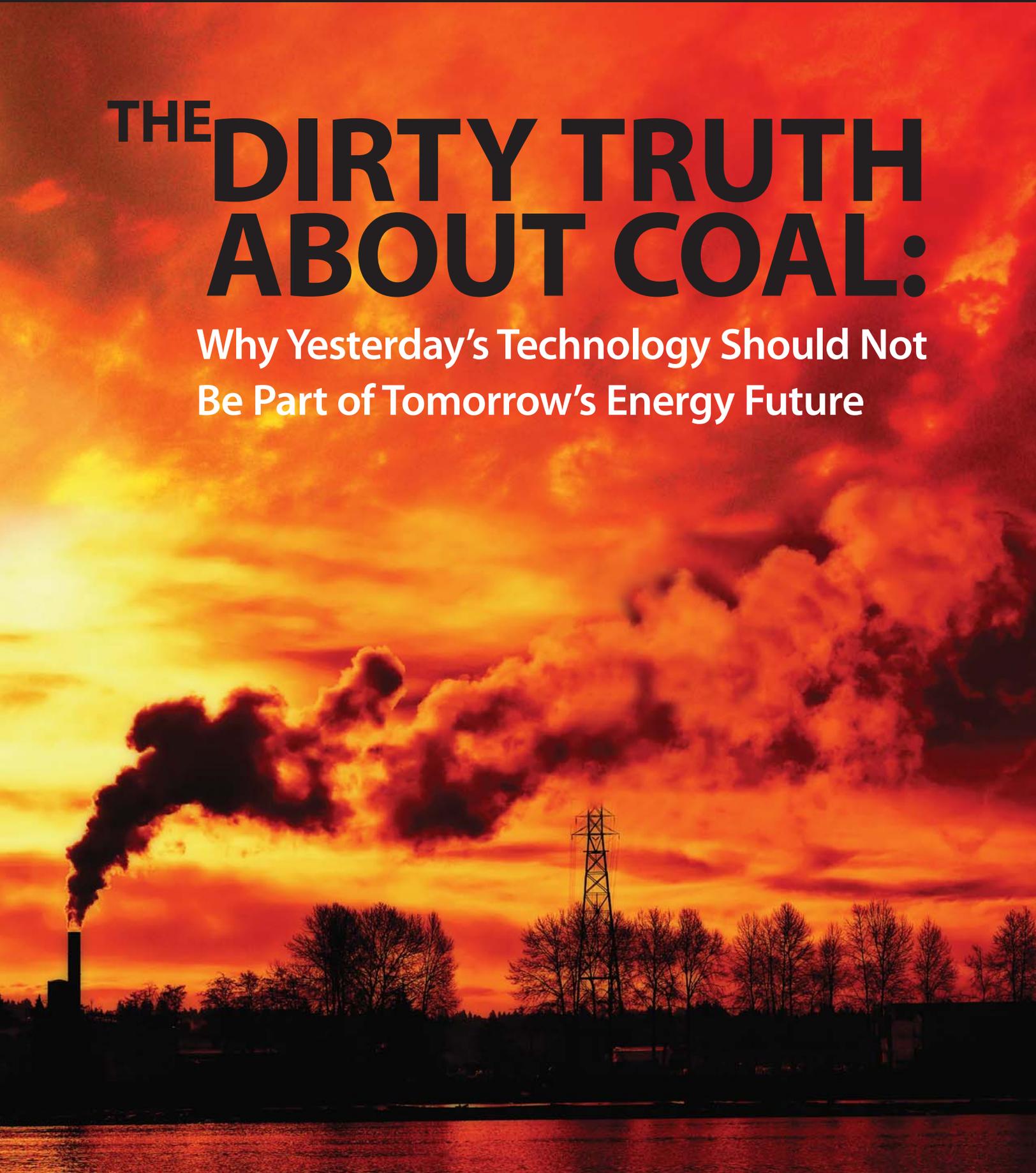




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THE DIRTY TRUTH ABOUT COAL:

