

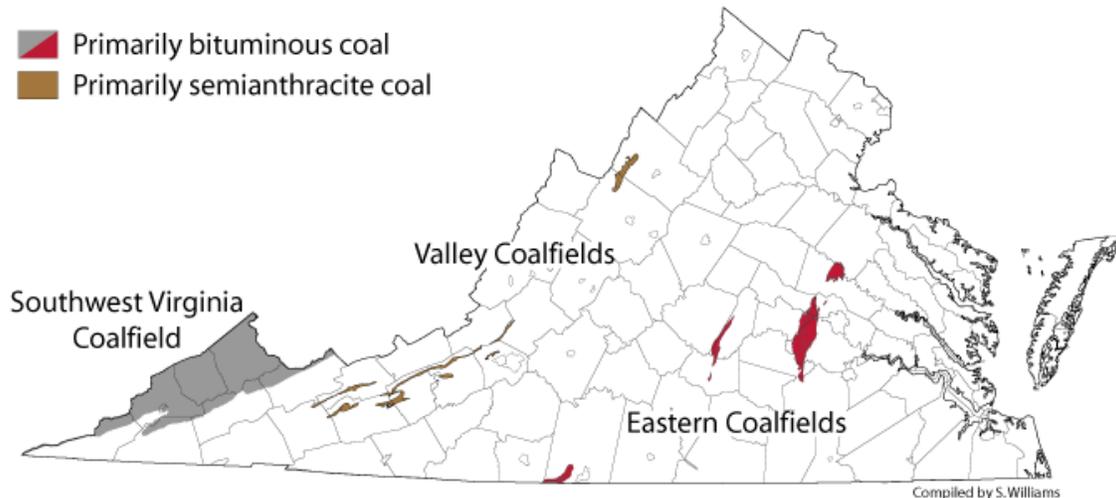
## SECTION 6 - COAL

### Coal Mining in Virginia

- The first commercial production of coal in the United States occurred in 1748 from the Richmond coalfield located in the Richmond Basin of Virginia (Figure 6-1). The last major mines in this area closed in 1927.
- Coal was also commercially-produced off and on from the Valley Coalfield from the 1850's until 1954.
- Today, coal is mined in the Southwest Virginia Coalfield which began shipping coal commercially in 1882. Since the 1950's, virtually all of Virginia's coal production has come from the Southwest Virginia Coalfield. This coalfield is part of the extensive Appalachian Coal Basin, which extends from Pennsylvania to Alabama.



Figure 6-1: Virginia's Coalfields<sup>1</sup>



- Fifty-one Virginia mining companies produced 17 million tons of coal in 2013, ranking the State 14<sup>th</sup> in production, nationwide. Two companies produced nearly eight million tons, accounting for 45 percent of 2013 production, as noted in the table below.

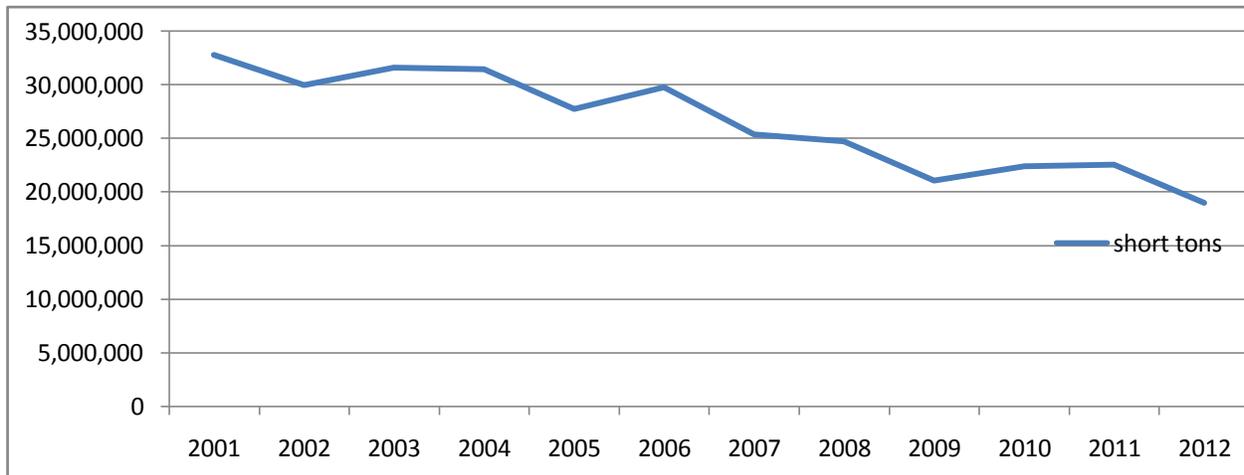
<sup>1</sup> DMME, <http://www.dmme.virginia.gov/dgmr/coal.shtml>

