PINCOCK Perspectives

Delivering Smarter Solutions

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Why Is Coal Our Economic Future?

There is a more optimistic note in the coal sector these days, and for good reason. In 2003, electricity in the U.S. was generated by using energy resources consisting of coal (50%), nuclear (20%), natural gas (18%), hydro (7%) fuel oil (2%) and other forms (3%). Between 1993 and 2002, electricity generation grew from 3,197 to 3,858 gigawatt hours for a net increase of 21 percent. This growth was met by increasing the utilization of nuclear and coal plants and by adding new capacity. Coal plant utilization increased from 60 to 70 percent while nuclear plants increased from 70 to 90 percent. Although coal plants have additional capacity growth, nuclear plant capacity growth has been exhausted. Therefore, we can expect some future growth in coal-generated electricity in the near term from our existing plants.

New power plant construction languished from 1985 through 1999, when less than 20 gigawatts of new capacity per year was built. Between 2000 and 2003, 187 gigawatts of capacity was added. Of this amount, 175 gigawatts, or 94 percent, was fueled by natural gas. This boom for natural gas plants quickly faded with many of the announced combined cycle natural gas power stations being cancelled and some, such as Teco Energy's Union and Gila plants, stopped in mid-construction. This abrupt change was due to overbuilt capacity and high natural gas prices. This is unfortunate because the turbine efficiency and environmental benefits provided by gas-operated units are significant. *From a historical fuel perspective, the U.S. failed to recognize that we did not have the natural gas resources necessary for these power plants to provide electricity at acceptable costs.*

It is of value to review a perspective of raw fuels supply 25 years ago. Then, it appeared that natural gas resources in the U.S., in contrast to coal, had a very short life span. A colleague recently mentioned a Morgan Massey (a familiar coal industry executive at the time) comment apparently made well over 25 years ago. Mr. Massey suggested that a national energy policy should recognize how precious our natural gas resources were to the U.S. The concept was rather simple; use natural gas as a fuel for small consumers so the environmental impact is more limited and use coal as a fuel for large consumers where the environmental impact can be controlled and continually reduced by new technology. This made a lot of sense then and makes even more sense today. *The problem is that this precious fuel, even now, is not coveted. The natural-gas power generating capacity expansion over the past few years has resulted in a huge increase in the cost of natural gas. Natural gas prices have increased because existing reserves are being*

PAH NEWS PICK

CALENDAR

- ***National Coal Transportation Association – 2004 Spring General Conference***
  April 19–21, 2004
  El Conquistador
  Tucson, Arizona
  email: tom@nationalcoaltransportation.org
- ***EXPOMIN Chile 2004***
  April 20–24, 2004
  Fisa Maipu Fairground
  Santiago, Chile
  email: info@fisa.cl
- ***CIM Mining Industry Conference & Exhibition***
  May 9–12, 2004
  Shaw Convention Centre
  Edmonton, Alberta, Canada
  email: jgaydos@cim.org
- ***Sixth International Gold Symposium***
  May 4–7, 2004
  Museo de la Nacion
  Lima, Peru
  email: cmendoza@snmpe.org.pe

■ ***NEWMONT LOOKS AT BUILDING COAL-FIRED POWER PLANT IN NEVADA***

Newmont Mining, a gold mining company based in Denver, is seriously considering building a 200-MW Powder River Basin coal-fired power plant in north central Nevada. The plant would generate electricity for its four mining operations there and would be located on company property somewhere in the midst of the mining operations along the Interstate 80 corridor. Newmont's four Nevada operations produce about 2.5 million ounces of gold each year. A final decision will not be made until mid-year.

■ ***COAL INDUSTRY WINS MINING LAWSUIT***

On February 23 the U.S. Supreme Court refused to consider whether the Office of Surface Mining improperly loosened rules for underground mining operations near protected areas. In the lawsuit, environmental groups argued for protection of overlying areas, such as national forests, that could be damaged by subsidence from longwall mining. The lawsuit specifically said that Section 522(e) of the 1977 Surface Mining Act should apply to deep mining, something that would have severely restricted such mining. A U.S. District Court decision stated that this rule applied to and could restrict deep mining, but that decision was appealed and overruled by the D.C. Circuit court on June 3, 2003. The National Mining Association says that if the district court ruling were upheld, approximately 45,000 coal miners would have been out of work.

■ ***PEABODY PURCHASES RAG OPERATIONS***

St. Louis-based Peabody Energy has agreed to purchase several RAG Coal International AG coal operations for $441 million. The purchase deal includes the 7.5 million-ton/year Twentymile mine in Colorado and the 7-million metric tonne/year (combined) Burton and North Goonyella mines in Australia. The acquired mines had a combined earning of $95 million in 2003. Peabody and RAG first announced a tentative deal in late December. The transaction is expected to close within the next three months and requires no additional U.S. or Australian regulatory approvals.

depleted and new low-cost reserves have not been developed.