Why Yesterday's Technology Should Not Be Part of Tomorrow's Energy Future



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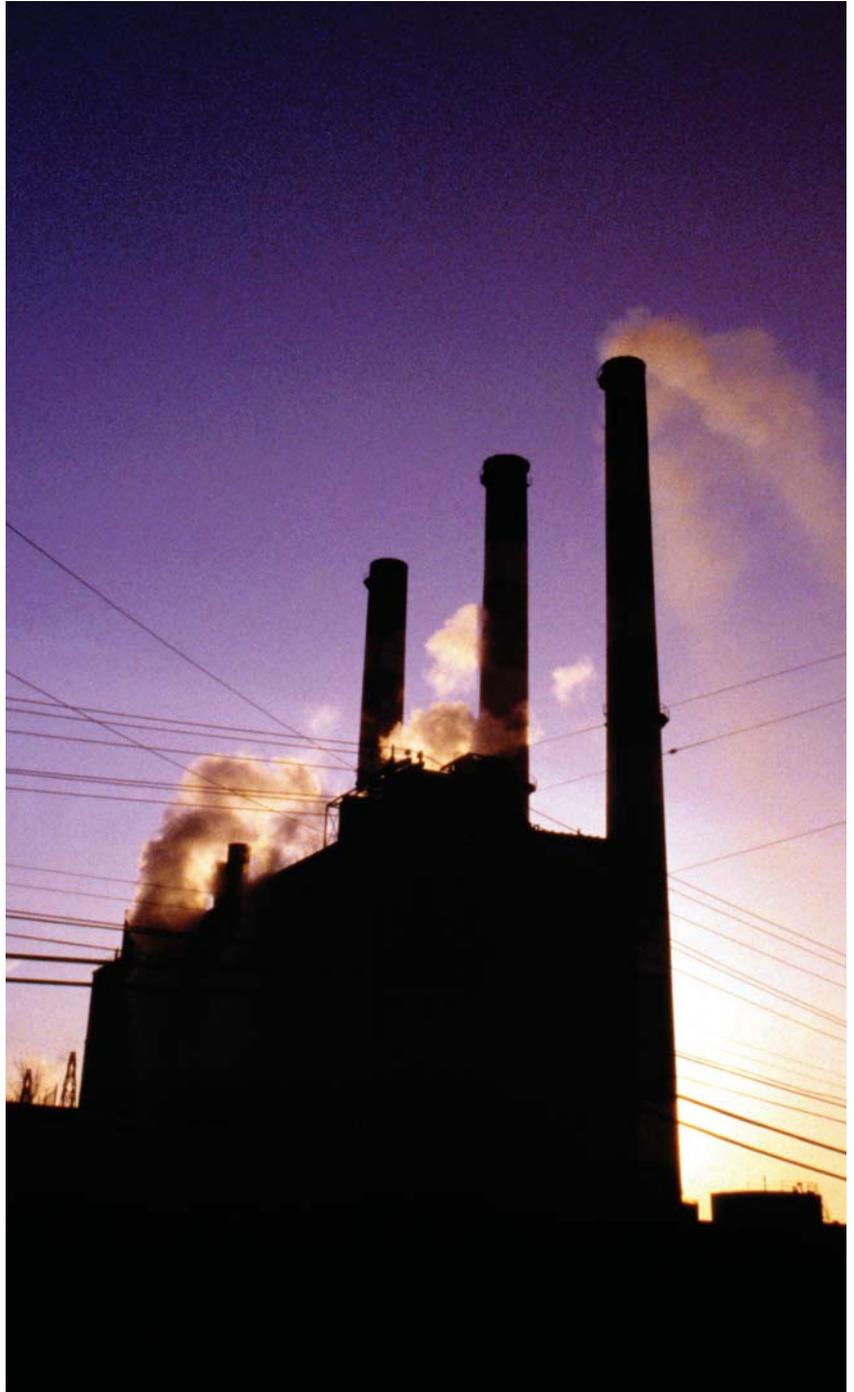
Why Yesterday's Technology Should Not Be Part of Tomorrow's Energy Future

INTRODUCTION

It was more than 100 years ago on the shores of the lower East River in New York City that Thomas Edison opened the Pearl Street Station, the first centralized coal-fired power plant to come on line. Although this new plant served just a few blocks, Edison had jumpstarted a new industry and set off a wave of power plant building across America. From that moment on, burning coal fueled our Industrial Revolution and forever changed the landscape of energy production.

Today, 125 years later, coal continues to play a huge role in fueling America. Coal-fired power plants produce about half of our nation's electricity,¹ and in 2006 a record 1.161 billion tons of coal was mined, most of which went directly to electricity generation.² Unfortunately, coal is also one of the most polluting sources of energy available, jeopardizing our health and our environment.

Long known as a major source of air pollution, coal-fired power plants are also major contributors to global warming, accounting for almost 40 percent of our nation's carbon dioxide pollution (CO₂), the prime global warming pollutant.³ But the truth is that the pollution created by generating electricity from coal does not start or stop at the power plant. It stretches all the way from the coal mine to long after coal is burned and the electricity has been used in our homes and businesses. Mining and burning coal scars lungs, tears up the land, pollutes water, devastates communities, and makes global warming worse.





Many of these environmental and societal consequences have devastating characteristics that may never be remedied. Consider these numbers:

260 million	Gallons of water used for coal mining in the U.S. every day
120 million	Tons of solid wastes produced every year by burning coal
90 million	Gallons of waste slurry produced every year while preparing coal to be burned
21 million	People in the U.S. who live within five miles of a coal-fired power plant
12 million	Gallons of water used per hour at an average coal-fired power plant
12,000	Miners who died from black lung disease between 1992 and 2002
1,200+	Miles of streams that have been buried or polluted in Appalachia because of mountaintop removal mining
47	U.S. states and territories with mercury fish consumption advisories for at least some of their waters
150+	New coal-fired power plants proposed for the U.S.
55	Percent decrease in number of coal miners employed from 1985–2000
22	Percent increase in coal mining production from 1985–2005

Unfortunately, the list is much longer. As this report documents, our current use of coal is neither sustainable nor cheap. Claims of “clean coal” and “carbon free” coal are misleading, serving more as a marketing tool than as an honest change in dirty practices.

The good news is that we do not have to continue making these sacrifices in the name of meeting our energy needs. We can reduce our dependence on coal by increasing efficiency and relying more on clean energy power, and we can minimize the damage coal causes by ensuring it is mined responsibly,

burned cleanly, and does not take us backward on global warming.

As we choose our energy future, we need to make sure that we consider the full impact of each decision. When it comes to coal, that means considering all of the damages incurred by our society and our environment. We must shift from the polluting fossil fuels of the past to new sources of energy like clean fuels and energy efficiency that will meet our energy needs and save us money, cut pollution, improve public health, employ new technologies, create new industries and jobs, and put us on a path that will stabilize our climate.

MINING: FROM GROUND TO TRAIN

The first stage in the dirty life cycle of coal begins when it is mined irresponsibly from the earth. Beyond the damage to our lands, water, and air, coal mining also jeopardizes the health and safety of workers and nearby communities. Unfortunately, these costs of coal are only one part of a larger story.

