
# U.S. and World Coal Production, Federal Taxes, and Incentives

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# Summary

Even though U.S. coal production remained strong over the past decade, reaching record levels of production, coal is losing its share of overall U.S. energy production primarily to natural gas. One of the big questions for the industry is how to penetrate the overseas market, particularly in steam coal, to compensate for declining domestic demand. As U.S. energy policy and environmental regulations are constantly debated, there is ongoing congressional interest in the role of coal in meeting U.S. and global energy needs. The question may not be whether the domestic production of coal is here to stay but, rather, how much U.S. coal will be mined, what type, and under what regulatory framework.

Energy Information Administration (EIA) statistics show that more than half (55%) of U.S. coal reserves are located in the West, dominated by Montana and Wyoming, which account for 43%. When including the top five producing states (three of which are in the East), 70% of U.S. coal reserves are accounted for. The United States government owns about one third, or 87 billion short tons (BST), of U.S. domestic reserves.

Coal production in the United States reached an all-time high of 1,174.8 million short tons in 2008, before declining to slightly under 1,100 million short tons from 2009 to 2011. Coal production on federal lands accounts for about 43% of U.S. production, according to the Bureau of Land Management (BLM). World coal production has increased by nearly 60% since 2002, most of the increase coming from China—up 130%.

Overall, U.S. coal production has been very strong over the past decade and if the industry is successful in penetrating the global market, primarily for steam coal, U.S. production may continue to grow faster than consumption. If recent trends continue, the U.S. coal industry will likely become more concentrated and produce more on federal lands. Businesses in the coal industry are subject to federal income taxes, but coal producers benefit from a number of federal tax provisions, commonly referred to as tax expenditures.

There are several congressional concerns related to coal production on federal lands. One concern is the potential for under-market-value coal auctions (sales), e.g., lease offers being accepted by the BLM with few competitive bids. In these cases, the federal government may not receive fair market value for the lease sale.

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# Introduction

Even though U.S. coal production remained strong over the past decade, coal is losing its share of overall U.S. energy production, primarily to natural gas. One of the big questions for the industry is how to penetrate the overseas coal market, particularly for steam coal, to compensate for declining domestic demand. In the past few years, coal production was at or near record levels and exports were up, while domestic demand declined. As U.S. energy policy and environmental regulations are constantly debated, there is ongoing congressional interest in the role of coal in meeting U.S. and global energy needs. The question may not be whether the domestic production of coal is here to stay but, rather, how much U.S. coal will be burned, what type, and under what regulatory framework.

The gap between U.S. coal production and consumption may continue to widen as low cost natural gas becomes more attractive to power plants (at least in the short run) and as older coal plants idle or close and uncertainties with emission regulations potentially inhibit new coal plant investments.

The Energy Information Administration (EIA) forecasts coal exports to continue to rise over their forecast period (2015-2040). Exports to the Asian market are expected to increase, but there are potential bottlenecks such as infrastructure (e.g., port development and transportation) that could slow export growth. Factors contributing to lower coal demand in the United States include low economic growth, high coal prices, lower natural gas prices, and coal plant retirements. **Table 1** illustrates the current coal supply-demand balance.

The coal industry is highly concentrated in the United States, with just a handful of major producers, operating primarily in four states, and the dominant holder of reserves (about one-third) being the U.S. government. Coal deposits (resources) are spread throughout the United States (see **Figure1**).

**Table 1. U.S. Coal Supply and Demand**

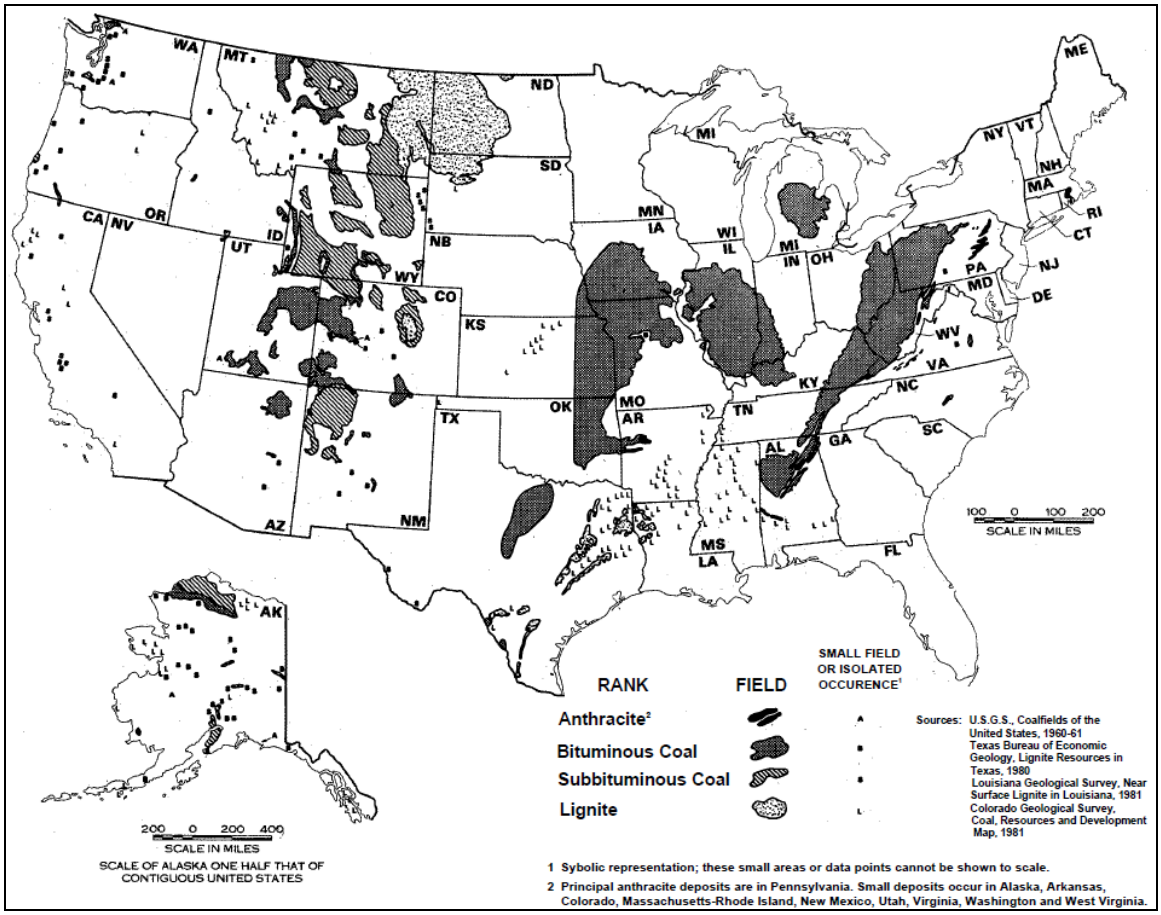
(million short tons)

| | 2010 | 2011 |
|---|---|---|
| **Total Supply** | **1,117.0** | **1,120.0** |
| - Production | 1,084.0 | 1,096.0 |
| - Imports | 19.4 | 13.1 |
| - Waste Coal Supplied | 13.7 | 12.5 |
| **Total Demand** | **1,130.0** | **1,106.0** |
| - Consumption | 1,049.0 | 999.1 |
| —Electric Power | 975.1 | 928.6 |
| - Exports | 81.7 | 107.3 |
| —Metallurgical | 56.1 | 69.5 |
| —Thermal | 25.6 | 37.7 |
| Stock Change | (13.0) | (7.1) |
| Unaccounted | 0.2 | 20.7 |
| Exports/Production | 7.5% | 9.8% |

