. This accounted for a total employment loss of 8,534, or 43.7%. Underground employment losses accounted for 92% of this decline, falling by 7,866 miners from 14,800 in 1990 to a low of 6,934 in 2003. Southern surface mine employment over the same period fell by only 668, for a loss of 14%. Also, as would be expected, 2003 stands as a low point for the number of mines in operation, as the number of surface mines fell from 88 in 1994 to 68 by 2003, while the number of underground mines fell from 258 to 123. After 2003, however, the number of mines and employees rebounded. Surface mining grew again to 96 mines and 6,247 employees by 2006, while underground mining expanded to 145 mines employing 9,208 miners. These increases softened the overall decline in southern mining employment. Surface mine employment in 2006 exceeded that of any other year since 1990, and had grown by 2,004 since 1994 to number 6,247 total miners, representing an increase of 47.2% over 1994 levels and 32.2% over 2003 levels. Over the same period, southern surface mine production rose by only 28%, reflecting the reduced average productivity of surface mines. See Chart 15 for a depiction of these trends. Chart 16 illustrates how the rise in surface mining has affected total and underground employment.

The number of underground mines rebounded as well, but not because of an increase in production, which actually fell another 8.2 million tons after 2003. However, the number of mines grew by 22 over 2003 levels (also resulting in a decrease in mine productivity), while employment increased by

[60] This calculation was performed by dividing mining employment data from the EIA by annual estimates of West Virginia's workforce provided by WORKFORCE West Virginia, a division of the WV Department of Commerce. Data for 1990-1994 can be found online at www.wvbep.org/bep/lmi/DATAREL/Drd&w.htm. Data for 1995-2006 is available at www.wvbep.org/scripts/bep/lmi/cntyform2.cfm.

almost 2,300. In light of the sharp decline in production over this period, a conclusion for this trend has been hard to come by. However, one explanation may be that underground production data for recent years fails to reflect the true productive capacity of some proportion of the additional mines, or that the operations are attempting to extract thinner or deeper seams of coal, thus requiring additional miners in order to bring the coal to the surface. In any case, further analysis of and relating to mine and employment productivity offers a better understanding of these trends.

Chart 15: Coal Mining Employment and Production in Southern West Virginia, by Mine Type, 1994-2006

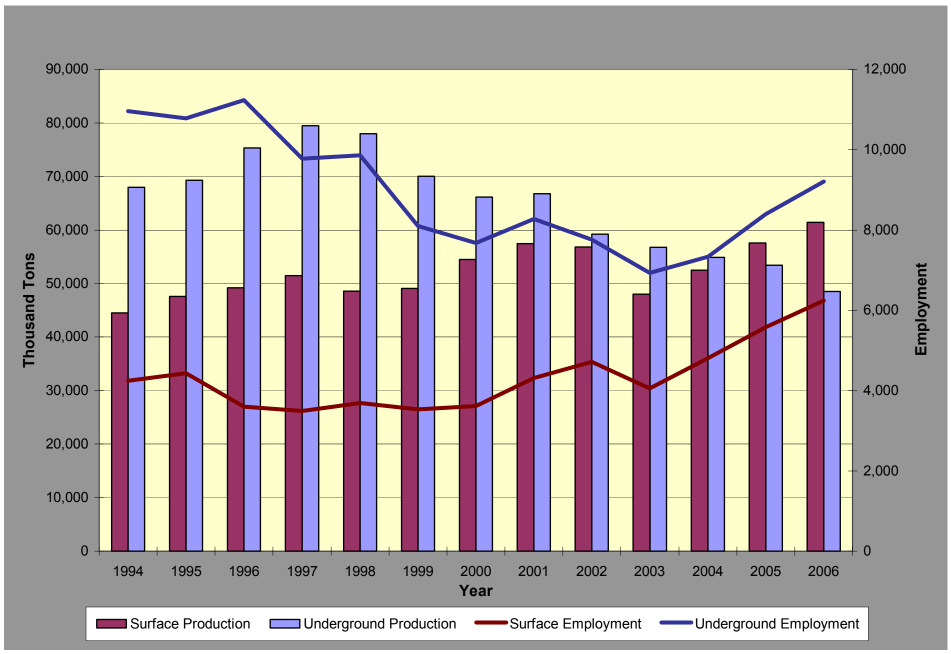
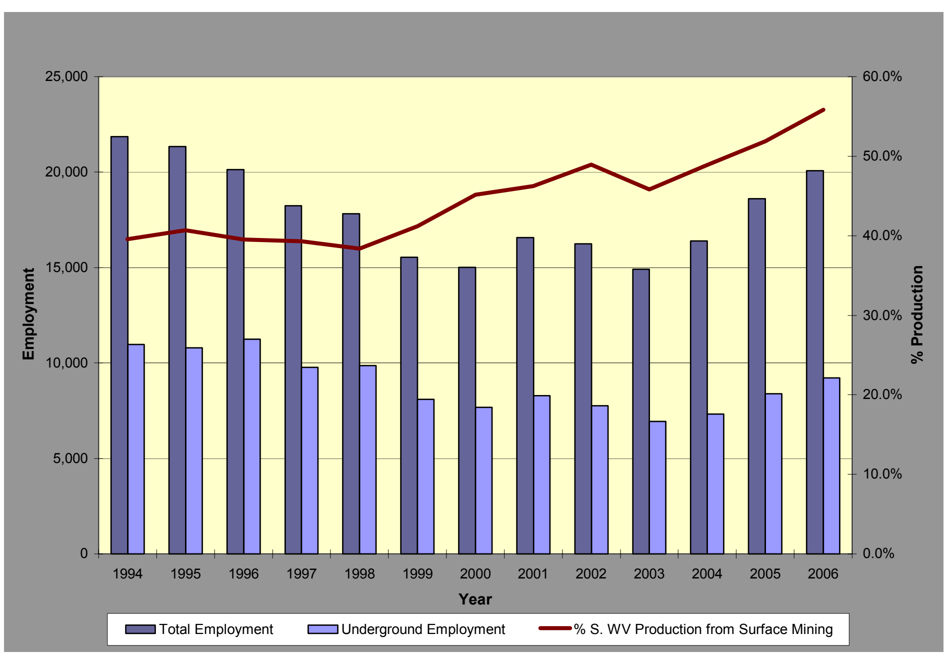


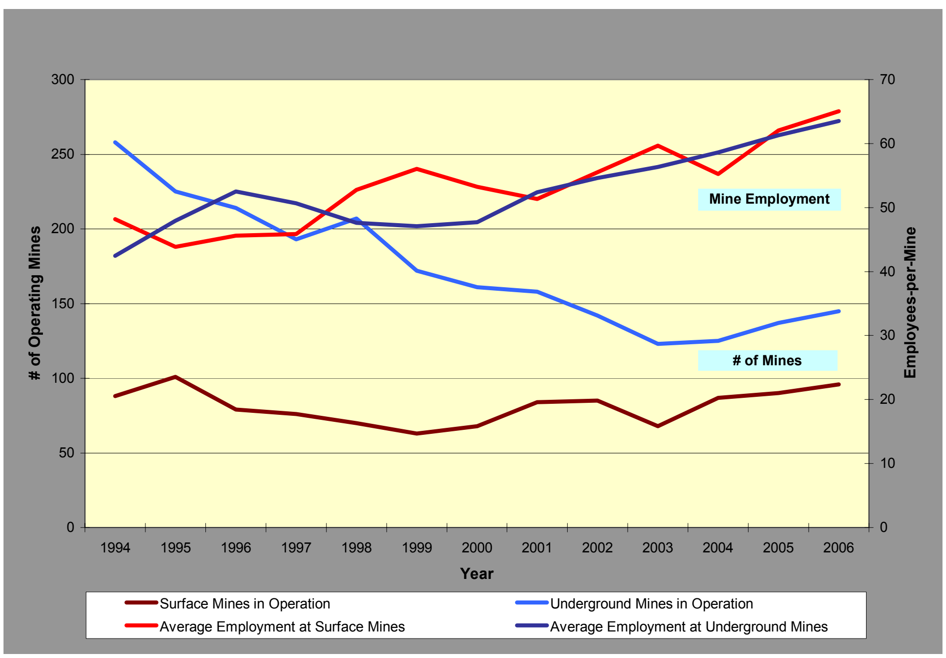
Chart 16: The Impact of Surface Mining on Total and Underground Mine Employment in S. WV, 1994-2006



As was the case with the production analysis, measures of productivity serve as useful tools for drawing conclusions about what is really happening with coal production and employment in southern West Virginia. One of these measures is the average number of employees per mine. By comparing average mine employment to the number of mines in operation, preliminary conclusions can be drawn about the size of the mine and/or the intensity of extraction. By then comparing the average mine employment to average mine productivity, these conclusions may be strengthened. By the same methods, conclusions can also be made regarding the land-impacts of coal production in southern West Virginia.

Since 1994, neither surface nor underground mines in southern West Virginia have carried a significant advantage in terms of average mine employment. Indeed, in one year it may be the case that underground mines employ more miners on average than surface mines do, while in the following year the opposite occurs. In any case, average employment for surface and underground mines is approximately the same in any given year. The important trend to consider is that the average mine employment for both mine types has been increasing rapidly, as of late. In 1994, average employment at surface mines was 48, and at underground mines, 44, and as recently as 2001 these numbers had increased only slightly to 51 and 52, respectively. Since then, however, there has been a sharp rise in the average number of mine employees to 65 per surface mine and 64 per underground mine, an increase of 14 and 12 in only five years. The same period is marked by a significant increase in the number of surface mines, but only a small increase in the number of underground mines (see Chart 17).

Chart 17: Avg. Mine Employment and Number of Mines in Southern West Virginia, by Mine Type, 1994-2006

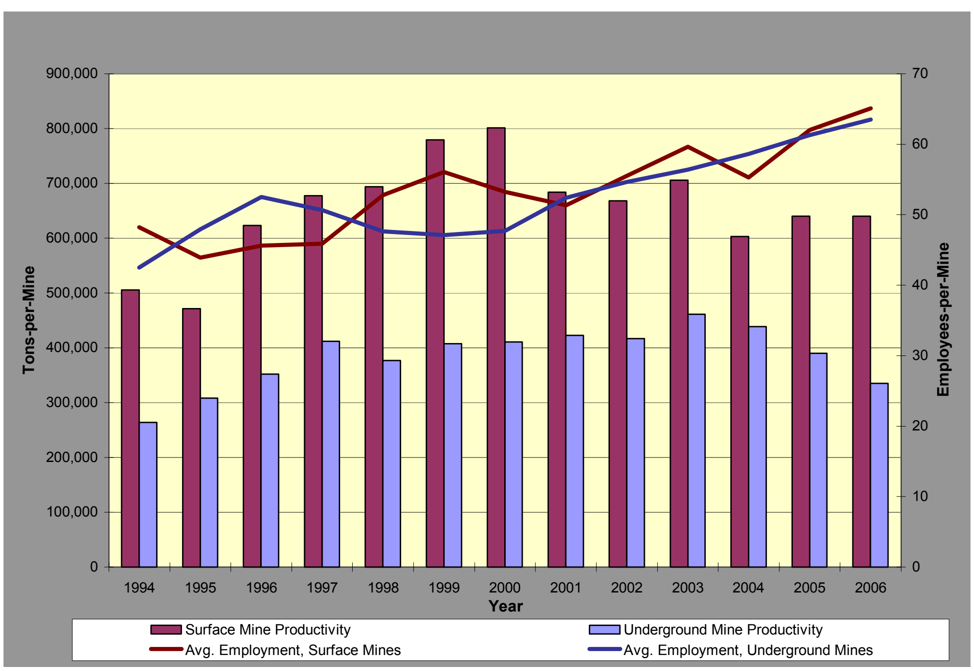


The trends related to surface mining in Chart 17 show a decline in the number of mines and a subsequent increase in average mine employment until 1999. This suggests what is already expected, which is that surface mines were getting bigger (in the form of Mountaintop Removal mines), and so they required more workers in order to remove the greater amounts of rock "overburden." Between 2000 and 2002, there was a jump in the number of surface mines coinciding with a decrease in average mine employment. This is likely the result of limitations placed on valley fill permits due to the *Bragg* decision, which the above chart suggests led to the operation of a greater number of surface mines that were smaller in size, and so allowed for the continued increase in surface production. As earlier trends in surface mine production have shown, this chart illustrates how 2003 was marked by "business-as-usual" large-scale surface mining, as the number of operating mines fell sharply, and the average mine employment rebounded. More recent trends are less puzzling. Between 2004 and 2006, both the number of mines and average employment increased, meaning both more mines and larger mines. The production data supports this conclusion, as surface production rose by 4 to 5 million tons annually from 2003 to 2006.

As for underground mines, Chart 17 shows that the period between 1994 and 2003 was marked by a steady decline in the number of mines and a steady increase in the average number of employees per mine. This suggests that as surface mining expanded in production and scope, surface mines were assimilating more of the less productive, thinner seam underground mine operations, and perhaps left the more economically recoverable (read, "profitable") seams to underground mining. Production data further supports this conclusion. The rapid decline in southern underground production coupled with an increase in the average mine productivity (tons-per-mine) of underground mines suggests that the less productive mines that had been extracting thin and medium seams of coal were being abandoned and then assimilated into surface mines (**see Chart 18**).

Since 2003, there seems to have been a partial reversal of these trends, whereas surface mines began assimilating thicker seams that had previously been mined underground, leaving the thinner seams to underground operations. This is suggested by the fact that the number of underground mines has risen along with a more rapid increase in average mine employment, while average mine productivity and total production have declined. The increase in average underground mine employment may be explained by the fact that thinner coal seams require a greater extraction effort. That noted, Chart 18 offers more insight into the significance of surface mining trends.

Chart 18: Average Mine Employment and Mine Productivity for Southern West Virginia Mines, 1994-2006



To this point, this study has determined that surface and MTR mines are expanding in size, thus requiring more workers per mine and that, as of late, more of these large mines have been in operation than were operating in previous years. And the MTR mines are even bigger than in recent years. **However, size no longer seems to correlate to higher mine productivity.** Comparing data for 2001 and 2005 offers a telling illustration of this. In 2001, 84 surface mines produced a total of 57.5 million tons of coal, averaging 684,000 tons of production and 53 workers per mine. In 2005, 90 surface mines produced a total of 57.6 million tons of coal, and averaged 640,000 tons and 62 workers per mine. What this comparison shows is that six more surface mines were required in 2005 to produce the same amount of coal as in 2001. Further, the mines operating in 2005 were bigger than those operating in 2001, as suggested by the increase in average mine employment between these two years. Finally, the mines in 2005 were 44,000 tons less productive on average than the 2001 mines. **Thus, surface mines in 2005, while more expansive than those operating in 2001, were producing less coal per mine.** It is likely that many of the operating mines between the two years represent the same mine, which, since average employment increases suggest an increase in mine size, only further supports the conclusion that expansion does not necessarily result in greater production. At least it has not in recent years.

Overall, the dramatic shift in West Virginia coal mining from underground mines to surface mines, and from North to South, has rendered West Virginia coal production increasingly dependent on large surface and Mountaintop Removal mines operating in the southern counties. This dependency may prove harmful to West Virginia's coal industry, both as a whole and in the southern region. Between 1994 and 2006, the proportion of total West Virginia coal produced by southern surface mines rose steadily from 27.5% to 40.3%, with total southern contributions increasing from 66.5% to as high as 77% of all West Virginia coal production, before leveling out over recent years at just over 72%. However, due to a combination of lawsuits against surface mines and an apparent decline in economically recoverable coal by surface mining methods, annual West Virginia coal production fell by 9.4 million tons. Since peak production levels in 1997, annual production has dropped by a staggering 21.4 million tons.

Not unexpectedly, southern coal production has seen the same declines. As the share of southern coal production coming from surface mines has risen from 39.6% to 55.8% over the study period, southern coal production experienced a net loss of 2.5 million tons of annual production. However, since peak production levels in 1997, this loss has amounted to 21 million tons. Recent data trends illustrate a resurgence since 2001 in the number of both surface and underground mines, yet this resurgence has failed to result in any substantial increase in production and suggests that after more than a decade of 'efficiency' benefits from the expansion of surface mining, the coal industry is having to work harder in order to increase, or even to maintain, production levels. Employment data support this conclusion.

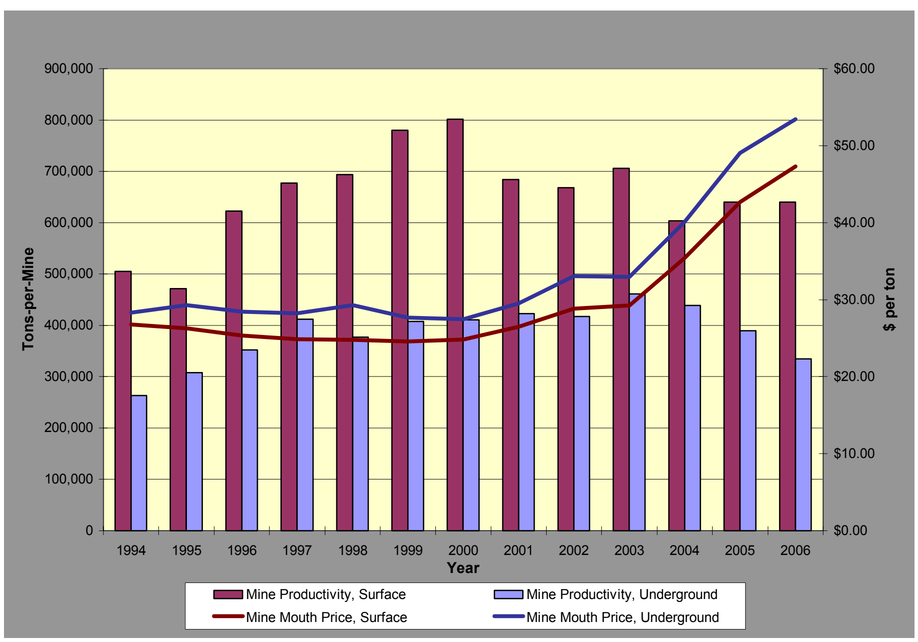
Until the past few years, it was the case that the expansion of surface mining as a proportion of total West Virginia coal production, due to its highly mechanized character, led to the rapid decline in coal-mining employment. However, the past few years have been characterized by the increasing size of surface mines, thus requiring more employees per ton of coal extracted. This trend shows that even mechanization has its limits, and, though it may be portrayed in such a manner, will not lead to a dramatic resurgence in coal mining employment opportunities without an exponential increase in land impacts, for every additional worker at a surface mine signifies an additional portion of a mountain destroyed.

