[_private/header.htm]

Reprinted with permission - Proceedings of the Pittsburgh Coal Conference

---

PRODUCTION TRENDS OF MAJOR U.S. COAL-PRODUCING REGIONS

Robert C. Milici

U.S. Geological Survey
956 National Center
Reston, Virginia, 22092

INTRODUCTION

The United States has produced more than 60 billion tons of coal during the last 180 years. Of this, about 40 billion tons have been produced from the Appalachian basin, 10 billion tons from the Illinois basin, 1 billion tons from the Gulf Coast region, 4 billion tons from the northwestern Rocky Mountain Region, 2 billion tons from the central Rocky Mountain region, and about 3 billion tons from the other coal fields in the country. Much more than 60 billion tons remains to be produced and apparently, at present consumption rates, there is enough coal to last the country for another few hundred years.

Sometime during the last half of this production life cycle, however, when one-half or a little less than one-half of the coal reserves (economically producible coal) have been exploited and the remaining, less desirable coal beds are being mined, U.S. coal production will begin a long, irreversible decline. A national decline in coal production, is not anticipated for many years, and perhaps will not begin until sometime late in the next century.

DISCOVERY-TO-DEPLETION LIFE CYCLE

The National Coal Resource Assessment currently under study by the U.S. Geological Survey (USGS) will provide coal quality and coal quantity data essential to estimate the remaining amount of coal in the United States that is suitable for various uses, as well as the data necessary to estimate potential production rates in the coal-producing states and regions during the next several tens of years. The coal industry, and indeed all other extractive industries, are dynamic systems that evolve through cycles of discovery, development, maturity, and depletion. These cycles occur on all scales, from individual mines

or wells to oil and gas fields or mining districts, to states and regions, and ultimately may involve the entire country [1]. Large-scale discovery-to-depletion cycles are driven by a more-or-less continuous long-term demand for the resource. Although coal has a variety of uses, the great majority of the coal mined in the U.S. is for electric power generation. The current high demand for coal reflects the investment of the electric power industry in large coal-fired boilers, and this industry currently accounts for nearly 90 percent of U.S. domestic coal consumption.

MAJOR COAL-PRODUCING REGIONS

In general, coal production in the Appalachian region has moved well into the mature phase of the resource life cycle (Figure 1). Some parts of Appalachia are being depleted rapidly, which contributes greatly to the economic depression of the region, whereas other parts still exhibit some growth. Production in many of the Appalachian states is declining as reserves are depleted by mining, and are redefined and reduced by environmental constraints and falling prices [2]. Because long-term mining has preferentially extracted the thicker and more accessible coal beds, the remaining thinner and deeper coal deposits are or will be progressively less competitive in current and future markets.

Maryland and Tennessee produce coal at very low levels, and Georgia is for all practical purposes mined out. Coal production in Ohio and Pennsylvania is well past peak production and is in decline. The decline of coal production in the western parts of the Appalachian basin is exacerbated by the relatively high sulfur content of the coal, which limits its use because of its relatively greater contribution to air pollution. Alabama and Virginia [3] are at, or a few years past, peak production and each of these states may soon be entering a phase of general decline. In spite of declining production in much of the basin, however, overall production from the Appalachian basin has increased steadily since 1979 and continues to be driven upward by the high demand for steam coal. Only eastern Kentucky and West Virginia are still producing coal in increasing amounts and both appear to be several years away from maximum production. Indeed, the lower costs of longwall mining has made some of the central Appalachian coal deposits more competitive in spite of generally falling prices. When half, or a little less than half, of the original coal reserves of eastern Kentucky and West Virginia has been depleted, however, and their production also begins to decline, overall production from the Appalachian basin will begin its inevitable long term decline. Remaining coal reserve estimates for the Appalachian basin, in part based on data from Averitt [4], range from about 25 to 28 billion tons, and more than half of these reserves are in Kentucky and West Virginia.

