SECTION 3.7

COAL RESOURCE ASSESSMENT

INTRODUCTION

This assessment addresses coal use, production, prices, transportation, reserves, and mining operations in New York State and the United States. It also addresses recent developments and trends in the coal industry, examining environmental factors, including the Governor's Acid Deposition Reduction Program and advanced coal technologies, the U.S. Department of Energy's (U.S. DOE) Clean Coal Power Plant Improvement Initiative, and the implications of electric power restructuring on the coal industry. In addition, this assessment reports on the future outlook for coal use in New York and presents a forecast of price and demand.

UNITED STATES COAL OVERVIEW

Coal is America's most abundant indigenous fuel source, accounting for 95% of the nation's fossil energy reserves. The U.S. has a 250-year supply of coal based on current usage levels. One quarter of the world's known coal supplies are in the United States. U.S. coal production is second only to China's among world producers. In 2000, over one billion tons of coal were produced in the U.S., mined in 25 coal-producing states. Wyoming is the largest coal producer, with 339 million tons mined in 2000, representing 31% of U.S. production. Approximately two-thirds of U.S. coal production is surface mined. Nearly all of U.S. coal production is used domestically.

Table 1

2000 United States Coal Production, Use, and Prices (Million Tons and Nominal Dollars)		
Production by Region	**mmtons**	**%**
Appalachian	420.9	39.1
Interior	144.7	13.5
Western	509.9	47.4
Total	**1,075.5**	
Use by Sector	**mmtons**	**%**
Electric Power	979.9	90.8
Coke Plants	29.5	2.7
Other Industrial Plants	65.4	6.0
Residential/Commercial Users	4.9	0.5
Total	**1,079.7**	
Average Delivered Price	**$/ton**	
Electric Utilities	$23.83	
Coke Plants	$44.43	
Other Industrial Plants	$31.59	

Source: U.S. DOE, Energy Information Administration,
U.S. Coal Supply and Demand: 2000 Review
Annual Energy Review, 2000

As shown in Table 1, over one billion tons of coal were used in the U.S., with more than 90% used in the electric power sector. Coal-fired power plants account for 57% of all U.S. electricity generation, and over 80% of electricity generation in twelve states in the Midwest, Southwest, and West.

Coal is by far the least expensive fossil fuel on a dollar per British thermal unit ($/Btu) basis, averaging less than one-half the prices in 2000 of petroleum and natural gas. The delivered price of coal continues to decline, in keeping with a trend that started more than two decades ago. Approximately two-thirds of all coal mined in the U.S. is transported by rail. Hauling coal is the largest single source of freight revenue for U.S. railroads. Coal is also the largest freight revenue commodity moved by barges on the nation's inland waterways.

United States Coal Production

During the past seven years, U.S. coal production continued to grow at an annual rate of nearly 2%. This growth occurred, despite the closing or consolidation of mines, because the average size and productivity of the remaining mines increased. The 20 largest coal producing companies now account for more than 70% of U.S. production.

In 2000, coal production in the U.S. totaled 1,075.5 million tons from the Appalachian, Interior, and Western coal supply regions. As shown in Table 2, coal production in the Appalachian Region was 420.9 million tons in 2000. West Virginia is the largest coal producing state in the Appalachian Region, followed by Kentucky and Pennsylvania. Coal production in the Interior Region was 144.7 million tons in 2000. Texas is the largest coal producing state in the Interior Region, followed by Illinois and Indiana. In 2000, a total of 509.9 million tons of coal was produced in

Table 2

2000 United States Coal Production by Coal-Producing State

Region and State	Number of Mines	Production (Million Tons)
Appalachian Region	**1392**	**420.9**
Alabama	47	19.2
Kentucky, Eastern	421	105.1
Maryland	15	4.3
Ohio	79	22.2
Pennsylvania	339	75.1
Tennessee	24	2.7
Virginia	161	32.8
West Virginia	306	159.8
Interior Region	**125**	**144.7**
Illinois	23	33.4
Indiana	34	28.0
Kansas	2	0.2
Kentucky, Western	37	27.0
Louisiana	2	3.7
Mississippi	1	0.9
Missouri	2	0.4
Oklahoma	10	1.6
Texas	14	49.6
Western Region	**71**	**509.9**
Alaska	1	1.6
Arizona	2	13.1
Colorado	12	29.1
Montana	6	38.4
New Mexico	7	26.2
North Dakota	4	31.3
Utah	15	26.7
Washington	2	4.3
Wyoming	22	339.3

Source: U.S. DOE, Energy Information Administration, *U.S. Coal Supply and Demand: 2000 Review* the Western Region, dominated by Wyoming, which accounted for two-thirds of the regional production and nearly one-third of the U.S. production. The state of Wyoming produced 339.3 million tons of coal, which represents nearly the sum of the next three largest coal-producing states combined. Coal production has grown in the Western Region in recent years and is now nearly 50% of U.S. production.