If we analyze the U.S. natural gas reserve question posed in the late 70s, we can see what has happened to natural gas resources. This exercise should shed a little light on the recent increase in natural gas prices and the forecasts that project prices to remain at or above their current levels. The statistics, taken from the U.S. Department of Energy's EIA (Energy Information Administration), are shown in Table 1. It can be seen that at the start of 1977, proven natural gas reserves were 213 trillion cubic feet, and the U.S. was consuming 19 trillion cubic feet of natural gas per year. If reserves are divided by annual production, the reserve life is about 10 years. Of course, new natural gas resources are continually being developed. A long-term assessment provides a much better framework to evaluate natural gas resources. Over the past 25 years, year-end proven natural gas reserves have only fallen from 207 to 187 trillion cubic feet. This represents only a reduction of 20 trillion cubic feet or a drop of 0.8 trillion cubic feet per year. At this rate, assuming all things are equal, the 2002 natural gas reserve should last over 200 years. Well, all things are not equal and this analysis requires a more in-depth examination. As can be seen from Table 1, new discoveries, extensions, and

TABLE 1
US Natural Gas Reserves
Trillions of Cubic Feet
Dry Gas Basis

Year	Beginning Reserves	Production From Reserves	New Discoveries Adjustments and Reserve Changes	Net Change	Ending Reserves
1977	**213**	(19)	13	(6)	**207**
1978	207	(19)	19	1	208
1979	208	(19)	12	(7)	201
1980	201	(19)	17	(2)	199
1981	199	(19)	21	3	202
1982	202	(18)	17	(0)	202
1983	202	(16)	15	(1)	200
1984	200	(17)	14	(3)	197
1985	197	(16)	12	(4)	193
1986	193	(16)	14	(2)	192
1987	192	(16)	12	(4)	187
1988	187	(17)	(3)	(19)	168
1989	168	(17)	16	(1)	167
1990	167	(17)	19	2	169
1991	169	(17)	15	(2)	167
1992	167	(17)	15	(2)	165
1993	165	(18)	15	(3)	162
1994	162	(18)	20	1	164
1995	164	(18)	19	1	165
1996	165	(19)	20	1	166
1997	166	(19)	20	1	167
1998	167	(19)	16	(3)	164
1999	164	(19)	22	3	167
2000	167	(19)	29	10	177
2001	177	(20)	26	6	183
2002	183	(19)	23	3	**187**

Note: Totals may appear not to add due to rounding

reserve changes have significantly mitigated reserve depletion.

Production from current reserves obviously has higher costs. If we look at data for the past six years in Table 2 (page 4), a clearer understanding of current dynamics can be observed. Production has been relatively flat, ranging from 18.9 to 19.7 trillion cubic feet per year. Meanwhile, imports have ranged from 2.8 to 3.6 trillion cubic feet per year, increasing by 23%. Inventory capacity has remained fairly constant at 8.2 to 8.4 trillion cubic feet.

Next, we can see the breakdown of consumption to observe that residential demand has been flat while electric utilities have increased their consumption by 40%, from 4.1 to 5.7 trillion cubic feet per year. It is interesting to note, however, that when consumption in the electric utility, commercial, and industrial sectors are added together, that their combined consumption has only risen from 15.8 to 16.0 trillion cubic feet per year, an increase of only 1 percent. Apparently, natural gas pricing has reduced the consumption of natural gas in the industrial sector by 1.3 trillion cubic feet per year over the 6-year period. However, the electricity sector natural gas consumption increase was equivalent to 33% of residential consumption.

Meanwhile, costs have been quite erratic, primarily because of higher wellhead costs associated with old higher-cost depleting reserves and new higher-cost gas fields. During the period, average delivered natural gas prices have increased 14% with spikes in 2001 as high as 44% over the base year of 1997. The average wellhead price increases are even larger, averaging 27% with spikes as high as 73% in 2001.

Two conclusions are quite evident. First, wellhead prices are significantly higher than six years ago. Secondly, these increases have resulted in decreased consumption in the industrial sector. Table 2 also shows the annual changes, relative to 1997, in the weighted average, wellhead, and post-wellhead prices, demonstrating the volatility of natural gas prices. Given that natural gas prices prior to this period typically ranged in the $2 to $3 per million Btu range, this table shows that the shift in natural gas consumption to electricity generating stations has resulted in higher prices, although total demand has not increased. One should wonder what the impact has been to the industrial sector and how this might that might affect our economy.