**Source:** U.S. Energy Information Administration (various reports), http://www.eia.gov/coal/data.cfm.

**Notes:** Units = million short tons (one short ton equals 2,000 pounds). May not sum due to rounding. Values in parenthesis are negative. According to EIA, waste coal is usable material that is a byproduct of previous coal processing operations, usually composed of mixed coal, soil, and rock (mine waste). Most waste coal is burned as-is in unconventional fluidized-bed combustors. For some uses, waste coal may be partially cleaned by removing some extraneous noncombustible constituents. Examples of waste coal include fine coal, coal obtained from a refuse bank or slurry dam, anthracite culm, bituminous gob, and lignite waste.

**Figure 1. U.S. Coal Deposits**




**Source:** Energy Information Administration, http://www.eia.gov/coal/reserves.

**Note:** The Lower-48 United States is divided into three coal regions: Appalachia, Interior, and Western.

There has been considerable congressional interest in coal, with over 100 bills that were introduced in the 112th Congress many of which addressed environmental and worker safety issues, neither of which are covered in this report. The discussion below is intended to provide some background and context for potential coal debates during the 113th Congress.

This report serves as a primer on U.S. and world coal resources and production and highlights some of the congressional interest related to coal production on U.S. federal lands. The report primarily describes the past 10 years of coal activity but also includes a discussion of future coal production projections and federal coal incentives, many of which do not expire.

# Background Primer on Coal

Coal consists of the fossilized remains of ancient plant life that have been transformed through metamorphosis into carbon-rich mineral deposits.[1] It occurs as seams in sedimentary rock strata as old as 300 million years, though the most abundant deposits in the United States were deposited during the geologic Carboniferous period between 210 and 250 million years ago. Coal mineral classification considers type, rank, and grade. The plant life that coal originated from determines its type, and the degree of metamorphosis determines its rank, grade, and the amount of inorganic mineral matter present. Qualities such as moisture, carbon, sulfur, and ash content contribute to a coal's heating value as a fuel (measured in British thermal units [Btus]).

The content of sulfur is significant because of the sulfur dioxide (SO2) emissions that occur during coal combustion. Under the Clean Air Act, there are federal limits on the amount of $SO_2$, among other pollutants, allowed from coal-fired power plants.[2] Western coal (low sulfur and low energy content) primarily produced in the Powder River Basin (PRB) of Wyoming,[3] is used generally for power generation, while eastern coal has been used domestically for power generation and exported for coking and metallurgical purposes. Moisture adds weight to the coal, increasing shipping costs while decreasing its heating value. Minerals deposited with the plants that formed coal create ash when coal burns. **Table 2** below illustrates the various coal classifications.

[1] In geology, metamorphism is the solid state change in the structure, texture, or composition of rocks caused by heat, pressure, or stress.

[2] There are also state limits in some cases.

[3] PRB coal is located primarily in Montana and Wyoming.

**Table 2. Coal Classifications**

| | Type | Heating Value | Occurrence | |
|---|---|---|---|---|
| High | **Anthracite** (Hard Coal)<br>Shiny black,<br>High carbon content | 15,000 Btu/lb.<br><br>Typical use:<br>metallurgy,<br>domestic heating | Limited geographically to mainly Appalachia and Pennsylvania. | Low |
| → RANK → | **Bituminous** (Soft Coal) | 10,500 - 15,500 Btu/lb.<br><br>Typical use:<br>electric power generation,<br>coke for steel making. | The most abundant U.S. coal type, found primarily in Appalachia and the Midwest. | ↓ MOISTURE ↓ |
| | **Sub-bituminous**<br>Dull-black | 8,300 - 13,000 Btu/lb.<br><br>Typical use:<br>electric power generation,<br>heating | Resources primarily found in Montana, Wyoming, Colorado, New Mexico, Washington, and Alaska. Most produced U.S. coal in 2011, accounting for 47% of production. | |
| Low | **Lignite**:<br>Brownish-black<br>High moisture<br>High ash<br>Low carbon<br>Low heating value | 4,000-8,300 Btu/lb.<br><br>Typical use:<br>electric power generation. | Resource mainly found in Texas, North Dakota, Louisiana, and Montana. | High |

**Source**: International Energy Agency.

# Coal Mining Methods

There are two primary mining techniques used in the United States: underground mining and surface mining. About 69% of U.S. coal comes from surface mines, while the remaining 31% comes from deep underground mines.

## Underground Mining

There are two primary underground mining techniques: room and pillar (including conventional and continuous mining) and longwall. Room and pillar and continuous mining is practiced as follows: In flat-lying coal beds, conventional room and pillar techniques rely on cutting, drilling, blasting, loading, hauling, and roof bolting—a labor-intensive process. Long steel bolts properly spaced and driven into the roof are required. In continuous mining, the cutting, drilling, blasting, and loading are performed by a mechanical excavator known as a continuous miner. The continuous miner cuts and loads the coal. Together, room and pillar and continuous techniques account for 50% (conventional, room and pillar—2%; continuous—48%) of underground mining.[4]

[4] *Meeting Projected Coal Production Demands in the USA, Upstream Issues, Challenges, and Strategies*, prepared by the Virginia Center for Coal and Energy Research, Virginia Polytechnic Institute and State University, 2008, pp. 80-82.

The most efficient technique in underground mining is the longwall method, which employs a large machine with a rotating drum that moves back and forth across a wide coal seam. Once coal is removed by a longwall miner or other method, it is then moved out of the mine with conveyor belts or shuttle cars. About 50% of underground coal is produced using the longwall technique.

### Surface Mining

Surface mining, also called "open-pit" or strip mining, entails blasting rock above the coal with explosives. This overburdened rock is then removed with huge electric shovels and draglines to reveal the coal seam. The coal seam in a surface mine is worked in long cuts by uncovering and removing coal then backfilling and reclaiming land in sequence. In other words, while coal extraction is taking place, as required by federal law, the reclamation work occurs in an adjacent area previously mined. Mountaintop removal mining is a form of strip mining.[5] Mountaintop removal mining generally removes a coal seam from one side of a mountain to the other. This is typically done in "steep-terrain" surface mining. Some of the overburden or "excess spoil" from the top of the mountain is placed in a valley fill. The placement of the excess spoil in valleys adjacent to mining areas remains controversial.[6]

## The Coal Cycle

After being mined, coal goes through a cleaning prep facility, where it is cleaned and separated by grades. Cleaning upgrades the quality of the coal by removing some of the impurities such as rock, clay, and other ash-producing material. In the eastern United States, this refuse is generally pumped into an impoundment area often built near old underground mines in steeply sloping valleys. Once cleaned and separated, if necessary, the coal is stockpiled and shipped to the customer by rail, barge, truck, or conveyor. It usually takes more than one mode of transport for coal to reach its final destination. Utilities burn pulverized coal to produce high-pressure steam that powers an electric generator. As coal is burned, emissions are produced that contain sulfur dioxide, nitrogen oxides, carbon dioxide, particulate matter, ash, and mercury. A discussion of coal combustion emissions is found in other CRS reports.[7]

# U.S. Coal Resources and Reserves

Assessing the amount of coal in the United States is quite complex. Two very different terms used to describe coal deposits—resources and reserves—are sometimes used interchangeably, but have very different meanings.