The classification of coal is based on its fixed carbon, volatile matter and moisture content, and on its heating value. Lignite, also called brown coal, is ranked lowest in quality, and has a high moisture content, as much as 45% by weight. Its heating values range from 9 to 17 million Btu per ton, with an average of about 14 million Btu per ton. Subbituminous coal, or black lignite, contains 20% to 30% moisture and has a heating values that ranges from 16 to 24 million Btu per ton. Subbituminous coal's heating values average about 18 million Btu per ton. Bituminous coal, or soft coal, is the most commonly mined. Its moisture content usually is less than 20% and the heating values range from 19 to 30 million Btu per ton for an average of 24 million Btu per ton. Anthracite, or hard coal, is ranked highest in quality. With a moisture content generally less than 15%, its heating values range from 22 to 28 million Btu per ton and average about 25 million Btu per ton. This coal is found only in Pennsylvania and is used mostly for space heating and limited electricity generation. The Appalachian Region is the principal source of bituminous and anthracite coal. The Western Region coal includes some bituminous coal, but is primarily subbituminous coal and lignite. Table 3 provides U.S. coal production statistics by classification of coal, mining methods, and origin.

Table 3

United States Coal Production, 2000
(Million Tons)

Classification	**mmtons**	**%**
Bituminous Coal	548.5	51.0
Subbituminous Coal	433.8	40.4
Lignite	88.7	8.2
Anthracite	4.5	0.4
Mining Method	**mmtons**	**%**
Underground	382.9	35.6
Surface	692.6	64.4
Origin	**mmtons**	**%**
West of the Mississippi	566.2	52.6
East of the Mississippi	509.3	47.4

Source: U.S. DOE, Energy Information Admin., *Annual Energy Review, 2000*

United States Coal Use

In 2000, the use of coal in the U.S. reached an all-time peak of 1,079.7 million tons. More than 90% of all coal was used by the electric power sector. In 2000, coal was used to produce 57% of all electricity generated in the United States. The 991.3 million tons of coal used in the electric power sector does not include coal used by cogeneration facilities. Use of coal for cogeneration is included in industrial and commercial sector figures reported by U.S. DOE, Energy Information Administration

(U.S. DOE/EIA), so actual contribution of coal to electricity generation is slightly higher. In 2000, New York State ranked thirty-fifth among U.S. states in coal use; Texas, Indiana, Ohio, Alabama, and West Virginia, respectively, were the top five.

United States Coal Reserves

As of January 1, 1997, the demonstrated reserve base (DRB) of coal resources in the U.S. exceeded 500 billion tons (estimated by U.S. DOE/EIA), nearly half located in the Western Region. The DRB is the estimated quantity of in-ground coal resources in the U.S. that meet minimum criteria. Although the DRB is approximately 500 times the U.S. annual coal production rate, all coal in the DRB is not recoverable. Almost half of the DRB is either inaccessible or likely to be lost in the mining process. The estimated recoverable reserves of coal in the U.S. (the portion of DRB that can be recovered economically with the application of current extraction technologies) total 275 billion tons. The estimated recoverable reserves for low (0.60 pound of sulfur per thousand Btu or less), medium (0.61 to 1.67 pound of sulfur per thousand Btu), and high (1.68 pound of sulfur per thousand Btu or higher) sulfur coal are relatively similar, as shown in Table 4.

Table 4

Estimate of Recoverable Reserves of Coal in United States
(as of January 1, 1997) - (in billion tons)

Region	Low Sulfur	Medium Sulfur	High Sulfur	Total
Appalachian	12	20	23	55
Interior	1	10	58	69
Western	88	55	9	151
U.S. Total	**100**	**85**	**90**	**275**

Source: U.S. DOE, Energy Information Administration, *U.S. Coal Reserves: 1997 Update*

The amount of recoverable reserves at active mines in the U.S. is estimated at 19.3 billion tons, based on information from mine operators for each active property. The majority of active recoverable reserves are in the Western Region (13 billion tons), followed by the Appalachian Region (4.7 billion tons), and Interior Region (2.6 billion tons).