If recent trends continue, and surface mining expands to account for ever greater proportions of production, it can be expected that such an expansion will be met not only by an increase in the number of mines, but also, and to a greater degree, by an increase in the size of individual mines as is reflected in the permit data for recent years. On the other hand, this report's analysis of EIA data suggests that this model of coal production may be met by limits on economically recoverable reserves in the near future.

Price as an Additional Indicator

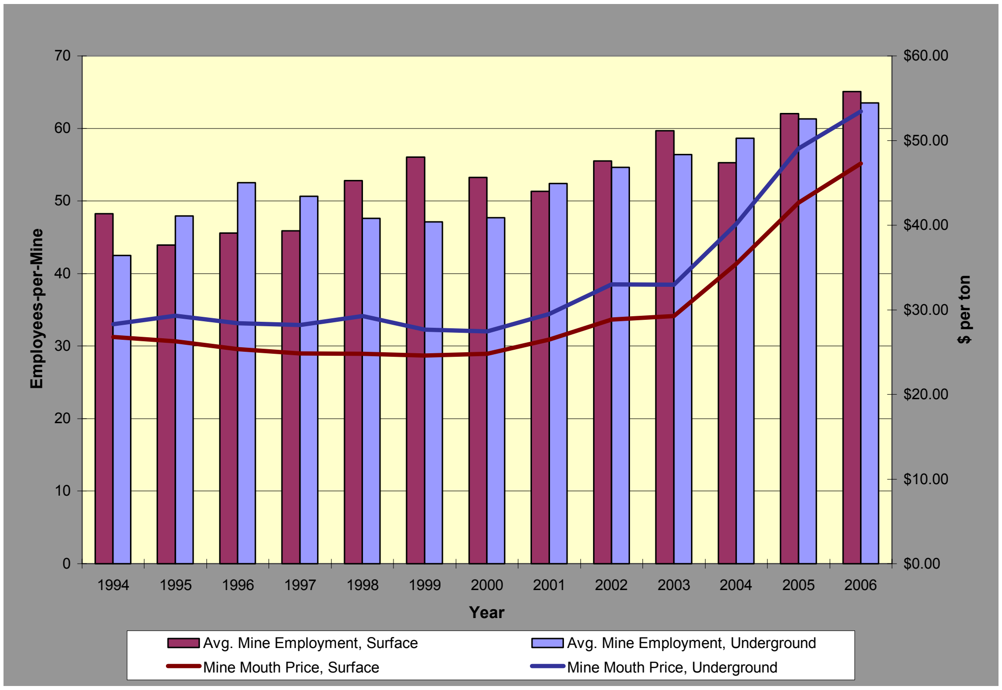
Data for production and employment indicates that surface mining may be near its peak productivity, if it has not reached it already. Sharp increases in price due to rising operation costs and supply and demand pressures reflect this. As average mine productivity has fallen, and average mine employment has increased, the price per ton of surface mined coal has risen, nearly doubling in just the past six years (see Charts 19 and 20). Rising prices for surface mined coal may also reflect effects of litigation. **In contrast, this study suggests that the recent rise in price for underground coal reflects not a decrease in economically recoverable reserves, but rather a trend whereas surface mines, in an attempt to remain productive and profitable, are assimilating more and more of the thicker coal seams that could be economically recoverable by underground mining methods.** As this occurs, underground mines are forced toward the mining of thinner seams, thus increasing the price of underground coal. In either case, supply pressures are the primary driver of the recent price spike. Demand-side pressures such as electricity generation and exports have not played a part, as exports of southern West Virginia coal have decreased from the peak export years of 1997 and 2000, and the amount of West Virginia coal used for in-state electricity generation in 2006 approximated the amount used in 1997.

Chart 19: Mine Mouth Price and Mine Productivity for S. West Virginia mines, by Mine Type, 1994-2006[61]



[61] Mine Mouth prices reflect the raw cost of coal, as they are based on the costs of producing the coal, and do not reflect post-mining cost influences such as transportation. For this reason, mine mouth prices were viewed as the best available cost-based indicator of production trends.

Chart 20: Mine Mouth Price and Avg. Mine Employment for S. West Virginia Mines, by Mine Type, 1994-2006



Further analysis and supporting information will show that there remains plenty of coal that is mineable by underground methods. Whatever the cause for the price increase, social, environmental, political and economic factors are all rendering surface mining and Mountaintop Removal less economically viable. For this reason, as well as for the sake of preserving the mountains and the communities that depend on them, it is necessary to begin the process of shifting coal production in West Virginia away from large surface and Mountaintop Removal mines, and back into underground mines. Only by doing so will West Virginia be able to break its economic dependence on coal production, as such a shift will allow for the preservation of the remaining mountains. This could then lead to the diversification of West Virginia's energy portfolio, and even more importantly, to the diversification and localization of rural economies in southern West Virginia. To this end, this study will show that such a shift serves as an economically viable and beneficial option for West Virginia.

Review of Key Findings and a Viability Analysis for Shifting Production

For the purpose of analyzing the potential need for and viability of a reverse shift in production methods away from Mountaintop Removal and back to underground mining, it is necessary to review and highlight the main conclusions that have been drawn from the production data. A comparative analysis of both absolute production data and mine productivity across mine types and regions is required before any conclusions about viability can be made. As employment is a direct result of production shifts, employment is not considered a determining factor for viability.

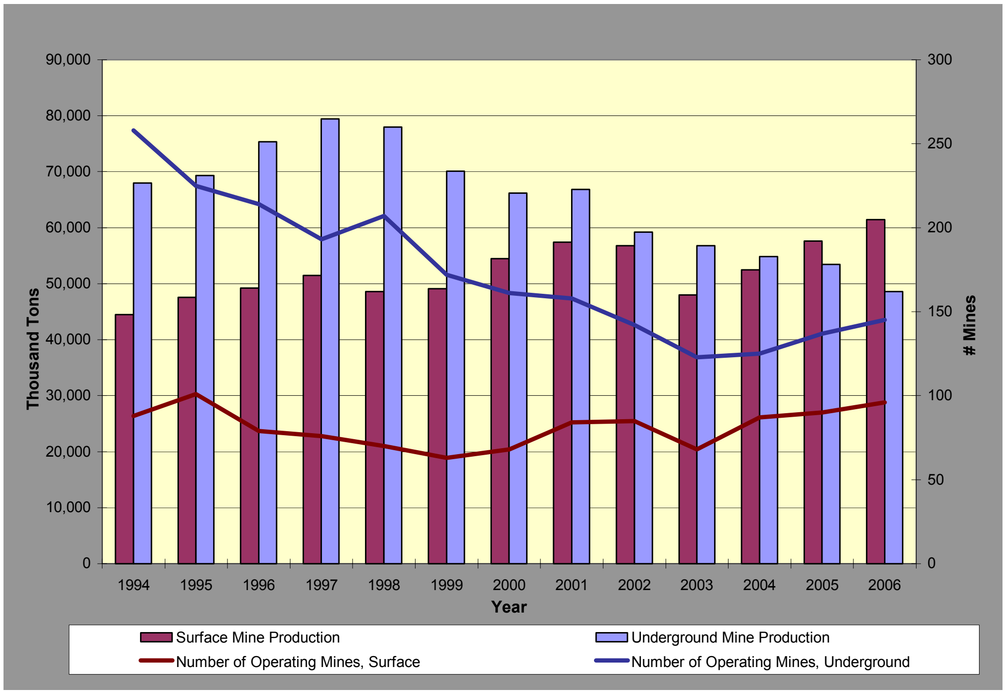
To address the issue of viability, it is best to begin with absolute production data. One of the key findings of the production analysis was that the decline in total coal production in West Virginia was largely the result of a decline in production at northern mines, and that this decline was the result of less demand for higher-sulfur northern coal and more demand for low-sulfur southern coal. Northern production fell rapidly by 10.5 million tons in the five years after the Clean Air Act was passed in 1990, and reached its lowest level of 34 million tons in 2002. It has since rebounded, exceeding 42 million tons of production in both 2005 and 2006. The rebound was the result of an unknown factor allowing for the greater production and consumption of higher-sulfur coal. Two possible explanations for the rebound may be an increase in the foreign exports of high-sulfur coal, and/or the installation of emissions-capture instruments at more coal-fired powered plants.

South: Surface-to-Underground Shift

Coal production in the South has fluctuated, reaching peak production over the study period at 131 million tons in 1997, then hitting a low of 105 million tons due to litigation effects in 2003. Southern production has since leveled out at 110 million tons. Overall, southern production in 2006 was only slightly below 1990 and even 1994 levels of 112.5 million tons (see Chart 6). Another key finding was that southern coal production experienced an almost direct shift in production from underground to surface mining. Data for 1994 shows that southern underground mines produced nearly 68 million tons, while surface mines produced just under 44.5 million tons. By 2006, these numbers had almost switched, with surface mine production at 61.4 million tons, and underground production down to 48.6 million tons. The net loss in southern coal production of nearly 2.6 million tons over the study period represents the amount by which losses in underground production exceeded the gains in surface production.

The greater loss in underground production may indicate that a reverse shift to underground mining in the South may not be feasible. However, given the effect that lawsuits had on surface mine production, it can be expected that these values would more closely approximate each other had those lawsuits not taken place. Further, when the *Bragg* case was first introduced in the courts in 1998, and production from southern surface mines experienced a slight two-year decline as six surface mines were shut down, underground production rose to its second highest level over the study period at 78 million tons, up from the 68 million tons produced in 1994. This increase in production was made possible by the opening of fourteen new underground mines between 1997 and 1998, and serves to offer the preliminary conclusion that a shift back to underground mining in southern West Virginia may be a viable option. This is because if such a reverse shift in production occurred as recently as 1997, a similar shift back to underground mining may be possible today. Chart 21 illustrates the supporting data.

Chart 21: Coal Production and Number of Operating Mines in southern West Virginia, by Mine Type, 1994-2006

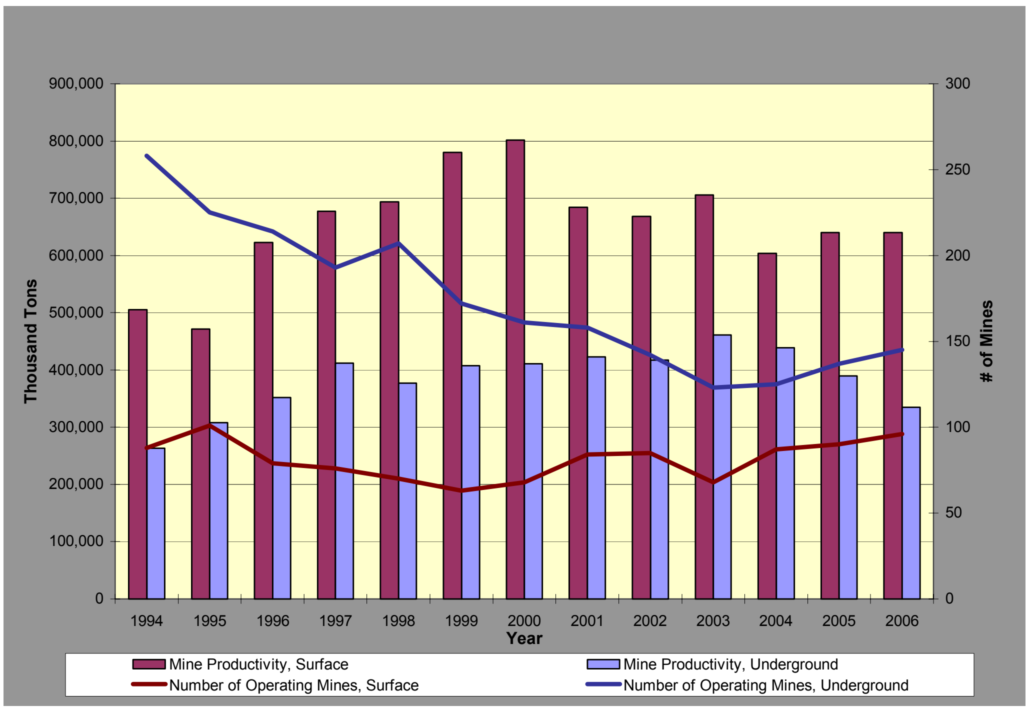


Another measure of viability that must be considered is mine productivity. It is not surprising that surface mines in southern West Virginia out-produce underground mines. In 1994, total coal-producing surface mines numbered 88. As surface production increased to peak production levels in 1997 and 1998, the number of producing mines fell to 76 and 70, respectively. This trend reflects the rapid spatial and numerical expansion of Mountaintop Removal and other large surface mining operations. Even though total surface production had fallen to 120 million tons, peak mine productivity for surface mines was reached in 2000 at an average of 800,000 tons of production per mine, when the number of operating mines stood at 68. There was a big jump in the number of surface mines from 2000 to 2001 – from 68 to 84 – and, since then, the number of surface mines has risen to 96.

The increase in the number of mines, for the most part, did not result in the production of more coal; as the number of surface mines increased from 84 to 90 between 2001 and 2005, production only increased by 200,000 tons. The only production increase due to a greater number of surface mines occurred in 2006, when the operation of six more mines resulted in 3.8 million additional tons of production. Also, average mine productivity fell to 640,000 tons-per-mine by 2006. This data signifies that, even though the average size of large surface and Mountaintop Removal mines has been increasing, this increase in size only resulted in greater per-mine production until 2000. The decline in mine productivity since then, coupled with an increase in the number of mines and only a slight increase in total surface mine production, offers the conclusion that the ratio of production to land impact (tons-per-acre) is getting smaller.

Since 1994, surface mines have produced an average of 643,000 tons-per-mine, after peaking at 800,000 tons-per-mine in 2000. In comparison, southern underground mines over the same period averaged 374,000 tons-per-mine, peaking at 462,000 tons-per-mine in 2003, though productivity since then has dropped to its lowest level since 1996 at 335,000 tons-per-mine (see Chart 22). Conclusions thus far have determined that this is more likely due to the assimilation into increasingly larger surface mines of more of the thicker seams that could have been mined using underground methods. In order to estimate the true probable production potential of underground mines in southern West Virginia, production and mine data was excluded for the first and last year of the study period, and then, from the remaining data, for the years of maximum and minimum productivity. For the remaining years, the average productivity of southern underground mines was 399,800 tons per mine, and this serves as a useful measure of the potential productivity of underground mines.

Chart 22: Mine Productivity and Number of Operating Mines in S. West Virginia, by Mine Type, 1994-2006



The main point regarding mine productivity is that in southern West Virginia, surface mines out-produce underground mines. It is also important to remember, though, that large surface and MTR mines assimilate two or more underground mines into one large surface mine. This being the case, it is not unreasonable to estimate that for some proportion of surface mining operations – perhaps 70%, based on the amount of surface production coming from MTR – underground mining could perhaps produce more coal, per mountain, than surface mining. This is a key factor in analyzing the viability of shifting southern coal production away from MTR mines and back to southern underground mines. The concern, then, is whether or not there are enough underground seams remaining that are economically producible.

Inadvertently supporting a key conclusion made in this study - that the combination of the recent decrease in underground mine productivity and a decreasing ratio of production-per-acre for surface mines is most likely NOT the result of a decline in economically recoverable reserves mineable by underground methods - Massey Energy, the second leading coal producer in West Virginia, recently responded to Wall Street concerns about the implications of the 2007 *Appalachian Center for the Economy and the Environment* decision on coal production, stating that the decision would not immediately affect production, **but that Massey's 'vast Appalachian reserves of more than 2 billion tons allows it to boost underground production if necessary.'**[62] It appears, then, that even Massey believes a surface-to-underground mine shift should be feasible and, as noted, according to the data trends such a shift occurred in 1998. Therefore, a shift in mining method seems to be viable, and what remains to be seen now is whether the same holds true for a reverse regional shift from South to North.

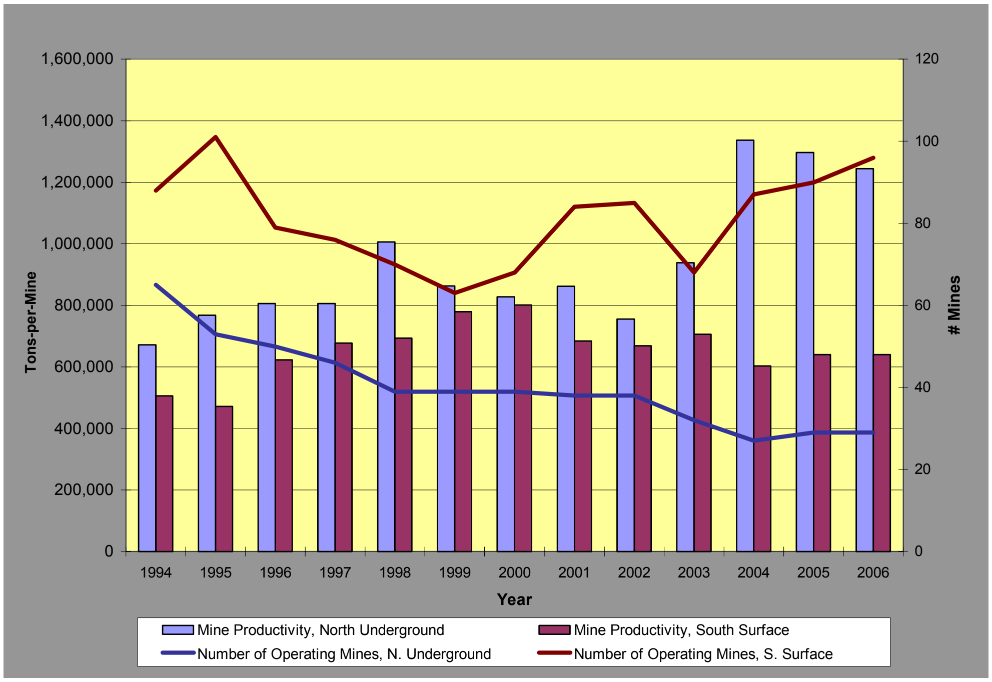
Regional: South-to-North Shift

Given the possibility that legislation may be passed in the near future requiring the installation of sulfur and nitrogen-oxide capture technology on emission stacks at electric power plants, it is also useful to compare the mine productivity of southern surface mines to that of northern underground mines in order to analyze the viability of a reverse regional shift in production back toward northern West Virginia.