Resources provide a broad measure of coal production potential, or amount of coal "in the ground" summing the identified and undiscovered deposits of a minimum thickness.[8] Reserves

[5] For an in-depth discussion of mountaintop removal mining see CRS Report RS21421, *Mountaintop Mining: Background on Current Controversies*, by (name redacted).

[6] *Meeting Projected Coal Production Demands in the USA,* Upstream Issues, Challenges, and Strategies, p. 75.

[7] See CRS Report R42950, *Prospects for Coal in Electric Power and Industry*, by (name redacted), (name redacted), and (name redacted), and CRS Report R41914, *EPA's Regulation of Coal-Fired Power: Is a "Train Wreck" Coming?*, by (name redacted) and (name redacted).

[8] U.S. Geological Survey, *The National Coal Resource Assessment Overview*, USGS Professional Paper 1625-F, (continued...)

are known quantities that can be produced given current prices and technology. Resource assessments are complex and rely on bed thickness as a major factor in determining recoverability, with direct correlation between bed thickness, depth, and recoverability. Coal rank (degree of metamorphism) and coal quality (heating value) contained in a unit of coal are factors as well. A February 2013 assessment by the U.S. Geological Survey (USGS) estimate the Powder River Basin coal resource alone at about 1.07 trillion short tons.[9]

A National Research Council (NRC) study cautions that it is not sufficient to know there is a vast resource base in the United States because only a small amount can be mined economically (the reserves) and advises caution when using coal resources to estimate the life of the U.S. coal base.[10] Resources, however, can become reserves. Reserve data is temporary and subject to change based on public policy, coal versus natural gas prices, production rates, transportation issues, exports, technology, and other conditions. Reserves are only an estimate of what might be recovered. Reserves must be developed from a better defined resource base according to the Virginia Center for Coal and Energy Research report.[11] A maturity index is used to measure the ratio of the amount of remaining economically recoverable resources to the previously mined tonnages. The Interior and Appalachian regions have less than a 0 index meaning their recoverable reserves are less than the amount already mined. Those areas are far more developed than the western regions. The remaining eastern resources may be thinner and of lower quality overall, which may lead to more mining underground than before because much of the surface resources have already been mined.[12]

The United States has the largest amount of coal reserves and resources in the world. The U.S. Energy Information Administration (EIA) estimates there are about 261 billion short tons of recoverable domestic coal reserves. The total demonstrated resource base (DRB) is estimated at about 484.5 billion tons.[13]

EIA statistics show that more than half (55%) of U.S. coal reserves are located in the West, of which Montana and Wyoming together account for 43% (see **Table 3**). When including the top five producing states (three of which are in the East), 70% of U.S. coal reserves are accounted for. The United States government owns about one third, or 87 billion short tons (BST), of U.S. domestic reserves, followed by Great Northern Properties Limited Partnership (20 BST), and Peabody Energy Corporation (9 BST).[14] All together, the top three reserve owners account for about 45% of U.S. coal.

(...continued)

Editors Brenda S. Pierce and Kristin O. Dennen, Chapter D, p. 1, 2009.

[9] USGS, *Assessment of Coal Geology, Resources, and Reserve Base in the Powder River Basin, Wyoming and Montana,* Fact Sheet 2012-3143, February 2013.

[10] National Research Council, Committee on Coal Research, Technology, and Resource Assessments to Inform Energy Policy, *Coal: Research and Development to Support National Energy Policy*, National Academies Press, 2007.

[11] *Meeting Projected Coal Production Demands in the USA, Upstream Issues, Challenges, and Strategies*, prepared by the Virginia Center for Coal and Energy Research, Virginia Polytechnic Institute and State University, 2008, pp. 80-82.

[12] Ibid.

[13] *Inventory of Assessed Federal Coal Resources*, August 2007. (42% of the DRB is located in the PRB and an estimated 203.5 billion short tons in the PRB is on federal lands.) The demonstrated resource base is defined by the USGS as measured and indicated reserves plus sub-economic resources.

[14] National Mining Association, 2010 Coal Producers Survey, May 2011.

**Table 3. U.S. Coal Reserves by State, 2011**

(billion short tons)

| State | Underground | Surface | Total | Percent of Total |
|---|---|---|---|---|
| Montana | 35.9 | 38.8 | 74.7 | 28.8 |
| Wyoming | 22.9 | 14.9 | 37.8 | 14.6 |
| Illinois | 27.8 | 10.1 | 37.9 | 14.6 |
| West Virginia | 15.0 | 2.1 | 17.1 | 6.6 |
| Kentucky | 7.0 | 7.3 | 14.3 | 5.5 |
| Pennsylvania | 10.4 | 1.0 | 11.4 | 4.4 |
| Ohio | 7.6 | 3.7 | 11.3 | 4.4 |
| Colorado | 5.9 | 3.7 | 9.6 | 3.7 |
| Texas | None | 9.3 | 9.3 | 3.6 |
| New Mexico | 2.8 | 4.1 | 6.9 | 2.7 |
| Others | 12.8 | 15.6 | 28.4 | 10.7 |
| Total | 148.1 | 110.5 | 258.6 | 100.0 |

**Source:** EIA Annual Coal Report 2011.

**Notes:** Some differences from EIA's International Energy Outlook, 2011.

# U.S. Coal Production

In recent decades, the U.S. coal industry has changed significantly. Coal production has shifted from high-sulfur to low-sulfur driven by the steady demand from electric power plants (coal's primary customer) need to comply with environmental standards. Coal production has fluctuated since 2002 (see **Table 4**) but overall production has been higher than in previous decades. Coal production in the United States reached an all-time high (in tonnage) of 1,174.8 million short tons in 2008, before declining to slightly under 1,100 million short tons from 2009 to 2011. However, natural gas has been the recent fuel of choice for new power plants, reducing coal's domestic market share from 42% in 2011 to 32% by April 2012.