United States Coal Mining

The U.S. coal mining industry has undergone considerable change in the past several decades that has resulted in a significant decrease in the total number of coal mines, while at the same time mining productivity has increased. Coal mine productivity, in tons of coal produced per miner hour, improved both in underground and surface mines in all three coal-producing regions. Between 1995 and 2000, as labor productivity improved from 5.4 to 6.5 tons per miner hour, the average number of miners working daily declined from 90,000 to 78,000. See Table 5 for additional U.S. coal mining statistics.

The U.S. coal mining industry has adopted a number of technological changes to improve the productivity and cost-effectiveness of mining operations. Examples of such changes include improved mining equipment, better material handling techniques, and enhanced automation of equipment monitoring.

Table 5

United States Coal Mining Statistics

	1995	**2000**
Production (in million tons)		
Underground	396	383
Surface	637	693
Total	1,033	1,076
Number of mines (active)		
Underground	977	839
Surface	1,127	749
Total	2,104	1,588
Number of miners (in thousands)		
Underground	58	46
Surface	32	32
Total	90	78
Productivity (tons per miner hour)		
Underground	3.4	3.9
Surface	8.5	10.3
Average	5.4	6.5

Source: U.S. DOE, Energy Information Admin.,
Annual Energy Review, 2000
Coal Industry Annual, 1999

United States Coal Price

Coal prices declined in 2000, continuing the downward trend of the past twenty-five years. In 2000, the annual average price of coal delivered to utilities was $24.28 per ton. As reported by the U.S. DOE/EIA in the *Annual Energy Review - 2000*, the 1999 national average prices for coal by class were $38.94/ton for anthracite, $23.88/ton for bituminous, $11.04/ton for lignite, and $7.02/ton for subbituminous.

Because of differences in shipping distance and transportation mode, transportation costs vary greatly for different regions and sources of coal. Appalachian and Interior Region coal is costlier at the minemouth, but its transportation costs are lower, involving relatively shorter hauls to consumers by rail and barge. Low-cost Western Region coal is shipped primarily by rail over great distances, thus incurring higher transportation costs than Appalachian and Interior Region coal. Coal transportation costs on average represent 50%, 20%, and 12% of the delivered price for Western, Appalachian, and Interior Region coal, respectively.

United States Coal Transportation

Coal is an important commodity carried by rail. In 2000, railroads received $7.8 billion, in excess of 20% of their revenues, from transporting coal, and coal comprised 758 million tons, or over 40%, of the total tons of freight hauled by rail. Over the past ten years, the rail industry's share of coal transportation has increased, primarily to satisfy increased demand for low-sulfur western coal. About 74% of U.S. low-sulfur coal reserves are located in Montana and Wyoming. Domestic railroads carried 68 percent of the nation's coal, transporting an average of 14.4 million tons of coal per week in 2000. Coal is also moved by barges, ships, and trucks, where these modes of transportation are economical. A few electricity-generating facilities are located near coal mines and receive their coal directly by conveyor or coal-slurry pipeline.

Average coal rail hauls are getting longer, reflecting the increased penetration of western coal carried by rail into southern and eastern U.S. markets. The average haul of coal by rail grew by 33% from 485 miles in 1979 to 643 miles in 1995. Railroads continually adopt technological innovations that offer customers greater flexibility. One example is the "coaltainer", a container designed especially for transporting coal by rail and by truck. Another innovation for transporting coal by rail is the use of real-time satellite monitoring and computerized traffic management systems to improve the scheduling and routing of trains. These electronic traffic management systems will become increasingly important as more electricity generators move toward "just-in-time" inventory management.

NEW YORK STATE OVERVIEW

New York used 311 trillion Btu of coal in 2000. This figure represents 8% of the State's total primary energy use of 4,094 trillion Btu. New York has no coal mining activity and no known coal reserves. In 2000, the average cost of coal delivered to New York electricity generators was $39.11 per ton, over 60% higher than the national average of $23.83 per ton.

Coal Use in New York State

In 2000, nearly 12.1 million tons of coal were used in New York State, representing 1% of the nation's demand. About 80% of this coal was used to produce electricity; the industrial sector accounted for 18%; residential and commercial use accounted for the remaining 2%. Over the past several years, the amount of coal used for electricity generation has remained relatively stable, while coal used by the other end-use sectors (residential, commercial, and industrial) has declined.

