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About the Cover:
Reclaim area at Kennecott’s Spring Creek Mine.

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March 4, 1865
The American Coal Council (ACC) is proudly celebrating its 22nd Anniversary this year!

The ACC’s predecessor organization, the Western Coal Council (WCC), was founded in 1982 as the Western Coal Export Council (WCEC), a private industry trade group formed to promote exports of western U.S. coal to the Pacific Rim. The WCEC grew out of the efforts of a multi-national Task Force formed under the auspices of the Western Governors’ Association (WGA). In 1981, that Task Force published a study on “Western U.S. Steam Coal Exports to the Pacific Basin.” Three nations — Japan, Taiwan and South Korea — along with more than 40 U.S. companies participated in the study group.

In 1986, the Western Coal Export Council changed its name to the Western Coal Council to more accurately reflect the organization’s support for expansion of both foreign and domestic markets for western U.S. coal. The strengths and practices established in those early years — including a broad-based membership, a partnering, non-adversarial approach to business, excellence in educational programming, and an eagerness to work closely with other groups to advocate for the coal industry’s interests — continued to foster the WCC’s growth and development.

In the spring of 2002, the WCC undertook the next step in its development as the membership voted overwhelmingly to transition from a regional to a national organization. The American Coal Council (ACC) continues to be dedicated to advancing the development and utilization of coal as an economic, abundant and environmentally sound fuel source. The Association’s national focus and its increasingly close ties with national and state organizations and other industry groups will enhance its advocacy efforts in the future.

Our membership base includes coal suppliers, consumers, energy traders, transportation companies, ports and terminals and coal support service firms. Over the last 10 years, the ACC has increased its membership by nearly 500 percent. Today, the nearly 135 member companies of the American Coal Council have combined their respective voices to serve as the pre-eminent business voice of the American coal industry.
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COAL EXPERTISE & PROJECTS WORLDWIDE
Welcome to the second issue of American Coal. Our first issue in Spring 2003 was distributed to 5,000 industry participants, industry associates, community leaders, media, and Congressional delegates and staffers.

This second issue follows the same format, with editorial features emphasizing coal education and advocacy. We’ll also be distributing a separate utility-coal industry directory of ACC members. American coal industry participants supply the editorial content, which is focused on coal’s benefits to the American economy, and the fact that it is an abundant, secure, and environmentally sound energy source. We have included accompanying articles and case studies to detail specific examples of how coal is addressing our nation’s energy needs.

American Coal also reinforces ACC’s role as the pre-eminent business voice of the American coal industry. Since our transition to a national association in the Spring of 2002, we’ve gained increasing visibility amongst the legislative, regulatory, education, and advocacy communities, as well as in the media. We’re deliberately expanding and strengthening our business voice to support coal advocacy efforts as part of ACC’s outreach programs.

The core ACC mission remains business education through conferences and seminars. These forums allow attendees to build professional relationships, secure market intelligence, and gain valuable insights necessary to advance their business interests. This year’s events include the second annual technical program on mercury, which will be held March 24-25 in Irving, Texas. Our first mercury seminar, held in 2003, was well attended, and we expect strong support for this year’s event as the MACT rule making takes shape.

The 2004 PRB seminar is PRB Coal Use: Risk Management Strategies & Tactics, and takes place July 27-29 in Overland Park, Kansas. Our annual PRB coal seminars provide valuable information to power generators considering PRB coal or those who already consume PRB coal and wish to share best practices with other power generators.

The ACC’s two strategic issue conferences will address critical marketplace and public policy issues affecting our industry. They feature expert speakers from industry, government, and the environmental community. The Spring Coal Forum will be held May 17-19 in Frisco, Texas. The Coal Market Strategies Conference is scheduled for October 18-20 in Tampa, Florida.

Another way the ACC fulfills its mission, to be the pre-eminent voice for the coal industry, is through special-interest group activities. The Ash Special Interest Group is undertaking an Ash Economic Assessment to examine utilization of coal combustion products (CCPs) and the potential economic impacts of legislative, regulatory, and marketplace initiatives that affect the use of CCPs. John Ward of ISG Resources and Al Christianson of Great River Energy chair this group.