**Table 4. U.S. Coal Production 2002-2011**

(million short tons)

| Year | Total | Eastern | Western | Underground | Surface |
|---|---|---|---|---|---|
| 2002 | 1,094.3 | 492.9 | 601.4 | 357.4 | 736.9 |
| 2003 | 1,071.8 | 469.2 | 602.5 | 352.8 | 719.0 |
| 2004 | 1,112.1 | 484.8 | 627.3 | 367.6 | 744.5 |
| 2005 | 1,131.5 | 493.8 | 637.7 | 368.6 | 762.9 |
| 2006 | 1,162.7 | 490.8 | 672.0 | 359.0 | 803.7 |
| 2007 | 1,146.6 | 478.2 | 668.5 | 351.8 | 794.8 |
| 2008 | 1,171.8 | 493.3 | 678.5 | 357.1 | 814.7 |
| 2009 | 1,074.9 | 449.6 | 625.3 | 332.1 | 742.9 |

| Year | Total | Eastern | Western | Underground | Surface |
|---|---|---|---|---|---|
| 2010 | 1,084.4 | 446.2 | 638.2 | 337.2 | 747.2 |
| 2011 | 1,095.6 | 455.8 | 638.5 | 345.6 | 748.4 |

**Source:** Energy Information Administration, http://www.eia.gov/totalenergy/data/annual/pdf/sec7_7.pdf.

Out of the four major U.S. fuel sources—oil, natural gas, coal, and uranium—coal has the largest domestic reserve base and has accounted for the largest share of U.S. energy production in Btus since the early 1980s. In 2005, coal production was 33% of all U.S. energy production.[15] However, in 2011, natural gas surpassed coal and accounted for 30% of U.S. energy production because of sharp production increases, while coal fell to 28% of U.S. energy production. EIA's reference case (2011) predicts that coal will continue to lose energy production market share to natural gas as coal would drop from 28% to 24% by 2040 (see **Table 5**). Cases in which coal production rises more than the reference case involve assumptions of higher natural gas prices, lower coal prices, and higher economic growth. Coal production would grow at a 0.2% annual average rate through 2040 in the reference case.

**Table 5. U.S. Energy Production in Btus**

(numbers are in percent of total)

| | Coal | Natural Gas | Crude Oil | Nuclear | Renewables | NGPLs[a] | Total |
|---|---|---|---|---|---|---|---|
| 1950 | 40 | 17 | 32 | 0 | 8 | 2 | 100 |
| 1960 | 25 | 30 | 35 | negligible | 7 | 3 | 100 |
| 1970 | 22 | 34 | 32 | negligible | 6 | 4 | 100 |
| 1980 | 28 | 30 | 27 | 4 | 8 | 3 | 100 |
| 1990 | 32 | 26 | 22 | 9 | 8 | 3 | 100 |
| 2000 | 32 | 28 | 17 | 11 | 9 | 4 | 100 |
| 2010 | 29 | 29 | 20 | 11 | 10 | 4 | 100 |
| 2025 | 25 | 32 | 21 | 10 | 11 | NA | 100 |
| 2040 | 24 | 34 | 17 | 10 | 14 | NA | 100 |

**Source:** U.S. EIA, Annual Energy Review 2011 (for historical data to year 2000). EIA Annual Energy Outlook 2013 Early Release Overview for data years 2010, 2025, and 2040.

a. NGPLs are natural gas plant liquids. EIA projections for 2025 and 2040. Percentages above may not add to 100 due to rounding.

Coal production on federal lands accounts for about 43% of U.S. production, according to the Bureau of Land Management (BLM). Coal production from the Powder River Basin (PRB), most of which is on federal lands, accounts for 41% of U.S. production, all of which is surfaced mined. Powder River Basin coal production is projected to increase, according to the EIA, becoming an even larger share of U.S. production as Interior coal has declined in recent years and is projected to grow slowly over the EIA forecast period (2016-2040). Appalachian coal has declined sharply over the past couple of decades and is projected to continue to decline through 2020 after which

[15] EIA, Annual Energy Outlook (AEO), Early Release Overview, 2012, p. 12.

production is projected to increase, particularly for coking coal exports but with fewer shipments of steam coal for the U.S. market.[16]

Sub-bituminous surface mining in the western region (lower rank and lower sulfur coal) has become the dominant feature of U.S. coal mining since the mid-1970s. Surface mining has grown from 55% of coal production in 1975 to 69% of production in 2011. Western coal took the lead over eastern production in 1999 when it rose to 53% of production. Western production now accounts for 58% of U.S. coal production. U.S. coal production from the West is projected to continue to dominate (reaching 68% of U.S. production) throughout the EIA forecast period (2016-2040).[17]

Eastern and underground coal may have peaked in 1990 at 630.2 and 424.5 million short tons, respectively. A number of factors are behind this dramatic shift from underground eastern coal to western-based surface coal, and from bituminous coal to sub-bituminous coal including the ease of mining, coal utilization, mining conditions, mining technology, health and safety, environmental laws, and mining costs.[18] Five coal-producing states account for 72% of total U.S. coal output (see **Table 6**).

**Table 6. U.S. Coal Production, Selected States, 2011**

(million short tons)

| State | Production | Percent of Total |
|---|---|---|
| Wyoming | 438.7 | 40.0 |
| West Virginia | 134.6 | 12.3 |
| Kentucky | 108.8 | 9.9 |
| Pennsylvania | 59.2 | 5.4 |
| Texas | 45.9 | 4.2 |
| Other | 308.4 | 28.1 |
| Total | 1,095.6 | 100.0 |

**Source:** EIA /Annual Coal Report, 2011.

The National Research Council reported in 2007 that "the context for any assessment of future U.S. coal production is inextricably linked with the development of a national carbon emissions policy. Potential constraints on greenhouse gases (especially $CO_2$) emissions and the technical and economic feasibility of $CO_2$ control measures are the dominant issues affecting the outlook for the future of coal use over the next 25 years and beyond."[19] However, since 2007, there are several other factors that will influence U.S. coal production, such as, natural gas prices, the development of the infrastructure to support the use of natural gas for electricity, and how much and how quickly U.S. western steam coal can penetrate the international market.

[16] AEO, 2012, p. 99.

[17] EIA , Annual Energy Outlook 2013, Early Release Overview.

[18] *Meeting Coal Production Demands in the U.S.A, Upstream Issues, Challenges, and Strategies.*

[19] National Research Council, Committee on Coal Research, Technology, and Resource Assessments to Inform Energy Policy, *Coal: Research and Development to Support National Energy Policy*, National Academies Press, 2007.

## Coal-Producing Industry

In 2011, the top five coal mining companies were responsible for about 58% of U.S. coal production, led by Peabody Energy Corp. with 18.5% and Arch Coal, Inc. with 14.6% (see **Table 7**). Other major producers include Alpha Natural Resources, Llc, Cloud Peak Energy, and CONSOL Energy, Inc. The concentration of production among the top five producers was similar in 2002 when they accounted for 46%. The two leading producers in 2002 were Peabody Energy Corp., with 13.7% of production, followed by Kennecott Energy Co. Inc. with 10.2% of production. The next three top producers included Arch Coal, Inc., RAG American Co., and CONSOL Energy, Inc.

