Wyoming's Coal Resources
Summary Report

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Introduction

Affordable energy for the nation has propped up the Wyoming coal industry that has recently been impacted by competing fuel sources, congested railways, and impending environmental regulations. Despite these challenges, Wyoming produced 39 percent of all the coal mined in the United States in 2013, and today continues to lead the nation in coal production.

Wyoming produces more coal than the next six top coal-producing states combined (West Virginia, Kentucky, Pennsylvania, Illinois, Texas, and Montana). In 2013, Wyoming's 18 coal mines produced more than 388 million tons, nearly 40 percent of the nation's coal.

One of the most prolific coal-mining regions in the world is in the Powder River Basin (PRB) of northeastern Wyoming (Campbell and Converse counties). Campbell County leads the nation in coal mining with over 343 million tons produced in 2013 (table 1). Nine of the nation's 10 largest coal mines operate as surface mines in the PRB. Wyoming also has surface mines near Rock Springs, Thermopolis, and Kemmerer, and one underground mine, the Bridger Mine, in Sweetwater County.

Wyoming has some of the most efficient coal mines in the nation. This is because the coal resource the state produces is less expensive to mine and burns cleaner than the high-sulfur coal mined in other parts of the country. In the PRB, the thick coals in the Tongue River Member of the Fort Union Formation are considered "clean coal" for power plants.

The U.S. Energy Information Administration (EIA) predicts a positive future for PRB coal. While utilities have been turning to natural gas for new generating capacity, its price volatility during the extended cold weather stretch in the winter of 2014 resulted in a larger amount of coal being used for electrical generation.

Coal Production

Wyoming's coal mines continued with robust growth in 2013 and 2014. Most of this coal was burned in power plants to make steam for generating electricity, with approximately 1 percent used for industrial purposes.

The largest U.S. coal mine is Peabody Energy's North Antelope Rochelle Mine in the PRB. It produced over 111 million tons of coal in 2013. The nation's second largest coal mine is Arch

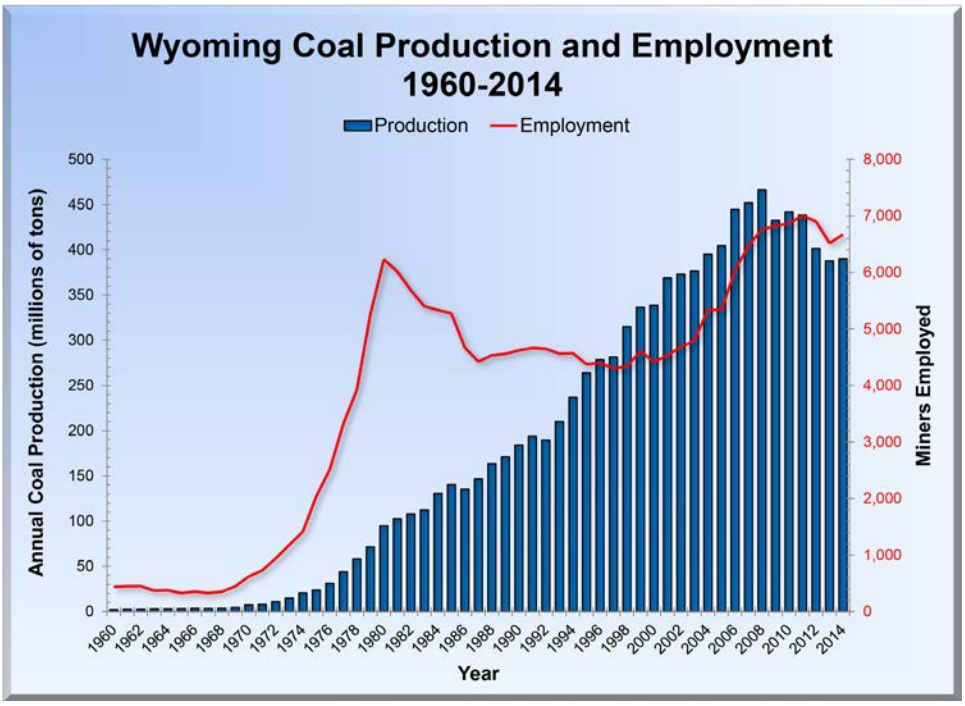

Figure 1. Wyoming coal produced along with the number miners employeed since 1960.