Although coal resources are large, the high sulfur content of Illinois basin coal impedes its use for electric power generation and restricts the amount of economically producible coal in the basin. As a result, production in the Illinois basin is undergoing a slow but general decline as it is replaced in steam coal markets by low-sulfur coals from the very thick, sub bituminous coal of the Powder River basin (Figure 2). Using data from Averitt [4] as a starting point, coal reserves calculated for the Illinois basin are about 21 billion tons as of January 1, 1995.

In contrast with coal production from the Appalachian and Illinois basins, coal production from the Rocky Mountain and Gulf Coast states is increasing at comparatively high rates and these regions are in a relatively early phase of the resource life cycle. Annual production from the northern Rocky Mountains, including the Powder River basin, has increased significantly in the last several decades, from less than 3 million tons to 250 million tons or more in 30 years, in response to the need for burning low-sulfur coal in order to meet the requirements of the clean air act (Figure 3). Coal reserves in the Powder River basin are great. Glass [5] reports a demonstrated reserve base (resources from which reserves are computed [6]) of 69.5 billion tons for Wyoming, a number which he considers understated, and Sholes [7] reports a reserve of 50 billion tons of strippable lignite and sub bituminous coal from eastern Montana. The extensive investment by industry to develop the infrastructure needed to mine and transport Powder River basin coal to markets in the central and eastern U.S. attests to its importance as a major fuel for the generation of electric power in the U.S. for the foreseeable future. As a result, Wyoming leads the nation in coal production and certain individual Wyoming mines produce more coal than some of the major coal-producing states east of the Mississippi River.

Lignites are extensively utilized for electric power generation in Texas and North Dakota. The relatively low calorific value (Btu) and high moisture content of these lignites diminishes their value, and capability for transportation and use any significant distance from coal mines. Instead, they commonly are consumed in power plants located near the mines. In recent years, population growth and the demand for electric power have increased significantly in the Gulf Coast region, and coal production in Texas has soared to nearly 60 million tons (Figure 4). Texas is now the sixth leading coal-producing state in the Union. Kaiser [8] reports a demonstrated reserve base of about 19.4 billion tons and resources of 50.9 billion tons of lignite for Texas.

Central Rocky Mountain coal deposits are in a relatively early stage of the resource life cycle, as is indicated by their remarkable growth from about 20 million tons annually to nearly 80 million tons during the past 20 years (Figure 5). Maximum development of this resource, which depends greatly on the development of large-scale mining operations and transportation networks, as well as on markets, has not yet been attained. Coal production in the region, however, has increased significantly in recent years, mostly in response to the demand for electric power generation in the western U.S.

ACKNOWLEDGMENTS

Coal production data used in graphs were obtained mostly from the U. S. Department of Energy, Energy Information Agency (EIA).

REFERENCES CITED

1. M. K. Hubbert, The energy resources of the earth, Scientific American, Vol. 225 (1971) 60-70.

2. Energy Information Agency, Coal Industry Annual, 1994, U.S. Energy Information Administration, DOE/EIA-0118 (92) (1995).

3. R. C. Milici and E. V M. Campbell, Virginia coal resources-a long term view, Virginia Coal and Energy Jour. 3 (1991) 1-22.

4. Paul Averitt, Coal Resources of the United States, January 1, 1974, U.S. Geological Survey Bulletin 1412, (1975) 131 p.