Coal is mined from the earth by one of two mining techniques. Surface mining, which is used for coal that is relatively near the surface of the ground, involves scraping away earth and rocks to access coal seams buried below. Underground mining is used for coal that is buried deep in the earth, and usually involves a system of tunnels and enormous underground rooms. About two-thirds of U.S. coal is from surface mining, while the other third comes from underground mining.⁴

Coal mining can cause irreparable harm to the natural landscape, both during mining and after. Trees, plants, and topsoil are cleared from the mining area, destroying forests and wildlife habitat, encouraging soil erosion and floods, and stirring up dust pollution

that can cause respiratory problems in local communities. In mountaintop removal mining, a coal company literally blasts apart the tops of mountains to reach thin seams of coal buried below. Underground mining, including an intensive method known as longwall mining, leaves behind empty underground spaces which can collapse and cause the land above to sink. Known as subsidence, this process can cause serious structural damage to homes, buildings, and roads when the land collapses beneath them.⁵ It can also lower the water table and change the flow of groundwater and streams. Like mountaintop removal, longwall mining has become increasingly popular because of low costs and high yields, and in spite of growing environmental destruction.⁶



Ernie Sistek/ Kennametal



Mark Schmerling

MOUNTAINTOP REMOVAL MINING DESTROYS APPALACHIA

One of the most devastating types of coal mining is known as mountaintop removal mining, a technique common in Appalachia. Mining companies literally blow the tops off mountains to reach thin seams of coal and then, to minimize waste disposal costs, dump millions of tons of waste rock into the valleys and streams below, causing permanent damage to the ecosystem and landscape. This destructive practice has damaged or destroyed approximately 1,200 miles of streams, disrupted drinking water supplies, flooded communities, eliminated forests, and destroyed wildlife habitat.⁷ Coal companies have created at least 6,800 fills to hold their mining wastes, and the government estimates that if this mining continues unabated in Appalachia it will destroy 1.4 million acres of land by 2020—the date when the coal is expected to run out.⁸

Beyond these environmental concerns, mountaintop removal mining poses other dangers to local communities as well. One stunning example is Sundial, West Virginia, where Marsh Fork Elementary School lies a mere 400 yards downhill from a massive coal waste impoundment containing 2.8 billion gallons of toxic sludge.⁹ The state acknowledges the facility would likely cause deaths if it fails,¹⁰ and estimates students and teachers would have only about three minutes to escape if a breach occurred.¹¹ Alarming, almost a third of impoundments in the state built since 1972 have ruptured, spilling more than 170 million gallons of sludge.¹² Even worse is the track record of the parent company, Massey Energy, which owns the impoundment; it is responsible for over half of the state's spills. Impoundment dam breaks have caused widespread devastation in West



Mark Schmerling

Virginia before, like the Buffalo Creek disaster that killed 125 people and left thousands more homeless.¹³

Central Appalachia is home to some of the poorest counties in the nation.¹⁴ Interestingly, while mining production rose in West Virginia 32 percent over a ten-year period, the number of mining jobs dropped by 29 percent because mountaintop removal mining relies on machinery and explosives rather than experienced miners.¹⁵ Mountaintop removal mining has also caused the value of some homes to drop 90 percent, and is responsible for cracking the foundations and walls of nearby houses.¹⁶ This mining also jeopardizes the much needed income brought into the region from tourism. Mountaintop removal mining is simply the most destructive—and irresponsible—mining technique used today.



Marsh Fork Elementary School, shown to the right of the silo pictured above, lies only 400 yards downhill from a coal waste impoundment.

Vivian Stockman / www.ohvec.org. Flyover courtesy SouthWings

Coal mining is frequently associated with water pollution, including acid mine drainage. One source of acid drainage is from gobbs, or piles of waste coal and other rocks that are cast aside during mining.¹⁷ Another more common source of mine drainage is abandoned mines that fill with water that becomes acidic and mixes with heavy metals and minerals.¹⁸ When this toxic water leaks out, it combines with groundwater and streams, causing water pollution and damaging soils. Acid mine drainage can harm plants, animals, and humans. For example, in Pennsylvania alone acid mine drainage has polluted more than 3,000 miles of streams and ground waters, which affects all four major river basins in the state.¹⁹ The toxic pollution has even led to places termed “no fish,” or streams where fish cannot survive because the water is so polluted. Acid mine drainage has also been a problem for the past two decades in western Maryland, where officials have documented 342 leaks of toxic water and where a new discharge killed all of the fish in the Georges Creek in 2006.²⁰

Coal preparation, or “washing,” is another source of water pollution. Coal preparation uses large quantities of water and chemicals to separate impurities from mined coal to make it easier to burn. Using anywhere from 20 to 40 gallons of water per ton of coal,²¹



Vivian Stockman / www.ohvec.org

coal washing separates out non-combustible components, which can be up to 50 percent of what is processed, and typically washes them away in a sludge known as slurry.²² Up to 90 million gallons of slurry are produced every year in the U.S.²³ Coal slurry is stored in large waste pits known as impoundments that hold millions of gallons of coal mining wastes. Some of the risks involved with impoundments include seepage into local water supplies and impoundment breaks that can send wastes barreling down mudflows, destroying property and lives in its path. One such incident happened in 2000, when a 72-acre impoundment in Martin County, KY breached, killing fish and aquatic life in the Big Sandy River and disrupting public drinking water supplies.²⁴ All told, the spill dumped 250 million gallons of water and 31 million gallons of coal wastes into the local watershed—over twenty times the amount of oil spilled when the Exxon Valdez ran aground.²⁵



Other types of pollution are also caused by coal mining, including different types of air pollution. Explosives used during underground and surface mining release carbon monoxide pollution, a health threat for workers.²⁶ Coal mining and coal washing both stir up small dust and coal particles, which combine with other chemicals in the air and can cause serious and potentially fatal respiratory problems like black lung.²⁷ Harmful air pollution is also

released when coal is transported. About 75 percent of all coal shipments in the U.S. are made via railroads,²⁸ which are one of the nation’s largest sources of soot and smog pollution.²⁹ Both soot and smog can cause health problems, including respiratory problems

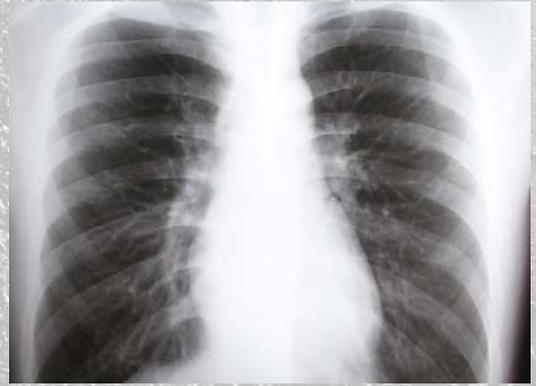
and increased risk of asthma attacks.³⁰ Coal-laden railcars also cause soot pollution when coal dust blows off into the surrounding air, a substantial problem considering that a typical coal plant requires 40 railcars per day to deliver the 1.4 million tons of coal needed each year.³¹ The problem of blowing coal dust from trains and trucks is clearly seen in some communities where residents routinely wipe thick layers of coal dust off their houses.³²



BLACK LUNG PUTS COAL MINERS AT RISK

Black lung is a group of respiratory diseases in coal miners that can cause serious lung disease and death.³³ Known technically as pneumoconiosis or silicosis, black lung is caused by repeated exposure to coal dust and other small particles stirred up during coal mining. Symptoms include coughing, spitting up black material, shortness of breath, and eventual hardening and scarring of the lungs. Although some of the symptoms can be alleviated, there is no known cure for black lung and no reversal of the symptoms.

