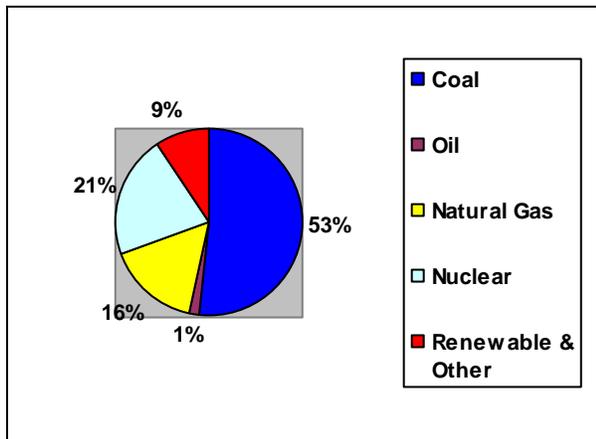


# Coal: Energy Security for Our Nation's Future

## Overview

**Coal is the largest fossil fuel resource in the U.S. and fuels more than 50 percent of all electricity generation.** The energy content of proven recoverable coal reserves exceeds that of our petroleum and natural gas reserves by a factor of 5 to 10. Between the 1973 oil embargo and 2007, domestic natural gas production declined by 11% and oil production by 44%. However coal production nearly doubled from 599 million to 1.15 billion tons.

FIGURE 1. % OF TOTAL U.S. ELECTRICITY GENERATION



Energy Information Administration, 2008 Annual Energy Outlook

The value of coal to the U.S. economy and national security is founded on the size, quality and accessibility of the domestic coal resource. The economic potential of coal is realized through exploration, mineral rights acquisition, mine development, coal production and processing, coal transportation and use, and mine closure and reclamation. This paper will discuss coal reserves, mining and transportation issues pertinent to maintaining and expanding U.S. coal production.

Because of domestic coal's abundance, and the productivity of the American mining industry, US coal is one-fifth to one-tenth the price of petroleum or natural gas on an equivalent energy basis. Coal is the country's only net fossil fuel export, resulting in a positive trade balance of \$2.4 billion in 2007, compared to a net cost of imported natural gas and oil of \$25 billion and \$245 billion, respectively.

**Coal, mined in 26 states, represents 33 percent of all domestic energy production. It is used in 48 states to meet 22% of domestic energy demand; it fuels more than 50% of US electricity generation.**

## U.S. Coal Reserves

The U.S. coal resource is truly vast. In 1999, the EIA estimated the total U.S. coal resource to be 3.97 trillion short tons. Of this total resource, the EIA estimated the Demonstrated Reserve Base (DRB) to be almost 500 billion short tons as of 2007. The DRB is widely distributed among 31 states: 100 billion tons in the Appalachian region (ten states); 160 billion tons in the Interior region (eleven states); and 240 billion tons in the Western region (twelve states). The majority (340 billion tons) of the DRB is accessible by underground mining methods, the rest (160 billion tons) by surface mining.

A portion of the DRB is accessible and economically recoverable by current mining methods, at current prices, under existing regulations. At current production rates, the "estimated recoverable reserve" (ERR) would last for about 240 years. Even if production were to double, the ERR would last for more than a century.

The U.S. reserve base requires additional study. The current DRB estimate is based on a national assessment at the county/coalbed level reported back in 1974 by the Bureau of Mines (BOM) for reserves as of 1971 using

then-current geologic knowledge and mining technology. The DRB has been updated numerous times to incorporate depletion and certain updated reserve data. However, the foundation of the current DRB remains the original 1974 BOM study.

Also requiring additional study is the ERR portion of the DRB. The ERR may be greater or less because of a number of factors including regulatory changes, land-use restrictions, changes in production costs and prices, and improvements in mining technology. A similar conclusion was reached in a 2007 National Research Council study (NRC 2007), which called for a “coordinated federal-state-industry initiative to determine the magnitude and characteristics of the nation’s recoverable coal reserves, using modern mapping, coal characterization, and database technologies,” ... “with the goal of providing policy makers with a comprehensive accounting of national coal reserves within 10 years.”

## **Mining Methods**

Approximately 40% of U. S. coal (on a tonnage basis) is mined by underground methods and 60% by surface methods. Both methods have incorporated technological innovations over the last few decades that have made coal mining more productive and safer, with less environmental effect.

About one-half of underground coal is mined with the longwall process, which has helped revolutionize underground mining in the past 20 years. The longwall process uses a rotating drum, which is moved mechanically back and forth across a wide “panel” of the coal seam, often a thousand feet long. The loosened coal falls onto a conveyor for removal from the mine. A longwall system has a hydraulic roof support that advances as the mining machinery proceeds. This system of mining has greatly increased coal mine productivity and safety.

Most of the remaining underground coal production is done by continuous mining, which utilizes a special cutting machine to remove coal from the “working face” of the

seam and remove it from the area by conveyor. Remote-controlled continuous miners allow an operator to direct the machine from a distance increasing safety.

Surface mining is essentially an earth-moving operation. The rock and soil above the coal, called “overburden,” are removed and the coal is extracted. The mined area is backfilled with earth and reclaimed, restoring the site to its approximate original condition. Draglines, a key element in the increase in surface mine productivity, are large excavating machines used to remove overburden. The machines have a large bucket suspended from the end of a huge boom, which may be as long as 300 feet. The bucket, suspended from a cable, can scoop hundreds of tons of overburden as it is dragged across the excavation area. The dragline moves on huge pontoon-like feet and is one of largest land-based machines.

Many companies, particularly in the eastern and Midwestern states have built modern, computerized coal preparation plants at their mines that can remove more than one-third of the impurities from raw coal. This reduces transportation costs, electricity generation costs, and reduces the waste management burden at the power plant.