The Energy Trading group has published a fact sheet on the basics of coal trading and is working to develop case studies that document the mechanics and nuances of trading activities. Tom Hiemstra of Evolution Markets chairs this group.

In 2003, the ACC launched two new committees – a Western Utility-Coal Committee and an Eastern Utility-Coal Committee – to provide a forum to address issues unique to each market. Under the leadership of Kelly Cosgrove of Kennecott Energy and Keith Drohan of Dominion Energy, these committees have hosted breakout and roundtable sessions, and developed action plans and objectives for future activities.

The ACC is also active in promoting coal through charitable contributions and education efforts. We support the Fort Mandan Visitor Center, the 1804-1805 Winter home of the Lewis & Clark Expedition. The Center demonstrates the environmental stewardship efforts of the energy industry through its use of construction materials manufactured with CCPs. We are actively working with the U.S. Department of Energy as it develops a national energy information and education program to enhance public knowledge of energy resources, technologies and economics. And, we are helping voters understand the impact energy legislation has on their pocketbooks by publishing Congressional voting records on energy issues, and enabling voters to contact their legislators real-time. This information is available to members on our Web site at www.americancoalcouncil.org. We are hoping it will be used extensively in the coming election cycle.

This publication is a vivid example of how the ACC works. Three members volunteered their expertise to make it happen – Vic Svec of Peabody Energy, Rick James of We Energies, and Evan Ard of Evolution Markets. Their leadership turned a creative idea into a valuable advocacy and educational tool. In the same manner, our educational programs, advocacy efforts and special interest group activities are built on member leadership and involvement. I look forward to how you will help ACC be the pre-eminent business voice for the American coal industry!
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credibly enough, it’s been a year since the inaugural issue of American Coal was published. When we launched this project in the summer of 2002, we hoped it would enhance the visibility of the American Coal Council (ACC) and its members, as well as provide some good information on marketplace and public policy issues of importance to our industry.

The success of that first issue well exceeded our expectations. We got more requests for the magazine than we could fill and many compliments on the quality of the editorial content. The magazine was cited in numerous industry periodicals and Congressional hearings, and other associations are now modeling their publications on our effort. Most notably, American Coal was successful in providing timely, factual information on our business to industry associates, public policy makers, community leaders and the media.

The inaugural magazine set a high standard for subsequent issues – one that I believe we’ve met this time around. The range of topics covered in this issue convey a strong message that the coal supply and coal generation industries are working hard to meet the needs for technological innovation, environmental stewardship, and business acumen. The articles also present a good snapshot of the many and varied challenges our industry faces.

This is a complex business. There’s no quick, easy way to explain to the guy seated next to you on the plane why we still use coal to generate electricity or what we’re doing to ensure his great-grandchildren have an affordable, reliable supply of electric power. Our hope is that the articles in this magazine will not only help you in your daily business, but provide you with some “information nuggets” to share with your seat mate.

We’re grateful to our authors for sharing their expertise and insights. The variety of authors represented – including senior government officials, the academic, research and association communities, and industry executives from the coal supply, consumption, transmission and trading sectors – is reflective of the ACC’s membership base and its collaborative approach to conducting its business.

The composition of American Coal’s editorial review board is also in keeping with our association’s efforts to represent the varied interests of the coal industry. Many thanks to Vic Svec (Peabody Energy), Rick James (We Energies), and Evan Ard (Evolution Markets) for so effectively managing the editorial direction and content of this issue.

We’re thankful, as well, for the participation of our advertisers, who represent a broad and diverse cross-section of the utility-coal industry. Our efforts to spread the good word about this business would not be possible without their contributions.

Finally, and especially, to the members of American Coal Council – thanks for your tremendous support. Over the years, your membership has made it possible for us to expand and improve our educational programming, services and activities – including the publication of American Coal. We welcome your comments and your guidance as we continue to grow, prosper and branch out.
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Mission Statement
The American Coal Council (ACC) is dedicated to advancing the development and utilization of coal as an economic, abundant and environmentally sound energy fuel source. The Association promotes the lawful exchange of ideas and information regarding the coal industry. It serves as an essential resource for companies that mine, sell, trade, transport or consume coal. The ACC provides educational programs, advocacy support, peer-to-peer networking forums and market intelligence that allow members to advance their marketing and management capabilities.