**Table 6-1: Virginia's Two Largest Coal Producing Companies**

CONSOL Energy	4,800,000 tons
Paramont Coal Company Virginia, LLC	3,258,138 tons

- Virginia coal production peaked at 46.6 million tons in 1990. Production decreased in Virginia from 30 million tons in 2002 to 19 million tons in 2012. The gradual decline is the result of the depletion of the more productive (thick) and easily-mined coal seams that have lower mining costs<sup>2</sup>.

**Figure 6-2: Virginia Coal Production, 1960-2012<sup>3</sup>**



**Table 6-2: Virginia Coal Mining Employment<sup>4</sup>**

Year	Number of Producing Mines	Number of Coal Miners At Producing Mines
2003	156	4,411
2008	143	4,394
2012	112	4,641
2013	89	4,864

<sup>2</sup> <http://www.energy.vt.edu/vept/coal/>

<sup>3</sup> Virginia Department of Mines, Minerals and Energy

<sup>4</sup> Virginia Department of Mines, Minerals and Energy

- Virginia’s coal industry directly employed 4,864 people in 2013, up from 4,411 in 2003.
- While the number of producing mines has decreased as more productive and easily obtained coal reserves have been depleted, the number of miners has increased by approximately 10 percent.
- Virginia produces the majority of its coal from underground mines.<sup>5</sup> In 2012, 61 percent of coal mined in Virginia came from underground mines.
- The percentage of surface mined coal has increased in recent years, from 16 percent in 1990, to 25 percent in 1998, and to 39 percent in 2012.<sup>6</sup> The percentage of coal mined from surface sites is expected to decrease over the next 10 years as the larger areas of surface reserves are mined out.
- Virginia accounted for 4.5 percent of U.S. coal production east of the Mississippi River in 2012.<sup>7</sup>
- There has been a trend towards consolidation of coal ownership.
- The top five companies produced more than 50 percent of the coal mined in the United States, in 2010. Of those companies, listed in Table 6-3, Arch Coal Inc., Alpha Natural Resources LLC, and CONSOL Energy Inc. operate coal mines in Virginia.



**Table 6-3: Top 5 Coal Producers in the United States, 2012<sup>8</sup>**

Rank	Controlling Company Name	Production (thousand short tons)	Percent of Total Production
1	Peabody Energy Corporation	192,563	18.9
2	Arch Coal Inc.	136,992	13.5
3	Alpha Natural Resources LLC	104,306	10.3
4	Cloud Peak Energy	90,721	8.9
5	CONSOL Energy Inc.	35,406	5.5

- In Virginia, production is predominately (70 percent of mining operations) from small operations (36 employees on average) mining remnant or finite reserves, using the room and pillar mining method. Most of these smaller operators contract for larger companies.
- Coal mining companies pay severance taxes of 2 percent of the value of the coal extracted to the county where the mine is located, as well as personal property and other local taxes.