New York State Coal-Fired Generating Units

New York has 16 coal-fired electricity generating plants located in thirteen counties of the State. These facilities, listed in Table 6, represent nearly 4,000 megawatts of net summer capability for the New York electricity system, accounting for 16% (24,520 gigawatt-hours) of electricity generated in the State in 2000. These plants are all located outside of the metropolitan New York City area; the greatest concentration is in Western New York.

Table 6

Coal-Fired Generating Units in New York State
(net summer capability in megawatts)

Company and Plant Name	County	Units	Summer Capability
1. AES - Hickling	Steuben	2	63.0
2. AES - Greenidge	Yates	2	124.9
3. AES - Jennison	Chenango	2	54.0
4. AES - Milliken	Tompkins	2	307.0
5. AES - Somerset - Kintigh	Niagara	1	674.8
6. AES - Westover	Broome	2	106.9
7. Black River - Fort Drum	Jefferson	1	46.3
8. Central Hudson	Orange	2	363.6
9. CH Resources - Niagara	Niagara	1	51.9
10. Eastman Kodak	Monroe	12	186.4
11. Fibertex Energy	Onondaga	1	84.0
12. Jamestown, City of	Chautauqua	2	50.0
13. Mirant - Lovett	Rockland	2	376.8
14. NRG - Huntley	Erie	6	684.0
15. NRG - Dunkirk	Chautauqua	4	504.0
16. Rochester Electric & Gas	Monroe	4	252.0

Source: U.S. DOE, Energy Information Administration,
Inventory of Nonutility Electric Power Plants in the United States 1999

New York State Electricity Coal Prices

In the electricity generation sector, the average delivered cost of coal to New York has remained fairly stable over the past ten years, as shown in Table 7. Table 8 lists detailed average delivered cost of coal to New York State electricity generating plants for the year 2000.

The average sulfur content of coal delivered to the State's electricity generators in 2000 was 1.1% by weight, compared to the U.S. average of 0.9%. Because New York generators buy eastern coal, the Btu content of coal used for electricity generation is much higher than the U.S. as a whole, 13,117 Btu per pound on average for New York, compared to 10,115 Btu per pound nationally.

Table 7

Average Delivered Cost of Coal to New York State Electric Utility Plants		
Year	(¢/MMBtu)	($/ton)
1991	159.4	41.19
1992	148.8	38.62
1993	149.6	38.63
1994	145.2	37.63
1995	141.2	36.86
1996	142.8	37.15
1997	142.4	37.32
1998	143.4	37.44
1999	144.9	37.77
2000	149.1	39.11

Source: U.S. DOE, Energy Information Administration, *Cost and Quality of Fuels for Electric Utility Plants, 2000*

Table 8

2000 Average Delivered Cost of Coal to New York State Electric Utility Plants		
Type of Purchase	(¢/MMBtu)	($/ton)
Contract	152.2	$40.04
Spot	127.9	$32.91
Mine Type		
Surface	129.9	$32.88
Underground	150.4	$39.56
Sulfur Content		
Less than 0.5%	159.5	$40.21
0.5% - 1.0%	157.2	$41.40
1.0% - 1.5%	136.6	$34.97
1.5% - 2.0%	130.3	$33.29
2% - 3%	132.3	$34.98

Source: U.S. DOE, Energy Information Administration, *Cost and Quality of Fuels for Electric Utility Plants, 2000*

Origin of Domestic Coal Used in New York State

In 1999, domestic coal delivered to New York originated in six states. Pennsylvania and West Virginia accounted for 87%. By far the dominant mode of coal transportation into New York is rail. Coal is also moved by barge and trucks to end-users in New York. Barge transport of coal occurs primarily on Lake Erie. Table 9 lists the origin of domestic coal delivered to New York in 1999 by method of transportation.

Table 9

Origin of Domestic Coal Delivered to New York State by Method of Transportation, 1999
(thousand tons)

State:	Railroad	River	Great Lakes	Tidewater	Trucks	Total
Illinois	0	0	0	0	63	63
Kentucky	1,176	39	0	0	0	1,216
Ohio	16	0	0	0	4	20
Pennsylvania	4,227	50	465	0	634	5,376
Virginia	93	0	0	0	0	93
West Virginia	3,608	92	0	77	5	3,782
Total	**9,120**	**181**	**465**	**77**	**706**	**10,550**

Source: U.S. DOE, Energy Information Administration, *Coal Distribution Report*.