**Table 7. Leading U.S. Coal Producers**

| 2011 | | 2002 | |
|---|---|---|---|
| **Producer** | **Percent of Total** | **Producer** | **Percent of Total** |
| Peabody Energy Corp. | 18.5 | Peabody Energy | 13.7 |
| Arch Coal, Inc. | 14.6 | Kennecott | 10.2 |
| Alpha Natural Resources | 10.6 | Arch Coal, Inc. | 10.1 |
| Cloud Peak | 8.7 | RAG American Co. | 6.4 |
| CONSOL Energy | 5.7 | CONSOL Energy | 5.6 |

**Source:** EIA, Annual Coal Reports, 2002 and 2011.

The number of coal mining firms has decreased in the United States, while the size of the average mine and output per mine have increased. The number of mines has fluctuated over the past ten years, but generally has declined by 60% since the 1990s (e.g., from 3,430 in 1990 to 1,325 in 2011) as some of the smaller mines have become uneconomic.[20]

While coal production levels were at about the same level in 2011 as they were in 2002 and the number of coal mines declined, the number of coal miners has increased (75,466 to 91,611) over the same period. Production per miner hour has drifted downward since 2001 from 7.10 tons per hour to 5.55 tons per hour in 2011.[21]

The concentration of production at the global level is not as great. In 2010, the top five world coal producers account for about 18% of world production (Coal India (6%), Shenhua Group China (5%), Peabody Energy (2.8%), Datong Coal Mining Group-China (2.1%), and Arch Coal (2.1%). The top 30 coal firms produced 40% of world production (see **Table 8**).[22]

[20] EIA, Annual Coal Report, 2011.

[21] National Mining Association, Most Requested Statistics, U.S. Coal Industry, 2012.

[22] OECD/IEA, 2011, p. 418-419.

**Table 8. Leading World Coal Producers, 2010**

| Producer | Percent of Total Production |
|---|---|
| Coal India | 6 |
| Shehua Group | 5 |
| Peabody Energy Corp. | 2.8 |
| Datong | 2.1 |
| Arch Coal, Inc. | 2.1 |

**Source:** OECD/IEA.

# Coal on Federal Lands

There are substantial federal coal resources; about 957 billion short tons (excluding Alaska) according to a 2007 interagency report on an inventory of federal coal resources.[23] Production increases on federal land are possible given the industry's interest in seeking out international markets for PRB coal. The greatest growth opportunity and long term potential may be for thermal coal exports into the Asian markets.

## The Leasing Process for Coal

The Bureau of Land Management (BLM) administers coal leasing on all federal lands. All BLM coal leasing is done competitively except in cases where a party holds a "prospecting permit" issued prior to the Federal Coal Leasing Amendments Act of 1976 or where contiguous acres are added to existing leases. The process for coal leasing on federal lands is similar to the process for oil and gas leasing. It is governed by Section 2 of the Mineral Leasing Act (MLA), as amended. Federal coal leasing is based on the BLM's Resource Management Plan (RMP) and the Forest Service (FS) Forest Plans. The BLM uses the following "planning screens" to focus on areas where there is the greatest interest or potential for leasing:[24]

1. Determine areas with coal potential;
2. Apply unsuitability criteria;
3. Apply multiple use conflict analysis; and
4. Consult with qualified surface owners (including private land owners).

There are two processes by which federal lands may be leased for coal production. The first is "regional coal leasing," in which BLM selects tracts for leasing as needed to meet regional requirements as outlined by "regional coal teams" composed of BLM officials and interested state

[23] *Inventory of Assessed Federal Coal Resources and Restrictions to Their Development,* In compliance with the Energy Policy Act of 2005, P.L. 109-58 section 437, prepared by U.S. Departments of Energy, Interior, and Agriculture.

[24] Ibid, p.12.

and local parties. The second is leasing on application whereby mining companies submit an application to lease certain tracts.[25]

About 70% of the estimated federal coal resources on 3.6 million acres have not been screened under the BLM's land use planning process because of low industry interest.[26]

### Regional Coal Leasing

The Secretary of the Interior establishes regional coal leasing levels after receiving input from the states and other relevant stakeholders. Areas are then delineated and ranked according to interest for coal leasing. After ranking and selection, BLM produces a regional coal leasing environmental impact statement (EIS) to satisfy the requirements of the National Environmental Policy Act (NEPA). After further consulting at the local, state, and federal levels, the BLM adopts a lease sale schedule. The BLM establishes fair market value (FMV) and maximum economic recovery for the tracts before the lease sale begins.[27] BLM does not accept any bid for less than the FMV as determined. Currently, the minimum bid is established in regulation (43 C.F.R. 3422) at no less than $100 per acre. After notice, the BLM conducts the lease sale and awards the lease to the highest bidder that meets the lease sale requirements. BLM reserves the right to reject any and all bids for any reason.[28]

### Leasing on Application

Under this process, a coal producer submits an application to the BLM indicating an interest in certain tracts that are included in its coal land use plan. The application must contain certain data intended to assist BLM in conducting the environmental analysis needed to satisfy the requirements of National Environmental Policy Act (NEPA). Then, the BLM determines the FMV and maximum economic recovery for the proposed lease tract, and consults with the same parties with whom consultation is required for regional leasing as described above. After these requirements are met, the lease sale is conducted in the same manner applicable to regional coal lease sales.[29]

## Lease Terms and Conditions for Coal

### General Statutory Restrictions

Under U.S. and state laws, only U.S. citizens, associations of U.S. citizens, and corporations organized under U.S. laws may bid on and lease coal on federal land. No entity is permitted to own or control coal leases with an aggregate acreage in excess of 75,000 acres in any one state or more than 150,000 acres in the United States.[30]

[25] 43 C.F.R. 3420 Coal Management, Competitive Leasing.

[26] *Inventory of Assessed Federal Coal*, p. xi.

[27] BLM, Coal Resources Frequently Asked Questions, http://www.blm.gov/energy/coal resources.

[28] 43 C.F.R. 3420 Coal Management, Competitive Leasing.

[29] 43CFR 3425, Leasing on Application.

[30] BLM at http://www.blm.gov/energy/coal.

## Coal Lease Terms

BLM-issued coal leases are for initial terms of 20 years, with automatic extension "for so long thereafter as coal is produced annually in commercial quantities from that lease." In addition to rental payments of not less than $3 per acre, lessees are required to make payment to the government of a royalty of at least 12.5% in amount or value of coal that is recovered from leased land that is surfaced mined. The federal rate for underground coal mining is 8%. All leases are subject to the condition of diligent development and continued operation.[31] Lessees must also furnish bonds sufficient to ensure compliance with the terms and conditions of the lease.[32]

## Coal Revenues (Federal and State)

Historically, federal coal production has generated significant revenues for the federal government and the states in which it is produced. States receive 50% of revenues generated in their state (minus administrative costs of 2%). Total revenues have grown rapidly since the 1990s, reflecting higher coal values and volumes. For instance, royalty revenue generated from federal coal leases doubled from 1983 to 1986, then doubled again by 1990, reaching $236 million. Revenue continued to rise, reaching $434 million in 2002 and $774.1 million in 2011. The states' share in 2011 was $387.2 million, with Wyoming receiving $319.6 million or 82% of the total disbursed to the states. Revenues from federal coal leases reached an all-time high in 2009 at $780.4 million, providing states with revenues of $348.6 million. Wyoming has been the dominant coal producer on federal lands, receiving the majority of federal coal revenues disbursed to the states.[33]

## Federal Coal Resources

Under Section 437 of the Energy Policy Act of 2005, Congress directed the Administration to conduct an inventory and assessment of federal coal resources and restrictions to their development. The study was to identify lands available for coal development and restrictions on their land and to identify environmentally compliant and super-compliant resources (based on sulfur dioxide emissions per million Btus).[34] The study evaluated the Powder River Basin (PRB) federal land and coal resources.[35]

The PRB contains 550 BST or 58% of the federal resources assessed, and PRB represents 88% of coal produced on federal lands. [36] The total federal estate surveyed was 5.4 million acres (including split estate lands whereby the surface owner and mineral rights owner are two separate parties).