On average, northern underground mines have been two to three times as productive as southern surface mines and, for every year since 1994, have remained more productive than southern surface mines. Since 1994, northern underground mines have produced an average of just under 900,000 tons-per-mine, whereas southern surface mines have averaged just over 640,000 tons of production per-mine. Thus, over the study period, northern underground mines have out-produced southern surface mines by a ratio of almost 3:2. Since 2004, that ratio has increased to 2:1 as northern underground mines averaged 1.29 million tons, while southern surface mines averaged only 630,000 tons (see Chart 23). **Perhaps the most hopeful statistic for the purposes of this report is that mine productivity at northern underground mines was not simply the result of the operation of fewer mines, but fewer mines producing more coal than in previous years - meaning that there is plenty of coal remaining in northern West Virginia that is economically recoverable by underground mining methods.** Finally, and for the mere objective of providing a complete analysis, it must be noted that northern surface mines, while twice as productive in 2006 as they were in 1994, still remain the least attractive option for a production shift, averaging only 227,000 tons-per-mine since breaking 200,000 tons in 2001.

62 Jafari, Samira. "Mountaintop Removal Permit Challenged." Associated Press, December 6, 2007. Online: http://www.forbes.com/feeds/ap/2007/12/06/ap4414363.html.

Chart 23: Comparison of Mine Productivity at S. Surface and N. Underground Mines, 1994-2006



Finally, in addressing the *need* for a shift in production methods, it can be said that aside from the severe environmental and social impacts of Mountaintop Removal Mining outlined at the onset of this report, the data have shown that there are also economic reasons - related to production, employment and the comparative prices of coal - for shifting away from MTR and back to underground mining. Chart 8 (page 32) shows that the decline in northern underground coal production resulted in only a short-lived increase in production at southern underground mines. This trend ceased after total West Virginia coal production peaked in 1997. As of 2006, northern underground production had fallen by a total of 7 million tons since 1994, while southern underground production fell by 19.4 million tons. One possible explanation for this is that as the average size of southern surface mines grew, the mines began to assimilate more underground mining operations into the surface mines. In any case, the fact remains that surface mining is not producing at levels equal to the underground mines they replaced, and overall coal production has declined.

While the transition to southern surface mining and the expansion of Mountaintop Removal occurred as a means for meeting increased demand for low-sulfur coal (by allowing for the more rapid and cost-efficient extraction of that coal), this transition has, both directly and indirectly, only resulted in a net decline in coal production. In the long run, however, the true cost of this shift will not be the loss in coal-related revenues, it will be in the loss of the mountains and of the resources they could provide in support of future alternatives for the southern West Virginia "coalfields" based on economic diversification. The following section will outline the policy proposal based on a production shift, and will further utilize data analysis to estimate what the structure of West Virginia's coal industry will look like after such a shift is made. With this information, final conclusions about viability will be possible.

III. Proposal and Analysis for Shifting Coal Production Away from Mountaintop Removal and Back to Underground Mines

Overview

Unless the Clean Air Interstate Rule (CAIR)[63] results in the implementation of requirements for all coal-fired power plants to install the best available technologies for capturing sulfur- and nitrogen-based emissions, increased demand for low-sulfur coal will result in the continued expansion of Mountaintop Removal and other large surface mines. As the production analysis illustrated, such an expansion will occur at an exponential rate as the production-per-acre ratio falls and coal companies increase the size of their operations in order to maintain production levels. Contrary to the assertions often made by industry officials, Mountaintop Removal operations do not result in minimal impacts on the environment or on the communities situated in the valleys below the mines, nor do they leave the land in a better condition than it was in before mining occurred. Also, other than the construction of a small airport, a federal building, a federal prison, a crumbling high school and a golf course mainly used by Friends of Coal, more than two decades of surface mining and Mountaintop Removal have produced little evidence of the new development and economic opportunities that were supposed to result from the creation of flat land. In fact, this business of flat land creation has resulted only in a decline in mining employment, the exacerbation of land inequalities, and in increasingly greater threats to health and livelihood for many of southern West Virginia's inhabitants. Overall, the supposed benefits of Mountaintop Removal coal mining have failed to materialize, while leading only to the loss and degradation of the very resources that will be needed for supporting any alternative models of economic development. One such model for many communities could be based on the development of available wind potential.

Much of West Virginia's wind potential lies in the southern region where the mountain peaks are the highest. Unfortunately, many of the peaks that earlier state-level wind maps have shown to exhibit commercially viable wind have been reduced by hundreds of feet due to MTR, permanently eliminating their potential for the large-scale production of wind energy. Others, such as Coal River Mountain in Raleigh County, are being threatened with the same fate. Large-scale wind power development is not viable for most southern West Virginia locales, as most of the harvestable wind lies in the eastern portion of the region, but this does not preclude the development of small-scale wind projects in the western region. The development of wind power in rural areas across the United States has also been shown to provide greater economic benefit for rural areas than are known to result from fossil-fuel industries. The coal industry's failure to bring development to southern West Virginia, as described earlier in this report, suggests that wind power may also result in greater economic benefit for the communities there.

The most important benefit associated with wind power development, and indeed its greatest advantage over surface mining, is that it allows for at least the possibility of a multiple land use strategy for economic development, whereas surface mines serve as a single-use mode of 'development.' Not every alternative development model will be based or be dependent on wind power. However, as the failures of the coal industry and the negative impacts resulting from their preferred mining methods have shown, all future possibilities for development are dependent on the preservation of the mountains.

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[63] Environmental Protection Agency, Online: http://www.epa.gov/cair/

The preliminary objective of this study was to argue against Mountaintop Removal on the basis that wind power and underground coal could replace MTR coal. A policy based on wind development displacing MTR coal is mostly a strategy for preserving the mountains for the development of wind power, and so fails to provide a strategy for replacing MTR in the areas where wind speeds are not high enough for commercial development. Additionally, as investigations for this study proceeded, it was quickly determined that the contribution of MTR to electricity generation in West Virginia was not the issue (only 17% of Mountaintop Removal coal production is used for in-state generation), but rather, the export of West Virginia coal to other states for *their* generation needs. Therefore, the policy focus shifted toward where it should have been in the first place, production. Any shift in production directly impacts the mix of coal that is exported and used for generating electricity.

What this study proposes is a 75/25 shift away from Mountaintop Removal, whereas 75% of all coal produced by way of MTR is shifted back to underground mines, and 25% is transferred to smaller scale surface mines, such as contour mines. The increase in underground production will be distributed between northern and southern underground mines based on current regional production proportions, though future requirements for the installation of emissions-capture technologies at coal-fired power plants could allow for more production to be shifted northward. As some surface mining, and even a few Mountaintop Removal operations, also occur in the North, the 25% of MTR coal transferred to smaller surface mines has also been distributed according to current regional production. The tons displaceable by wind power were not included in the analysis, though the calculations for this were conducted. The amount of coal that could be displaced by wind power is small enough to approximate annual fluctuations in total production, so their inclusion would only undermine the credibility of the analysis. However, wind power is included in one part of the analysis summarizing the post-shift contributions of energy resources to the employment benefits stemming from the proposed production shift; as well as in another section summarizing post-shift sources of electricity generation in West Virginia.

Before continuing on to the policy analysis, there are a few important issues to be addressed regarding the policy proposal. First, the percentages chosen for this policy were chosen arbitrarily, and were only used initially as a test measure for determining a value of practical use in putting forth a proposal. These percentages resulted in new production data that supported the viability of a 75/25 shift. Second, this policy hinges on the confident belief, as formed by the preceding production analysis, that Mountaintop Removal mining methods are perceived and utilized as a more efficient means of producing coal, and not because the underground mining of remaining coal seams has become less of an option. Third, the data analysis for the production shift was conducted using the same data and calculated percentages presented in the preceding section. Finally, for practicality purposes, the objective of this policy is not to reduce total production levels, nor to eliminate all surface mining. These are, however, ultimately desirable goals due to the many other problems stemming from the extraction and burning of coal. That noted, the following analysis serves to illustrate how annual levels and distributional proportions of coal production, exports, employment, prices and electricity generation will look after the full implementation of the proposed production shift.

Production

Production Shift by Mine Type

Table VIII below presents total West Virginia production levels for surface and underground mining as they occurred between 1990 and 2006. As the table shows, over the study period, the share of total production from underground mining fell from 72.9% in 1990 to 55.5%, while that from surface mining subsequently rose from 27.1% to 44.5%. The production data for Mountaintop Removal (MTR) are not accurate for each year. These numbers were calculated according to the estimate put forth by Britton and others that 70% of all surface mine production between 2001 and 2006 was from MTR, so data for only these years approximates actual MTR production. This does not affect the policy analysis, as comparisons made for the purpose of determining the impact of the policy proposal will only be made for recent years. For purposes of determining viability, however, all non-litigation years are also subject to comparison. The data under the heading "75% New MTR to shift" reflect 75% of MTR production, which is the amount by which underground production will be increased. The data for surface production *will not* be increased by 25% MTR, but rather reduced by 75% MTR since MTR production is already reflected in the data for surface mine production. The 25% shift is automatically assumed to be a shift to lesser forms of surface mining.

Table VIII: Pre-Shift Production Levels (1000 tons)

Year	Total	Underground	Surface	MTR	*75% New MTR to shift*	*% Total Prod Underground (pre)*	*% Total Prod Surface (pre)*
1990	169,204	**123,306**	45,898	32,129	24,096	72.9%	27.1%
1991	167,351	119,821	47,530	33,271	24,953	71.6%	28.4%
1992	162,164	115,212	46,952	32,866	24,650	71.0%	29.0%
1993	133,687	90,323	43,364	30,355	22,766	67.6%	32.4%
1994	161,776	111,679	50,097	35,068	26,301	69.0%	31.0%
1995	162,997	110,029	52,968	37,078	27,808	67.5%	32.5%
1996	170,433	115,585	54,848	38,394	28,795	67.8%	32.2%
1997	173,743	116,523	57,220	40,054	30,041	67.1%	32.9%
1998	171,186	**117,191**	53,995	37,797	28,347	68.5%	31.5%
1999	157,978	103,727	54,251	37,976	28,482	65.7%	34.3%
2000	158,257	98,439	59,818	41,873	31,404	62.2%	37.8%
2001	162,415	99,550	62,865	44,006	33,004	61.3%	38.7%
2002	150,078	87,918	62,160	43,512	32,634	58.6%	41.4%
2003	139,712	86,793	52,919	37,043	27,782	62.1%	37.9%
2004	147,993	90,932	57,061	39,943	29,957	61.4%	38.6%
2005	153,650	91,009	62,641	43,849	32,887	59.2%	40.8%
2006	152,374	84,628	67,746	47,422	35,567	55.5%	44.5%

Table IX (**below**) shows how production levels look after the proposed 75/25 shift. The new data for 2002-2006 provides a source of validation for this policy proposal. Increasing underground production by 75% of MTR would have resulted in production levels of between 114.6 and 123.9 million tons for the past five years, *which is the same level of underground production that occurred in 1990 at the beginning of the shift to surface mining and Mountaintop Removal!!* **It is also the approximate level of production that occurred as recently as 1998, suggesting that increasing underground production to 1990/1998 levels may be feasible** (**compare BOLD data in Tables VIII and IX**). Surface mine production levels, on the other hand, would be reduced to below 1990 levels.

The **annual 52.5% decrease in surface production** shown for each year reflects the multiplication of 70% and 75% (0.7*0.75 = 0.525), since MTR produces 70% of all surface production, and the amount by which the proposed shift reduces surface production equals 75% of MTR. For underground production, Table IX shows that a production shift for 2006 would have amounted to a 42% increase in total underground production. However, given the sharp, unexplained decrease in production between 2005 and 2006, it is likely that, on average, **this policy would result in somewhere between a 33% and 36% increase in underground production**. **Finally, with a 75/25 production reversal, underground production as a share of total annual coal production in West Virginia would increase from 56%, currently, up to 79%, based on 2006 data, while the surface share of production would drop from 45% down to 21%, annually.** It must be noted that underground production accounted for only 73% in 1990, so 79% may be appear to be a slightly lofty goal. However, total West Virginia coal production was much higher in 1990, so in terms of absolute tons of production, a 79% underground share of production seems to be feasible.

Table IX: Post-Shift Production Levels (1000 tons)

Year	Total	New Underground	New Surface	*% Increase Underground*	*% Decrease Surface*	*% Total Prod Underground (post)*	*% Total Prod Surface (post)*
1990	169,204	147,402	21,802	19.5%	52.5%	87.1%	12.9%
1991	167,351	144,774	22,577	20.8%	52.5%	86.5%	13.5%
1992	162,164	139,862	22,302	21.4%	52.5%	86.2%	13.8%
1993	133,687	113,089	20,598	25.2%	52.5%	84.6%	15.4%
1994	161,776	137,980	23,796	23.6%	52.5%	85.3%	14.7%
1995	162,997	137,837	25,160	25.3%	52.5%	84.6%	15.4%
1996	170,433	144,380	26,053	24.9%	52.5%	84.7%	15.3%
1997	173,743	146,564	27,180	25.8%	52.5%	84.4%	15.6%
1998	171,186	145,538	25,648	24.2%	52.5%	85.0%	15.0%
1999	157,978	132,209	25,769	27.5%	52.5%	83.7%	16.3%
2000	158,257	129,843	28,414	31.9%	52.5%	82.0%	18.0%
2001	162,415	132,554	29,861	33.2%	52.5%	81.6%	18.4%
2002	150,078	120,552	29,526	37.1%	52.5%	80.3%	19.7%
2003	139,712	114,575	25,137	32.0%	52.5%	82.0%	18.0%
2004	147,993	**120,889**	27,104	32.9%	52.5%	81.7%	18.3%
2005	153,650	**123,896**	29,754	36.1%	52.5%	80.6%	19.4%
2006	152,374	**120,195**	32,179	42.0%	52.5%	78.9%	21.1%

Production Shift by Region

After shifting 75% of Mountaintop Removal production to underground mining, subsequently reducing surface mine production by the same amount, it was then necessary to distribute the gains and losses according to current regional distribution patterns**.** For example, since 42.6% of 2006 underground production was produced in the North, then 42.6% of underground production gains will be produced with the opening of new northern mines, and so 57.4% with new southern mines. Tables X-A and B compare the actual ("old") coal production levels for the North and South regions with how these levels would look were the production shift implemented. As the proposed policy is based on a shift in mining methods, the new data was produced, necessarily, by first calculating a shift by mining method, and only afterwards by region. Also, the EIA only provides regional production by mine type beginning with 1994; therefore, post-shift regional data is only available since 1994. Finally, **total production is not affected by the proposed production shift.**

Table X-A: Pre- and Post-Shift Production, North (1000 tons)						
Year	Total WV Prod.	North Prod. Old	North New	% Incr. North	% Prod. Old	% Prod. New
1994	161,776	49,316	56,661	14.9%	30.5%	35.0%
1995	162,997	46,114	53,578	16.2%	28.3%	32.9%
1996	170,433	45,910	52,985	15.4%	26.9%	31.1%
1997	173,743	42,802	49,339	15.3%	24.6%	28.4%
1998	171,186	44,618	51,304	15.0%	26.1%	30.0%
1999	157,978	38,788	45,331	16.9%	24.6%	28.7%
2000	158,257	37,601	45,106	20.0%	23.8%	28.5%
2001	162,415	38,170	46,184	21.0%	23.5%	28.4%
2002	150,078	34,032	41,871	23.0%	22.7%	27.9%
2003	139,712	34,949	41,979	20.1%	25.0%	30.0%
2004	147,993	40,646	50,136	23.3%	27.5%	33.9%
2005	153,650	42,628	53,566	25.7%	27.7%	34.9%
2006	152,374	42,398	54,239	27.9%	27.8%	35.6%

Table X-B: Pre- and Post-Shift Production, South (1000 tons)						
Year	Total WV Prod.	South Prod. Old	South New	% Decr. South	% Prod. Old	% Prod. New
1994	161,776	112,460	105,115	-6.5%	69.5%	65.0%
1995	162,997	116,883	109,419	-6.4%	71.7%	67.1%
1996	170,433	124,523	117,448	-5.7%	73.1%	68.9%
1997	173,743	130,941	124,404	-5.0%	75.4%	71.6%
1998	171,186	126,527	119,882	-5.3%	73.9%	70.0%
1999	157,978	119,191	112,647	-5.5%	75.4%	71.3%
2000	158,257	120,656	113,151	-6.2%	76.2%	71.5%
2001	162,415	124,245	116,231	-6.5%	76.5%	71.6%
2002	150,078	116,045	108,207	-6.8%	77.3%	72.1%
2003	139,712	104,762	97,733	-6.7%	75.0%	70.0%
2004	147,993	107,347	97,857	-8.8%	72.5%	66.1%
2005	153,650	111,022	100,084	-9.9%	72.3%	65.1%
2006	152,374	109,976	98,135	-10.8%	72.2%	64.4%

Post-shift regional production percentages, *by mine type,* remain unaffected by the production shift. In other words, the regional distribution of surface production, as a percentage, remains the same. However, *in a strictly regional sense*, since most MTR production occurs in southern West Virginia, the proposed production shift results in a net northward shift in production. This was an expected result since a portion of the 75%-MTR increase in underground production was distributed to northern mines. **That said, a 75/25 policy results in the northward shift of approximately 11-12 million tons of annual coal production. This equates to a 10-11% decrease in southern production, and a 26-28% increase in northern production.** As for the impact on regional contributions to total West Virginia coal production, the South's share of the total will drop from its current level of 72.2% down to 64.4%, resulting in an increase in the North's share from 27.8% to 35.6%. **Once again the numbers suggest that the proposed policy may be viable, as post-shift northern production levels of around 54.2 million tons are only slightly higher than actual production was in 1994 (49.3 million), and are indeed lower than the 56.5 million tons they were at in 1990 when the Clean Air Act was passed (see Table XI-A)**. To further test viability, it was necessary to conduct a detailed analysis of intra-regional impacts of the 75/25 production shift. The following summary analysis will show what a post-MTR coal production industry in West Virginia could look like.

Post-Shift Production in Northern West Virginia, by Mine Type

As a general note, the proportional changes in total surface and underground production resulting from the proposed production shift are reflected in the following regional analyses. For example, northern underground production increases by the same proportion as total underground production does, while northern surface production is reduced by the same proportion as total surface production. The same is true for changes in southern production. For this reason, these percentages will not be repeated.