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The ACC facilitates the lawful exchange of ideas and information regarding the American coal industry. It serves as an essential resource for companies that mine, sell, trade, transport or consume American coal. The ACC also serves as a resource for those wishing to expand or enhance business relationships in North American and international coal markets.

Membership benefits include educational programming and technical seminars, advocacy support, broad-based networking, Web site, electronic and printed membership directory inclusion, newsletter and members-only electronic updates, database resources, policy input, referrals and event discounts.

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<td>March 24-25, 2004</td>
<td>Omni Mandalay Hotel Irving (Dallas), Texas</td>
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<td>Spring Coal Forum: Outlook Coal: Prospects for Future Coal Generation</td>
<td>May 17-19, 2004</td>
<td>Westin Stonebriar Resort Frisco (Dallas), Texas</td>
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<td>PRB Coal Use: Risk Management Strategies &amp; Tactics</td>
<td>July 27-29, 2004</td>
<td>Overland Park Convention Center, Overland Park, Kansas</td>
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<td>Coal Market Strategies: Coal Power: Fueling a Sound Economic and Environmental Future</td>
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Coal has fueled America’s economic growth for over a century. From the industrial revolution through the post-World War II economic boom to the computer and dotcom revolutions, coal has been instrumental in providing the low-cost energy that powered the U.S. economy. For its future growth, the U.S. will continue to rely on coal for several reasons:

- Energy independence – the U.S. has abundant coal reserves;
- Stable, low prices – coal is inexpensive when compared to other fuels and does not exhibit the price volatility of other fuels, such as natural gas;
- Improved environmental performance – more coal-fueled power plants produce more electricity with fewer net emissions than in the early 1970s; and,
- Jobs and taxes – coal mining and transportation provide jobs and tax benefits to the country.

When compared to competing energy sources, coal has clear advantages.

National defense lies in domestic coal

The petroleum-based transportation sector is the Achilles heel of the United States. The nation imported 55 percent of its petroleum in 2001. By 2025, the Energy Information Administration (EIA) predicts that 68 percent of the petroleum used in the U.S. will be imported. The vast majority of oil serves transportation needs. Cut off the supply of oil, and the U.S. economy will most certainly stall.

Consider how vulnerable the U.S. is. The most geo-politically volatile places on earth—the Middle East, Africa, South and Central America, and the former Soviet Union—are the net exporters of petroleum, and in some instances, are known bases of terrorist networks.

Coal, by contrast, is largely a domestically available resource. In fact, coal provided for the nation’s defense during World War II. For example, scientists and engineers of the Carbide Institute and the DuPont Belle chemical plants, in the Great Kanawha Valley of central West Virginia, used the black rock as feedstock for synthetic rubber and nylon, strategic materials needed by the military to win that conflict.

Coal can once again provide the strategic material for defending the U.S., in part through weaning the country from imported oil. Coal gasification, for example, has long been used to produce a variety of chemicals, among them hydrogen and carbon monoxide, the building block chemicals for so-called Fischer-Tropsch fuels — synthetic diesel which burns more cleanly than petroleum-based diesel. Coal can be used to derive synthetic diesel for today’s trucks and buses or to produce hydrogen for tomorrow’s fuel cell vehicles.

The benefits of clean coal technology

Today’s power plants are already employing numerous clean coal technologies that have proven effective in reducing various emissions. Additional technologies are being developed and tested to further enhance emissions control.

Coal gasification is one such technology that can lead the nation to energy independence. Integrated gasification combined cycle (IGCC) power plants produce a variety of chemicals along with electricity, leading to greater overall efficiency. Other fuels such as biomass can be co-fired with coal. Oxygen-blown (vs. air-blown) coal gasification produces a concentrated stream of CO₂ at high pressure that improves sequestration economics and reduces the efficiency penalty associated with CO₂ capture.

Coal gasification is one of the cleanest coal technologies, inherently lower in SO₂, NOₓ and particulate matter emissions, producing the least solid waste and wastewater, and offering the lowest potential cost for mercury as well as CO₂ removal. Coal gasification is a proven technology and is the only near-term direct route to producing massive quantities of hydrogen for the transportation sector.