5. G. B. Glass, Wyoming, *in* 1995 Keystone Coal Industry Manual, Chicago, Illinois (1995) G-189-G-211.

6. Energy Information Agency, Coal production, 1992, U.S. Energy Information Admin., DOE/EIA-058 UC-950 (1993) p.110

7. M. A. Sholes, Montana, *in* 1995 Keystone Coal Industry Manual, Chicago, Illinois (1995) G-100 - G-106.

8. W. R. Kaiser, Texas, *in* 1995 Keystone Coal Industry Manual, Chicago, Illinois (1995) G-148 - G-154.

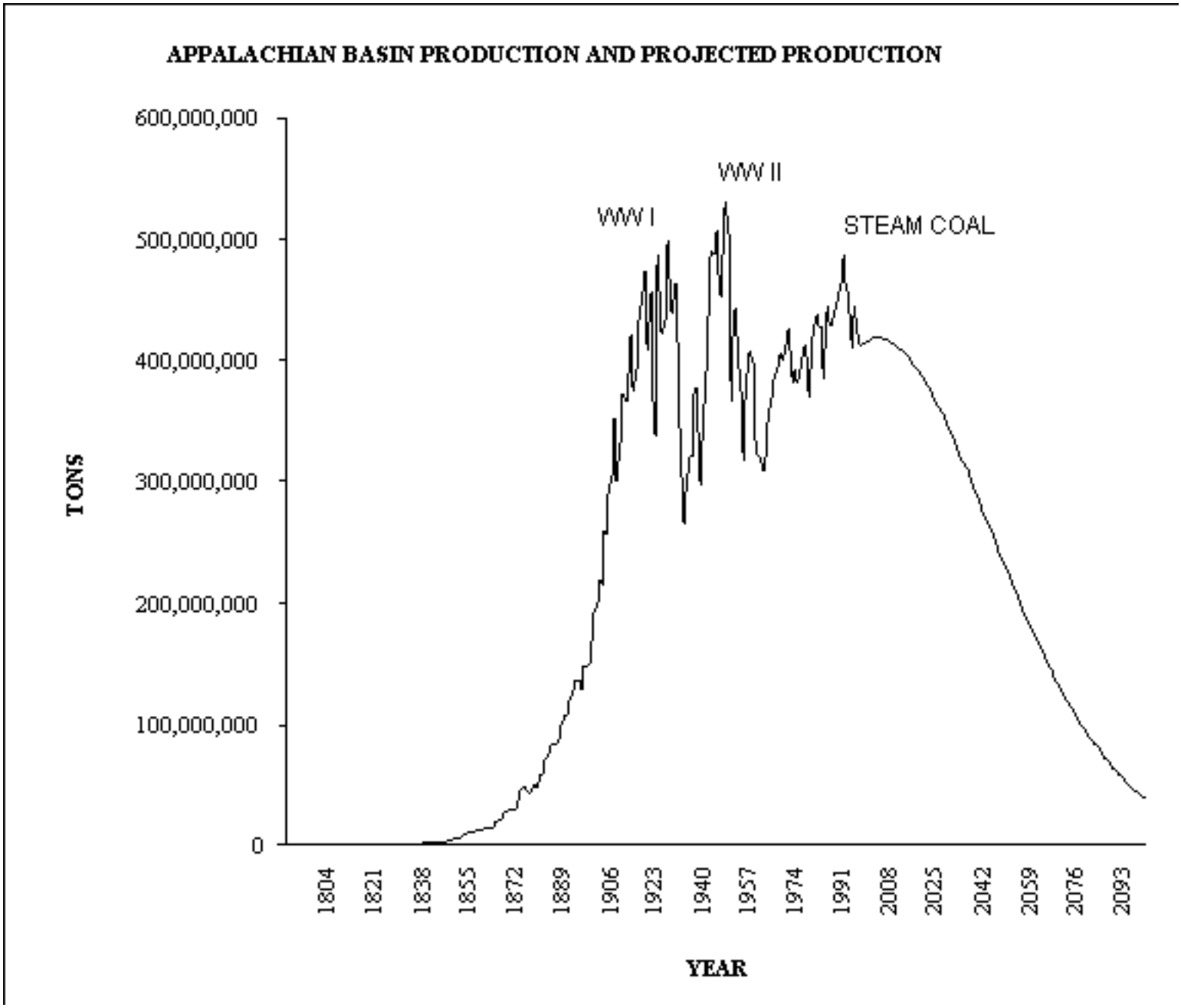

Figure 1: Coal production and projected coal production for the Appalachian basin. The production decline is based on a (recoverable) reserve estimate of about 26 billion tons, cumulative production (1994) of 40.3 billion tons, and calculated reserve decline rates that range from 1.5 to 5 percent per year over the next century. Region is in mature phase of resource life cycle.