## **Worker Health and Safety**

Coal mining safety is regulated by the Mine Safety and Health Administration (MSHA). The U.S. coal industry has become increasingly safe, both when compared with other industrial and service sectors and with historical coal industry performance. Coal mine safety requires constant vigilance and commitment of both management and labor to identify and eliminate all causes of accidents and injuries. This is being implemented through continuous safety training, improvements in operating practices and through the development and adoption of technologies that increase the intrinsic safety of the mine environment.

## **Environmental Impact**

Today’s coal industry is committed to protecting the environment. To achieve the necessary balance between regulation and

commercial progress, the mining industry works with state and federal agencies to comply with current regulations and to provide input if experience suggests regulations may need revision.

Coal mining activities are regulated through the Surface Mining Control and Reclamation Act of 1977 (SMCRA), as well as other rules and regulations. SMCRA established a "nationwide program to protect society and the environment from the adverse effects of surface coal mining operations and surface impacts of underground coal mining operations [and] to promote the reclamation of mined areas left without adequate reclamation."

SMCRA addresses virtually every environmental and land use issue associated with coal mining and establishes standards for coal operators. The regulations to implement SMCRA are developed by the Office of Surface Mining, Reclamation and Enforcement (OSM). OSM's regulations establish requirements for designating lands as unsuitable for coal mining and standards for addressing surface subsidence from underground coal mining operations. The federal program also has a mechanism to collect a fee to reclaim the unreclaimed sites from past coal mining activities. A state with coal reserves that wants to regulate its coal industry develops state laws and regulations, compatible with their federal counterparts, and has the primary regulatory authority under OSM oversight.

A provision in SMCRA allows any interested person to petition the state to designate a coal property as unsuitable for mining. The "designation of lands as unsuitable for coal mining" affected thousands of acres of coal throughout the coal-bearing regions of the country in the 1980s and 1990s.

Permits under SMCRA must comply with all applicable federal and state laws and regulations. Water discharges are regulated under the Clean Water Act (CWA). Permits set specific effluent standards that the discharge must meet. Both SMCRA and the CWA contain language that addresses the need to protect the water flow in perennial streams. SMCRA establishes buffer zones for

surface coal mining operations. Underground mines may leave coal in place to avoid restricting stream flow. Another provision of the CWA pertains to permits issued by the Army Corps of Engineers for overburden to be placed in valleys containing streams. These "valley fill" permits are essential to a form of surface mining known as mountaintop mining. SMCRA allows for mountaintop mining operations and the Corps of Engineers has established an extensive permitting process.

The impact of a mine on habitats containing threatened and endangered species is covered in SMCRA. The U.S. Fish and Wildlife Service and comparable state agencies review permit applications. Mining plans may be revised or disallowed to avoid impacts to their habitats.

Another SMCRA provision deals with the potential for post-mining wastewater discharges. OSM's policy, adopted by most states, prohibits permits from being issued for any new mine likely to have a post-mining wastewater discharge.

## **Coal Transportation**

Transportation is crucial to coal use and growth. Coal is consumed in all regions of the United States and users depend on timely coal delivery through an efficient transportation system encompassing railroads, trucks, barges and vessels, and mine-mouth conveyor systems. In 2003, 680 million tons of coal was delivered by rail, 115 million tons by truck and 114 million tons by water. Of the approximately 400 U.S. coal-fueled power plants, 58 percent are served by rail, 17 percent by barge and vessel, 10 percent by truck, 12 percent served by multiple modes of transportation (primarily rail and barge), and 3 percent are mine mouth plants. All transportation modes have significant capital invested in infrastructure and equipment.

All transportation modes, railroads in particular, will be called on in the future to transport coal longer distances to existing and new markets. Capital investments for locomotives, freight cars and track infrastructure will need to be put in place by

individual rail systems to meet the growing demand for coal transportation. For this reason, the Council supports federal tax incentives for investments in railroad infrastructure.

About 200 million tons of coal is transported on the inland waterways. On a national basis, water carriage accounts for 5% of freight costs, while producing 15% of all ton-miles. However, the condition and age of the waterways lock and dam infrastructure pose a major challenge to future growth. The barge industry pays a user tax into the Waterways Trust Fund to pay half the costs for infrastructure projects, but federal budget pressures have limited expenditures even from this self-funded source of revenue. With adequate Congressional support, the inland waterways can cost-effectively expand its capacity to move more cargo and facilitate the delivery of energy and other basic materials.

More than 120 million tons of coal is transported by truck from mine to consumer. In the coming years, the trucking, mining, railroad and barge industries will face many of the same challenges. These include finding

and retaining experienced employees, minimizing diesel fuel costs, and addressing the increased costs for replacement parts. The long-term maintenance and expansion of the U.S. rail, water and highway infrastructure will also require considerable investment.

## Conclusions

The vast size and high quality of the U.S. coal resource, coupled with the productivity of the U.S. mining and transportation industries, makes it our most valuable domestic energy resource. The NCC concluded in a 2006 study that the coal mining industry and transportation infrastructure can be expanded to double coal production by 2025 to meet the nation's anticipated future energy needs. Even at this expanded rate, domestic coal reserves are adequate for 100 years or more. To achieve this will take a continued investment in mines and the transportation infrastructure, within a regulatory structure that accommodates both public policy and coal production goals. Maximizing and expanding coal production will build a platform for strong new economic growth and job creation for Americans.

*As a public advisory committee to the Secretary of Energy initially chartered in 1984, The National Coal Council has compiled over 30 reports at the Secretary's request on numerous issues affecting coal and U.S. energy policy. The factual information in this paper, and the conclusions based thereon, are drawn from these studies and the documents used to compile them, all of which have been submitted to the Secretary of Energy.*