The Centers for Disease Control (CDC) estimate that about 12,000 miners died from black lung in the U.S. in the ten-year period ending in 2002,³⁴ while other estimates put the toll at about 1,500 per year.³⁵ There is a strong correlation between length of exposure (years in the mine) and prevalence of black lung, with about eight percent of long-term workers affected by the disease.³⁶ Although the prevalence of black lung has decreased since federal mining legislation



was passed in 1969, a report released in August 2006 by the CDC showed a new resurgence of the disease, with many miners aged 30–60 developing a progressive form of the disease at a much higher rate than expected.³⁷ Mining regulations require that coal mining dust exposure be limited, but evidence suggests that these tests are faulty and sometimes even falsified.³⁸

Beyond conventional air pollution, coal mining is also a source of global warming pollution. Methane, a global warming gas more than 20 times as potent as carbon dioxide, is found trapped around seams of coal.³⁹ It is released from the surrounding rocks when coal is mined, as well as during coal washing and transportation. Coal mining releases about 26 percent of all energy-related methane emissions in the U.S. each year.⁴⁰

In addition to pollution and public health issues, coal mining can affect local communities and families in other ways, too. For example, coal mining can destroy sources of local revenue, including losses from tourism and recreation, such as the estimated \$67 million lost annually in Pennsylvania from sport fishing because of streams too polluted from acid mine drainage.⁴¹ Coal mining can also damage homes and decrease property value, making it hard for people to sell their houses and move. For people who remain, coal mining becomes a threat to local water supplies since it uses up to 260 million gallons of water per day.⁴² Finally, every year dozens of people are seriously injured or killed near coal mines, including drowning and falling into mine shafts.⁴³

Contrary to many claims, coal mining has been a decreasing source of jobs over the last two decades

and is still considered to be one of the most dangerous jobs in America.⁴⁴ Estimates of mining production and working coal miners show that between 1985 and 2005 mining production in the U.S. increased 22 percent,⁴⁵ while the number of coal miners decreased by about 55 percent.⁴⁶ The average income of coal miners has also been on the decline, with estimates putting the average weekly wage of a coal miner in 2004 20 percent lower than it was in 1985 (adjusted for inflation).⁴⁷

Finally, although federal and state laws require reclamation plans for coal mining sites, there is little evidence to show that these programs are effective at undoing all of the environmental harm caused during the mining process. Damages to water supplies, destroyed habitats, and poor air quality are often hard to remedy in the short term, and require intense investments over the long term to solve. Additionally, in the 25 years since the abandoned mine provisions of the Surface Mining Control and Reclamation Act have been in place, only about one third of the known mine sites have been restored.⁴⁸ And an estimated 3.5 million Americans are currently living within one mile of an abandoned mine.⁴⁹

From polluted water to damaged communities, coal mining is leaving a legacy of destruction in its wake.

BURNING COAL: OUR NATION'S POWER PLANTS

About 90 percent of the coal that is mined and produced in the U.S. is destined for our nation's power plants, where coal is used to generate about half of our energy.^{50, 51} Unfortunately, from toxic air and waters to global warming, burning coal continues to be one of the dirtiest sources of electricity used today.



From smog to mercury to carbon dioxide, coal-fired power plants are one of the largest sources of air pollution in the U.S. The consequences for human health are staggering, especially with regards to particle pollution, one of the most dangerous—and deadly—types of air pollution in our country. Particle pollution, also known as soot, can be released directly from smokestacks or indirectly through other pollutants like sulfur dioxide (SO₂) that react in the air to form tiny particles. Soot is particularly dangerous to people because it can be inhaled deep into the lungs where the small-

est of particles cross directly into the blood stream just like oxygen.⁵² Soot can trigger heart attacks and strokes, worsen asthma, cause irregular heart-beat, and lead to premature death.⁵³ Particle pollution also harms the environment, and is the leading cause of haze and reduced visibility in the U.S., including in our National Parks.⁵⁴ The damages from particle pollution continue after it has settled to the ground, where it causes acidification of waters, soil nutrient depletion, and destruction of forests and crops.⁵⁵



In addition to being the largest source of sulfur dioxide pollution,⁵⁶ coal-fired power plants are the second largest source of nitrogen oxides (NO_x) in the nation, earning them a reputation as a major contributor to smog.⁵⁷ Smog, or ground level ozone, forms when nitrogen oxides emitted by the plants react with sunlight and other chemicals in the air. Smog causes a wide range of symptoms like shortness of breath, increased risk of asthma attacks, permanent lung damage, and premature death.⁵⁸ Scientists have compared exposure to

smog to getting a sunburn in the lungs.⁵⁹ In addition to its health effects, smog damages the environment and can destroy entire ecosystems.⁶⁰ Smog harms plants and trees, making it hard for them to make and store food, and can damage leaves, making them vulnerable to disease, insects, and extreme weather. Persistent smog pollution can alter and disrupt plant growth over time, leading to reductions in crop yields.^{61, 62} In the U.S., smog pollution is estimated to cost \$500 million in reduced crop production every year.⁶³