What about the cost? Currently, in this country, hydrogen is produced largely from natural gas. According to Air Products, one of the world’s largest producers of hydrogen, the cost of hydrogen produced from natural gas at a large steam methane reformer (SMR) plant is approximately equal on an energy equivalent basis to gasoline produced at a refinery. Experts at ChevronTexaco note that when the price of natural gas reaches $4.00 to $5.50 per million British thermal units (mmBtu), gasification from coal becomes a cheaper alternative for producing hydrogen. According to the Department of Energy’s (DOE) Energy Information Administration (EIA), wellhead prices for natural gas for the first three quarters of 2003 were between $4.71 and $6.69 per mmBtu.
IGCC offers high efficiency, environmentally superior performance, fuel and product flexibility and enhanced CO₂ sequestration potential.

Add to this the fact that coal is already responsible for providing more than 50 percent of the electricity generated in the U.S. Oil and gas combined place a distant second at 20 percent, as does nuclear energy also at 20 percent. In surveys asking the typical person-on-the-street where electricity comes from, the most often cited source was hydropower, from which only six percent of U.S. electricity is generated!

IGCC is just one of many clean coal technologies that hold great promise for advancing emissions control in the future.

Coal is abundant

The U.S. ranks first in coal reserves with enough readily mine-able coal to last for 70 or more years with reserves of up to 250 years.

Oil production in the U.S. peaked in the early 1970s. Global oil production from conventional resources is estimated to peak around 2015 according to some analysts. DOE experts note that if recoverable conventional oil reserves were double the current estimate, global oil production would peak in 2035.

Unless gas hydrates in the Gulf of Mexico can be safely and economically recovered, natural gas production is expected to peak around 2020 in the lower 48 states. This includes expected production from unconventional sources, such as coal bed and coal mine methane. Production will increase only in Alaska. However, imports of liquefied natural gas (LNG) are projected to increase. While experts say that imported LNG will be less than two percent of all energy consumed, large energy companies have made recent investments in LNG seaports to import natural gas. This represents another step down the “rely on others” path.

The existing domestic pipeline infrastructure will not be able to meet a large increase in demand for natural gas. Significantly higher demand would require imports of natural gas from northern Canada and/or Alaska and imports of LNG from other countries.

While uranium is the cheapest fuel, the country is still debating what to do with the spent fuel. Nuclear plants also have safety issues. It is unlikely that new nuclear plants will be built in the near future due to public opposition and the high costs associated with construction and waste disposal.

Renewables today account for around eight percent of all electricity production in the U.S. Hydropower is, for all intents and purposes, tapped out. Renewables are a long way from being able to provide the levels of electricity required to replace significant amounts of coal-fueled power. In Massachusetts, Cape Wind Associates is meeting stiff opposition to its plans to build a large wind farm in the Nantucket Sound. Their problems make it clear that not-in-my-backyard opposition will be an issue for any large-scale development of new power-generating facilities—even those viewed as “clean.”

While continued improvement in renewable energy is a worthy endeavor, until significant improvements in the cost of renewable energy are achieved, coal will remain the country’s most affordable fuel for power generation.

Coal is the low-price energy leader

Throughout the 1990s, coal has been the low-price energy leader. The EIA reports that since 1990, the price per mmBtu for coal ranged from $1.20 to $1.45, petroleum was $2.02 to $4.17, and natural gas was $1.98 to $4.48. Coal is 300 percent cheaper!

Coal’s low cost makes it the best source for the nation’s electricity needs. Over the past 25 years, coal prices have remained remarkably stable. This stability is expected to continue into the future. Why? In large part because coal productivity has gone from just six tons per miner per day in 1945 to 52 tons per miner per day in 2001.

By comparison, natural gas wellhead prices reached record highs of nearly $10.00 per thousand cubic feet (mcf) in late 2000 and early 2001, but fell sharply soon thereafter to around $2.50 per mcf. During the winter of 2002-03, the U.S. Northeast and Midwest saw increasing prices as gas storage levels hit unusually low levels and cold weather limited pipeline operations. The EIA reports that the natural gas spot price at the Henry Hub has generally been above $5.00 per million Btu on a monthly basis since the beginning of 2003.