<sup>5</sup> <http://www.eia.doe.gov>

<sup>6</sup> EIA Annual Coal Report – November 2014: <http://www.eia.gov/coal/annual/>

<sup>7</sup> <http://www.eia.gov/state/?sid=VA>

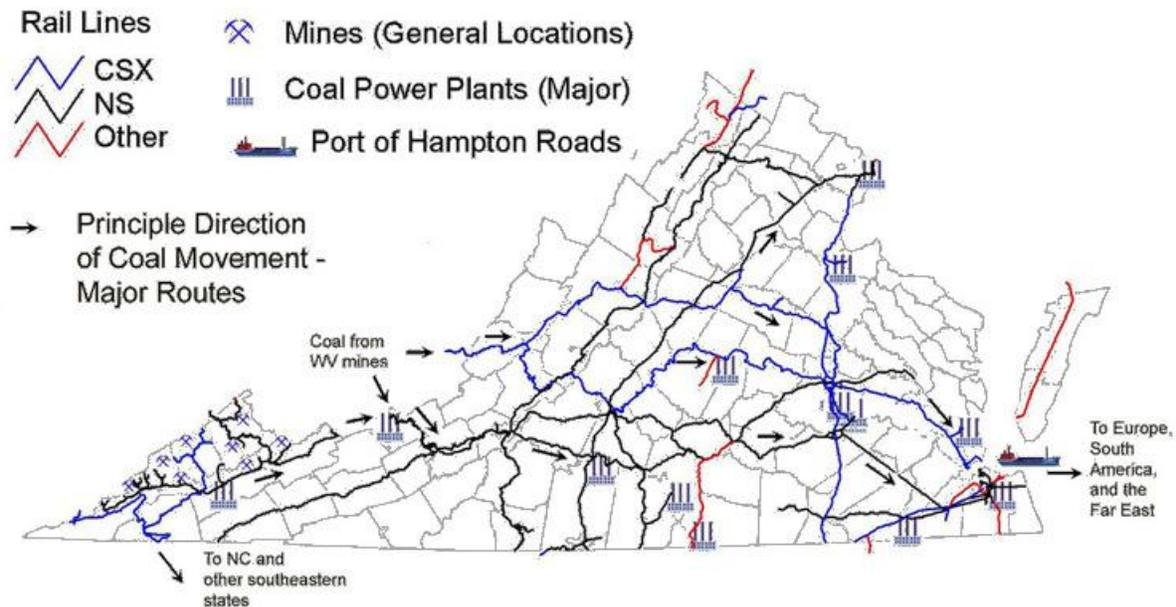
<sup>8</sup> <http://www.eia.doe.gov>

- Percentage of local government revenue derived from mineral taxes in the coal producing counties:<sup>9</sup>
  - Buchanan: 52%
  - Dickenson: 41%
  - Lee: 2%
  - Russell: 13%
  - Tazewell: 62%
  - Wise: 21%\*

## Infrastructure

- Most Virginia coal is shipped from mines to preparation plants and rail load outs by truck, then to market and ports by rail.
- On a tonnage basis, coal accounts for more than two-thirds of all Virginia rail freight traffic. Coal is shipped from the Southwest Virginia coalfield via Norfolk-Southern, and CSX railroads via each company's primary coal corridor lines.
- Virginia coal is exported from terminals in the Port of Hampton Roads to Europe, South America, and the Far East.
  - The Port, America's largest coal export facility, serves as an export point for Virginia coal, and processed over 38 percent of U.S. coal exports in 2012.
  - The markets for this coal include electric generators located close to East Coast shipping lanes and overseas electric utilities and steel manufacturers.