AIR POLLUTION AND COMMUNITIES OF COLOR

Many scientific studies have shown that communities of color are disproportionately exposed to harmful air pollution, including pollution from coal-fired power plants. Over half of the nation's population lives in counties that have unhealthy levels of air pollution like soot and smog.⁶⁴ Furthermore, one study found that 60 percent of Latinos and 50 percent of African-Americans live in areas that are failing two or more national air quality standards, as compared to only 33 percent of whites.⁶⁵

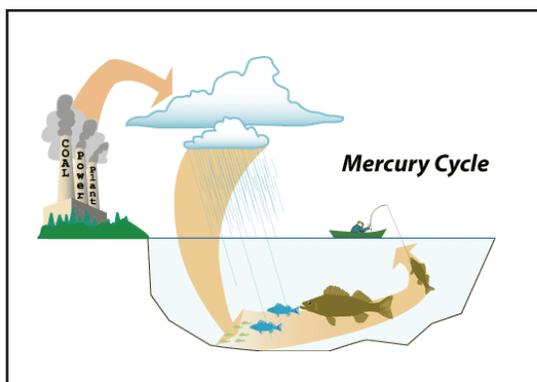
One of the contributing factors may be that communities of color and low income communities tend to live in areas that are closer to harm-

ful sources of pollution. African-Americans are more likely to live within 30 miles of a coal-fired power plant.⁶⁶ African-Americans and Latinos also tend to live closer to other sources of toxic pollution like waste sites and bus depots, which makes them more likely to develop health problems from air pollution.⁶⁷ In addition to living closer to coal-fired power plants, African-Americans also have one of the highest rates of asthma among any cultural group, and are three times as likely as whites to die from asthma.^{68, 69} Numerous studies have shown that smog and soot pollution can trigger asthma attacks and increase the need for hospitalizations.⁷⁰



The same air pollution that causes smog and soot also causes acid rain. Acid rain occurs when power plant emissions like sulfur dioxide and nitrogen oxides react with water and oxygen in the air to form acidic compounds that fall to the ground.⁷¹ Acid rain falls onto plants and trees and eventually ends up in lakes, streams, and the soil. Once in the environment, the acidic compounds cause different kinds of environmental damage, including damage to trees, loss of aquatic life, and detrimental changes to the soil.⁷² Although acid rain in the U.S. has decreased since air protections were put into place, emissions are still relatively high compared to normal conditions and continue to harm the environment.⁷³ And, unfortunately, repeated acid rain over time can suppress the resiliency of natural systems, meaning that over time it takes longer and longer for nature to recover.⁷⁴

Additionally, coal-fired power plants emit large quantities of toxic air pollutants such as chromium, lead, arsenic, hydrogen chloride, and mercury. In fact, they are one of the largest sources of man-made mercury pollution in the U.S.⁷⁵ After mercury is released in the exhaust, it enters the air and then rains down into our streams, lakes, and other waters where it poisons the fish and seafood that eventually make their way to our dinner tables. Mercury accumulates in fish and the animals and people who eat them, causing brain damage, mental retardation, and other developmental problems in unborn children and infants.⁷⁶ It has also been linked to a greater risk of coronary heart disease in men.⁷⁷ The mercury problem in the U.S. is so widespread that every year one in six women of childbearing age has mercury levels in her blood high enough to put her baby at risk.⁷⁸ Moreover, in 2004, forty-seven U.S. states and ter-



ritories had mercury fish consumption advisories for at least some of their waters.⁷⁹ Unfortunately, certain populations may be at greater risk from mercury pollution, including African-Americans and American Indians.⁸⁰ New plants that burn waste coal for energy will make the problem even worse because waste coal has much higher concentrations of mercury.⁸¹

CULTURAL IDENTITY AND TAINTED FISH: MERCURY EXPOSURE AMONG AMERICAN INDIANS

Mercury exposure is directly linked to eating contaminated fish, and people who eat more fish have more mercury in their blood. In turn, this means that families who rely more heavily on fish in their diets are at greater risk from mercury pollution. In addition, studies have shown a correlation between fish consumption and ethnic identity, with African-Americans and Latinos topping the list for exposure.⁸²

One group that may be at particular risk from mercury pollution exposure is American Indians, especially individuals who live on reservations or in communities that depend on fish for subsistence.⁸³ Studies of the Seminoles, Chippewa, and other native groups show that American Indians tend to eat many more fish meals per year than average, putting them and their families at greater risk from mercury pollution.⁸⁴ In addition to being a staple of the diet, fish and fishing among indigenous groups also may serve as part of a strong cultural identity, connecting the individuals with the land and the seasons. For instance, in Florida, Seminole Indians living near the Everglades continue to rely on fish as a major part of their traditional diet, even though studies have linked mercury pollution to the death of endangered Florida panthers and local bird pop-



ulations.⁸⁵ Another example is in the Midwest, where Chippewa Indians depend heavily on fish for cultural identity, including during annual ritual ceremonies.⁸⁶ Every year the seasonal break up of ice is celebrated through a community-wide feast of walleye fish that are caught during a big spearfishing event.⁸⁷ Fish that is not eaten at the feast is often taken home and frozen for future meals.⁸⁸ In both examples, testing has shown that people in these areas who eat a lot of fish have mercury levels well above the safe limit. One sample from the Chippewa indicated that 36 percent were at risk.⁸⁹



Coal-fired power plants also require huge amounts of water for cooling and other purposes. An average 500 megawatt (MW) coal-fired power plant uses more than 25 gallons of water for each kilowatt hour produced, which translates to 300 million gallons of water per day or 12 million gallons of water per hour.⁹⁰ In the U.S., electric power plants account for 48 percent of total water withdrawals every year—an astounding 195 billion gallons of water every day.⁹¹ Coal-fired power plants use so much water that some have had to limit their operations because of water shortages, while other new plants have faced opposition due to local concerns about water use.⁹² In addition to shortages, water use at coal-fired power plants can harm fish and shellfish both when water is withdrawn and when it is discharged after cycling through the plant.⁹³ Water that is discharged is typically much hotter than the water that it is discharged into, which raises the overall water temperature. Among fish, this can decrease fertility and cause changes in heart rates.⁹⁴ The discharged water can also contain chlorine and other harmful chemicals.⁹⁵

Burning coal also releases carbon dioxide (CO₂) pollution, a primary culprit in global warming.