Some coal-fired power plant operators have expressed concerns over the potential adverse economic impacts of State actions to limit the present and future use of coal for electricity generation. In particular, they cite the strong dependence of New York's rail freight industry on coal transportation and suggest that limiting coal use would hurt the railroads and those other industries and businesses that rely on the railroads for delivery of supplies and products.

DEVELOPMENTS AND TRENDS IN THE COAL INDUSTRY

Environmental Factors

Coal mining can have significant negative effects on land and water resources. Soil subsidence and erosion are long-standing problems associated with underground and surface mining. These environmental matters are addressed by the Surface Mining Control and Reclamation Act of 1977 and the Abandoned Mine Reclamation Act of 1990. Water resources are degraded by mining and coal preparation. The Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977 both contain provisions to limit water pollution and run-off from coal extraction and processing. The management and disposal of coal waste from mining, preparation, and combustion are regulated at the federal level by the Resource Conservation and Recovery Act of 1976 and at the State level by 6 NYCRR Part 360 Solid Waste Management Facilities regulations. Nationally, coal mining waste is used as fill for mine land reclamation projects. In New York State, coal combustion wastes have a variety of uses, including: as an ingredient in the manufacture of cement, asphalt, roofing shingles, gypsum, calcium chloride, lightweight aggregate, lightweight block, and low-strength backfill; as a traction agent on roadways and cement; as an aggregate substitute in concrete; and as structural fill in building foundations. It is estimated by New York State Department of Environmental Conservation that 731 thousand tons of coal combustion waste were beneficially reused in 1999.

Coal combustion presents air quality and other environmental concerns due to the release of sulfur dioxide (SO_2), nitrogen oxides (NO_x), particulate matter (PM), and carbon dioxide (CO_2) into the atmosphere. SO_2, NO_x, and PM emissions are associated with air quality impacts and acidification of water resources (acid rain), while CO_2 emissions are believed to contribute to global warming. In-State emissions of SO_2 from coal-fired plants have been reduced significantly as a result of New York's State Acid Deposition and Control Act (SADCA), and Title IV of the federal Clean Air Act (CAA) Amendments of 1990. As a result of these initiatives, total SO_2 emissions from New York's electricity generation plants have been reduced by 50% from 1980 levels. NO_x

emissions, which combine with volatile organic compounds (VOCs) in the presence of sunlight to form ozone (or smog), are being addressed by Title I of the federal CAA amendments. Substantial staged reductions in summer ozone season NO_x emissions from electricity generation plants were made in 1995 and 1999 (up to 55% for upstate coal-fired plants). By 2003, summer NO_x emission reductions of up to 75% from 1990 levels will be required for coal-fired plants. Issues associated with utility sector air emissions are discussed in more detail in the Energy and the Environment issue report (Section 2.3).

Governor's Acid Deposition Reduction Program

The Governor's Acid Deposition Reduction (ADR) Program announced in 1999 is expected to result in regulations that will require New York's electricity generation plants to reduce SO_2 emissions by 50% below the levels required by the federal CAA Amendments of 1990. The ADR Program will also require such plants to implement year-round controls for NO_X, a substantial extension of the five-month summer ozone season controls required under current federal and State regulations. The first full year of fully-implemented NO_X controls is expected to be 2005, and SO_2 controls are expected to be fully phased in by January 2008.

NO_X compliance actions may include a mix of end-of-pipe emission control technologies, such as selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR). SO_2 compliance actions may include switching to lower-sulfur coal, retiring certain coal plants, and installation of flue gas desulfurization (FGD) equipment, or scrubbers, on a substantial proportion of existing coal plants. While the primary objective of the ADR Program is to reduce emissions of precursors of acid rain, modeling analysis indicates that emissions of CO_2, the principal greenhouse gas associated with global warming, could be reduced by up to 10%. This indirect benefit would likely result in shifts from coal and oil-fired generation to natural gas.