Table XI-A: Post-Shift Coal Production by Mine Type, NORTH (1000 tons)

Year	Old Production	*Old Surface*	*% Total*	*Old Under*	*% Total*	New Production	*New Surface*	*% Total*	*New Under*	*% Total*
1990	**56,541**									
1994	49,316	5,614	11.4%	43,702	88.6%	56,661	2,667	4.7%	53,994	95.3%
1995	46,114	5,388	11.7%	40,726	88.3%	53,578	2,559	4.8%	51,019	95.2%
1996	45,910	5,637	12.3%	40,274	87.7%	52,985	2,678	5.1%	50,307	94.9%
1997	42,802	5,746	13.4%	37,056	86.6%	49,339	2,729	5.5%	46,609	94.5%
1998	44,618	5,382	12.1%	39,236	87.9%	51,304	2,576	5.0%	48,728	95.0%
1999	38,788	5,135	13.2%	33,653	86.8%	45,331	2,439	5.4%	42,892	94.6%
2000	37,601	5,319	14.1%	32,281	85.9%	45,106	2,527	5.6%	42,579	94.4%
2001	38,170	5,418	14.2%	32,753	85.8%	46,184	2,574	5.6%	43,610	94.4%
2002	34,032	5,350	15.7%	28,683	84.3%	41,871	2,541	6.1%	39,330	93.9%
2003	34,949	4,921	14.1%	30,029	85.9%	41,979	2,337	5.6%	39,641	94.4%
2004	40,646	4,564	11.2%	36,082	88.8%	50,136	2,168	4.3%	47,968	95.7%
2005	42,628	5,037	11.8%	37,590	88.2%	53,566	2,393	4.5%	51,173	95.5%
2006	42,398	6,324	14.9%	36,074	85.1%	**54,239**	3,004	5.5%	51,235	94.5%

Table XI-A compares pre- and post-shift production levels for northern West Virginia, as a total and by mine type. Reflecting results of the preceding regional analysis, the columns "Old Production" and "New Production" in Table XI-A also show that a production shift in recent years would have increased northern production by a maximum of 11.8 million tons. This net annual increase would result from the combination of a 15.1 million ton rise in northern underground production to 54.2 million tons, and a 3.3 million ton decline in northern surface production to 3 million tons. This represents an overall shift in production of 9% from surface to underground, reflected in the closing of existing surface mines and the opening of new underground mines. Table XI-A also includes data for 1990 in order to show, as a total, that post-shift northern coal production for 2006 would have equaled pre-shift levels in 1990. Post-shift underground production in 2006, however, would have exceeded pre-shift 1994 levels (the most-recent year available) by 7.5 million tons, representing a 17% increase, which might bring into question the feasibility of shifting so much production to northern underground mines.[64] It can be assumed, however, that pre-CAA 1990 production at northern underground mines would have more closely approximated post-shift 2006 production. A more definite measure of feasibility can be drawn from Table XI-B.

[64] In a manner consistent with methods of determining viability used throughout the policy analysis, by comparing recent post-shift production levels for northern underground mines to earlier pre-shift levels, preliminary determinations can be made as to the potential of northern underground mining to meet the production levels required by the proposed shift. Earlier production levels serve as an indicator of the total productive capability of northern underground mines.

At 2006 productivity (tons-per-mine) levels for northern underground mines (**see Table XI-B**), the 7.5 million ton difference between post-shift 2006 production levels and actual 1994 levels could be met by only opening an additional 7 underground mines. In order for northern underground mines to absorb the 13.6 to 15 million ton increase in production (from current 2006 levels) that the proposed production shift would require, 10-12 new mines would have to be opened, for a total of 41 underground mines. However, analysis thus far has suggested that higher mine productivity levels can result from the closing of less-efficient mines; so, as they reflect the average productivity for 29 mines, the 2006 levels of 1.24 million tons-per-mine may not be a valid estimate of what the average mine productivity would be for 41 mines. For this reason, it is useful to use the average mine productivity of all mines operating over the whole study period, which equates to 893,395 tons-per-mine.[65] This value can be viewed as an indicator of the true average production potential for northern underground mines. At this level, post-shift underground production will require a total of 57 mines, or eight less mines than were operating in 1994 (**see Table XI-C for a data summary of this analysis**). Additionally, had the 65 underground mines been producing at 893,395 tons-per-mine in 1994, they would have produced a total of 58.1 million tons of coal, or 6.8 million tons more than the proposed production shift requires. **Overall, these results strongly suggest that any newly opened northern underground mines will possess the productive capability to absorb the increase in production required by the proposed production shift.** While this is a rough analysis, it is as strong as such an analysis can be without specific information about individual mines. The same analysis of southern underground mining should prove to be less complicated.

Table XI-B: Post-Shift Underground Mining, NORTH

Year	Old Under Production	*# Mines (Old)*	*N. Under Tons/Mine*	New Under Production	*# Mines (New)*
1994	**43,702**	65	672,338	53,994	80
1995	40,726	53	768,415	51,019	66
1996	40,274	50	805,480	50,307	62
1997	37,056	46	805,565	46,609	58
1998	39,236	39	1,006,051	48,728	48
1999	33,653	39	862,897	42,892	50
2000	32,281	39	827,718	42,579	51
2001	32,753	38	861,921	43,610	51
2002	28,683	38	754,816	39,330	52
2003	30,029	32	938,406	39,641	42
2004	36,082	27	1,336,370	47,968	36
2005	37,590	29	1,296,207	**51,173**	39
2006	36,074	29	1,243,931	**51,235**	41

Note: *In these tables, units for the production data are in 1000 tons, while data for productivity (tons/mine) is given in actual tons. Also, the years chosen for comparison throughout the policy analysis are years in which in was concluded that production levels were not significantly hampered by litigation affecting surface mining. This is one of the main reasons that post-shift production estimates used in the analysis reflect 2005 and 2006 estimates, rather than a 3- or 5-year average.*

[65] This average was calculated by taking the total production of northern underground mines for the study period (1994-2006), and dividing by the total number of mines. This is the same process used to calculate annual mine productivity averages, just extended over time.

Table XI-C: Post-Shift Viability Analysis, NORTH UNDERGROUND							
Year	Old Under Production (Actual)	# Mines (Old)	N. Under Tons/Mine	Avg. Potential Tons/Mine	Old Under Production (Potential)	New Under Production	# Mines New (Avg)
1994	43,702	65	672,338	893,395	**58,071**	53,994	60
1995	40,726	53	768,415	893,395	47,350	51,019	57
1996	40,274	50	805,480	893,395	44,670	50,307	56
1997	37,056	46	805,565	893,395	41,096	46,609	52
1998	39,236	39	1,006,051	893,395	34,842	48,728	55
1999	33,653	39	862,897	893,395	34,842	42,892	48
2000	32,281	39	827,718	893,395	34,842	42,579	48
2001	32,753	38	861,921	893,395	33,949	43,610	49
2002	28,683	38	754,816	893,395	33,949	39,330	44
2003	30,029	32	938,406	893,395	28,589	39,641	44
2004	36,082	27	1,336,370	893,395	24,122	47,968	54
2005	37,590	29	1,296,207	893,395	25,908	51,173	57
2006	36,074	29	1,243,931	893,395	25,908	51,235	57

Post-Shift Production in Southern West Virginia, by Mine Type

Table XII-A: Post-Shift Coal Production by Mine Type, SOUTH (1000 tons)										
Year	Old Prod.	Old Surface	% Total	Old Under	% Total	New Prod.	New Surface	% Total	New Under	% Total
1990	112,564									
1994	112,460	44,483	39.6%	67,977	60.4%	105,115	21,129	20.1%	83,986	79.9%
1995	116,883	47,580	40.7%	69,303	59.3%	109,419	22,601	20.7%	86,818	79.3%
1996	124,523	49,211	39.5%	75,311	60.5%	117,448	23,375	19.9%	94,073	80.1%
1997	130,941	51,474	39.3%	79,467	60.7%	124,404	24,450	19.7%	99,954	80.3%
1998	126,527	48,572	38.4%	77,954	61.6%	119,882	23,072	19.2%	96,810	80.8%
1999	119,191	49,116	41.2%	70,075	58.8%	112,647	23,330	20.7%	89,316	79.3%
2000	120,656	54,498	45.2%	66,158	54.8%	113,151	25,887	22.9%	87,264	77.1%
2001	124,245	57,447	46.2%	66,798	53.8%	116,231	27,287	23.5%	88,944	76.5%
2002	116,045	56,810	49.0%	59,235	51.0%	108,207	26,985	24.9%	81,222	75.1%
2003	104,762	47,998	45.8%	56,764	54.2%	97,733	22,799	23.3%	74,934	76.7%
2004	107,347	52,497	48.9%	54,851	51.1%	97,857	24,936	25.5%	72,921	74.5%
2005	111,022	57,603	51.9%	53,419	48.1%	100,084	27,361	27.3%	72,722	72.7%
2006	109,976	61,421	55.8%	48,554	44.1%	98,135	29,175	29.7%	68,960	70.3%

Table XII-A compares pre- and post-shift production levels for southern West Virginia, as a total and by mine type, and shows that a production shift in recent years would have reduced annual southern production by a maximum of 11.8 million tons (equal to the northern increase). This net annual decline would result from the combination of a 32.2 million ton decrease (reflecting 75% MTR) in surface production to 29.2 million tons, and a 20.4 million ton increase in underground production to 69 million tons.

The issue to consider again, in terms of whether or not the proposed production shift serves as a viable policy for halting the use of Mountaintop Removal mining, is whether or not the increase in underground production would be feasible. Unlike northern production, the answer to this question for southern production is available through a simple comparison. The reason for this is that earlier years were marked by significantly higher levels of underground production than have been experienced in recent years. As noted, a 75/25 production shift would increase southern underground production to 69 million tons. This level of production was met or exceeded for every year between 1995 and 1999. However, underground production declined sharply between 2005 and 2006, but even at post-shift 2005 production levels, **the data suggest that post-shift levels of southern underground production can be easily achieved**. Of course, this conclusion is based on the confident assumption that recent declines in southern underground production resulted not from a decline in coal that was economically recoverable by underground mining methods, but rather, from an increased assimilation of the more productive underground seams into ever-larger surface mines.

Table XII-B illustrates how southern coal production would be distributed after the implementation of the proposed production shift. The red column titled "Avg. Tons/Mine" represents the average productive capacity of southern underground mines since 1994, while the red column titled "# Mines (Avg.)" shows how many mines producing at this average capacity would be needed in 2005 and 2006 to cover the increase in underground production. The average mine productivity is again considered an indicator of how productive the average underground mine can actually be. In this case, the value of 374,277 tons-per-mine seems to be a conservative representation of the true productive capability of the average southern underground mine, since between 1997 and 2004, underground mines produced an average of 414,756 tons. As a comparison, surface mines produced an average of 643,327 tons-per-mine over the study period, and an average of 696,193 tons-per-mine between 1997 and 2004.

Table XII-B: Post-Shift Underground Mining, SOUTH

Year	Old Under Production	*# Mines (Old)*	*S. Under Tons/Mine*	*Avg. Tons/Mine*	New Under Production	*# Mines (New)*	*# Mines New (Avg)*
1994	67,977	258	263,477	374,277	83,986	319	224
1995	69,303	225	308,013	374,277	86,818	282	232
1996	75,311	214	351,921	374,277	94,073	267	251
1997	79,467	193	411,746	374,277	99,954	243	267
1998	77,954	207	376,589	374,277	96,810	257	259
1999	**70,075**	172	407,413	374,277	89,316	219	239
2000	***66,158***	161	410,919	374,277	87,264	212	233
2001	66,798	158	422,772	374,277	88,944	210	238
2002	*59,235*	142	417,148	374,277	81,222	195	217
2003	**56,764**	123	461,496	374,277	74,934	162	200
2004	54,851	125	438,808	374,277	72,921	166	195
2005	53,419	**137**	389,920	374,277	**72,722**	187	194
2006	48,554	**145**	334,855	374,277	**68,960**	206	184

Based on actual 2006 mine productivities, the proposed shift would require the opening of 61 new underground mines in southern West Virginia over 2006 levels (73 total for WV). However, at an average productivity of 374,277 tons-per-mine, the shift would only require the opening of 29 new mines. By comparison, the number of surface mines would drop by 50 (61 in total), from 96 to 46.

Table XIII presents the percent shares of total West Virginia coal production, from each mine type and by region, as they would stand following the full implementation of the proposed shift of 75% of current MTR production to underground mines. As the table shows, North production in a post-shift coal economy would account for 35.6% of total production, up from its current share of 27.8%. Underground production would increase to account for 78.9% of total West Virginia production, up from 55.5% currently, with the greater majority of this increase occurring in the South. Southern underground production would increase from 31.9% to 45.3% of the total. The percent of total production coming from southern surface mines would decrease from 40.3% down to 19.1%. Finally, and most importantly, **the share of total West Virginia coal produced at Mountaintop Removal mines will fall from 31.1%, down to 0%. In essence, this means, according to the results of the analysis, that the production shift proposed here would successfully re-distribute, to underground mines and smaller surface mines, 31.1% of all coal produced in West Virginia**.

Table XIII: Summary, Post-Shift Shares of Total Production, 1994-2006

Year	% Total from Underground	*North Under*	*South Under*	% Total from Surface	*North Surface*	*South Surface*	% Total from North	% Total from South
1994	85.3%	33.4%	51.9%	14.7%	1.6%	13.1%	35.0%	65.0%
1995	84.6%	31.3%	53.3%	15.4%	1.6%	13.9%	32.9%	67.1%
1996	84.7%	29.5%	55.2%	15.3%	1.6%	13.7%	31.1%	68.9%
1997	84.4%	26.8%	57.5%	15.6%	1.6%	14.1%	28.4%	71.6%
1998	85.0%	28.5%	56.6%	15.0%	1.5%	13.5%	30.0%	70.0%
1999	83.7%	27.2%	56.5%	16.3%	1.5%	14.8%	28.7%	71.3%
2000	82.0%	26.9%	55.1%	18.0%	1.6%	16.4%	28.5%	71.5%
2001	81.6%	26.9%	54.8%	18.4%	1.6%	16.8%	28.4%	71.6%
2002	80.3%	26.2%	54.1%	19.7%	1.7%	18.0%	27.9%	72.1%
2003	82.0%	28.4%	53.6%	18.0%	1.7%	16.3%	30.0%	70.0%
2004	81.7%	32.4%	49.3%	18.3%	1.5%	16.8%	33.9%	66.1%
2005	80.6%	33.3%	47.3%	19.4%	1.6%	17.8%	34.9%	65.1%
2006	78.9%	33.6%	45.3%	21.1%	2.0%	19.1%	35.6%	64.4%

Concluding Comments on Production and Viability of the Proposal

The proposed 75/25 production shift would result in a model of coal production in West Virginia that stands as a stark contrast to the model in place today. However, the new model would closely approximate the one that existed before surface mining and Mountaintop Removal emerged as the favored method for mining coal. Since the objective of this study was to offer a practical alternative to Mountaintop Removal mining, it was not feasible to propose a reduction in total West Virginia coal production, even though the data suggest that the rise in surface mining and MTR has had the effect of doing just that – reducing total coal production. Therefore, the strength of the proposed production shift was contingent upon the ability of both northern and southern underground mines to be re-opened and absorb the resulting production increases. **To this end, while there is more that needs to be considered before claims of *absolute* viability can be made, this study concludes that the proposed shift, in terms of the productive capacity of northern and southern underground mines, serves as a viable alternative to the current model.** Since costs and benefits are also important factors to be considered in proposing a shift in production, what remains, then, is an analysis of the impacts that this proposal will have on mining employment and the average (mine mouth) price of West Virginia coal.

Employment

Overview – pre-Shift Employment Trends

To summarize earlier findings, *until the past few years* the transition from underground mining to large surface and Mountaintop Removal operations resulted in a rapid decline in total coal mining employment in West Virginia. As mining operations moved southward and to the surface, and as surface mining operations were increasingly mechanized, the per-ton demand for labor diminished. The pick and shovel were replaced by the boom and the blast, while numerous "miners" were turned into "equipment operators." The problem is that the surface mines that were taking over the underground mines did not require a one-to-one transition. For each miner-turned-equipment operator, more than one underground miner was sent to the unemployment office. One reason for this is that mines in the North are capable of extracting thicker, more productive seams than those that exist in the South, so they require more miners, per mine, than surface and underground mines in the South do. As production shifted southward, 5,430 miners in the North lost their jobs between 1990 and 2006. These jobs were not transferred to southern underground mines, however.

The demand pressures that caused the southern shift in production were at the same time forcing coal mining in the South to the surface. Because of this, an additional 5,600 southern underground miners have been forced to seek non-mining employment, locally or by moving elsewhere. Until 2003 this loss was even worse, as southern underground mine employment had dropped by 7,860, but it has since rebounded. It is important to note that not all employment losses were due to a shift to surface mining, but also resulted from a decrease in total coal production. However, this is mostly true for the northern employment losses, since southern coal production is only slightly lower than it was in 1990. As a whole, the decline in southern employment IS due to a transition to surface mining. Until 2003, the South had experienced a total employment loss of 8,534, of which, as noted, 7,860 were from underground mines. These underground losses, however, did not equate to equal gains in surface employment. As data Table XIV shows, up until 2003 the number of southern surface mines fell from 88 to 68 mines, while the available jobs per mine increased by 12. This equated to a decline of 200 surface mining jobs in southern West Virginia, which occurred even as southern surface production increased by 10 million tons. Thus, the shift to surface mining only led to more employment losses.

Table XIV: Coal Mining Employment, 1990-2006

	Total			**Underground**				**Surface**			
Year	**Total Mine Employment**	**North**	**South**	**# Mines North**	**Jobs/Mine North**	**# Mines South**	**Jobs/Mine South**	**# Mines North**	**Jobs/Mine North**	**# Mines South**	**Jobs/Mine South**
1990	29,578	10,053	19,525								
1994	21,861	6,659	15,202	65	92	258	42	51	13	88	48
1995	21,334	6,114	15,220	53	105	225	48	45	12	101	44
1996	20,121	5,279	14,842	50	95	214	53	43	12	79	46
1997	18,245	4,980	13,265	46	99	193	51	34	13	76	46
1998	17,822	4,268	13,554	39	95	207	48	30	19	70	53
1999	15,536	3,906	11,630	39	87	172	47	32	16	63	56
2000	*15,012*	*3,712*	*11,300*	*39*	85	*161*	*48*	*29*	14	*68*	*53*
2001	16,579	3,989	12,590	38	94	158	52	24	18	84	51
2002	*16,247*	*3,770*	*12,477*	*38*	86	*142*	*55*	*26*	20	*85*	*56*
2003	14,905	3,914	10,991	32	108	123	56	26	18	68	60
2004	16,403	4,263	12,140	27	141	125	59	22	21	87	55
2005	18,611	4,629	13,982	29	141	137	61	21	26	90	62
2006	20,076	4,621	15,455	29	137	145	64	20	32	96	65

One final comparison useful for understanding the employment impacts of the shift from northern underground mines to southern surface mines is this: Between 1994 and 2006, the ratio of average mine employment at northern underground mines to that at southern surface mines was 2:1. This means that for every job transferred from northern underground mines to southern surface mines, another job was being eliminated. If each employee at a southern surface mine therefore produced 2 tons of coal for every 1 ton produced by a northern underground miner, this could be seen as an equal shift, perhaps even acceptable as an "efficiency shift." However, this was not the case. Over the same period, the average southern surface miner produced only 1.4 tons of coal for every ton that the average underground miner in the North produced. Thus was the overall impact of Mountaintop Removal on coal mining employment in West Virginia (**comparative mining trends and employment indicators are shown in Table XIV above**). The following analysis will show that this trend can be somewhat reversed by implementing the proposed production shift.