Even though coal-fired power plants generate just about half of our nation's electricity, they account for over 80 percent of the carbon dioxide pollution from electricity production in the U.S.⁹⁶ In fact, coal-fired power plants have the highest output rate of carbon dioxide (or carbon intensity) per unit of electricity among all fossil fuels.⁹⁷ The dangers of carbon dioxide pollution and global warming are becoming clearer every day, and scientists continue to report on the effects of global warming that are already being observed around the world.⁹⁸ Left unchecked, these damages will continue to grow, and will lead to increased water shortages, widespread malnutrition, increased deaths from intense weather events, widespread flooding of coastal areas, increased rates of extinction and loss of biodiversity, and changes in precipitation patterns, among other problems.⁹⁹ Unaddressed global warming will have serious consequences on our health, food, water, ecosystems, and coasts.¹⁰⁰

From deadly soot and smog to mercury pollution in our waters, coal exacts an expensive toll on our society and our environment. And, unfortunately, the damages do not stop after the coal is burned.

THE COAL RUSH

Even though coal-fired power plants already produce about half of our nation's electricity, there are plans on the drawing board to build more than 150 new plants in the next few years.¹⁰¹ If they are all built, the new capacity would be 90 gigawatts (GW) of new power generation—an amount equal to about a fourth of all of the currently operating coal-fired power plants in the U.S.¹⁰² Of these plants, a significant number are slated for the Midwest, with 16 proposed in Illinois alone.¹⁰³ The cost to build all of these plants is nearly \$150 billion.¹⁰⁴

Unfortunately, most of these new plants would use the same technology that was used to build coal-fired power plants a generation ago.¹⁰⁵ If all of these plants are built, they will increase carbon

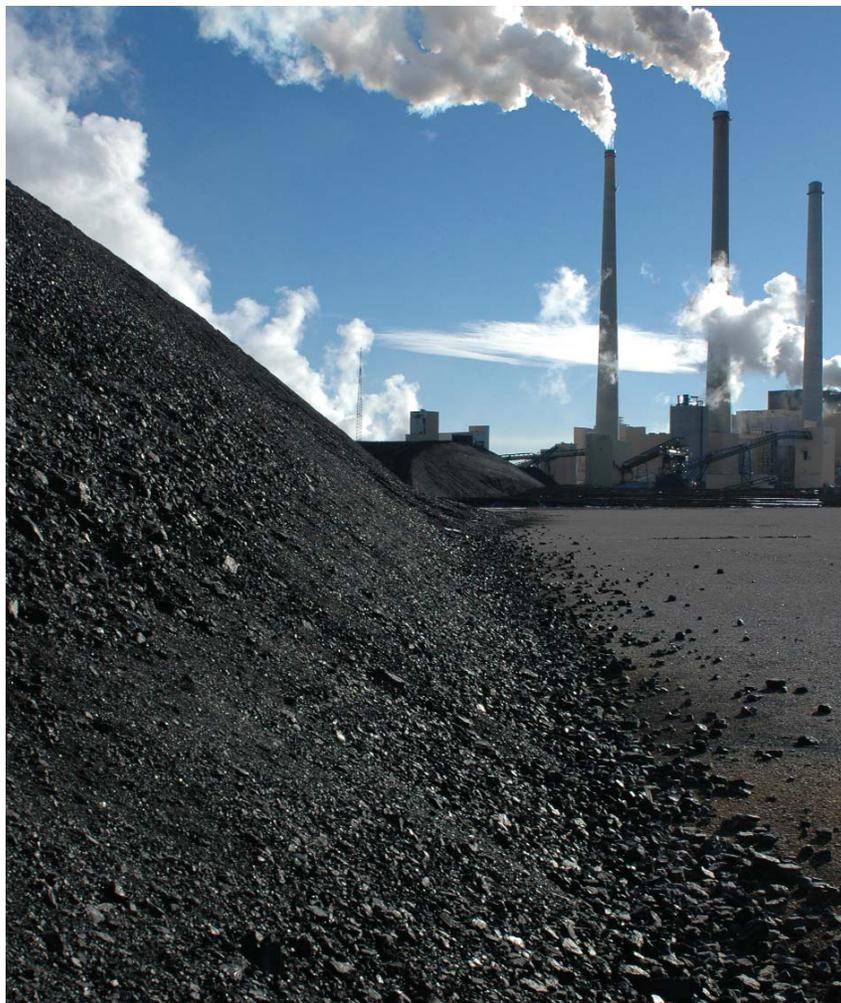
dioxide pollution from electricity production in the U.S. by more than 25 percent from 2004 levels and our nation's total carbon dioxide pollution by 10 percent.¹⁰⁶ The projected carbon dioxide pollution from only 72 of these new plants is equal to more than half of the emissions reductions expected under the Kyoto Treaty,¹⁰⁷ and to all of the emissions reductions that could be made if California's clean car standards were applied to the rest of the U.S. and Canada. Building just two of the biggest new plants would cancel out all of the reductions proposed by Northeast states as part of their Regional Greenhouse Gas Initiative. Add to this the fact that coal-fired power plants have a lifespan of 50–70 years, and the total carbon dioxide pollution of these plants will exceed 35 billion metric tons.¹⁰⁸

WHAT REMAINS: THE LEGACY OF COAL COMBUSTION WASTES

The final stage of the life cycle of coal is the wastes that remain after coal is turned into electricity. Known collectively as coal combustion wastes, these toxic byproducts are a combination of solid and liquid wastes produced at coal plants. Although the chemical composition of coal wastes is dependent on a range of factors like coal origin and pollution controls,¹⁰⁹ the types of wastes produced are nearly identical at all coal-fired power plants. For example, these wastes include parts of the coal that do not fully burn during generation like fly ash (from the smokestacks) and bottom ash (from the bottom of the boiler).¹¹⁰ They also include the particles and chemicals trapped by air pollution controls, like scrubber sludge or flue gas desulfurization sludge. Finally, they include many “low-volume” wastes, including runoff from coal reserve piles and liquid wastes that are formed during cleaning and routine operations.¹¹¹