Coal's Black Thunder Mine, also in the PRB, which produced over 98 million tons in 2013.

More than 10 billion tons of coal have been produced from Wyoming coal mines since 1865. Over this 150-year period, Wyoming ranks third behind West Virginia and Pennsylvania in cumulative coal production. Nearly 70 percent of the state's historic total was produced in the last 20 years. The PRB continues to be a major source of the nation's coal with Wyoming maintaining its No. 1 ranking in production. The state's mines also provide nearly 7,000 jobs annually (fig. 1).

Coal Distribution and Consumption

Production at the mines increased between the end of 2013 and the middle of 2014 because coal stockpiles at electric power plants were relatively low nationally. Due to cold weather last year, stockpiles significantly decreased, and many operators increased their fall 2014 deliveries over the previous year. As a result, stockpile inventory has improved for 2015. Also a factor, record grain harvests and increasing petroleum railcars have led to coal trains vying for space on common railroad networks. Despite this issue, coal railcar loadings in 2014 were up 1 percent nationally (EIA, 2015). The majority of PRB coal is shipped to power plants in 32 other states, as over 96 percent of Wyoming coal is transported by railway.

The top five states that used Wyoming coal in 2013 were: Texas (54 million tons (MT)), Illinois (50 MT), Missouri (41 MT), Wisconsin (20 MT), and Iowa (20 MT) (fig. 2). The longest haul in the nation for Wyoming coal sales was to Florida. In-state, Wyoming power plants consume about 25 million tons of Wyoming-produced coal annually and industrial plants consumed 1.5 million tons of coal from Wyoming, in addition to importing 83,000 tons of coal from Colorado, Montana, and Pennsylvania. More than 27,000 tons of Wyoming coal was also used at commercial and institutional facilities in Wyoming.

Coal Geology and Quality

Wyoming coal ranges from Cretaceous to Eocene in age (145 to 56 million years). Freshwater peat swamps formed along the western shoreline of the Cretaceous Interior Seaway. Over geologic time, the seaway dried up as it regressed to the northeast, leaving the peat swamps to be covered by overlying sediments from the southwest. During the Paleocene (66 to 56 million years) and Eocene (56 to 34 million years), thick peat swamps were developed along river systems between mountain uplifts, while basins such as the PRB were formed. The sheer weight of the overlying rock, over geologic time, and increases in pressure and temperature turned the dried-up peat into coal. Thick peat was compressed into coal beds and carbonaceous shale as much as 200-feet thick.

Table 1. Wyoming's 2013 coal production by county and mining method (Wyo. State Inspector of Mines, 2014).

County	2013 Production*	Method		Mines
		Underground	Surface	
Campbell	343,018,222		343,018,222	12
Converse	31,354,248		31,354,248	1
Hot Springs	26,587		26,587	1
Lincoln	4,639,135		4,639,135	1
Sweetwater	8,956,880	4,442,616	4,514,264	3
Total	387,995,072	4,442,616	383,552,456	18

* Production in short tons.

Coal mined today in Wyoming is considered "clean coal" because of its very low sulfur concentrations. Wyoming coal is generally characterized as a low sulfur (0.2-0.4 percent) and ash (4.3-6.1 percent) subbituminous (8200-8800 British thermal units (Btu)) coal resource. In this respect, Wyoming coal does not require the cleaning and processing needed for much of the coal in the eastern United States. As a result, Wyoming coal mines can ship their coal directly to power plants. Low-sulfur Wyoming coal is often blended with high-sulfur eastern U.S. coal at power plants to form an environmentally compliant fuel source.