[31] Diligent development is a statutory requirement that the lessee begin producing commercial quantities of coal within the 10-year primary lease term. If not, the lease is terminated.

[32] Ibid.

[33] Office of Natural Resources Revenue website at http://www.onrr.gov.

[34] "Lands available" are areas in a Resource Management Plan that are leased or could be leased for coal development.

[35] *Inventory of Assessed Federal Coal Resources and Restrictions to Their Development*, prepared by U.S. Departments of Energy, Interior, and Agriculture in compliance with the Energy Policy Act of 2005, P.L. 109-58, August 2007.

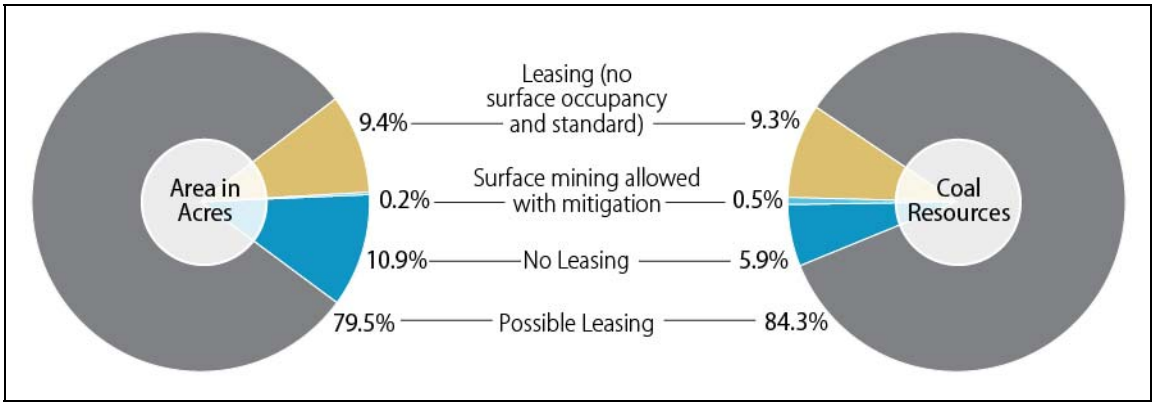
[36] A broad category of measurement that would include the demonstrated reserve base and economically recoverable reserve (as discussed in the Resource and Reserve section of this report), but using a broader resource assessment methodology that includes the following categories: hypothetical, inferred, indicated, and measured.

There are three major categories of land classification in the study:

1. leasing available under standard lease terms or with no surface occupancy;
2. leasing permitted with restrictions (possible leasing); and
3. leasing prohibited.

Leasing is prohibited on 591,000 acres in the PRB, which is estimated to contain 5.9% of the potential federal coal. Leasing is "possible" on 4.3 million acres containing an estimated 84.3% of federal coal resources. Leasing is available under standard lease terms on 82,000 acres and available with no surface occupancy on 431,000 acres, containing 5% and 4.3 % of federal coal resources, respectively. See **Figure 2.**

**Figure 2. PRB Federal Land and Coal Resources by Access Category**




**Source:** U.S. Departments of Energy, Interior, and Agriculture.

## Congressional Concerns

There are several congressional concerns related to coal production on federal lands. A key concern raised by stakeholders is the potential for under-market-value coal auctions (sales), e.g., lease offers being accepted by the BLM with few competitive bids and the federal government possibly not receiving fair market value for the lease sale.

The BLM has established a floor bid price of $100 per acre but typically bids are offered and accepted on a dollar-per-ton basis. The minimum acceptable bid amount is established by BLM and kept confidential. Most recently, these bids have ranged from $0.25 per ton to over $1.00 per ton, based on the quality of the reserves, among other factors. Coal reserve estimates are established internally by the BLM and often based on exploration information gathered by the coal industry. The $100 per acre floor price or the minimum dollar bids per ton are added to the potential royalty revenue to represent the fair market value of the tracts being leased.

Other questions arise regarding whether the federal government is receiving the fair market value based on the value of the coal, particularly in the international market, which would include examining arms-length and non-arms-length transactions as well as price, volume, and the royalty rate.[37] For arms-length sales, the Office of Natural Resources Revenue (ONRR) relies on the

[37] An arms-length contract is one in which the contract is between independent, non-affiliated parties, and those parties (continued...)

"gross proceeds accruing to the lessee" (minus allowable deductions, such as transportation and washing) to value coal for royalty purposes. For non-arms-length transactions, coal valuation regulations (30 C.F.R. 1206.257 (c) (1)(2)) provide ONRR guidance on valuing coal sales.[38] In a joint letter (January 3, 2013) to Secretary Ken Salazar, Senators Wyden and Murkowski outlined the possibility of underpayment of federal royalties and raised specific questions for more information about the royalty management program.[39]

Another associated issue of concern is the opportunity for coal producers to lease contiguous tracts non-competitively. The BLM justifies this practice on the grounds that there would be little interest by others and that the current practice makes the coal more likely to be developed. But to critics, this practice offers an unfair advantage to the existing coal producer.

The PRB area was declared a non-coal producing region by the BLM in 1990 because of the low expression of leasing interest at that time. For example, the BLM reports that industry interest fell from 46 expressions of interest in 1982 to six expressions of interest in 1988.[40] This designation allows for lease-by-application to occur and is of concern to many because it offers fewer opportunities for public input on a potential lease sale, according to the BLM. Environmental groups are arguing for the PRB region to be recertified as a coal producing area. The Powder River Regional Coal Team (RCT) reviews the region's status and could recommend to the BLM Director that the region be recertified. The RCT consists of representatives from BLM, state and county agencies, and Native American tribes in Wyoming and Montana.

# Tax Issues[41]

Currently, there are a number of federal tax incentives available that support coal production, clean coal or advanced coal technologies, and coal mine safety. Certain states impose severance taxes—an excise tax on natural resource extraction—on coal.

## Federal Tax Payments

Businesses in the coal industry are subject to federal income taxes. In 2009, 1,150 coal mining corporations filed tax returns with the Internal Revenue Service (IRS), paying a total of $207.4 million in corporate income taxes.[42] In addition to corporate income taxes, taxes were paid by

(...continued)

must have opposing economic interest. Affiliations could be evaluated by looking at the corporate ownership. A non-arms-length contract is one between affiliates.

[38] The regulations discuss five sequenced benchmarks that may be used to determine value: gross proceeds for a comparable arms-length sale; use of coal price reported to the Public Utility Commission by the utility; price of delivered coal as reported to the EIA; other relevant matters such as the spot market price paid by unaffiliated producers with comparable contracts; or the net back valuation method (which nets out certain downstream costs to get to a free-on-board mine price). There are a number of conditions that determine which benchmark is to be used.

[39] http://www.wyden.senate.gov/news/press-releases/wyden-murkowski-seek-answers-on-coal-royalty-payments

[40] BLM Environmental Assessment of the North Antelope and Rochelle Coal Lease Applications for a Powder River Coal Company.

[41] Authored by Molly Sherlock with CRS's Government Finance and Taxation section.