Post-Shift Employment

Calculations for determining how employment would be affected by the 75/25 production shift were conducted by analyzing each of the four categories of mines: Underground North, Underground South, Surface North, and Surface South. The only years available for analysis are those between 2001 and 2006, because these are the only years that were included in the study by J.Q. Britton, et al.[66] Since the results of that study – that 70% of all surface mine production in West Virginia came from Mountaintop Removal mines between 2001 and 2006 – are what the new production levels are based on, then these are the only years from which conclusions will be drawn. Two methods were used in order to estimate the policy's employment impact, each composed of multiple tests of variables relevant to each of the four categories. The results for both are reported here, though the results of the first method, for reasons that will be described, will be used only for comparative purposes. The conclusions regarding employment impact will be drawn from the results of the second method. The inclusion of both calculations is necessary because lessons learned from results of the first method were instrumental in directing the analysis of the results from the second method.

For ease of distinction, it is helpful to name the first method, generally, the "Mine Productivity Method," as it is based on the average mine productivity and average mine employment for each mine type. In this method, new employment levels were calculated as follows. First, the new production for each mine category was divided by the average mine productivity values that were calculated from the original data. This resulted in a new value for the number of operating mines for each category. The next step was to multiply the new number of mines by the annual values for average mine employment, which was also calculated from the original data. This resulted in new employment values for each category. The first calculations using the Mine Productivity Method were conducted for each year, using that year's averages. Since the policy calls for a production shift, this was the first obvious formula for determining employment impacts.

Tables XV A-C present the pre- and post-shift values for employment resulting from this formula. Tables A and B show the employment impacts on underground and surface mining, respectively, while Table C calculates the total impact, separating the results by region. One note of importance is, in order to present the employment impacts for a mixture of production scenarios, that the tables will include the average employment change for 2001-2006. The tables will also include results for the years 1990, 1994, 1997 and 1998. These years are useful for analytic and comparative purposes.

[66] Britton, J.Q.; Blake, B.M. Jr.; McColloch, G.H., "West Virginia," *Mining Engineering*, May 2007, p. 125.

Table XV-A, Post-Shift Employment, UNDERGROUND										
Year	Under Employ (new)	Under Employ (old)	Under Employ Change	*North New*	*North Old*	***North Change***	*South New*	*South Old*	***South Change***	% Change Under
1990	28,193	23,584	4,609							19.5%
1994	20,949	16,956	3,993	7,409	5,997	1,412	13,540	10,959	2,581	23.6%
1997	18,023	14,329	3,694	5,724	4,551	1,173	12,299	9,778	2,521	25.8%
1998	16,846	13,565	3,281	4,604	3,707	897	**12,243**	9,858	2,385	24.2%
2001	15,765	11,840	3,925	4,743	3,562	1,181	11,022	8,278	2,744	33.2%
2002	15,109	11,019	4,090	4,470	3,260	1,210	10,639	7,759	2,880	37.1%
2003	13,695	10,374	3,321	4,541	3,440	1,101	9,154	6,934	2,220	32.0%
2004	14,805	11,136	3,669	**5,058**	**3,805**	1,253	9,746	7,331	2,415	32.9%
2005	16,994	12,483	4,511	**5,561**	**4,085**	1,476	11,433	8,398	3,035	36.1%
2006	18,733	13,190	5,543	**5,656**	**3,982**	1,674	13,078	**9,208**	3,870	42.0%
Averages, 2001-2006			4,177			1,316			2,861	35.8%
Analysis	**17,693**	13190	**4,503**	5,425	3,957	**1,468**	12243	9208	**3,035**	

Since the shift is from surface mining to underground mining, underground employment stands to benefit the most from the proposed production shift. In the same vein, northern underground employment was expected to increase heavily. The reason for this is because over 32 million tons of the decrease in surface mining would occur in the South, and 27.8% of that decrease is shifted northward, while only 10% of a 3 million ton decrease in northern surface production is transferred south. As a result, northern underground mining employment would increase by 1,674 miners in 2006. For southern underground mining, it is likely that the proposed shift would increase employment by the average of 2,861, which approximates the 2001 and 2002 increases. The reason for this is based on the earlier conclusion that surface mines, since 2003 (when both underground and surface production, and so employment, fell sharply), have begun absorbing the thicker seams into their operations.

Over the past three years, even though underground production fell, the number of operating mines and average mine employment both increased, thus artificially raising employment. Were those seams to be transferred back to underground mines in 2006, the average mine employment would again stabilize. It might be expected that southern underground employment would increase to approximate 1998 levels, which is when new underground mines opened in an expected response to pending litigation on surface mines (thus setting the stage for the massive decline in 1999 to well below 1997 levels). In that case, employment at southern underground mines would increase by 3,035.

Recent production increases at northern underground mines, which this study has credited to an increased demand for low-sulfur coal exports, suggest that northern employment will actually increase by somewhere between 2004 and 2006 levels, for an average of 5,425 miners. The justification for using this average is that the production surge was marked by an increase over earlier levels in the number of mines, average mine employment, and average mine productivity, and these increases have proven to be stable since 2004. These trends suggest that recent employment and productivity data reflect the true potential of northern underground mines. Therefore, taking an average of both pre- and post-shift employment between 2004 and 2006 and calculating the difference of the two averages results in an increase of 1,468 miners at northern underground mines (**see Table XV-B**).

The complicated nature of this analysis serves as the first indicator of the flaws in this type of calculation. Recent trends in surface mine production have had an impact on underground production and employment that is the inverse to the impact surface mining was having until 2002. Before 2002, the expansion of surface mining led to the decline in the number of mines, the average mine employment and the total production of underground mines in southern West Virginia. Since 2003, there are now more underground mines, and more employees-per-mine, and yet production is still decreasing. This inconsistency throws the whole calculation off, and makes a comparative analysis necessary, which, in turn, undermines the initial calculation method. However, the method does result in a range for estimating employment gains or losses; and, in this respect, the proposed production shift would likely create between 3,321 and 5,543 new underground mine jobs, with the true increase likely reflecting a sum of the two values that resulted from the above analysis. From the analysis, it can be expected that the actual gain in underground employment resulting from the production shift would be approximately 4,503 new jobs, for a 34.1% increase over current employment. The measure of the policy's total employment benefits then hinges on how surface mine employment is impacted.

Table XV-B, Post-Shift Employment, SURFACE

Year	Surface Employ (new)	Surface Employ (old)	Surface Employ Change	*North New*	*North Old*	***North Change***	*South New*	*South Old*	*South Change*	% Change Surface
1990	2,847	5,994	-3,147							-52.5%
1994	2,330	4,905	-2,575	314	662	-348	2,015	4,243	-2,228	-52.5%
1997	1,860	3,916	-2,056	204	429	-225	1,656	3,487	-1,831	-52.5%
1998	2,024	4,257	-2,233	269	561	-292	1,756	3,696	-1,940	-52.5%
2001	2,251	4,739	-2,488	203	427	-224	2,048	4,312	-2,264	-52.5%
2002	2,483	5,228	-2,745	242	510	-268	2,241	4,718	-2,477	-52.5%
2003	2,152	4,531	-2,379	225	474	-249	1,927	4,057	-2,130	-52.5%
2004	2,502	5,267	-2,765	218	458	-240	2,284	4,809	-2,525	-52.5%
2005	2,911	6,128	-3,217	258	544	-286	2,652	5,584	-2,932	-52.5%
2006	3,271	6,886	-3,615	304	639	-335	2,967	6,247	-3,280	-52.5%
Averages, 2001-2006			**-2,868**			**-267**			**-2,601**	-52.5%

The impact that the policy would have on surface employment is pretty direct. Production would be cut by 52.5%, the remaining surface mines would be smaller, and, according to this method of calculation, they would employ 52.5% fewer miners. There is a major issue with the calculation for impacts on surface mine employment. The main problem with using current year averages for mine productivity and employment is that surface mines after the production shift are going to be smaller, less productive, and employ fewer miners-per-mine than the average surface mine does currently. On the other hand, the difference may be reconciled by the fact that by using current year averages, there are fewer mines after the shift, but more employees-per-mine since the average mine productivity remains unaffected. In any case, there is a lot of uncertainty with this calculation in regard to impacts on surface mine employment; so, for now, the average loss of 2,868 jobs from surface mines stands as the best available value.

Overall, given the concerns that arise with using a direct calculation, the most appropriate means for estimating the impact of the production shift on total employment is to compare the 2001-2006 average for surface mining to the analysis value for underground mining. Table XV-C presents the resulting total, the totals from 2001-2006 averages, and the 2006 total from the direct calculation.

Table XV-C, Post-Shift Employment, TOTAL, by Mine Type										
Year	**Total Employ (new)**	**Total Employ (old)**	**Total Employ Change**	*Under New*	*Under Old*	***Under Change***	*Surface New*	*Surface Old*	***Surface Change***	**% Change Total**
1994	23,279	21,861	1,418	20,949	16,956	3,993	2,330	4,905	-2,575	6.5%
1997	19,883	18,245	1,638	18,023	14,329	3,694	1,860	3,916	-2,056	9.0%
1998	18,870	17,822	1,048	16,846	13,565	3,281	2,024	4,257	-2,233	5.9%
2001	18,016	16,579	1,437	15,765	11,840	3,925	2,251	4,739	-2,488	8.7%
2002	17,592	16,247	1,345	15,109	11,019	4,090	2,483	5,228	-2,745	8.3%
2003	15,847	14,905	942	13,695	10,374	3,321	2,152	4,531	-2,379	6.3%
2004	17,307	16,403	904	14,805	11,136	3,669	2,502	5,267	-2,765	5.5%
2005	19,905	18,611	1,294	16,994	12,483	4,511	2,911	6,128	-3,217	7.0%
2006	**22,004**	**20,076**	**1,928**	**18,733**	**13,190**	**5,543**	**3,271**	**6,886**	**-3,615**	**9.6%**
Averages Only	21384	20076	**1,308**	17,366	13190	**4,176**	4,018	6886	**-2,868**	6.5%
Avg. and Anal	**21,711**	20076	**1,635**	17,693	13,190	**4,503**	4,018	6886	**-2,868**	8.1%

Beginning with the direct total, the results for 2006 show a decrease of 3,615 surface miners coupled with an increase of 5,543 underground miners, **for a total change in employment of 1,928**. As previously stated, however, the direct calculation carries with it uncertainty related to the fact that it may or may not adjust for changing averages for mine productivity and per-mine employment, which are the two independent variables in this calculation. The number of mines is directly related to mine productivity, and acts as a dependent variable. The inverse relationship between mine productivity and average mine employment is not likely to be a direct relationship, and predicting the impact of a shift to larger underground mines and smaller surface mines on mine productivity and average mine employment is difficult – especially given the recent trends in southern underground mine employment. It is, therefore, impossible to determine whether using 2006 data for the independent variables results in a reconciliation of the uncertainties. Using averages and analytical results, on the other hand, helps to raise the confidence level of the results.

The line in the above table for "Averages Only" presents data reflecting the average of all employment results from the direct "Mine Productivity" calculation for 2001 to 2006. In this case, the production shift would increase total underground employment by 4,176, while surface mine employment would drop by 2,868, resulting in a net increase of 1,308 mine employees. This is 620 mine employees less than the direct calculation for 2006 shows. The line for "Avg. and Anal" compares the same surface average with the value taken from the previous underground analysis, which was based on averages for 2004-2006. The resulting employment change using this method is a net employment impact of 1,635 new mining employees over current levels, a value which lies almost right in the middle of the other two.

As a result, the Mine Productivity analysis suggests that the proposed production shift would result in an increase of somewhere between 1,308 and 1,928 coal mining employees in West Virginia. The net positive gain in employment as calculated by this method shows that not only is the proposed production shift feasible in terms of the capability of underground mines to absorb the reduction in surface mine production, but also will serve to reverse the negative impact that the expansion of surface mining has had on total mining employment. Had the strange increase not occurred between 2004 and 2006, the calculations would have produced stronger results, but it remains that the proposed shift will result in an overall gain in coal-mining employment.

Indeed, as they were related to the inherent production characteristics of the mines themselves, the uncertainties that were recognized during the process of calculating the employment impacts led to the search for an independent variable that could simplify the employment calculation. This new variable turned out to be the tons produced per employee and was the basis for the second method, aptly named the "Employment Productivity Method." Employment productivity inherently helps to correct for average mine employment and productivity. It does not correlate absolutely to production, but taking averages over a specific time period serves more to correct for productivity variations than doing the same for mine productivity and average mine employment does. The only drawback to using employment productivity is that the analysis requires choosing the time period for each mine type and region that best reflects how mining will look after the proposed shift. For example, surface mines will be reduced back to early 90s levels when they were smaller and produced fewer tons-per-mine. So, as the following analysis will show, employment productivity levels for surface mining as used in this type of calculation should reflect the average employment productivity for surface mining that actually existed between 1990 and 1993.

In conducting the employment productivity analysis, five time periods were chosen, each according to their relevance to the findings in this study. An employment matrix of twenty-five charts was then created, using one chart for each mixture of mine type and time period, such as "Surface 90-93, Underground 90-98." However, not all such combinations were relevant to the analysis. For this reason, only three time periods are included in the final calculations and analysis. The early period of 1990 to 1993 is useful since after the passage of the Clean Air Act, large-scale surface mining such as Mountaintop Removal did not begin to really expand until 1994. Therefore, this time period is most useful for calculating new employment levels for surface mines.

The second time period is 1990 to 1998, which is most relevant to southern underground mines since southern underground mining was still strong in terms of mine productivity and total production through 1998. Further, the early part of this period is useful since the number of operating mines between 1990 and 1994 approximate the number of southern mines that will result from the proposed shift. Overall, the vast increase in southern underground mining that this policy proposes will result in the opening of both small and large mines of a wide range of mine productivity levels; so, an average employment productivity that reflects such a wide range is necessary.

The third time period used for this method is 1990 to 2006, and is most relevant to underground mines in the North. Taking the average employment productivity for the whole study period produces an average value for northern underground mines that best reflects the true production potential, per employee, of the northern mines. One reason for this is that over the study period, northern underground production occurred under a mixture of conditions requiring various combinations of mine size and employment productivity. In the early 90s (1990-1993), before the Clean Air Act took full effect, total northern underground production was still high, and the number of operating mines did not experience the greatest decrease until after 1994. It was, therefore, likely that this period was marked by a mixture of both large and small northern mines, as well as total production levels approximating post-shift production. Between 1998 and 2002, the number of operating mines and annual production stabilized, as did total employment, while mine productivity fluctuated, which suggests that this period reflects natural variations in employment productivity. Finally, 2004-2006 data is useful to include since it reflects the current productive capacity, and so the employment requirements, of the larger northern mines.

The second reason, or rather justification, for being able to use the 1990-2006 average is that northern underground mines were not directly impacted by the expansion of surface mines. Large surface mines have been concentrated in the South, and it has been only in the South where surface mines have assimilated underground mines. In sum, only production was impacted, not mine productivity. So, overall, it is both necessary and justifiable to use the average northern underground employment productivity over the whole of the study period in order to estimate how employment at northern mines will be impacted by an increase in production from current levels.

In total, twenty-five scenarios were created representing various combinations of average employment productivity over five different time periods. After intense consideration, only one was considered to produce the appropriate combination of mining conditions that would best reflect a post-production shift composition of mining conditions. The following table, therefore, combines new employment data for northern and southern surface and underground mines based on the average employment productivity for each as outlined above. The results for each mine type, by region, were calculated by dividing post-shift production totals by the average production-per-employee calculated from the original data over the respective time periods. These results are provided in Table XVI-B below. The preceding table, XVI-A, provides the numbers for employment productivity that were used in the calculations. Post-shift production levels by region and mine type are available in Tables XI-A (North) and XII-A (South).

Table XVI-A: Avg. Employment Productivity, for Analysis (tons/employee)

Surface, 1990-1993		Underground	
North	*South*	*North, 1990-2006*	*South, 1990-1998*
7,080	8,635	7,655	6,011

Table XVI-B: Mixed Scenario: 90-93 Surface, 90-98 South and 90-06 North Underground

Surface	**New Total**	*New North*	*New South*	***Old Total***	*Old North*	*Old South*	**Total Gain/Loss**
2001	3,524	363	3,160	4,739	427	4,312	-1,215
2002	3,484	359	3,125	5,228	510	4,718	-1,744
2003	2,970	330	2,640	4,531	474	4,057	-1,561
2004	3,194	306	2,888	5,267	458	4,809	-2,073
2005	3,507	338	3,169	6,128	544	5,584	-2,621
2006	3,803	424	3,379	6,886	639	6,247	-3,083
Underground	**New Total**	*New North*	*New South*	***Old Total***	*Old North*	*Old South*	**Total Gain/Loss**
2001	20,494	5,697	14,797	11,840	3,562	8,278	8,654
2002	18,650	5,138	13,512	11,019	3,260	7,759	7,631
2003	17,645	5,178	12,466	10,374	3,440	6,934	7,271
2004	18,398	6,266	12,131	11,136	3,805	7,331	7,262
2005	18,783	6,685	12,098	12,483	4,085	8,398	6,300
2006	18,165	6,693	11,472	13,190	3,982	9,208	4,975
2006 Total	**21,968**	7,117	14,851	**20,076**	4,621	15,455	**1,892**

The “Employment Productivity” method for calculating employment impacts of the proposed production shift produced results not unlike those resulting from the “Mine Productivity” method. As a quick note, only 2006 data are useful for analysis here. The nature of this calculation is to determine by how much the proposed production shift will increase employment over current levels. That said, the Employment Productivity method shows that total surface mining employment will drop from the current level of 6,886 down to 3,803 with the proposed shift, for a total loss in surface mining employment of 3,083. By comparison, the direct calculation for 2006 using the Mine Productivity method showed a surface mining employment decline of 3,615, for a new employment of 3,271. By this comparison, the Employment method indicates less of an impact on surface mine employment than the Mine method does. In this sense, the Employment method appears to suggest that the uncertainties that were discussed regarding the Mine method may actually have been somewhat reconciled through a law of averages that eludes this report. The addenda calculations to the Mine method do not offer a basis of comparison for surface employment impacts since the surface change for those calculations represented a basic average of surface impacts for 2001-2006. Overall, with a newfound confidence in the Mine method, combining the two results suggests a decline of between 3,615 and 3,083 for surface mine employment.