The Market Assessment and Portfolio Strategies (MAPS) is a computer-based analytical tool that models the operation of New York's electricity system and those of neighboring systems on an hour-by-hour basis. The objective of such modeling is to meet the required hourly electric load with available generation units, subject to generation and transmission constraints, operating reserve, and other requirements, while minimizing electricity production costs. Using MAPS, a Base Case was defined and evaluated for selected years to model the electric system without the ADR Program. Subsequently, a Compliance Case was defined and evaluated to show how the system might operate in order to comply with the ADR Program. This analysis of New York's electricity system indicates that implementation of the ADR Program is technically feasible with respect to the proposed time frame and emission targets. However, there are some risks of higher wholesale electricity prices in certain areas as a result of the incremental costs of the emission control actions required for compliance. In addition, there could be reliability impacts if operators of certain units choose to cease or restrict operations for significant portions of the year as an emission control strategy. Further, the proposed regulations are likely to increase the State's dependence on natural gas which could result in supply problems and/or higher prices.

Table 10 shows typical emission rates for SO_2, NO_X, CO_2, and Hg for existing coal plants in New York compared to estimated emission rates for coal plants that burn low-sulfur coal, plants with advanced emission controls, plants that have incorporated two new advanced coal technologies and natural gas combined-cycle plants. Burning low-sulfur coal could reduce SO_2 emissions from an uncontrolled plant by two-thirds; installing a scrubber could reduce emissions by 90% or more. These representative emission-reduction actions could be undertaken at existing coal-fired plants to meet the emission targets of the ADR Program.

Table 10

Emission Rates for Electric Generation Plants
(pound per megawatthours)

	SO_2	NO_X	CO_2	Hg
Existing Upstate Coal Plant[1]	28.4	4.7	2,310	0.000073
Existing w/Low-Sulfur Coal[2]	9.5	4.7	2,310	0.000073
Existing w/Advanced Controls[3]	3.0	1.6	2,412	0.000047
New Advanced Coal: CFB[4]	3.0	1.0	2,180	0.000042
New Advanced Coal: IGCC[5]	0.4	0.9	2,028	0.000010
Natural Gas Combined-Cycle	0.02	0.05	819	0.0

[1]Existing upstate coal plant assumes 1.8% sulfur coal with no scrubber; low-NO_X.burners.
[2]Low-sulfur coal assumes 0.6% sulfur coal; low-NO_X.burners.
[3]Advanced controls assumes 90% SO_2 reduction and 35% Hg reduction by scrubber and 65% NO_X reduction by selective catalytic reduction.
[4]Circulating fluidized bed.
[5]Integrated gasification combined cycle.

S*ource: NYSERDA*, Energy Analysis Program

Advanced Coal Technologies

Technologies are available and emerging to reduce emissions from coal burning at three different stages; pre-combustion, combustion, and post-combustion. Pre-combustion cleaning involves the removal of impurities from coal with physical, chemical or biological processes. Advanced combustion processes include improvements in existing coal combustion processes and new processes that remove pollutants from coal as it is burned. Post-combustion cleaning involves the removal of pollutants from the downstream flue gas after combustion and before exiting the stack. In addition, another category of advanced coal technologies involves the conversion of coal into another form of fuel. In most cases, the new fuel form provides both energy and environmental benefits by reducing the pollutants emitted from combusting the new fuel as compared to coal.

Most advanced coal technologies are the products of research conducted over the last 20 years. In recent years, technological advancements have led to substantial reductions in the cost of controlling SO_2 and NO_X emissions. Some of the most successful advancements are low-NO_X burners, selective catalytic reduction and scrubbers. Advanced pollution controls installed on existing power plants or built into new facilities can provide more effective and lower-cost ways to reduce sulfur dioxide and nitrogen emissions. Advanced power generation technologies are complete electric power generating systems that offer superior efficiency and environmental performance over conventional coal-burning systems. These new combustion processes, such as circulating fluidized bed (CFB) combustion, improve both efficiency and emission control. Another emerging combustion technology, integrated gasification combined cycle (IGCC), converts coal to a gaseous form similar to natural gas before being burned. As shown in Table 10, emissions of SO_2 and NO_X from coal plants using advanced coal technologies are expected to be 80% to 90% lower than typical existing coal plants.

Development and implementation of advanced coal technologies can be a significant contributor to achieving the State's energy, economic, and environmental goals. Advanced coal combustion technologies can provide opportunities for re-powering or upgrading existing coal-fired electricity generating facilities.