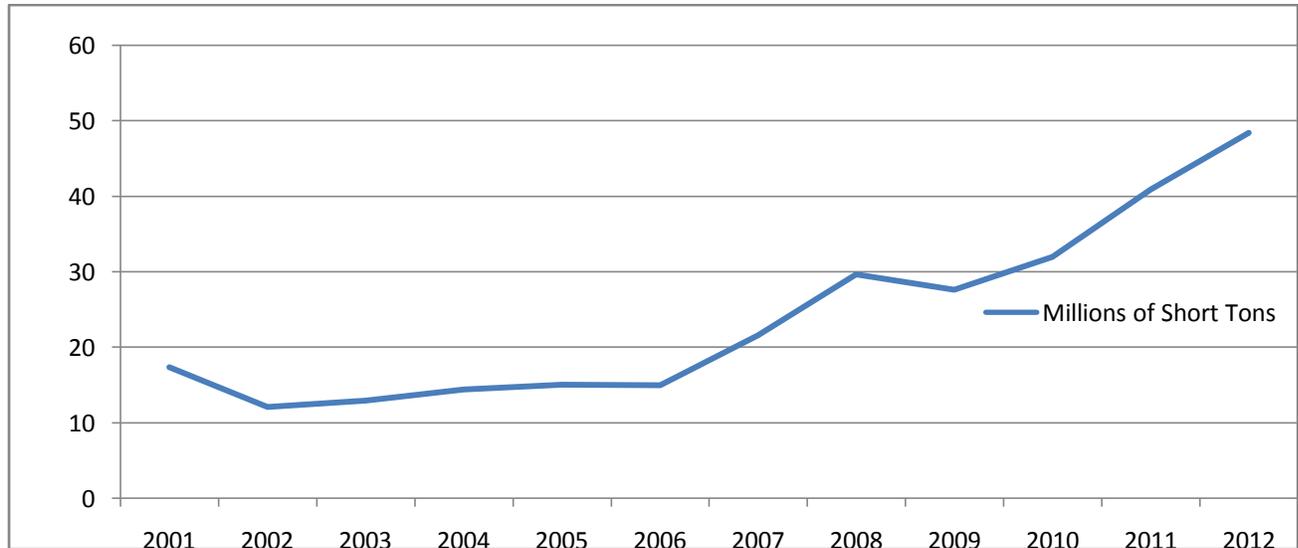
Figure 6-3: Map of Virginia's Coal Transportation Network<sup>10</sup>



<sup>9</sup> Virginia Auditor of Public Accounts, Comparative Report of Local Revenue, June 30, 2011. \*Wise County reflects June 30, 2010 report as most recent available.

<sup>10</sup> Virginia Energy Patterns and Trends (VEPT), Virginia Coal Transportation, <http://www.energy.vt.edu/vept/coal/virginiacoal.asp>, June 28, 2010

Figure 6-4: Coal Shipments from Norfolk, 2001-2012<sup>11</sup>



## Global Coal Market

- In 2010, 7.5 percent of coal produced in the US was exported and 2 percent of the coal consumed in the U.S. was imported.<sup>12</sup>
- In 2007, coal accounted for 27 percent of world energy consumption.
- Of the coal produced worldwide in 2007, 64 percent was shipped to electricity producers.<sup>13</sup>