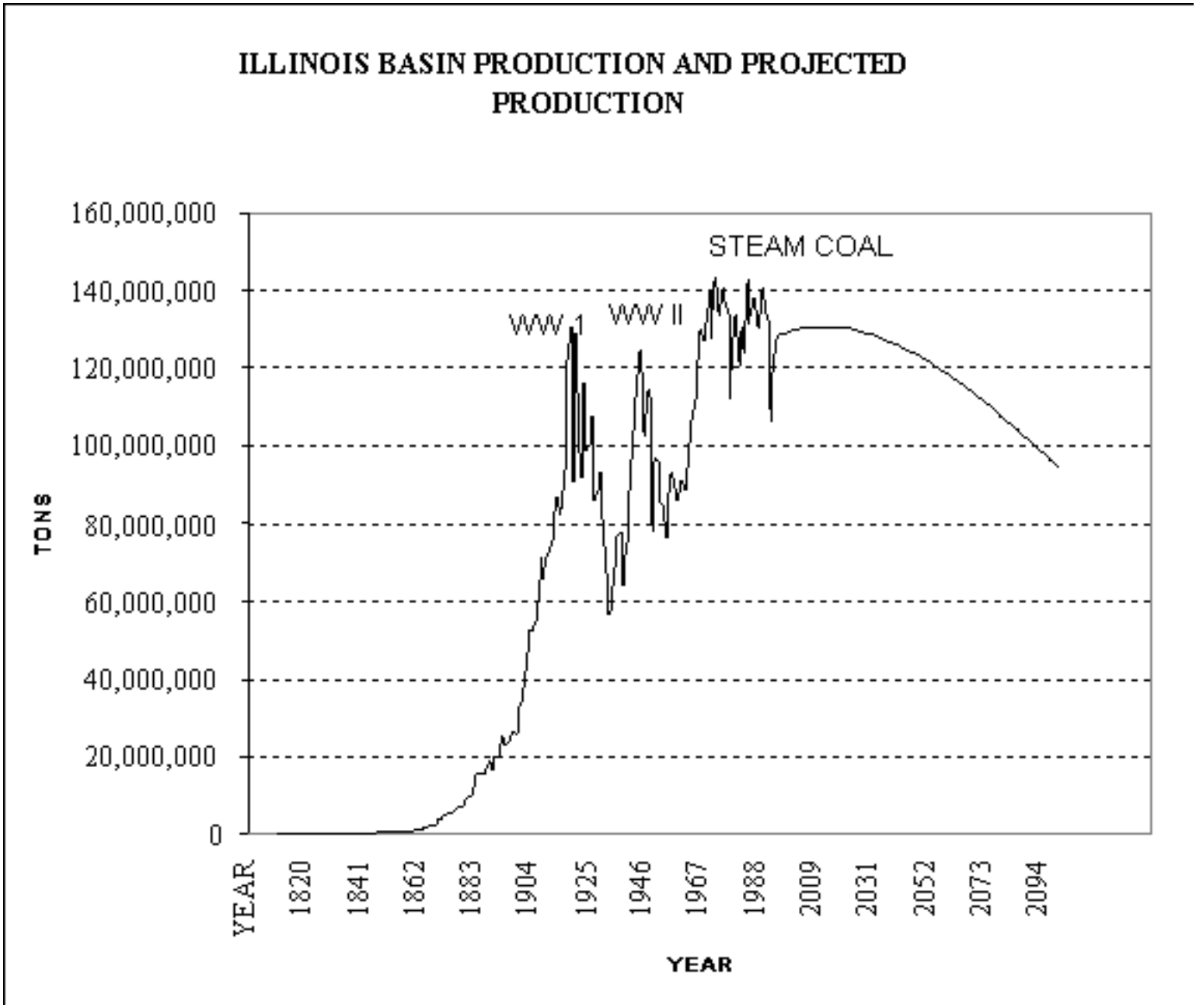

Figure 2: Production and projected production of coal in the Illinois basin. Projected decline is based on a cumulative production of about 10 billion tons, remaining reserves of 21 billion tons and an annual reserve depletion rate of about 0.6 to 1.1 percent over the next century. Reserves are probably overstated because of the high sulfur content of coal, and actual decline rates may be greater than shown. Region is in mature phase of resource life cycle.