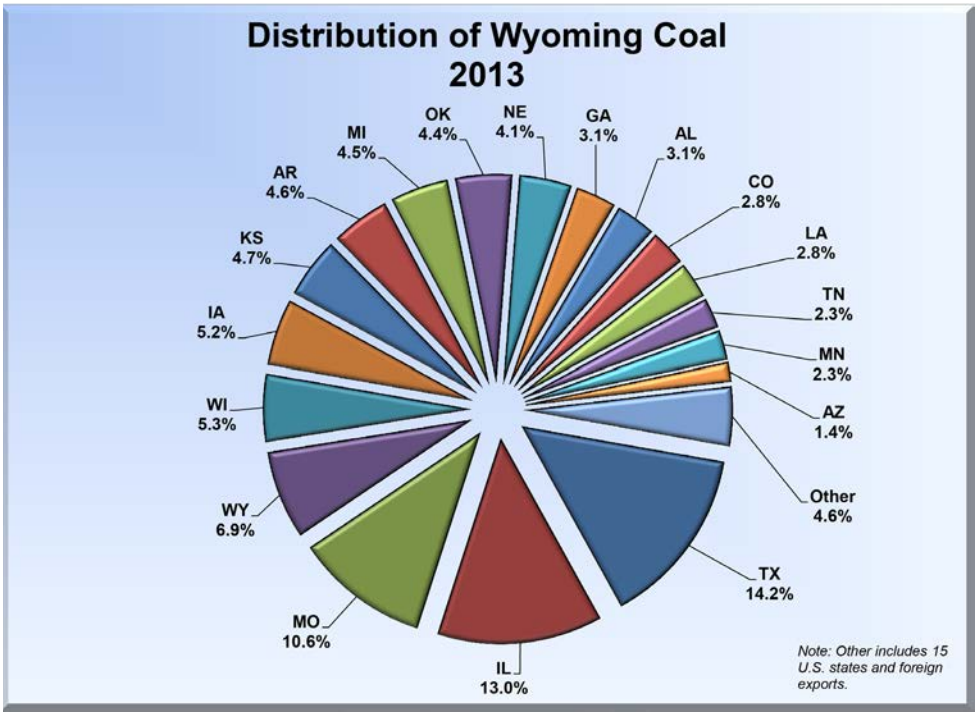

Figure 2. Distribution of Wyoming coal produced in 2013 by state (EIA, 2014).

Future of Coal Mining

The EIA projects the nation's coal production will decrease by 1 percent in 2015. Many power plants have installed sulfur dioxide scrubbers allowing them to use higher sulfur coal from interior regions of the United States such as the Illinois Basin. This year, new power plants will face more stringent regulations when the U.S. Environmental Protection Agency implements its Mercury and Air Toxics Standards, along with the agency's recommendations regarding carbon dioxide emissions.

Fortunately for the coal industry in Wyoming, the state's coal naturally has some of the lowest sulfur, mercury, and arsenic concentrations in the United States. Coal-fired power plants are the main source of electricity because they are safe, less expensive to operate, and reliable as a base-load electric fuel. Nationally, electricity demand is up 8 percent while coal consumption is up only 3 percent. The share of total U.S. electricity generation by coal is expected to fall from 39 percent to 38 percent, as lower natural gas prices make fuel-switching more attractive.

Sources:
Wyoming Department of Environmental Quality
Wyoming Mining Association
Wyoming State Inspector of Mines
U.S. Energy Information Administration
U.S. Mine Safety and Health Administration
U.S. Geological Survey
Office of Surface Mining Reclamation and Enforcement
Mineral Information Institute
Wyoming Department of Administration and Information, Economic Analysis Division

Graphics by James R. Rodgers, WSGS, 2015.

Preliminary Mining Safety and Health Administration estimates for 2014 indicate that Wyoming coal production increased by 2.3 percent over the past year from 388 million tons to 396 million tons.

The average spot price of PRB coal has increased by 15 percent from $10.58 a ton in 2013 to more than $12.20 a ton in 2014. Using the spot price for surface coal and $31.30 for underground coal, the value of Wyoming coal produced in 2014 increased to an estimated $4.9 billion, an 18 percent increase in value over 2013.

The North Antelope/Rochelle Mine (NARM) produced nearly 118 million tons of coal in 2014 or 12 percent of the entire nation's coal. In fact, NARM and Arch Coal's Black Thunder Mine together produced more than 22 percent of the U.S. coal supply. However, the coal industry in general has been threatened with more stringent air quality standards and low natural gas prices that have resulted in many utilities switching from coal to natural gas-fired power plants.