[42] Internal Revenue Service, *Statistics of Income—2009: Corporate Income Tax Returns*, Washington, DC, http://www.irs.gov/pub/irs-soi/09coccr.pdf.

coal companies structured as partnerships or other forms of pass-through entities on individual income tax returns.[43]

Domestically mined coal is also subject to an excise tax, with excise tax revenues dedicated to the Black Lung Disability Trust Fund. The tax rate is $1.10 per ton of coal produced from underground mines and $0.55 per ton of coal produced from surface mines, subject to a maximum tax rate of 4.4% of the coal's sales price. In 2010, black lung excise tax collections were $610.1 million.[44] In FY2011, the balance of the Black Lung Disability Trust Fund (BLDTF) was negative $5.5 billion.[45] The black lung excise tax is set to be collected until the Trust Fund has repaid all amounts borrowed from the general fund, or until December 31, 2018.

## Federal Tax Incentives

Coal producers benefit from a number of federal tax provisions, commonly referred to as tax expenditures (see **Table 9**).[46] Some of these incentives support conventional coal mining operations—specifically, the ability to expense (i.e., deduct immediately) exploration and development costs and the ability to claim percentage as opposed to cost depletion. Other incentives, such as the production tax credit (PTC) for refined coal and the credit for investment in clean coal facilities are designed to support cleaner, advanced coal technologies.

**Table 9. Coal-Related Federal Tax Incentives**

| Incentive | Description | Expiration |
|---|---|---|
| Expensing of Exploration and Development Costs | Taxpayers can expense (deduct immediately) coal mine exploration expenditures, with deducted amounts recaptured once the mine is producing or is sold. C corporations can only expense 70% of qualifying costs, with the remaining 30% recovered over 5 years. Alternatively, mine exploration expenditures can be amortized over a 10-year period. | Does Not Expire |
| Percentage Depletion | Capital costs can be recovered using percentage depletion. For coal, depletion deductions equal to 10% of gross income from the property are allowed. The deduction is limited to 50% of taxable income from the property. | Does Not Expire |
| Coal Royalties Treated as Capital Gains Income | Dispositions of coal royalties are treated as long-term capital gains, which are taxed at reduced rates. | Does Not Expire |

[43] The IRS Statistics of Income (SOI) data does not provide information on coal mining partnerships and S corporations. In 2009, there were 1,158 partnerships engaged in other mining activities, which include coal, metal ore, and nonmetallic mineral mining. These partnerships reported $1.0 billion in net income in 2009. This income flowed through and was reported on individual income tax returns. Data on income taxes paid by coal partnerships is not available.

[44] See IRS SOI Excise Tax Statistics, Table 20, Federal Excise Taxes Reported to or Collected by the Internal Revenue Service, Alcohol and Tobacco Tax and Trade Bureau, and Customs Service, by Type of Excise Tax, Fiscal Years 1999-2010, available at http://www.irs.gov/taxstats/bustaxstats/article/0,,id=97148,00.html.

[45] Receipts collected for the fund have not been sufficient to cover compensation payments and medical expenses for former coal mine employees. Over time, tax revenues have been supplemented with appropriations from the general fund and the issuance of debt.

[46] Background information on specific tax provisions can be found in U.S. Congress, Senate Committee on the Budget, *Tax Expenditures: Compendium of Background Material on Individual Provisions*, committee print, prepared by Congressional Research Service, 111th Cong., December 2010, S.Rept. 111-58.

| Incentive | Description | Expiration |
|---|---|---|
| Credit for Investment in Clean Coal Facilities | A 30% tax credit is available for integrated gasification combined cycle (IGCC) and advanced coal-based electricity generation technologies (ACBGT) projects. Tax credits are allocated to qualifying projects jointly by the Treasury and Department of Energy (DOE). | Allocation Based – Limited Funds Available |
| Exclusion of Special Benefit for Disabled Coal Miners | Disability payments to former coal miners out of the Black Lung Disability Trust Fund are excluded from taxable income. | Does Not Expire |

**Source:** CRS and the Internal Revenue Code (IRC).

**Notes:** Generally available tax incentives from which the coal industry benefits, such as the Section 199 production activities deduction, are not included in this table.

There are also tax provisions designed to encourage investment in mine safety equipment and mine rescue training. These two incentives were initially enacted on a temporary basis, but have been extended in the past as part of "tax extenders" legislation.

In addition, the coal industry benefits from a number of tax incentives that are available to multiple industries. For example, the Section 199 production activities deduction is available to all domestic manufacturers.[47] Mining is considered a qualified manufacturing activity for the purposes of claiming this deduction. Businesses that earn income through coal mining activities may also be allowed to structure as master limited partnerships (MLPs), a type of business structure that is associated with certain tax benefits.[48] The Section 199 deduction and the ability to structure as an MLP, while not unique to the coal industry, serve to reduce taxes paid by coal-related businesses.

The President's FY2013 Budget proposes eliminating various tax incentives for coal as part of a broader strategy to "phase out subsidies for fossil fuels."[49] Specifically, the President's proposal would repeal expensing of exploration and development costs, require that coal mines use cost depletion rather than percentage depletion, and repeal the capital gains treatment of coal royalties. Eliminating these three incentives would generate an estimated $2.6 billion in additional federal revenues over the FY2013 to FY2022 budget window.[50] The President's FY2013 Budget also proposes eliminating the Section 199 production activities deduction for coal, using the revenues generated to increase the Section 199 production activities deduction for certain advanced manufacturing activities.[51]

[47] For additional background, see CRS Report R41988, *The Section 199 Production Activities Deduction: Background and Analysis*, by (name redacted).

[48] For background on the MLP structure, see CRS Report R41893, *Master Limited Partnerships: A Policy Option for the Renewable Energy Industry*, by (name redacted) and (name redacted).

[49] Department of the Treasury, *General Explanations of the Administration's Fiscal Year 2013 Revenue Proposals*, Washington, DC, February 2012, p. 120.

[50] Ibid., p. 204.

[51] See CRS Report R41988, *The Section 199 Production Activities Deduction: Background and Analysis*, by (name red acted).

## Severance Taxes

Severance taxes are taxes imposed on the removal of natural resources from land or water. Severance taxes are generally charges based on the value or volume of the natural resource being extracted, and are thus independent of income or profits. Several states impose severance taxes on coal.[52] Severance taxes on coal are not collected at the federal level.

# World Coal

## World Coal Reserves and Resources

**Table 10** illustrates global ranking of coal reserves. The United States has about 261 BST in reserves (27.4% of world total) followed by Russia with an estimated reserve base of 173 BST (18.3%). China is third, with 126 BST (13.3%). Taken together, the top three countries hold 59% of the world's recoverable coal reserves. When India and Australia are added, the top five coal producing countries hold 75% of world recoverable coal reserves. This indicates a great deal of coal reserves concentration by country. The U.S. government alone would rank fourth (9%) behind China in reserve holdings.