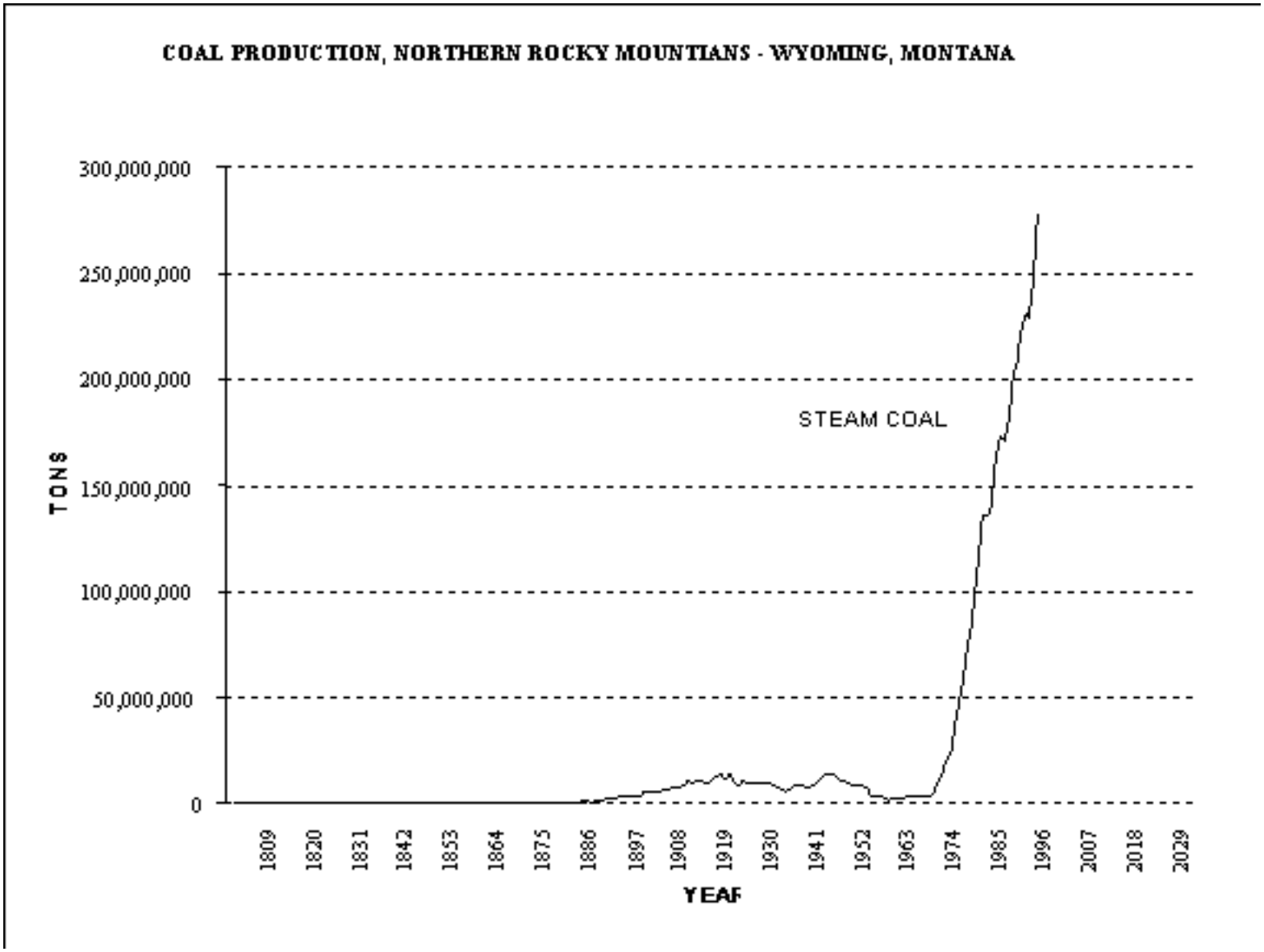

Figure 3: Coal production from the northern Rocky Mountains region. Region is in early phase of resource life cycle, as is indicated by its rapidy increasing production.