For updated production numbers and other information on Wyoming coal, log on to www.wsgs.wyo.gov/research/energy/coal

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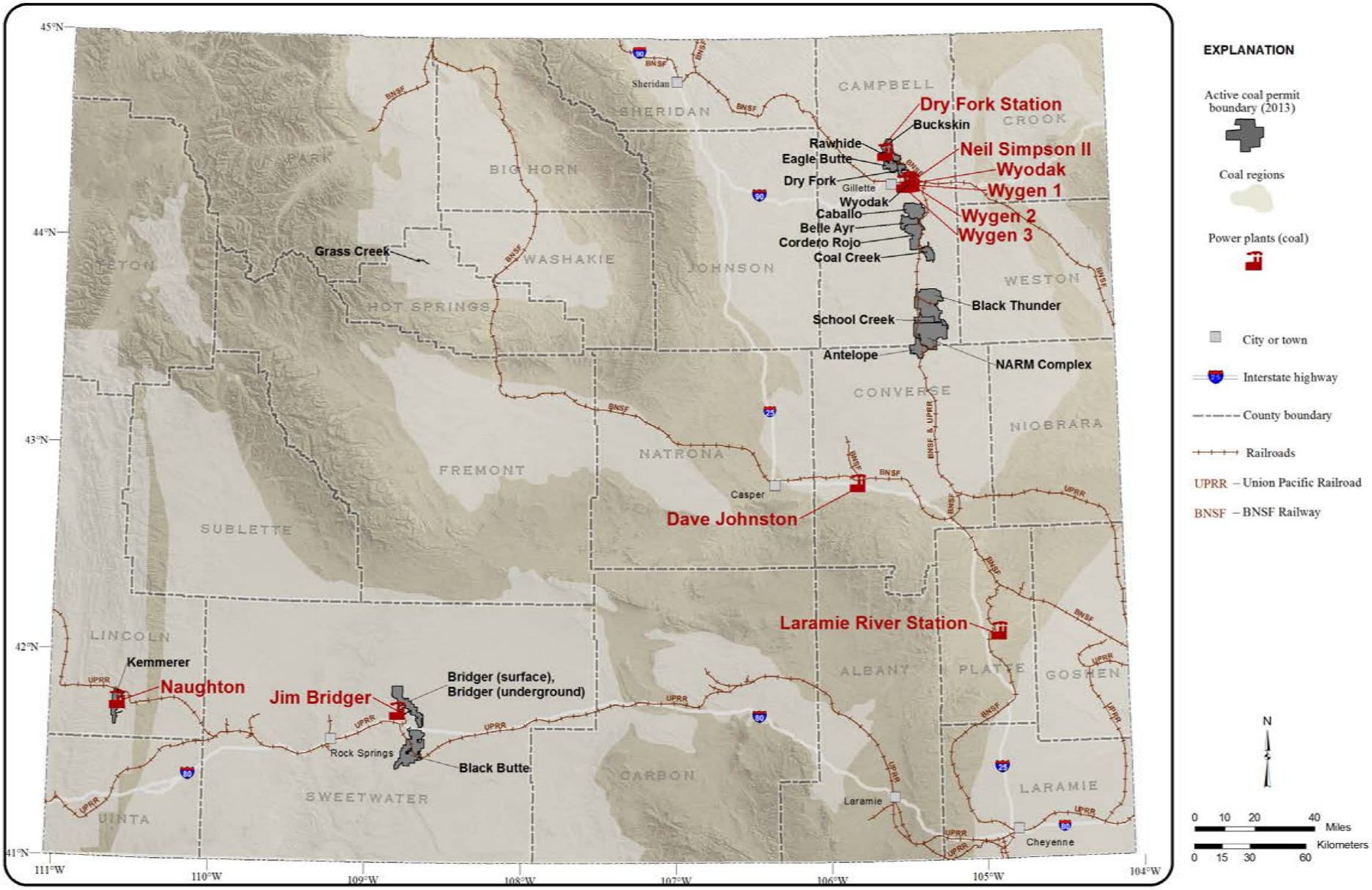
Geology - Interpreting the past - Providing for the future



EXPLANATION

Active coal permit boundary (2013)

Coal regions

Power plants (coal)

City or town

Interstate highway

County boundary

Railroads

UPRR – Union Pacific Railroad

BNSF – BNSF Railway

N

0 10 20 40 Miles

0 15 30 60 Kilometers

Wyoming Coal Mines and Coal Fired Power Plants

Map design by Phyllis Ranz 1/2015