There is something else very interesting in Table 2. Look at the pricing differential electric utilities enjoy over the residential sector. This is the last column in the bottom set of statistics. For example, in 1997, the delivered residential price was $6.94 and the electric utility price was $2.78, and the price advantage was $4.16 per thousand cubic feet. Realizing that a more complex distribution system certainly adds costs, this data shows the residential sector pays a price that is 177% to 284% higher than that paid by the electric utility sector. *How do these rates support a national policy of preserving a valuable natural resource that can greatly benefit our environment? Should we use our precious domestic natural gas reserves to fire power stations when we have massive coal resources? And why do we need to go down this path only to wind up importing liquid natural gas that is much more expensive?*

This months article was provided by John Kyle, P.E., Principal Mining Engineer
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■ ***COMEBACK EXPECTED FOR COAL-FIRED GENERATION***

Coal-fired generation could make a substantial comeback in coming years according to a recent report from Standard & Poor's Rating Service. The report states that while coal reserves are plentiful, stagnant U.S. and Canadian gas production and increased usage are expected to make them more dependent on liquefied natural gas imports for natural gas supplies in the future. This will pave the way for a comeback for coal-fired generations, especially with regulated utilities that are able to rate-base their investments. The report also questions whether there is any need for further generations. Since every region in the county has a generation capacity surplus, expected nuclear and coal-fired plant retirements have never materialized. Because all new plant construction is gas fired, there may be a significant need for baseload generations, the role for which coal-fired generation is best suited. The report also states that the vast majority of new coal plant projects will be constructed by regulated utilities or public power entities and cooperatives.

Minerals Corner—

Woodhouseite

$CaAl_3PO_4SO_4(OH)_{10}$ – Calcium Aluminum Phosphate Sulfate Hydroxide

Woodhouseite is a rare mineral that is almost exclusively found in a single location: the Champion Andalusite Mine on the western slopes of the White Mountain Peak in Mono County, California. It is named after U.S. mineral collector Charles D. Woodhouse. Crystals in woodhouseite, which can look nearly cubic, are up to several millimeters in size and usually light tan in color. Woodhouseite forms in quartz veins with topaz, tourmaline, andalusite and svanbergite. It is a difficult mineral to classify because it has both a phosphate anion group and a sulfate anion group. Woodhouseite's sulfate anion is intricate and essential in its structure, while the phosphate anions, to a limited degree, can be substituted.

TABLE 2
Natural Gas Production, Consumption and Pricing
For the Period 1997 through 2002
Based on the U.S. Energy Information Administration Data

Production - Dry Gas Billion Cubic Feet

Year	Produced	Net Imports	Net Storage Change	Balancing Account (a)	Total	Inventory Capacity
1997	**18,902**	**2,837**	24	974	22,737	8,332
1998	19,024	2,993	(530)	757	22,244	**8,179**
1999	18,832	3,422	172	-20	22,406	8,229
2000	19,182	3,538	829	-181	23,368	8,241
2001	**19,676**	**3,604**	(1,165)	132	22,247	**8,415**
2002	19,047	3,491	447	-332	22,653	na

Consumption - Dry Gas - Billion Cubic Feet

	Delivered Fuel						Consumptive Fuel			
Year	Residential	Electric Utilities	Commercial	Industrial	Vehicle	Total Delivered Fuel	Lease & Plant Fuel	Pipeline Fuel	Total Consumed Fuel	Total
1997	4,984	**4,065**	3,215	8,511	8	20,783	1,203	751	1,954	22,737
1998	4,520	4,588	2,999	8,320	9	20,436	1,173	635	1,808	22,244
1999	4,726	4,820	3,045	8,079	12	20,682	1,079	645	1,724	22,406
2000	4,996	5,206	3,218	8,142	13	21,575	1,151	642	1,793	23,368
2001	4,776	5,343	3,037	7,363	15	20,534	1,089	624	1,713	22,247
2002	4,909	**5,672**	3,166	7,203	15	20,965	1,053	635	1,688	22,653

Natural Gas Prices - $US per Thousand Cubic Feet

Year	Residential	Electric Utilities	Commercial	Industrial	Weighted Average	Change to Base Year Percent	Wellhead Price $	Change to Base Year Percent	Post-Wellhead Added Price $	Change to Base Year Percent	Utility Price Advantage Over Residential Price $	Utility Price Advantage Over Residential Percent
1997	**$ 6.94**	**$ 2.78**	$ 5.80	$ 3.59	$ 4.58		$ 2.32		$ 2.26		**$ 4.16**	250%
1998	$ 6.82	$ 2.40	$ 5.48	$ 3.14	$ 4.13	-10%	$ 1.96	-16%	$ 2.17	-4%	**$ 4.42**	**284%**
1999	$ 6.69	$ 2.62	$ 5.33	$ 3.12	$ 4.15	-9%	$ 2.19	-6%	$ 1.96	-13%	**$ 4.07**	255%
2000	$ 7.76	$ 4.38	$ 6.59	$ 4.45	$ 5.52	21%	$ 3.69	59%	$ 1.83	-19%	**$ 3.38**	**177%**
2001	$ 9.64	$ 4.61	$ 8.43	$ 5.28	$ 6.59	**44%**	$ 4.02	**73%**	$ 2.57	14%	**$ 5.03**	209%
2002	$ 7.88	$ 3.78	$ 6.57	$ 3.99	$ 5.23	**14%**	$ 2.95	**27%**	$ 2.28	1%	**$ 4.10**	208%

(a) Represents losses and data source differentials
na: Not Available

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