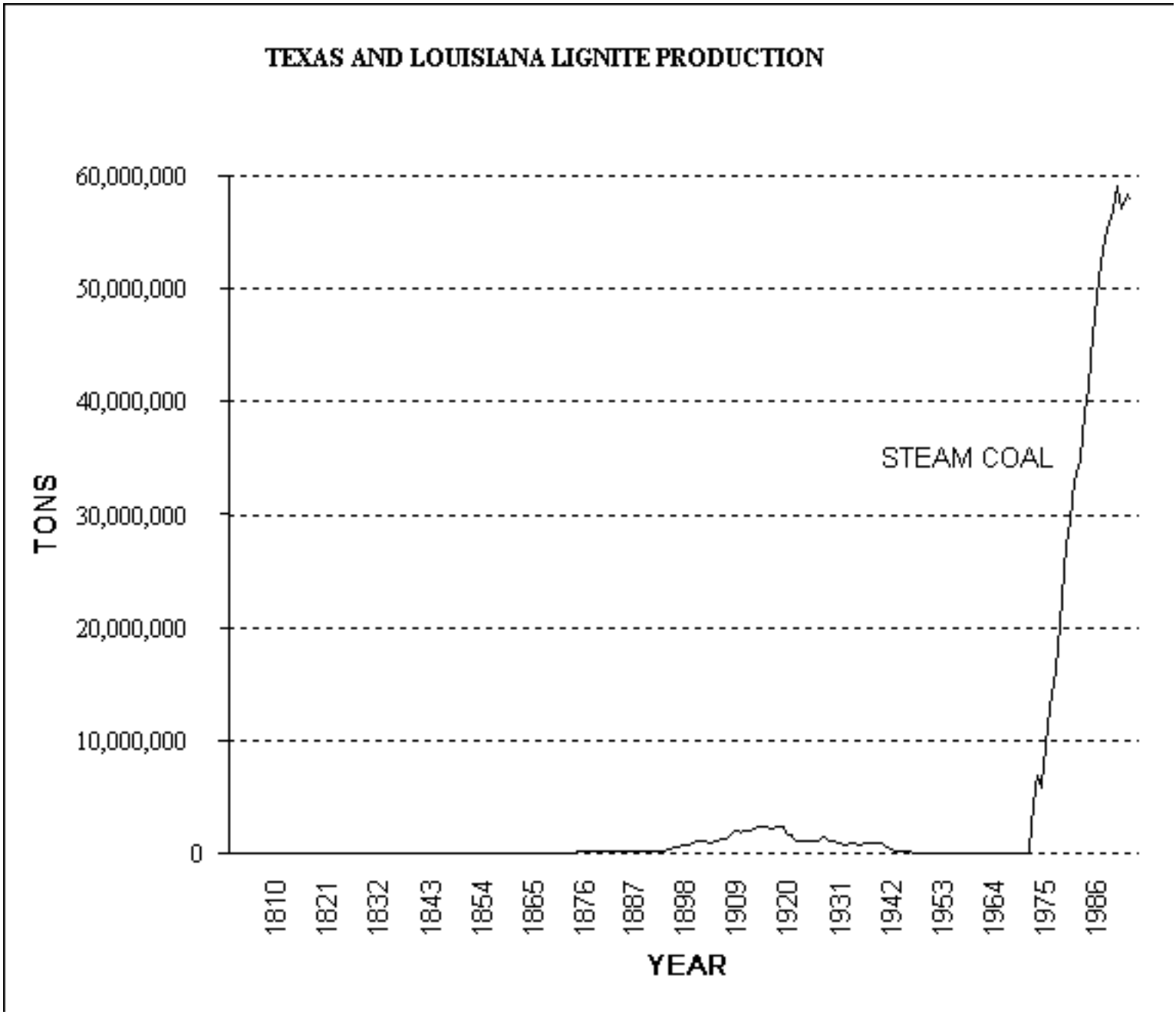

Figure 4: Production of Gulf Coast lignite deposits, Texas and Louisiana. Region is in early phase of resource life cycle.