For impacts on underground employment, the Employment method indicates an overall gain of 4,975. By comparison, the direct calculations for the Mine method resulted in a net gain of 5,543 underground employees, while the analysis addendum resulted in a gain of 4,503 new underground employees (this new variable is useful for analyzing underground employment impacts with the Mine method since it represents an adjustment for recent ‘artificial’ increases in southern underground employment). This report places more confidence in the value of 4,503. Overall then, combining the results of the two methods suggests a gain of between 4,503 and 4,975 underground employment opportunities. One stark difference between the results of the two methods is that the Mine method results in 3,035 more employees for southern underground mining, while the Employment method results in 2,264, meaning that the Employment method results in more employment benefits occurring in the North. This does not appear to indicate anything of consequence for the analysis, it merely reflects a difference in the two calculation methods.

Therefore, in combining the results of two different methods of calculation, this study concludes that the proposed shift of 75% of Mountaintop Removal production to underground mines will result in an additional 1,635 to 1,892 new employment opportunities at West Virginia’s coal mines. As a reminder, these are gains over 2006 levels. There are two important points that must be made though in regard to this conclusion. The first is, since 2004, total West Virginia mining employment has been rising by an average of 1,837 per year. This has been due, in this studies’ opinion, to two trends that actually support the need for a production shift. The first is that surface mines since 2004 have expanded rapidly. Total surface mine production has risen by 10.7 million tons in just the past two years, 9 million tons in southern West Virginia alone, while the average mine employment at southern mines has increased by 10 miners per mine from 55 to 65 (the average mine employment for southern mines between 1998 and 2003 was also 55). This increase was made available by higher productivity at existing mines as well as the opening of nine new surface mines in the South. See Tables XVII-A and B for a comparative summary of these trends. Finally, **based on estimates resulting from a preliminary study on wind power, direct jobs associated with developing West Virginia’s wind potential could amount to between 450 and 500 new long-term employment opportunities, bringing the potential employment benefit of stopping MTR to between 2,100 and 2,400 new jobs, and that is just with wind power.**

As previously noted on numerous occasions throughout this report – and this is a point that cannot be stressed enough – the fact that the average mine productivity has remained stable during recent years, combined with the higher average mine employment, suggests that large surface and Mountaintop Removal mines are destroying ever greater expanses of land in order even to maintain current average per-mine production levels. And they are constructing even more of these mines. Should this trend continue, southern West Virginia will experience exponentially greater impacts from Mountaintop Removal on the land and communities situated there. The conclusions in this report show that reversing coal production from surface mining to underground mining is both feasible and beneficial; therefore, there is an opportunity to bring a halt to highly destructive forms of coal mining. **Moreover, production and employment trends strongly suggest that NOW is the time to make such a shift.**

The recent increase in the number of underground mines in southern West Virginia, combined with a higher average mine employment, yet a decline in both total production and productivity, indicates that, more and more, underground mining is being forced into thinner and more difficult to extract seams, while surface mines assimilate more of the thicker seams that could be mined by underground methods. Should this continue, a future shift to underground mining may not be feasible without the North absorbing an even greater proportion of the shift. Further, in terms of the employment benefits of a production shift, the recent employment increases are resulting in fewer potential gains in employment each year from the proposed shift (**see Table XVII-B**).

Table XVII-A: Summary of Trends in S. West Virginia Coal Production and Employment, 2004-2006

Year	*Total WV Employment*	South Production	*South Employment*	S. Surface Production	*# Mines*	*Tons/Mine*	*Employment*	*Employ/Mine*
2004	16,403	107,347	12,140	52,497	87	603,414	4,809	55
2005	18,611	111,022	13,982	57,603	90	640,033	5,584	62
2006	20,076	109,976	15,455	61,421	96	639,802	6,247	65
Total Change	3,673	2,629	3,315	8,924	9		1,438	10
Annual Avg.	1,837	1,315	1,658	4,462	5		719	5

Table XVII-B: Annual Production Shift, Employment Method Benefits

Year	New Total	*New North*	*New South*	***Old Total***	*Old North*	*Old South*	Gain/Loss
2001	24,017	6,060	17,957	16,579	3,989	12,590	7,438
2002	22,134	5,497	16,637	16,247	3,770	12,477	5,887
2003	20,615	5,509	15,106	14,905	3,914	10,991	5,710
2004	21,591	6,572	15,019	16,403	4,263	12,140	**5,188**
2005	22,290	7,023	15,267	18,611	4,629	13,982	**3,679**
2006	21,968	7,117	14,851	20,076	4,621	15,455	**1,892**

Aside from the moral reasons for shifting West Virginia coal production away from Mountaintop Removal, and aside from the feasibility of such a shift and the potential employment benefits it could provide, there is one final economic argument for implementing the policy proposed in this study, relating to the price and competitiveness of West Virginia coal.

Price Impacts of the Proposed Production Shift

As Chart 19 shows (copied below from page 44), prices for southern West Virginia coal have recently skyrocketed, nearly doubling in just three years. This study suggests that the price increase serves to support the previous conclusions regarding recent trends in southern underground and surface mine production. Lowered productivity, higher labor demands per mine, and an overall decline in production over recent years have driven up the price of southern West Virginia coal, and this has had the additional effect of reducing West Virginia's competitiveness on the coal market. Increasingly, Eastern states are importing low-sulfur coal from Wyoming's Powder River Basin. In 2006, a ton of Wyoming coal, at the mine, was almost four times cheaper than a ton of southern West Virginia coal. However, Western coal has a lower heat content than Eastern bituminous coal and, thus, more of it needs to be burned per kilowatt-hour generated. The coal also has to be transported by rail from Wyoming, so the price of Wyoming coal by the time it reaches the East Coast is higher than it was at the mine. However, the fact that even West Virginian coal-fired power plants began importing coal from Wyoming in 2003 indicates the impact of West Virginia's coal extraction methods on its competitiveness in the coal market.[67] This has had a direct impact on West Virginia's coal exports, as 2005 was marked by a sharp decline in exports. The percentage of southern coal production that was exported dropped from 73% in 2004 to 61% in 2005 (2006 distribution data is not yet available), while the average price of southern coal increased by $8-per-ton.

In relation to these price and export trends, a recent Reuters article (2007) offered some insight into current conditions in the Eastern coal market, crediting production cuts to a deliberate attempt on the part of coal companies to halt the slide in coal prices by keeping tonnage off the market, thus pushing prices back up.[68] The conclusions that have been drawn from this study's analysis, however, suggest that this is false reasoning. Though this article was published in July of 2007, export and price trends through 2006 could not have changed that much in only seven months. The Reuters article mentions that some mines were closed in order to achieve the production cuts, but data through 2006 show an increase in the number of mines. In any case, the data do not add up to the reasoning provided in the article. Also, coal prices through 2006 were already high, and exports of West Virginia coal had reached a low for the study period.

There are some admissions to be made, however. The article describes "Eastern coal markets" in general, so the assertions that the article puts forth may not directly refer to West Virginia. However, the article prominently mentions Massey Energy and Consol, which are the two largest coal operators in West Virginia. Further, West Virginia is the leading producer of Eastern coal. In that sense, it can be inferred that the Reuters article is focusing on West Virginia's production and stockpiles. A second admission is that this report lacks production, export and price data for 2007, so there is no way to confirm or argue against the claims made in the article. Also, the coal spot market is the primary driver of coal exports, and it changes every week, while this report focuses only on annual trends. The fact remains, though, that prices for West Virginia coal are on the rise, exports are on the decline, and West Virginian power plants are purchasing and burning Wyoming coal. Since it takes coal to move coal, this also stands as a highly inefficient use of our natural resources.

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[67] EIA, *Annual Coal Report,* 2004-2006

[68] Reuters, UK. "It was East versus West this week when America's "Big Four" coal companies announced their second-quarter earnings," July 27, 2007. Online: http://investing.reuters.co.uk/news/

To conclude, in terms of price impacts of the proposed production shift, since over 70% of West Virginia's coal is produced in the South, shifting a significant proportion of southern coal production northward is likely to reduce the average price of West Virginia coal from $47.72 per-ton currently to $27.67 per-ton. For the same reasons that required a mine-category-specific analysis for employment, the new price value was determined using the same method of analysis that was used for the Employment Productivity calculation, meaning that new prices were calculated based on averages for specific time periods (**see Table XVIII**).

Chart 19: Mine Mouth Price and Mine Productivity for S. West Virginia Mines, by Mine Type, 1994-2006

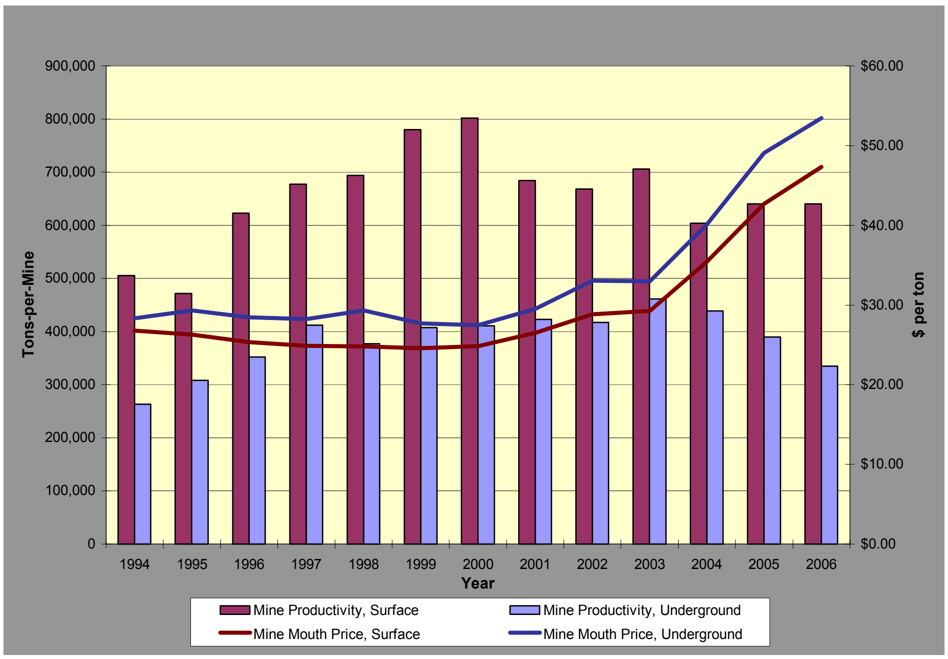

	Table XVIII: Summary Comparison of Pre- and Post-Shift Coal Prices ($/ton), 2001-2006								
	PRE-SHIFT North, by Mine Type				PRE-SHIFT South, by Mine Type				Avg. Price
2001	$22.47	20.2%	$29.86	3.3%	$29.51	41.1%	$26.48	35.4%	**$27.03**
2002	$24.42	19.1%	$27.93	3.6%	$33.03	39.5%	$28.84	37.9%	$29.62
2003	$25.61	21.5%	$26.36	3.5%	$32.96	40.6%	$29.25	34.4%	$29.87
2004	$27.98	24.4%	$31.25	3.1%	$40.13	37.1%	$35.41	35.5%	**$35.22**
2005	$32.52	24.5%	$38.10	3.3%	$49.06	34.8%	$42.66	37.5%	**$42.25**
2006	$35.26	23.7%	$36.95	4.2%	$53.44	31.9%	$47.30	40.3%	**$45.98**
Year	**Underground $/ton**	*% Total Production*	**Surface $/ton**	*% Total Production*	**Underground $/ton**	*% Total Production*	**Surface $/ton**	*% Total Production*	**Avg $/ton**
2001	$27.08	26.9%	$25.84	1.6%	$28.96	54.8%	$25.84	16.8%	$27.88
2002	$27.08	26.2%	$25.84	1.7%	$28.96	54.1%	$25.84	18.0%	$27.85
2003	$27.08	28.4%	$25.84	1.7%	$28.96	53.6%	$25.84	16.3%	$27.86
2004	$27.08	32.4%	$25.84	1.5%	$28.96	49.3%	$25.84	16.8%	$27.78
2005	$27.08	33.3%	$25.84	1.6%	$28.96	47.3%	$25.84	17.8%	$27.73
2006	$27.08	33.6%	$25.84	2.0%	$28.96	45.3%	$25.84	19.1%	**$27.67**
	POST-SHIFT North, by Mine Type				POST-SHIFT South, by Mine Type				Avg. Price

Concluding Comments on the Policy Proposal

In a public response to Judge Chambers' decision in June of 2007, which halted the construction of any new valley fills, effectively bringing a stop to Mountaintop Removal mining, Steve Roberts and Kenneth Purdue invoked the oft-used 'environment versus the economy' rhetoric, stating that "West Virginia's coal industry and its miners are facing a growing barrage of lawsuits and legal maneuvers from activist and environmental groups who seem to have a singular mission of destroying coal mining in our state."[69] The very title of their article, "Singular Mission: Economic Cornerstone of West Virginia Under Attack," suggests that West Virginia's economic development depends on this Singular method of extracting coal. The authors inferred that any action resulting in a restriction on large surface mining operations will inevitably bring the coal industry and West Virginia's economy to its knees: "Without the wages and benefits provided by the state's coal industry, many, many West Virginian's would be out of work and out of luck. The resulting hardship and pain would be felt by everyone in our state," and, "clearly the actions by groups such as [the Ohio Valley Environmental Coalition] are nothing more than an all-out assault on the economic and fiscal well-being of our state." In another article, published a month before Judge Chambers handed down his decision, Robert Workman, a miner who lost his job as a result of the *Bragg* decision in 1999 and was again facing a lay-off as a result of the pending decision, was quoted as saying, "I don't see how people like the anti-mining groups can put a tree or lizard above a man supporting his family."[70]

Responding to these claims, in the same article Dianne Bady of the Ohio Valley Environmental Coalition (OVEC) asserts that "It is not an issue of coal mining. It is an issue of mountaintop removal mining and illegal valley fills, and the permanent and irreversible damage they cause…The miners act as if there is only one set of people being harmed." In the same article, Bady also addresses the economic issue, noting that OVEC is composed of community members living in the coalfields who recognize that southern West Virginia needs jobs and economic development, but that Mountaintop Removal mining is not a logical answer for the economic development problem. "The water at these sites is often poisoned where the mining is done. You can't have economic development on a site where the water is poisonous or has disappeared altogether…We'd be happy to work with others to find out how we can create jobs without blowing up the mountaintop."

These two perspectives illustrate the clash of interests and rhetoric that have characterized the public battle over Mountaintop Removal over the past decade. The quotes by Roberts and Purdue might as well have been quotes from any coal industry official or coal-friendly politician working in West Virginia. The industry claims that MTR is necessary for the survival of West Virginia's economy, for providing jobs, to keep West Virginia competitive with other coal-producing states, and to provide America with cheap electricity. They also are quick to point out that surface mining is much safer than underground mining, which is true. The incidence of injury and fatality is four times higher at underground mines than it is at surface mines.[71] As mentioned by Dianne Bady, though, what the miners and industry fail to publicly recognize is that surface mining merely transfers that extra harm away from the miner and onto the nearby communities, and that the lawsuits are not about pitting environmentalists against the coal industry, they are about protecting the environment for the sake of the communities being affected by its destruction.

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[69] Roberts, Steve, and Purdue, Kenny, "Singular Mission: Economic cornerstone of West Virginia Under Attack," *The Record-Online*, www.wvrecord.com, June 14, 2007.
[70] Ward Jr., Ken, "Miners to Rally over Mountaintop Rulings Made in U.S. Court," *Charleston Gazette*, May 17, 2007.
[71] The data for this was taken from the West Virginia Department of Commerce, Office of Miners' Safety and Health, Online: www.wvminesafety.org/STATS.htm.

It is also true that many West Virginian's depend on surface mining for their income. What is left out of the jobs argument, though, is that the mechanized character of surface mining resulted in a 50% decrease in mining employment between 1990 and 2002. Even with recent rebounds, the total loss still equates to a 30% decline through 2006. Even further, the coal industry must have learned by now that Mountaintop Removal will not be able to proceed unchallenged. If industry officials were truly concerned about the jobs that surface mines provide, they would bring a halt to MTR mines themselves, if only to pre-empt further employment losses stemming from litigation against their preferred mining methods. This is, of course, unless they expect that the Office of Surface Mining and the Bush Administration will continue to bail them out by changing the rules in their favor. If this is the case, then the industry is only setting itself up for an uncertain future.

Unfortunately, this seems to be the case. The research conducted for this report failed to find a single public comment or article suggesting that a shift back to underground mining could provide both environmental and economic benefits. The surprising aspect of this is that even the second-leading coal producer and MTR practitioner in the state, Massey Energy, has publicly stated that it owns enough coal reserves, and possesses the capability, to mine coal by underground methods. Further, surface mining is no longer producing "cheap" coal, and this has impaired West Virginia's competitiveness on the coal market. As previously observed, even coal-fired power plants in West Virginia are now importing coal from Wyoming, when coal is being produced, literally in many cases, right in their own backyard.

These issues can be resolved, however, if only the coal industry were willing to recognize that surface mining and Mountaintop Removal have become an impediment, rather than a catalyst, to coal production in West Virginia. As this study has shown, not only has MTR proven to be a failed source of long-term coal production in West Virginia, but the coal industry has failed in defending the process, and they should be concerned over both of these issues. However, there exists an alternative that will result in net benefits for the coal industry and relieve it of the "growing barrage of lawsuits and legal maneuvers." The policy proposed in this study to shift 75% of MTR production to underground mines will serve to reduce the average price of West Virginia coal, thus allowing coal companies operating in the state to regain their competitiveness on the coal market. The policy also does not result in production cuts, even though there may be some short-term production impacts during the transition process. Further, the policy will allow the industry to avoid future lawsuits related to the environmental and social harms that come from blowing up mountains and filling in valley and headwater streams.