Taken together, the amount of coal combustion wastes produced every year is staggering: more than 120 million tons of solid wastes are produced every year.¹¹² This waste alone is enough to fill a million railcars every year, or a train that is 9,600 miles long.¹¹³ In addition, the amount of wastes and their toxicity are expected to grow significantly every year as dirty old coal-fired power plants are forced to clean up and install modern pollution controls that convert air pollutants to solid wastes.¹¹⁴

Although some solid coal wastes can be used in construction materials, most coal wastes are destined for landfills or surface impoundments.¹¹⁵ Surface impoundments are large open waste pits that are used to hold both liquid and solid coal wastes. Over time, the solids settle to the bottom of impoundments, where they may be removed and transferred to a landfill. Landfills are used to hold solid wastes, but water may be added to help reduce the amount of dust stirred up during disposal. The size of surface impoundments and landfills can be enormous, with some impoundments covering 1,500 acres—the size of over 1,100 football fields—and an average landfill holding 3.8 million cubic yards of wastes.¹¹⁶ In 1999, there were at least 600 coal waste impoundments and landfills located onsite at 450 coal-fired power





plant facilities.¹¹⁷ The majority of these waste facilities are concentrated in the Midwest, where there is a greater density of coal-fired power plants.¹¹⁸

Another destination for coal combustion wastes that has been gaining increasing attention is abandoned coal mine sites.¹¹⁹ In theory, coal wastes applied in small amounts may help seal off old mine rooms and walls, forming a layer to help trap coal mining residues from leaking.¹²⁰ Coal wastes applied in large amounts may be used as backfill for mine sites, adding materials to help fill in the enormous voids formed when the coal was removed during mining.¹²¹ However, because there has been little attention to this method the full environmental dangers of these applications remain undocumented and need to be studied.

Not only is it challenging to find a place to store so much coal combustion waste safely, but even after it is stored coal combustion waste can leak out and pollute the surrounding environment and groundwater. At landfills, leaks can occur when contaminated water percolates through the wastes or when water washes over exposed areas and carries off contaminants.¹²² The opportunities for leaks at

surface impoundments are even greater because they are often exposed, increasing the likelihood of polluted runoff into ground and surface waters.¹²³ In 2005, there were 24 acknowledged cases of environmental pollution from leaking landfills and impoundments, and many more suspected cases.¹²⁴

These leaking coal wastes and polluted runoffs can be extremely toxic and dangerous. Containing elements like lead, mercury, and arsenic in toxic doses,¹²⁵ coal combustion wastes and their pollution have been shown to cause illness and death in plants and animals. Direct exposure to these toxins and others causes lower rates of reproduction, tissue disease, slower development, and even death.¹²⁶ These damages are significant both individually and collectively, where coal waste contamination has been linked to changes in wildlife concentrations and disruptions in entire ecosystems.¹²⁷ Vegetation growing on or nearby coal waste disposal sites also exhibit signs of damage, including reduced growth and die offs.¹²⁸ These toxic compounds can accumulate in exposed animals and plants, causing the toxics to make their way up the food chain when they are eaten.¹²⁹

The same toxics that harm plants and wildlife also pose serious health risks to people.¹³⁰ People are exposed to these wastes through contact with contaminated soils, inhaling polluted dust, and eating plants and animals that have been



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exposed.¹³¹ Some coal combustion wastes are applied directly to agricultural fields, and evidence suggests that subsistence farmers and their families may have greater risks of exposure than other people.¹³² However, the single greatest threat of human exposure is from polluted groundwater and drinking water sources.¹³³ The toxins found in coal wastes have been linked to organ disease, increased

cancer, respiratory illness, neurological damage, and developmental problems.¹³⁴ Additionally, children who are exposed to coal combustion waste toxins are more likely to experience adverse reactions than adults.¹³⁵ In the mid-90s, the EPA estimated that

more than 21 million people, including more than six million children, lived within five miles of a coal-fired power plant,¹³⁶ a daunting figure considering that most coal combustion wastes are stored onsite. Pollution has been so bad in some locations that sites were classified as hazardous and drinking water wells had to be closed.¹³⁷

COAL COMBUSTION WASTES AND THE CHISMAN CREEK SUPERFUND SITE

Located 15 miles northeast of Norfolk, Virginia, the Chisman Creek Superfund Site provides a good example of the hazards posed by coal combustion wastes.¹³⁸ More than 25 acres in size, the Chisman Creek property is part of the Chesapeake Bay watershed, including a tributary that drains into the bay.¹³⁹ The site was formerly a favorite recreation spot among local residents for fishing, gardening, and riding off-road vehicles.¹⁴⁰ Unfortunately, during a period spanning almost two decades, the site was used as a dumping ground for more than 500,000 tons of fly ash produced at a nearby power plant owned by Dominion Resources.¹⁴¹

In 1980, six years after the site was abandoned, local residents noticed changes in the color of

their drinking well water.¹⁴² Testing revealed toxic levels of several metals, including arsenic, selenium, and vanadium, and in 1983 the site was listed as hazardous under the Superfund program.¹⁴³ Although Dominion tried unsuccessfully to challenge the listing, cleanup began three years later, starting with extending public drinking water lines to 55 homes and installing a water treatment system.¹⁴⁴ Other cleanup measures included covering and sealing off the fly ash pits and diverting part of the tributary.¹⁴⁵ In 1991 the site was partially rededicated as a local recreation site, but 25 years after Superfund designation there are still restrictions on groundwater use in the area.¹⁴⁶

A significant factor in coal combustion waste pollution is the lack of stringent federal regulations and safety requirements. In 2000, the EPA reaffirmed a 20 year old decision not to regulate coal combustion wastes as hazardous, choosing to continue side-stepping meaningful protections by classifying them as “special wastes.” One indication of the inadequacy of this approach is that many of these waste facilities continue to operate without any type of lining to prevent leakage, including about half of the landfills and over three fourths of the impoundments.¹⁴⁷ Furthermore, most states do not require

groundwater monitoring, and many do not require waste facilities to obtain state permits.¹⁴⁸

Unfortunately, this final act in the life cycle of coal does not come to a convenient conclusion. Most coal combustion wastes are stored indefinitely, and may continue to jeopardize the environment and humans for generations to come. Ironically, rather than returning neatly to its buried origins, coal that has passed through this life cycle is in the end converted into something more dangerous—and perhaps longer lasting.