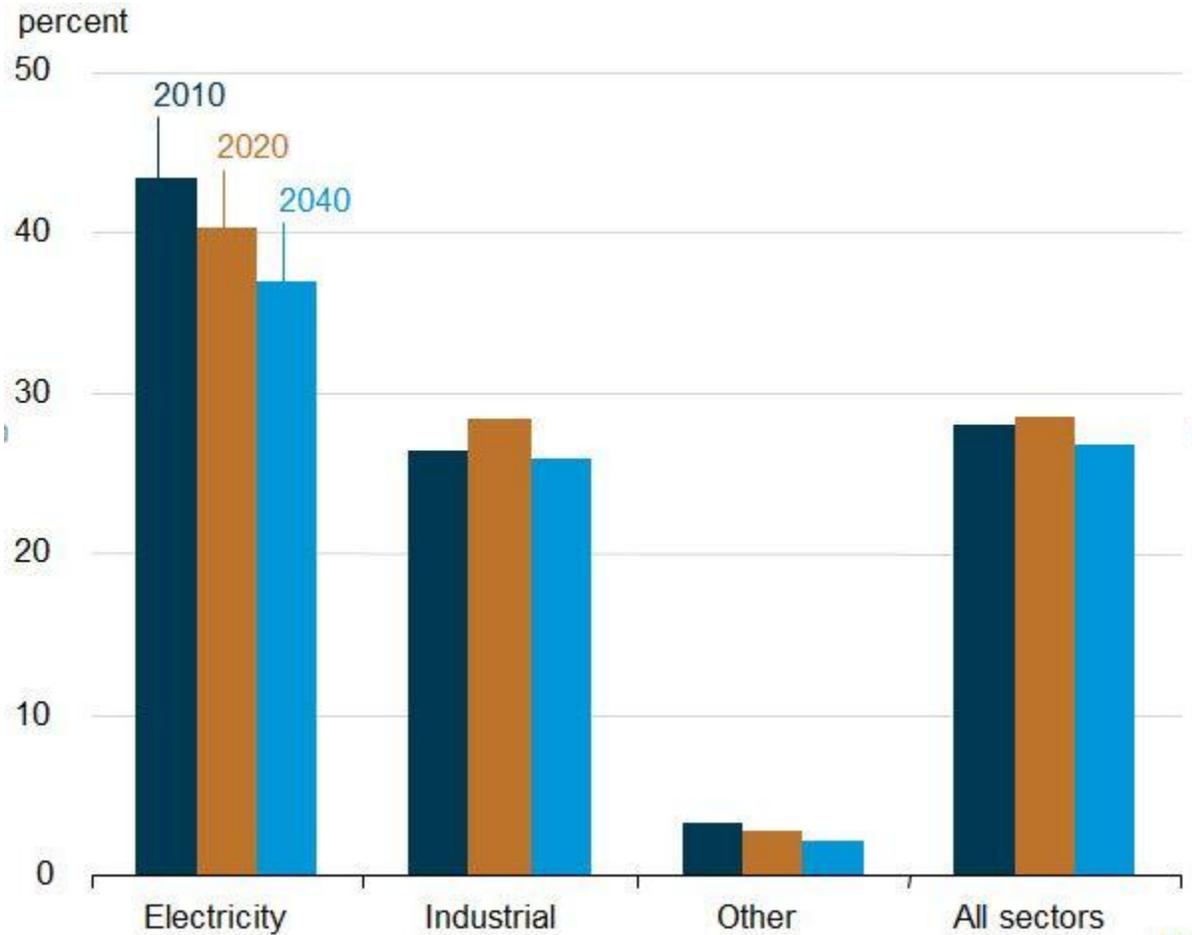


<sup>11</sup> Virginia Energy Patterns and Trends: Coal Shipments from the Port of Hampton Roads, [www.energy.vt.edu/vept/coal/basins.asp](http://www.energy.vt.edu/vept/coal/basins.asp)

<sup>12</sup> <http://www.eia.doe.gov>

<sup>13</sup> <http://www.eia.doe.gov>

Figure 6-5: Coal Share of World Energy Consumption by Sector, 2010, 2020, and 2040



- Given the noticeable decline in estimated reserves, the large reserves-to-production ratio for world coal indicates there is sufficient coal to meet demands well into the future. Additionally, those estimates could increase substantially as coal mining technology improves and as additional geological assessments of the coal resource are completed.<sup>14</sup>
- World coal reserves, although historically stable, have declined gradually from 1,145 billion tons in 1991, to 1,083 billion tons in 2000 and 909 billion tons in 2008.
- World coal reserves are estimated at 909 billion tons, which equates to a reserves-to-production ratio of 129 years.
- In 2007, China accounted for nearly 42 percent of world coal production, compared to the United States, at 18 percent. Other major leading coal producing countries include

<sup>14</sup> International Energy Outlook 2010, <http://www.eia.gov/oiaf/ieo/coal.html>, June 27, 2011

Australia, India, Africa, and Russia, which combined to produce 22 percent of the world's coal.<sup>15</sup>

## Coal Markets - Other Uses

- In a typical year, 25-30 percent of Virginia coal is sold domestically in Virginia and to other states for manufacturing steel or making industrial steam.
- A small amount is sold domestically for institutional, commercial, and residential heating.
- Virginia coal operators also sell coal in the European and Asian markets for steel manufacturing or electric generation.
  - Overseas tonnage varies greatly from year- to- year, depending on the competitiveness of Virginia coal as compared to Australian, Chinese, South African, Polish, and South American coal.

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## Coal Prices

- Coal is priced separately in the steam and metallurgical coal markets.<sup>16</sup> Steam coal is generally lower in cost.
- Coal prices fluctuate over a considerable range, as the international and domestic coal markets fluctuate due to changes in economic activity and demand for electricity and steel. The average sales price for Virginia coal in 2010 was \$98.46 per short ton, compared to a U.S. average price of \$35.61. The average reflects steam and metallurgical coal prices.