However, the success of the production shift depends on a number of factors. First, the proposed rule change to the stream buffer zone rule must be rejected. If the Office of Surface Mining succeeds in legalizing the destruction of streams by altering the rule, it will undermine the recent Chambers decision, and any future attempts at restricting Mountaintop Removal will be severely hindered. Even if the rule change does pass through committee, the coal industry can hardly expect that it will not be overturned in the near future, or that opponents of MTR will not find another way to challenge the legality of the associated mining process. In any case, it will be hard to convince the coal industry that a shift is immediately necessary if valley fills are legalized through the rule change.

The proposed shift also relies on the implementation of the Clean Air Interstate Rule. As it stands now, certain amendments to the rule are being negotiated. Otherwise known as CAIR, the rule was issued by the Environmental Protection Agency in 2005 and aims at reducing sulfur dioxide and nitrogen oxide emissions in 28 states, including West Virginia, by over 70% below 2003 levels.[72] The first sulfur dioxide phase is set to be implemented in 2010. The requirement in CAIR that is most vital to the success of the proposed production shift is that coal-fired power plants in Eastern states, to which the majority of West Virginian coal is exported, will be required to install particle scrubbing technology as a means of achieving the reductions. This requirement will allow for the northward shift of 11.9 million tons of coal production that would result from the implementation of the policy proposed herein.

The implementation of CAIR will also benefit West Virginia's coal producers. Northern underground mines are much more productive, per mine, than the average southern surface mine. Recent highs in average mine productivity at northern mines will, of course, decline with the opening of less productive mines in order to absorb the production increase. However, even since 1990, northern underground mines have produced an average of 200,000 tons of coal more than southern surface mines have, while producing that coal at an equal or lesser cost-per-ton than surface mined coal. Indeed, with the passage of CAIR, more production than this study proposes may be shifted northward, since regional power plants will once again be able to burn higher-sulfur coal. While the northward production shift will save southern mountains and communities, it will not come without a cost to northern communities, and these concerns are worth addressing.

The first concern is that even with the implementation of CAIR - which will likely result in a smaller-scale, northward production push anyway – if the OSM succeeds in legalizing valley fills, recent trends in northern surface mining suggest that Mountaintop Removal may rise to prominence in the North as well, while continuing as the preferred mining method in the South. Since 1999, northern surface mines have also expanded in size. Reflecting the same characteristics of expansion exhibited at southern surface mines through the 1990s, the number of surface mines in the North has decreased as total production has increased. In addition, the average mine employment has doubled over this time period, suggesting an expansion in mine size. In 2006, there were only 10 surface mines operating in northern counties, but it can be expected that both the number of mines and the average mine size will increase with the implementation of CAIR if the OSM approves the change to the stream buffer zone rule. Should this occur, then a northern shift in production will only result in the expansion of large surface and Mountaintop Removal mining in northern West Virginia. If, then, the production shift as proposed in this study is not combined with an outright ban on Mountaintop Removal, the whole purpose of proposing such a shift will be undermined.

The second concern is that underground mining is not without its own social and environmental short-comings. Acid-Mine Drainage, the release of greater amounts of mercury and particulates (or the disposal of those captured), and the greater dangers to the health and safety of the miners are all issues to be considered in any shift back to underground coal production in West Virginia and elsewhere. In truth, if it were practical, this report would be suggesting a transition away from coal altogether, but the author does not believe that such an opportunity will arise anytime soon; and, until it does, Mountaintop Removal will continue. In light of this, the implementation of the proposed policy will require the subsequent implementation of strict safety and environmental measures for underground mining, measures that are found lacking even today. Further, the

[72] Environmental Protection Agency, Clean Air Interstate Rule, Online: www.epa.gov/cair/index.html

relatively high level of northern underground production that the proposed shift requires suggests that this proposal may result in the peak productive capacity of northern West Virginia's underground mines. If this is indeed true, then this study strongly suggests the implementation of efficiency and conservation measures coupled with a concerted effort to develop alternative and renewable energy sources.

Overall, this study does not fail to recognize that West Virginia depends heavily on coal-related taxes for state revenue. In recognizing these concerns, this study has only proposed a shift in coal-mining, not a reduced level of production. Any losses in tax revenues may be recovered with a re-structuring of the state tax laws according to the proportional shift of production back to underground mines. In any case, the research and analysis in this report have shown that shifting 75% of coal production from large surface and Mountaintop Removal mines back into underground mines, and reducing the size and impact of remaining surface mines, is in all likelihood a viable option for West Virginia's coal industry. In order to minimize any adverse impacts of implementing the proposed transition, adjustments in state budget and tax laws will be necessary.

In support of this proposal, the evidence provided in this study suggests that West Virginia's coal industry is relying on a method of coal mining that has brought it to the brink of a recession. The only thing that seems to be propping up large surface mining operations is that the rise in surface mining, which has driven up the cost of surface mined coal in the past few years, has at the same time resulted in a greater increase in the cost of underground-mined coal; therefore, surface mining and MTR have remained the most 'cost-effective' method of mining coal. However, as the data suggest, these cost increases will soon reach a point where demand for West Virginia coal declines rapidly. According to 2006 export data, this process has already begun, and it will not be long before company and tax revenues are impacted. As this happens, the economic argument for Mountaintop Removal will wear thin.

These recent economic failures are only negatively compounded by the social impacts of MTR. The very fact that miners must make a choice between assisting in the destruction of mountains and nearby communities (even their own) on the one hand, and not being able to feed their families on the other, serves as a sign of an increasingly deleterious economic dependency on coal mining in West Virginia. This dependence is coupled with a lack of alternatives for economic opportunity and development, and while the coal industry has never been known to promote or support economic diversification, they must recognize that Mountaintop Removal destroys the resources that communities will need after the mining is done and the jobs are gone. Robert Workman, in asking how someone could place the interests of a tree over another human being, did not realize that the tree could also be providing him with an alternative or additional source of income.

The associated loss and contamination of natural resources stands as the most negative impact that Mountaintop Removal is having on future economic opportunities for southern West Virginia. In terms of the "jobs versus the environment" argument being waged over MTR, a notable impact of the proposed production shift is that the employment analysis in this study proves, to the coal industry and all of West Virginia, that a shift back to underground mining, relative to current production methods, will provide net benefits for both jobs AND the environment, thus linking these apparently polar opposites. An end to Mountaintop Removal will further develop this fledgling relationship as new industries and jobs can then be created that are based on the preservation of the mountains, rather than on their destruction.

Kayford Mountain, Raleigh County, WV. Photo taken by the author, with the assistance of the kind guidance of Julian Martin of the West Virginia Highlands Conservancy.

IV. Conclusion: Post-MTR Possibilities for Alternative Energy and Economic Development in Southern West Virginia

Overview: Moving Forward

"What a strip-job demonstrate(s), then, is the absence of any ethic or aesthetic. It is a moral failure; it is a failure of the imagination – a failure to understand energy and employment alternatives that would preserve the integrity and beauty of the Appalachian Mountains."
-- Erik Reece, *Lost Mountain*[73]

This study has attempted to present a comprehensive argument in support of an immediate transition away from Mountaintop Removal coal mining. While the focus of the study was on West Virginia, particularly the southern region, the author hopes that the conclusions drawn from the research provoke similar production-based studies in the other states impacted by Mountaintop Removal. In analyzing the economic forces that underlie the expansion of MTR, this study has concluded that those very same forces now support a reverse shift back to underground mining. Further, the research has shown that a production shift in the manner proposed herein is not only practical in terms of productive capability, it is also economically necessary, both for the coal industry and for the communities being impacted by MTR.

West Virginia has been defined by coal, injustice and poverty for long enough; and the level to which rural West Virginia has been sacrificed for the economic growth of the nation, while receiving only environmental devastation and social degradation in return, requires, if only as a matter of ethics, a paradigm shift in West Virginia's model of economic development. As Erik Reece describes it, Mountaintop Removal mining represents a failure of imagination. It is a failure to recognize that the energy production and economic potential of a mountain extends beyond just the coal lying within. It represents the ultimate separation between economics and morality, between profit and aesthetics, and between short-term gain and long-term sustainability. This study has shown that reversing direction can help southern West Virginia to move forward. Only by bringing an end to Mountaintop Removal, thereby preserving the integrity of the mountain ecosystem, can alternative models of development based on economic diversification be pursued, and a self-sustaining economy beneficial to all West Virginians be realized.

One Model for Alternative Development: Wind Power

One opportunity for developing an alternative economic model based on the sustainable use of southern West Virginia's mountains could begin with the development of wind potential where it is available. Unfortunately, many of the mountains exhibiting commercially viable wind speeds are being threatened with MTR. Even without the implementation of the proposed production shift, such mountains should be preserved, if only for their potential to produce sustainable energy. Mike Roth was one of the first to conduct research into the potential for wind power development to replace Mountaintop Removal. In his article, he points out that "the southern Appalachian regions with the highest wind potential usually correspond to those with the greatest variation in topography. It is also the case that these areas are the most likely to be flattened and mined by MTR."[74]

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[73] Reece, 213
[74] Roth, Mike, "Could Wind Power Replace MTR Coal?" *Appalachian Voice*, Online Archive, www.appvoices.org, April, 2002.

Roth's study focused on the economic benefit to coal companies of developing, rather than destroying, Appalachia's wind potential; and he recognized the rapid destruction of valuable wind resources upon which a portion of future energy production and economic development in parts of the region could be based. For their insight and overall relevance to this study, his concluding statements merit a complete recapitulation here:

"Massey Energy and other coal-based companies could increase profits and preserve the Appalachians by choosing not to engage in MTR…If coal-based companies like Massey redefine themselves as producers of wind energy and coal, energy production in the Appalachians can become a mutually beneficial, efficient, community supported endeavor. Over the next ten years, instead of replacing currently forested mountains with a flat, barren landscape, capable of little economic productivity, profitable domestic companies could develop it to perpetually generate 4% of U.S. power from a clean and safe source. If this paradigm shift were to occur, it would ensure that the communities would prosper with new jobs and a healthy environment would be guaranteed to present and future generations."[75]

In West Virginia, there is enough wind blowing across the rugged mountain topography to merit such a paradigm shift. A study conducted by AWS TrueWinds, a nationally prominent wind consulting firm, has identified 3,830 MW of commercially viable industrial-scale wind potential on private lands in West Virginia alone, much of which lies in the southern MTR region. Industrial-scale winds are Class 4 or higher, representing wind speeds exceeding 7.0 meters-per-second. The study also identified an additional 8,500 MW of smaller-scale wind potential that could be developed in the regions where wind speeds only reach Class 2 or 3 designations.[76]

As indicated by studies conducted on the rural economic impact of wind development, the potential for these winds to stimulate economic development in the communities of southern West Virginia is substantial. One such study, conducted by the National Renewable Energy Laboratory, concluded, generally, that "Wind installations create a large direct impact on the economies of rural communities, especially those with few supporting industries," and that "When compared to fossil fuel development, the development of renewable energy creates a larger impact on the economy." Addressing coal mining directly in this respect, the study concludes, "In communities where coal mining is the only large industry, the installation of wind farms would create another industry that then becomes a large part of the local tax base and contributes to local businesses."[77] These findings were re-iterated in another report published by the Appalachian Regional Commission – the agency charged with the planning and funding of development in the Appalachian region.[78] In an interesting complement to the findings in this study, the ARC's study proposed the development of Appalachia's wind potential, in part, due to the fact that Appalachian coal is losing its competitive advantage over Western coal. Coupled with this study's conclusion that preserving southern West Virginia's mountains is possible without impeding total coal production, these studies suggest, for the purpose of promoting development, that an end to Mountaintop Removal makes economic sense. Preliminary research on one mountain in southern West Virginia shows that a production shift combined with wind development would result in greater and more sustainable benefits to local communities than the proposed surface mining would.

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[75] Roth, "Could Wind Power Replace MTR Coal?"
[76] AWS TrueWind Solutions, LLC, "Project Report: Wind Resource Maps of West Virginia," prepared for the West Virginia Development Office and the U.S. Department of Energy. November 7, 2002. The actual conclusions of the study were presented in PowerPoint form to the WVDO. Slides from the presentation were provided for this study by the WVDO.
[77] Pedden, M., National Renewable Energy Laboratory, Economic Impact Studies, "Analysis of Economic Impacts of Wind Applications in Rural Communities." Online: www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs
[78] Appalachian Regional Commission, "Energy Efficiency and Renewable Energy in Appalachia: Policy and Potential, p.12.

Preliminary Case-Study: Coal River Mountain[79]

Coal River Mountain, located in Raleigh County, WV, serves as a prime example of where the proposed production shift and the development of wind power could be combined, thus opening the way for a multiple-use development strategy for local communities. Coal River Mountain lies just to the northeast of Cherry Pond Mountain in Raleigh County, and just to the south of Kayford Mountain, one of the largest contiguous Mountaintop Removal mines in West Virginia. Reflecting Mike Roth's statement that the mountains with the highest wind potential are also the most likely to be mined by MTR methods, these three mountains, along with Beech Ridge in Greenbrier County, pose the greatest potential for wind development outside of state and national parks in southern West Virginia. Kayford is long lost for wind development due to MTR, much of the potential for Cherry Pond has been leveled, and there are currently three large surface mine permits either pending or approved for Coal River Mountain, all of which have been stalled due to Judge Chambers' decision against valley fill permits in June of 2007. Because of this, it is vital to convince the West Virginia Department of Environmental Protection that the best option for Coal River Mountain and Raleigh County would be to reject the proposed surface mining and to support the development of wind power. The following analysis will show that the combination of underground mining and wind development offers greater benefits for energy production and employment than the proposed surface mining does. Only basic information concerning production, employment and energy potentials will be presented for each energy source before the analysis.

Proposed Surface Mining

Currently there are three surface mines proposed for Coal River Mountain (CRM) that are either approved, pending, or still in the process of drafting the permit. These are named Bee Tree (permit #: S-3010-04), Eagle II (S-3028-05) and Eagle III (unavailable). Together they comprise one large Mountaintop Removal mine covering 5,782 acres (9 square miles) of Coal River Mountain, most of which is covered with native hardwood forest. Bee Tree has been permitted for 1,252 acres, Eagle II for 2,040 acres, and Eagle III for 2,490 acres. The permits for Bee Tree and Eagle II show that every headwater stream coming off of Coal River Mountain will be filled with mining waste, for a total of 19 valley fills (6 each for Bee Tree and Eagle II, 7 for Eagle III). In total, the three mines will produce nearly 51 million tons of coal (**see Table XIX**). The expected life-span of each mine was determined by dividing the reported estimates for total production by the estimated annual production for each mine.[80] Doing so results in a 7-year period of operation for the Bee Tree mine, a period of 13 years for Eagle II, and of 10 years for Eagle III, with each successive mine commencing operations a year after the previous mine.

Table XIX: Coal River Mountain Permit Data

Mine Name	Acres (total)	Est.'d Annual Production (tons)	Est.'d Total Production (tons)	Production (tons)/acre	# Years of Operation
Bee Tree	1,252	1,550,000	10,917,636	8,720	7
Eagle II	2,040	1,391,396	18,088,151	8,910	13
Eagle III	2,490	2,231,589	21,950,067	8,815	10
CRM - Totals	**5,782**	**5,172,985**	**50,955,854**	**26,446**	

[79] All information on the mining permits and associated underground mines was gathered from copies of the Bee Tree and Eagle II permits obtained directly from the Oak Hill office of the DEP. Production data is in Section M, page 1 of the permits.
[80] Eagle III production estimates were extrapolated from averages of the estimates reported in the permits for Bee Tree and Eagle II, based on estimated production-per-acre. Acreage information available in the Bee Tree permit was found in Section C, page 9.

The coal produced at these mines will generate nearly 127 million Megawatt-hours of available electricity over the life of the mines.[81] At peak production, when all three mines are producing coal, they will feed the annual generation of 8.7 million MWh. For the purposes of analysis, since underground mine information is only available for the BeeTree and Eagle II mines, it is necessary to note that for these two mines alone, total electricity generation will amount to 95.5 million MWh, and for the 6 years that both are producing coal, annual generation potential will equal 7.1 million MWh. In all, only 5.86% of the potential electricity generation from Coal River Mountain surface mines would be consumed by, and therefore mined for the direct benefit of, West Virginians. An average of 71% of the coal produced will be exported. Only 17.6% will be used for electricity generation at West Virginia's power plants. And of all electricity generated at West Virginia plants, only 33% is actually consumed by West Virginian residents and businesses.

As for employment, based on 2006 EIA average surface mine employment data, each of these mines is expected to employ 65 workers. Using this estimate, for the span of 5 years when all three mines are operating, total Coal River Mountain surface mine employment will total 195. In terms of total direct job-years created,[82] the three operations will create a total of 1,950 job-years.

Coal River Mountain Underground Mines

Each surface mine permit outlines which underground mines operating in the area will be impacted by the proposed surface mining. According to the Bee Tree and Eagle II permits, there are seven open and four active underground mines that will be assimilated into the Coal River Mountain surface mines.[83] These are: White Queen (MSHA ID#: 4608297), Marsh Fork (4608551), Horse Creek Eagle (4609091), and Slip Ridge Cedar Grove (4609048).[84] As the proposed surface mines, each of the four underground mines is operated by a subsidiary of Massey Energy. What that means is that Massey is proposing to surface mine Coal River Mountain in order to extract the coal from three mines that it is currently extracting from four to seven mines.

The four active underground mines produced 2.44 million tons in 2006 and employed a total of 210 miners. Per mine, the four mines averaged 660,000 tons of production and employed an average of 52.5 miners. Three of the four mines produced at productivity levels over twice that of the average southern underground mine in 2006. In essence, these are highly productive mines. Further, the average underground mine productivity for all four mines even exceeds the 2006 productivity of southern surface mines (640,000 tons-per-mine) by 20,000 tons-per-mine. Over the expected life-span of the proposed surface mines, these underground mines would produce 37.1 million tons, compared to the 51.3 million tons estimated for the three surface mines. As for electricity generation, the coal produced at the four underground mines will generate a total of 5.8 million MWh annually, for a total of 87.1 million MWh over the expected life of surface mining (**see Table XX for production, employment and generation estimates for CRM underground mines**).

[81] Calculated based on 2006 average heat content of 2400.16 net kWh per ton burned at West Virginia power plants.
[82] One job-year is equal to one employee working for one year, or two employees working for six months each, etc.
[83] It should be noted that neither of the permits uses the term "Mountaintop Removal mine" to describe the type of mining that will take place. Instead they use the newer combination of "Area Mine with Peak Point Reduction." These are the same as MTR mines.
[84] Production Data for the underground mines was obtained from the Mining, Safety and Health Administration (MSHA). Online data search engine at: http://www.msha.gov/drs/drshome.htm#MID. The MSHA ID numbers were discovered by cross-referencing mine data from MSHA and the WVDEP. The permit #'s for each mine were obtained from information in the surface mine permits for BeeTree and Eagle II, Section N, page 15.