**Table 10. World Recoverable Coal Reserves by Rank, 2009**

(billion short tons)

| Country | Bituminous and Anthracite | Sub-bituminous | Lignite | Total | Percent of Total |
|---|---|---|---|---|---|
| United States | 119.2 | 108.2 | 33.2 | 260.6 | 27.4 |
| Russia | 54.1 | 107.4 | 11.5 | 173.1 | 18.3 |
| China | 68.6 | 37.1 | 20.5 | 126.2 | 13.3 |
| Other Non-OECD Europe and Eurasia | 42.2 | 19.1 | 40.1 | 101.4 | 10.7 |
| Australia and New Zealand | 40.9 | 2.5 | 41.4 | 84.8 | 8.9 |
| India | 61.8 | 0.0 | 5.0 | 66.8 | 7.0 |
| Africa | 34.7 | 0.2 | 0.0 | 34.9 | 3.7 |
| Other | 101.1 | 31.8 | 103.7 | 236.5 | 10.7 |
| World Total | 445.7 | 287.0 | 215.3 | 948.0 | 100.0 |

**Source:** IEO, 2011.

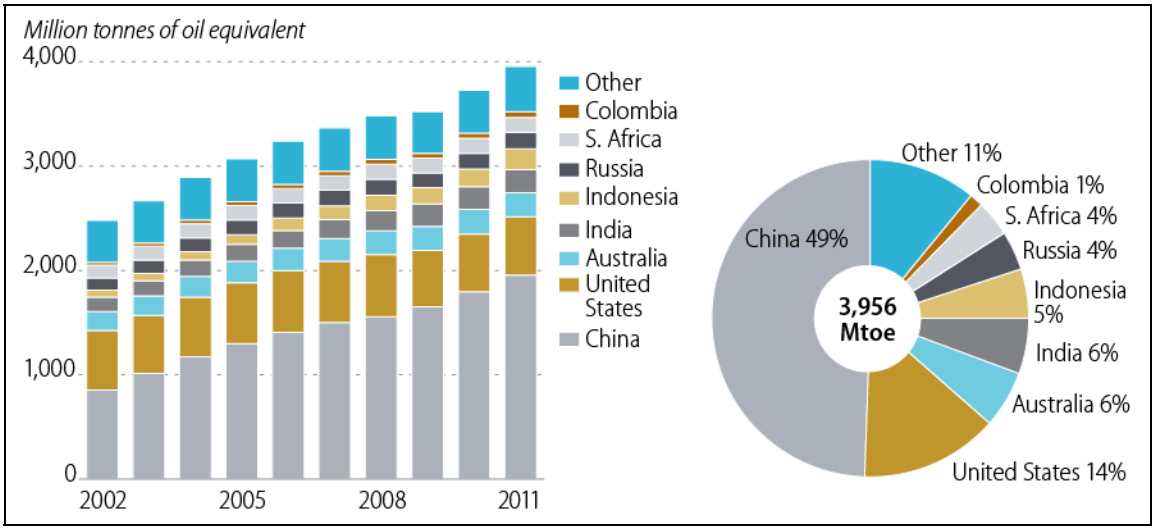
[52] Information on state-level severance taxes can be found on the National Conference of State Legislatures website, at http://www.ncsl.org/issues-research/budget/2011-state-severance-tax-collections.aspx. Severance taxes are distinct from state-level income taxes, which may also be imposed on coal-related businesses.

## World Coal Production

World coal production has increased by nearly 60% since 2002, with most of the increase coming from China—up 130%. China accounted for about 50% of coal production in 2011, up from 34% in 2002. The data illustrate that other countries such as Columbia, Indonesia, and India also had significant production increases since 2002. India's coal production grew by 60% over the past 10 years, while Indonesia's production more than tripled. Australia increased coal production by 26% over the same time period. Indonesia, a major coal exporter, is likely to use a larger share of its production for domestic consumption. See **Figure 3.**

**Figure 3. World Coal Production by Percent**

(2011)




**Source:** BP Statistical Review of World Energy, 2012.

## Projected World Coal Production

### EIA and OECD Outlook

EIA projects world coal output to rise by 40% over its most recent forecast period (2011-2035), but only by 11% over the next 10 years.[53] China would account for 61% of coal production increases through 2035. China accounts for 47%-50% of production now and is expected to account for about 51% in 2035, according to EIA projections. India would increase its production by 50% over the forecast period, as non-OECD Asian (including Indonesian) coal production is projected to grow by about 50%. EIA projects U.S. production to rise by 17% over the forecast period and coal production capacity to be large enough to satisfy the U.S. coal market. The EIA projects overall U.S. coal exports, measured in Btus, to rise by over 80% from 2009-2035, most of that increase coming from coking coal exports, which more than double over the forecast period. Steam coal exports would rise by 37%.

[53] Output is measured in quadrillion BTUs.

The OECD/IEA World Energy Outlook report (2011) makes projections based on a "New Policies Scenario."[54] According to OECD "new policies" projections, global coal output would rise 18% between 2009 and 2020, then remain essentially flat through 2035.[55] Growth in coal production is mostly in China and in other non-OECD countries, such as India and Indonesia. India would increase production by 70% and also increase its share of world output from 5.6% to over 10%. Under the New Policies scenario, U.S. coal output would decline from 14.1% to 12% of world coal output over the forecast period.

Overall, coal output from OECD countries would fall by 14%, while coal output from non-OECD countries would rise by 32%, according to the report. The OECD analysis shows significant gains for U.S. coal supply onto the world market—exports growing by 65% between 2009 and 2035 (most of which would be coking coal)—and projects a weak outlook for coal in the domestic market, which is considered by OECD to be the primary driver of U.S. coal output.

# Conclusions

Global coal production and demand has grown significantly over the past decade and coal will likely be the dominant fuel for power needs over the EIA forecast period, as Asian and many emerging economies grow and more rapidly increase their demand for electric power.

Despite the regulatory concerns, U.S. coal production was robust over the last decade, reaching an all-time production high (in tonnage) in 2008, before a slight decline following the great recession. U.S. coal production is forecast to rise at a rate (<1%) slightly above projected U.S. demand through 2040, according to the EIA. In 2011, coal fell below natural gas as the leading source of primary energy production in the United States and will unlikely reclaim the top spot that it held for nearly the past three decades.

If trends continue, the U.S. coal industry will likely become more concentrated and produce more on federal lands. This may raise the issue that lease sales could become no more competitive in the future than they are today and possibly even less competitive. But since fair market value returns to the government consider all of the revenue streams, not just bonus bids at the lease sale, it will become increasingly important for the federal government to capture the correct valuation of federal coal (price x volume) and assign the appropriate royalty rate. Most of the federal coal (94%) in the PRB is accessible or possibly accessible (pending land use plans or surface owner consent), but 70% of the resource base has not been screened for leasing because of low interest and higher costs. This lack of interest could place a limit on just how much federal coal actually gets developed.

Overall, U.S. coal production has been very strong over the past decade and if the industry is successful in penetrating the global market, primarily for steam coal, U.S. production may continue to grow faster than consumption. Although U.S. metallurgical coal will likely continue to be in demand on the world market, higher than predicted steam coal exports could further widen the gap between U.S. coal production and consumption.

[54] OECD's New Policy Scenario assumes "cautious implementation of the policy commitments and plans that have been announced by countries around the world" to reduce carbon emissions.

[55] Output is measured in million tons of coal equivalents.

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