CONCLUSION: “CLEAN COAL,” OR AMERICA’S LEAD ENERGY MISNOMER

From cradle to grave, ground to ash, the damages coal causes to our environment and society are enormous. Unfortunately, the consequences of burning coal for electricity do not normally weigh into our national discussions about our energy future. As this report shows, the costs of using coal are high and are continuing to rise, especially as our understanding of the consequences of global warming grows.



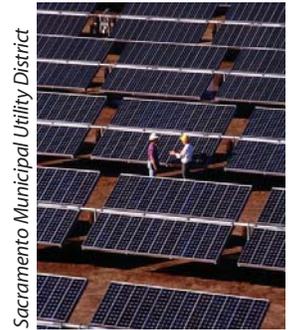
Moorhead Public Service



Aspen Skiing Co



Cielo Wind Power



Sacramento Municipal Utility District

The coal industry knows that the equation must change or they will be out of business—that is why they are pushing putative “clean” coal. But, coal as it exists today is anything but clean. Ambiguously defined, “clean coal” has become little more than an empty technological promise of a different way of doing business. Coal advocates, including the people and politicians who benefit the most from Big Coal’s checkbook, point to technological innovations they claim can help lessen the worst impacts of burning coal. Ironically, what they do not reveal is that industry has been fighting standards to clean up coal plants tooth and nail since the Clean Air Act was passed, and that a lot of older plants still do not have even the most basic—and readily available—pollution control devices. These coal advocates also fail to look at the full life cycle of coal, focusing their sight on the more well-known damages caused during the burn.

The two supposedly “clean coal” technologies that have attracted the most attention in recent years are carbon capture and sequestration (CCS) and Integrated Gasification Combined Cycle (IGCC).

Carbon capture and sequestration is a process where carbon dioxide produced at coal-fired power plants is captured from the plant’s exhaust and then stored underground to prevent it from entering the atmosphere. Although in theory CCS sounds promising, the challenges are enormous, ranging from separating out the CO₂ and transporting it to figuring out how to make sure it stays sealed off for thousands of years to come. In addition, the scale needed to store all of the carbon dioxide pollution from our nation’s coal-fired plants is massive, and would require huge undertakings to ensure that it does not leak into the atmosphere. As of now, carbon capture and storage has not been demonstrated with anything approaching the emissions of a coal-fired power plant and remains an unproven technology. Experts also disagree as to how long it will take for this technology to be available for commercial and wide-scale use.¹⁴⁹

The second technology, Integrated Gasification Combined Cycle (IGCC), is an alternative system for coal-fired power plants that converts coal to a gas that is burned to produce electricity. IGCC is

often promoted as the easiest system to retrofit to capture carbon dioxide emissions in the future should CCS work out. Proponents also like IGCC because it can emit lower amounts of soot and smog pollution. However, it emits just as much global warming pollution as other coal plants, not to mention the environmental and societal damages caused by mining the coal to fuel the plant and all of the additional coal combustion wastes. Until carbon capture and storage technologies are better developed, the carbon dioxide emissions will be much the same as any other coal plant.

tributes substantially to global warming. Coal wastes also put our health at risk, polluting drinking water and harming people who live near landfills and impoundments. These dirty secrets have serious societal and economic impacts that need to be calculated into our decisions about the energy future we are building now.

The challenge of cleaning up the way we mine and use coal is not small by any means. On average, our country consumes more than three million tons of coal every day, or about 20 pounds of coal for every person in the nation every day of the

Tom Hall, DOE



Beck Energy



Craig Miller Productions



The truth is that promises of these and other future technological innovations that will allow us to use coal with less pollution are not available today. Not surprisingly, these same “clean coal” advocates are also behind efforts to jumpstart a new “coal-to-liquids” industry. Liquid coal creates almost double the carbon dioxide emissions per gallon as regular gasoline, and replacing just 10 percent of our nation’s fuel with it would require a more than 40 percent increase in coal mining.^{150, 151} On top of these environmental damages, liquid coal needs billions of dollars of government subsidies and incentives to be viable, money that could be much better spent cleaning up our current use of coal and shifting toward cleaner sources of energy. Taxpayers gambled on liquid coal synfuels 30 years ago and lost billions of dollars, a lesson we should not have to learn twice.

Finally, as this report documents, the inescapable conclusion is that mining coal leads to environmental destruction, polluted waters, and devastated communities. Burning coal causes serious air pollution, jeopardizes our public health, and con-

year.¹⁵² We mine more than 1.1 billion tons of coal a year, and generate about half of our electricity from coal. To minimize the devastating effects of the way we currently use coal, we need to strengthen our nation’s laws and put policies into place to protect our communities and our environment. Some of these have already been proposed, like restoring the Clean Water Act’s prohibition on filling streams and wetlands with waste.

We owe it to our children to consider smarter, cleaner, healthier options for meeting our energy needs rather than locking ourselves into using a polluting, backward technology for the next 50 years that harms people, damages our environment, and makes global warming much worse. At the same time, we need to be wary of continuing to hitch our future to nonrenewable resources or buying into false promises about dealing with pollution somewhere down the road. We must make sure that coal is mined responsibly, burned cleanly, and does not exacerbate global warming if it continues to be part of our nation’s energy equation.

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