Table XX: Estimates for Coal River Mountain Underground Mines						
Mine Name	Est.'d Annual Production (tons)	Est.'d Total Production (tons)	Employment Annual	Employment Total (job-years)	Elect. Gen. Annual (MWh)	Elect. Gen. Total (MWh)
White Queen	354,043	4,956,602	36	504	849,760	11,896,638
Marsh Fork	650,386	9,105,404	56	784	1,561,030	21,854,426
Cedar Grove	588,474	8,238,636	40	560	1,412,432	19,774,045
Horse Creek	809,064	11,326,896	78	1,092	1,941,883	27,186,363
CRM - Totals	**2,401,967**	**33,627,538**	**210**	**2,940**	**5,765,105**	**80,711,472**

Production Shift Policy Analysis for Coal River Mountain

Using only production estimates for the Bee Tree and Eagle II mines, the four underground mines, producing 2.40 million tons per year (2.44 in 2006), will be only slightly less productive than the two surface mines producing 2.94 million tons per year. **This means, for the ten years of surface mine operation for BeeTree and Eagle II, that underground mining operations that will be impacted by these two surface mines have the potential to account for 82% of annual surface mine production on Coal River Mountain. Therefore, based on available permit data, for Coal River Mountain, at least, the 75/25 production shift policy is a feasible option.** Compared to the estimated annual production of all three proposed surface mines, the four underground mines have the potential to produce 47% of the annual and 65.1% of the total estimated production of the proposed surface mines. However, such an analysis is incomplete without underground mine information for Eagle III. Electricity generation potentials will compare at the same proportions as production does.

In terms of employment, the four underground mines will employ 210 miners, whereas the two surface mines will only employ 130 miners, in total. Even compared to all three mines, underground mines would employ 15 more total miners than the surface mines would. (**Table XXI compares the production, employment and generation potential for Coal River Mountain underground and surface mines**).

In light of these results, a shift in production from surface to underground mining works for Coal River Mountain. Even if contour mining were to continue on the sides of the mountain along the Bee Tree and Eagle II permits, it would only have to cover the remaining 10-17% of production lost by foregoing surface mining. On the other hand, with the implementation of the Clean Air Interstate Rule, the lost production could be made up at another underground mine in northern West Virginia. **In any case, this analysis proves, at least for two of the proposed surface permits, that the 75/25 production shift policy stands as a viable alternative, in terms of both production and employment, to the devastation of Coal River Mountain by Mountaintop Removal**. Perhaps most importantly, implementing the shift on Coal River Mountain will preserve the vast amount of wind potential that Coal River Mountain has been shown to exhibit, while allowing for other uses of the mountain as well.

Table XXI: Comparison of Underground and Surface Mining for Coal River Mountain						
Mine Type	Est.'d Annual Production (tons)	Est.'d Total Production (tons)	Employment Annual	Employment Total (job-years)	Elect. Gen. Annual (MWh)	Elect. Gen. Total (MWh)
CRM Under - 10 yrs.	2,401,967	24,019,670	210	2940	5,765,105	57,651,051
BeeTree and Eagle II	2,941,396	29,005,787	130	1365	7,059,821	69,618,530
% BeeTree/Eagle II	**81.66%**	**82.81%**			**81.66%**	**115.93%**
CRM Under - 14 yrs.	2,401,967	33,627,538	210	2940	5,765,105	80,711,472
CRM – All Surface	5,166,206	51,253,887	195	1950	12,399,721	123,017,529
% All CRM Surface	**46.49%**	**65.61%**			**46.49%**	**65.61%**

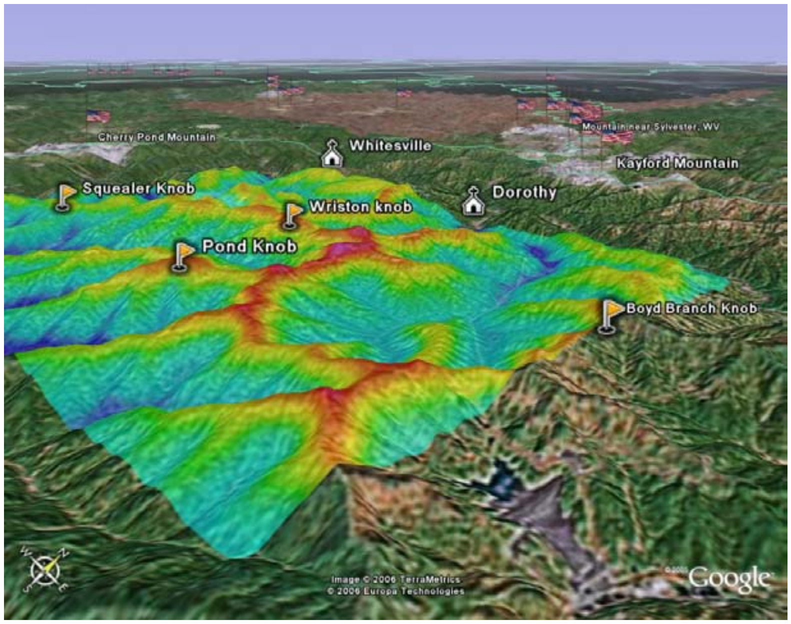
Coal River Mountain Wind Potential

Coal River Mountain stands as a prime location for the development of an industrial-scale wind farm. A Coal River Mountain Wind Farm would provide sustainable energy production for Raleigh County and West Virginia, and would serve as a source of long-term employment opportunities for the communities of the Coal River Valley. There exists great wind power potential along the ridges, as average annual wind speeds exceed even Class 7 designations (8.8 meters-per-second or greater), which is the highest designation for wind speed (**See Graphic 4**). The wind farm model presented in this study consists of 220, Vestas V80/1.8MW wind turbines, resulting in a faceplate generating capacity of 396MW, which far exceeds both the Mountaineer Wind Farm in Tucker County (66MW) and the Beech Ridge project proposed for Greenbrier County (200MW). Such a project would have the potential to produce 1,200,260,160 kWh per year. Mining on these sites, as currently proposed, would reduce the ridge elevation of the majority of the ridges targeted in this study for wind power development. This would cause a reduction of the average annual wind speeds along the ridges, and so would forever render a Coal River Mountain Wind Farm commercially unviable. (**See Graphics 5 and 6 for depictions of the wind farm and proposed mining**)

The model wind farm was created utilizing both ArcGIS software and wind maps provided by the respected wind consulting firm, WindLogics. Appalachian Voices and the author of this report were able to construct a computerized model of a wind farm on Coal River Mountain by placing digital "turbines" into ArcGIS, and then into Google Earth, and spacing them a minimum of three rotor diameters apart (equating to approximately 0.14 miles between turbines). By correlating the points representing turbines in this computerized model with the same points in the WindLogics software, we were able to determine how many turbines fit into each wind class. Of the 220 turbines that we found would fit on the ridges, 96 would be sited where there exist Class 4 average winds (7.0-7.5 m/s), 70 turbines would be sited in Class 5 winds (7.5-8.0 m/s), 53 in Class 6 winds (8.0-8.8 m/s), and 1 turbine in Class 7 winds (> 8.8 m/s). See the chart below for a summary:

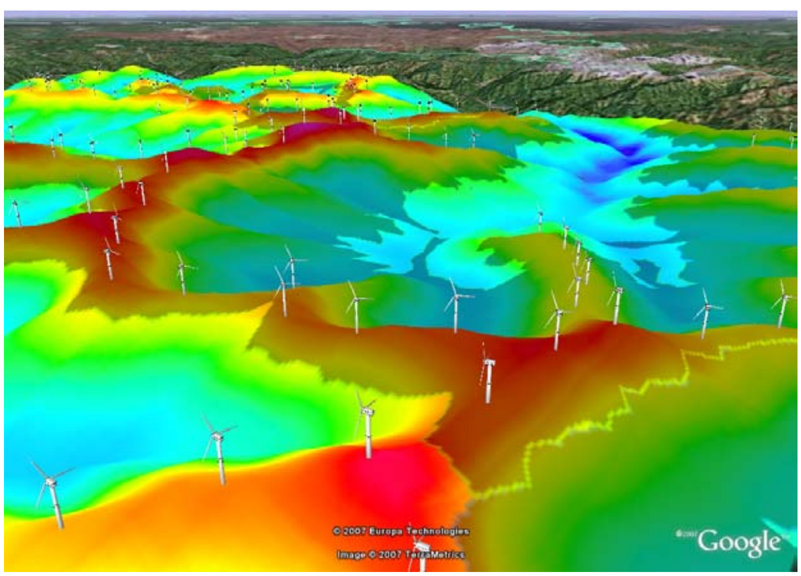
Table XXII: # Wind Turbines per Wind Class, CRM Wind				
	Class 4	**Class 5**	**Class 6**	**Class 7**
Wind Speed	7.0-7.5 m/s	7.5-8.0 m/s	8.0-8.0 m/s	> 8.8 m/s
# Turbines	96	70	53	1

Graphic 4: Wind Potential for Coal River Mountain, and a View of Surrounding MTR[85]



Coal River Mountain Wind Potential. Cherry Pond Mountain and mining can be seen in the distance on the left, and the extensive mining on Kayford Mountain is visible in the distant right, which is to the North of Coal River Mtn.

Graphic 5: Coal River Mountain Wind Potential and Turbines with Surface Mine Boundary



***Coal River Mountain Wind Farm with Vestas 1.8MW turbines, WindLogics wind map, and overlay of proposed Eagle II and Eagle III mines (shaded areas). Yellow represents commercially viable Class 4 winds, while orange, red and purple represent the higher Class 5, 6 and 7 winds, respectively. This image shows how proposed strip-mining will affect wind potentials on Coal River Mountain.*

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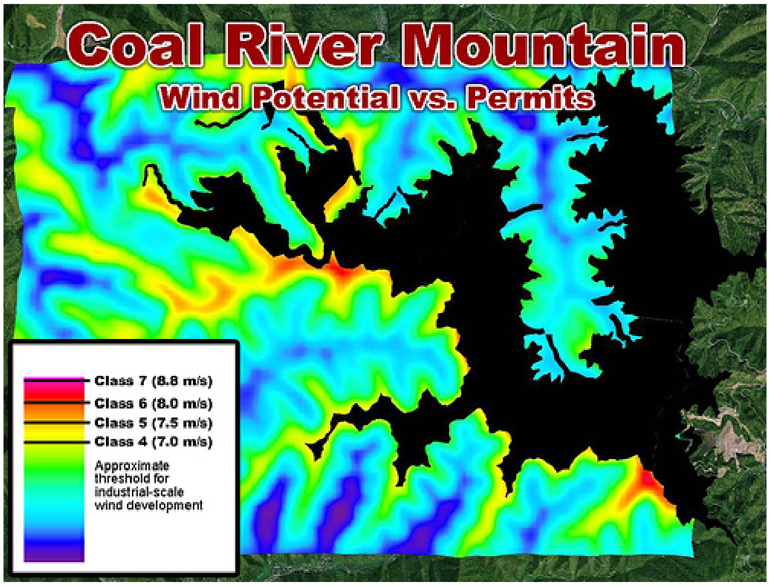
85 The wind map in this image was provided by a second WindLogics study, "Coal River Mountain Area, Regional Prospecting Analysis," August 30, 2006. The construction of the map composition was conducted by Appalachian Voices.

Graphic 6: Overlay of Coal River Mountain MTR boundaries over CRM Wind Potential



The area in black shows a composite of the three surface mining operations planned for Coal River Mountain. As the image shows, nearly 75% of the land exhibiting commercially viable wind potential (Class 4 and higher) will be lost due to surface mining, including most of the Class 6 and 7 sites.

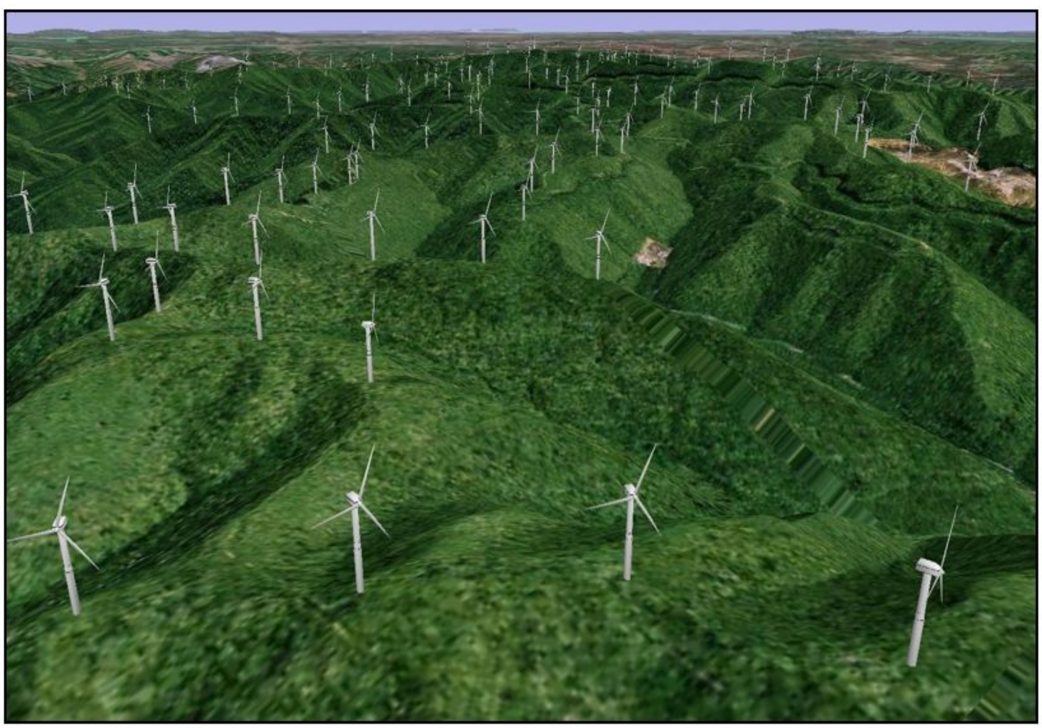
Almost the entire ridgeline along Coal River Mountain exhibits economically viable wind suitable for development. The initial wind study for the mountain also determined that a wind farm on the mountain would employ 133 workers during the initial one to two-year construction phase, and would employ 50 workers on a permanent basis for operations and maintenance purposes. In addition, the coal seams running under the mountain are, for the most part, numerous and thick. In this sense, this site offers one of the last remaining opportunities in southern West Virginia for combining underground coal mining with the development of a large, industrial-scale wind farm. The Mountaintop Removal operations planned for Coal River Mountain will produce coal for a total of only fourteen years, providing for only fourteen years worth of electricity, while resulting in the loss of vast wind resources that could provide clean energy indefinitely. In comparison, potential wind power could be coupled with the four highly productive underground mining operations, the sustainable harvesting of valuable forest products, the production of hydropower, and tourism.

In this sense, Coal River Mountain stands as a symbolic site, as an indicator of whether there is hope for the development of alternative options in southern West Virginia. On the one hand, should mining proceed as planned, it would represent the reckless destruction of a mountain that offers some of the greatest potential in all of southern West Virginia for the sustainable development of valuable energy and economic resources. These resources could provide local communities and Raleigh County with a source of development and revenue for far into the future. The other option, to forego the surface mining and continue with existing underground operations, would preserve the mountain for the formation of a diversified economy based on wind development and the creation of localized, resource-based industries. Should this option emerge victorious out of the dust of current legal battles, or out of a production shift such as the one proposed in this study, Coal River Mountain would become a shining example of how southern West Virginia communities can benefit from an end to Mountaintop Removal (**see Graphics 7 and 8 for a depiction of the two options for CRM**).

Graphic 7: Post-Mountaintop Removal, Coal River Mountain and Surrounding MTR Sites

The future of Coal River Mountain as envisioned by the coal companies. The land disturbance shown on Coal River Mountain is a simulation based on the proposed boundaries of the three permits.

Graphic 8: Coal River Mountain 396 MW Wind Farm Composed of 220 Turbines, Mountain Intact



Google Earth image of CRM as it would appear with the full development if its wind resources.

Concluding Comments

Coal River Mountain stands as just one example of the potential for West Virginia to move forward by taking a huge step back. For nearly two decades now, Mountaintop Removal has imposed a scale of destruction on the landscape of Central Appalachia far greater than anyone present at the drafting of the Surface Mining Control Act in 1977 could have expected. This method of mining has devastated the mountain ecosystems and, in doing so, has devastated the communities of southern West Virginia and elsewhere in the Mountaintop Removal region. For the inhabitants of these areas, the access even to the basic human need of clean water is being diminished on a daily basis. Nowhere in the United States is there a more drastic example of how unequal the distribution of the costs, and supposed benefits, of an ever-expanding economy can be. Beyond theories of a culture of poverty, of fatalism, of backwardness or passivism, what is happening in the Central Appalachian Mountains is the pure sacrifice of a land and people for the short-term benefit of outsiders. No one in the affluent population of the United States would just stand by while their homes were destroyed, or while their water was poisoned, but very few of them are standing up to say that it is wrong for such things to happen to another.

The people in Appalachia deserve more of an opportunity to live in the manner they choose, without having the very resources that have allowed them to survive in an oppressive coal economy for generations just ripped out from above them and dumped on their heads and into the bodies of their children. Julian Martin, a life long Mountaineer who has fought against the destruction of his homeland for decades, is just one of many who will guide visitors up what is left of Kayford Mountain, past the massive Cabin Creek valley fill to Larry Gibson's place, walk them through a thin section of beautiful hardwood forest, and out onto a cliff that used to be the top of the mountain. Here, he tells the visitor, "Welcome to Hell." One look at the devastation to the landscape, or one night spent listening to stories of massive floods or having to bathe children in contaminated waters, is all it takes to understand how deeply that sentiment is shared among those living in the shadow of Mountaintop Removal. In only two decades, the mountains and residents have gone from "Almost Heaven" to "Almost Hell."

There must be an alternative to this. This report has attempted to offer the argument that a reverse shift in production is a necessary and practical first step toward the enablement of an alternative model of economic development for the rural communities of southern West Virginia. Any policy such as the one proposed herein must be enhanced with other policies promoting the restoration of the land to a condition that will once again support life and that will result in an accelerated transition from a coal mono-economy to an integrated model of development that thrives on the sustainable and multiple use of the land. The production shift away from Mountaintop Removal this study proposes is just one step of many toward achieving this goal, but it has to be the first step. Only from there can Appalachia move forward, and West Virginia can get back to being "Almost Heaven" for those living among the mountains.

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