U.S. Department of Energy Clean Coal Power Plant Improvement Initiative

The U.S. Department of Energy (U.S. DOE) Clean Coal Power Plant Improvement Initiative provides funding for demonstrations of innovative technologies to improve the performance and economics of both new and existing coal-fired electric power plants.   The AES-Greenidge Multi-Pollutant Project, located on Seneca Lake in Yates county, New York, has been selected by U.S. DOE for funding. The advanced emission control technologies being tested by this project are expected to reduce SO_2 by 95%, NO_X by 60%, and mercury by 90% from the existing 100 megawatt generator at a significantly lower cost than conventional retrofit technologies. It will be the first application of co-firing biomass with a dry scrubber to remove SO_2 and mercury, and selective catalytic reduction to remove NO_X. The State supported AES-Greenidge's request for U.S. DOE funding for the project.

Electric Power Restructuring

During the 1990s, coal producers began to feel the dampening effects of electricity restructuring on demand for their fuel. Electric utilities and other power producers came under pressure to shed high-cost, long-term coal supply contracts and enter into more flexible, risk-sharing supply agreements. The current movement to restructure U.S. electricity generation markets and make them more competitive may lead to changes in the financial risks and demands on the supply and transportation infrastructures of the fuels used in electricity generation. Electric power industry restructuring is expected to result in renewed pressure for cost-cutting and consolidation in the coal industry. Electric power generators will attempt to pass on market risks to coal producers and carriers. As a result, coal contracts will likely become shorter in duration and lower in price. Also, small coal-producing firms may be forced out of business, and large firms are likely to continue to grow in size through acquisitions and mergers.

FORECAST SUMMARY

At the national level, coal demand is expected to increase 1% annually over the forecast period, in response to increasing electricity demand. At the same time, real mine-mouth prices for coal are expected to decline as a result of continued improvements in productivity, which has increased an average of 6.7% per year since 1979.

In contrast to the national trend, the State Energy Plan projects that total coal demand in New York will decrease 1% annually over the forecast period, largely due to the implementation of stronger environmental regulations, as discussed in Section 2.3 of the Energy Plan. Related compliance actions at coal-fired power plants might include switching to low-sulfur coal, adding scrubbers or other emission controls, repowering with alternative generation technologies, or retirements. New York coal demand is projected to decrease by 60 trillion Btu from 311 trillion Btu in 2000, to 251 trillion Btu in 2021, as shown in Table 11. Coal prices paid by the electric generation sector are estimated to decline 0.7% per year over the forecast period, from $39.11/ton to $33.46/ton in constant 2000 dollars. For a detailed description of the forecast methodology and more discussion on the forecast assumptions, see the Forecast Summary (Section 3.1).

FINDINGS AND CONCLUSIONS

Table 11

New York State Coal Demand and Price Forecast						
	Actual	**Outlook**	**Outlook**	**Average Annual Growth**		
	2000	**2006**	**2021**	**2000-2006**	**2006-2021**	**2000-2021**
Demand: (TBtu)	311	218	251	-5.8%	0.9%	-1.0%
Price*: ($/ton)	$39.11	$36.33	$33.46	-1.2%	-0.6%	-0.7%

Source: Energy Plan, *Forecast Summary*.
* Coal prices are expressed in constant 2000 dollars.

- Coal is America's most abundant indigenous fossil fuel resource, accounting for 95% of the nation's fossil energy reserves. The United States has a 250-year supply of coal.

- The U.S. is second only to China among world coal producers. In 2000, over one billion tons of coal were produced in the United States, mined in 25 coal-producing states.

- Approximately two-thirds of all coal mined in the United States is transported by rail, making coal the largest single source of freight revenue for United States railroads. Coal freight in New York accounts for approximately 37% of the total tons of freight hauled by rail.

- In 2000, nearly 12.1 million tons of coal were used in the State, representing less than 1% of the nation's coal demand. While coal use represents 8% of the State's total primary fuel mix, most of the coal (80%) was used to produce electricity.

- New York has 16 coal-fired electricity generation plants located in the State, representing nearly 4,000 MW of net summer capability for the State's electricity system.

- A major consideration in the use of coal as a fuel in electricity generation is the emission of sulfur dioxide, nitrogen oxides, particulate matter, and carbon dioxide. Advanced coal technologies offer utilities options for making substantial reductions in acid rain and greenhouse gas emissions, while providing health-related benefits as the result of improved air quality.

- Development and implementation of advanced coal technologies can be a significant contributor to achieving the State's energy, economic, and environmental goals.