

A Perspective on Coal in the 21st Century

By

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Abstract

Coal represents 95% of the United States fossil energy reserves and U.S. coal resources represent more energy than either world oil or natural gas reserves. Coal fired power plants currently produce 56% of U.S. electrical generation. Increasingly more stringent environmental standards for SO₂, NO_x, and mercury are putting pressure on future coal use. With current and evolving technologies, coal should be able to meet these new challenges and remain competitive with other generation options such as natural gas. There is, however, a major obstacle that severely threatens use of coal in the future. The issue of global climate change and corresponding requirements for CO₂ reductions present a major hurdle for the coal industry as we look towards the next century.

This paper presents a discussion of historical and projected electrical generation and fuel sources. It looks at technology options that will be cost effective and comply with increasingly more stringent environmental standards. Also, the issue of climate change and how coal could be affected by actions such as the Kyoto Protocol is presented.

Discussion

Coal currently is responsible for 56% of total electrical generation in the U.S.; natural gas, 13%; nuclear, 17%; hydro, 9%; renewables, 3%; oil, 2%. In EIA's 1998 forecast, coal is expected to grow at about 1% annually but will decrease its share of generation to 47% in 2015. Through retirements, nuclear's share decreases to 10%. Oil and hydro retain the same amount of generation but their contributions decrease to 1.5% and 7% respectively. Use of renewables increases slightly but its share remains around 3%.

While coal use increases, natural gas is forecast to be the big winner. The reason for this is partially due to the low capital costs of combined cycle gas plants and their attractive heat rates. The "wild card" is natural gas deliverability to utilities and delivered prices, which are assumed to increase only slightly from \$2.28/mmbtu in 1996 to \$2.74/mmbtu in 2015. Given natural gas' track record, these assumptions appear optimistic.

Comparing electricity prices for different regions we find that areas with the highest coal-fired generation have the lowest cost power. Interior regions relied on coal for 70% of generation in 1995 while coastal regions used 35% coal firing.

Lower cost coal fired generation has also resulted in increasing coal plant capacity factors.

The increasing concern over global climate change and carbon emissions reduction poses a significant threat for coal's future. Electric generation contributes about 36% of U.S. CO₂ emissions with transportation providing 33%. Both sectors are forecast to increase their emissions, however, due to the public's love affair with larger and less efficient vehicles, electrical generation may be called upon to bear a disproportionate amount of any required CO₂ reductions.

The Kyoto protocol requires the U.S. to reduce its carbon emissions to 7% below 1990 levels by 2008. This would require a 44% reduction from projected "business as usual" emissions in 2010.

Historically, since 1970, the United States has had an average electrical growth rate of 3.14%. GDP has grown at a rate of 2.69% during this same period resulting in a ratio of electrical growth to GDP of about 1.2 to 1. U.S. total energy use grew at a rate of only 1.29%, about half that of electricity. This indicates that we are experiencing greater electrification. In 1995-96, the electrical growth to GDP ratio was 1.3 to 1. EIA's 1998 forecast assumes an increase in efficiency of more than 40% from today. This results in electrical growth to GDP ratio decreasing to 0.83 to 1 by 2000 and 0.73 to 1 by 2020.

Since coal is carbon based, even with more efficient power plant designs such as the LEBS, with its 45% efficiency, coal emits twice as much CO₂ as a natural gas fired combined cycle gas turbine. Existing coal-fired plants can do little to improve efficiency to any great degree.

On a global basis, it is important that new technologies be continued to be developed and implemented for it is the developing nations that hold the key to future carbon emissions. While

the U.S. is clearly the largest emitter of carbon on both an absolute and per capita basis, projections show China to surpass the U.S. by 2015.

If the Kyoto Protocol were to be implemented, it would have little effect on global concentrations of carbon and projected global temperatures. It would have significant effects on the U.S. economy and would likely shift emissions from the U.S. to those countries not bound by the treaty. It would also prevent development of more efficient coal fired generation technologies that would help the third world nations as they grow their economies.