**Table 6-4: Steam Coal Prices - Average Delivered Price (\$/short ton)<sup>17</sup>**

Year	Electric Utility Plants	Other Industrial Plants
2000	\$24.28	\$31.46
2001	\$24.68	\$32.26
2002	\$24.24	\$35.49
2003	\$25.82	\$34.70
2004	\$27.36	\$39.30
2005	\$31.22	\$47.63
2006	\$34.26	\$51.67
2007	\$36.06	\$54.42
2008	\$41.32	\$63.44
2009	\$44.47	\$64.87
2010	\$45.09	\$64.24

<sup>15</sup> <http://www.eia.doe.gov>

<sup>16</sup> Metallurgical coal is used for making steel and generally has a higher energy value, lower ash, and higher volatility than steam coal.

<sup>17</sup> <http://www.eia.doe.gov>

- The federal Energy Information Administration (EIA) estimates that average minemouth prices<sup>18</sup> for Appalachian steam coal, after peaking in 2009, will decline by 0.5 percent per year through 2035. The decline will be a result of falling demand for the region's coal and a shift to lower cost production in the northern part of the Appalachian basin.
- Metallurgical coal prices are projected to remain volatile based on international demand for steel.

Figure 6-6: EIA Coal Price Forecast<sup>19</sup>

**Expected declines in mining productivity lead to further increases in average minemouth prices**

**Figure MT-62. Average annual minemouth coal prices by region in the Reference case, 1990-2040 (2012 dollars per million Btu)**



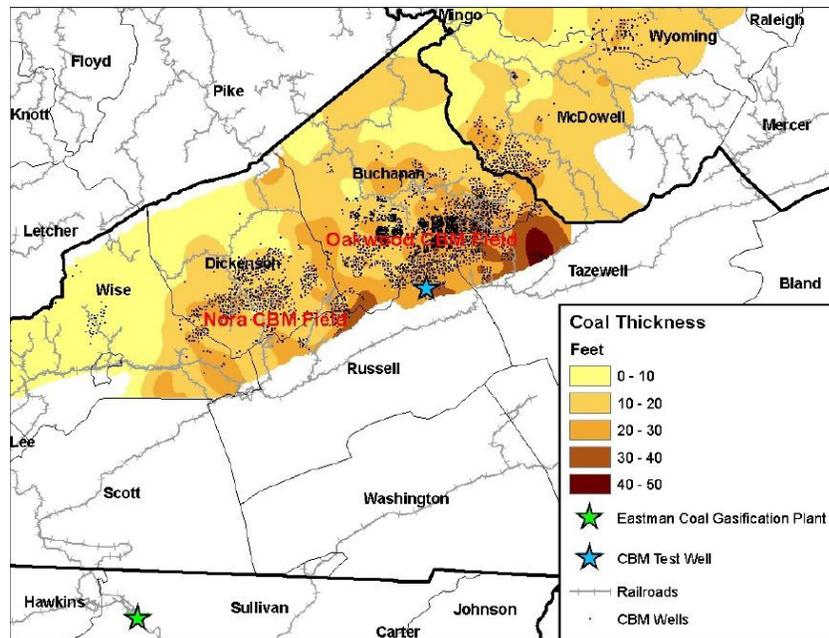
## Future Use of Coal

The Virginia Center for Coal and Energy Research led a team under the Southeastern Carbon Sequestration Partnership (SECARB) that tested key concepts of carbon capture and storage, including characterization of unmineable coal seams for carbon sequestration and testing sequestration technology in Russell County.

<sup>18</sup> Minemouth price is the price paid by a purchaser at the mine, without added transportation costs.

<sup>19</sup> <http://www.eia.doe.gov>

Figure 6-7: Location of Carbon Sequestration Test Well in Russell County, Virginia<sup>20</sup>



<sup>20</sup> Southeast Carbon Sequestration Partnership, Central Appalachian Coal Seam Project Fact Sheet, <http://www.energy.vt.edu/secarb/index.asp>, June 23, 2010