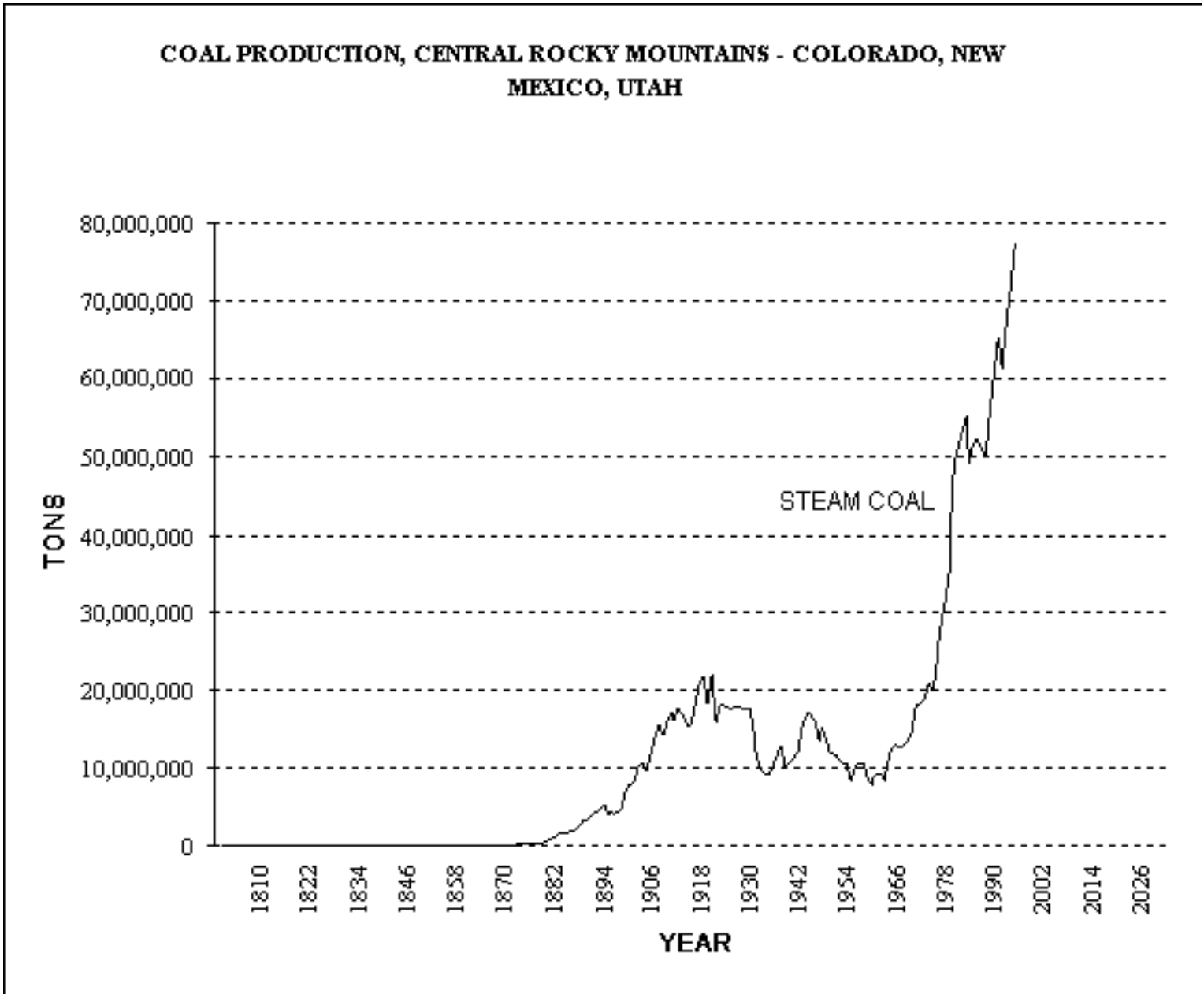

Figure 5: Coal production, south-central Rocky Mountains. Region is in early phase of resource life cycle.

[Documents Archive | Papers Listing | Products Home | **Eastern Energy Home**]

[_private/footer.htm]