As shown above, the cost of electricity produced from the most efficient gas-fired power plant, at current gas prices, is twice times higher in comparison to a typical coal-fired power station (including the cost of allowances).
The above map shows the relatively low retail prices of electricity in states that get most of their electricity from coal. By contrast, the northeastern states and California have some of the highest retail electricity prices and relatively little (or no) coal-fueled electricity. Cost per kWh and Percent of Electricity from Coal (Retail Price = Avg. cents per kWh YTD 11/02)

Clean coal is fact, not fiction

While some would accuse the coal industry of “green washing” the environmental impact of coal, the facts show that the mining and power industries have made significant advances in addressing negative environmental impacts of coal.

Burning coal does emit some harmful materials including SO₂, NOₓ and mercury. However, great strides have been made developing and implementing clean coal technologies. These technologies have made it possible to use more coal while at the same time emitting fewer harmful substances from coal plants.

Between 1980 and 2000, NOₓ emissions from coal-fueled power plants declined 56 percent (in pounds of emissions/kWh) and SO₂ emissions declined 61 percent. During this same period, coal use by utilities actually rose 74 percent. While coal use for domestic electricity has more than tripled since 1970, government statistics show SO₂ emissions have decreased more than 35 percent below 1970 levels.

Clearly coal-fueled generators are working hard to reduce the rates of emissions from their plants.

Among the technologies in place to lower NOₓ emissions are low NOₓ burners (LNB) and Selective Catalytic Reduction (SCR). LNBs are on 75 percent of coal plants and SCRs are now on order or under construction at 30 percent of existing coal-fueled capacity. SCRs can reduce NOₓ emissions by 80 to 90 percent and the cost of this technology has fallen steadily over the last two decades to about half of its original cost.

Flue Gas Desulfurization (FGD) technology has been installed at more than 400 coal-fueled units in the United States. This technology reduces the amount of SO₂ and removes more than 90 percent of mercury that a power plant emits, yet costs about a third of what it cost in the 1970s. Other technologies used to reduce emissions from power plants include Fluidized Bed Combustion (FBC) and Integrated Gasification Combined Cycle (IGCC) described earlier. FBC technology, which reduces both SO₂ and NOₓ inside the
Coal contributes high-paying jobs and tax revenues

Each year, coal mining contributes billions of dollars to the economy.

The Bureau of Labor Statistics reports that in 1999 coal mining provided 81,000 jobs with an average salary of $38,840 per year or $18.67 per hour.

Mining employs many people with a variety of skills and expertise. A quick check of SIC-code 12, Coal Mining, at the Bureau of Labor Statistics shows that coal industry workers include: mining company executives; computer support specialists and database administrators; surveyors, civil, environmental, industrial, mining and geological engineers; chemical, geological and petroleum technicians; legal professionals; occupational health and safety specialists; security guards; janitors; real estate agents; switchboard operators, bookkeepers and clerks; human resource specialists; shippers; secretaries; carpenters; electricians; rail-track layers; explosives specialists; continuous mine and roof bolting operators, shuttle car operators and other miners; mechanics of all sorts; machinists, welders, and cutters; inspectors, testers, sorters and other production helpers; material movers, truck drivers, conveyor operators, hoist and winch operators, and others.

By and large, the coal industry pays well. Salaries for mining industry managers and supervisors range from $56,000 to $115,000 per year. The average annual wage for building and grounds personnel is $23,000. Machinists, welders, inspectors and production workers earn $34,000 to $39,000 per year, as do machine operators of all types. Office workers earned $19,000 to $43,000 per year.

In general, coal mining has a combined direct and indirect impact of more than $160 billion on the U.S. economy. The coal industry itself pays more than $11 billion in taxes and fees to the Federal government each year and close to $9 billion to state governments.

Coal A Call to Action

Given the facts as presented, coal no longer deserves the black eye it often gets. The industry must spread the good word about coal. At the same time, the industry must continue to “walk the talk” seeking ever-cleaner methods for mining and using this valuable resource. Additionally, federal investments in research and development in coal must continue to ensure that reliable, affordable, clean energy is available to serve the country’s citizens.

If the U.S. were to develop the will to be energy-independent, coal could lead the way.

Sources:

Sturm, ChevronTexaco, private communication
Rita Bajura, NETL, Schmidt Eastman presentations at Energy Roadmap Workshop on Hydrogen, Stonewall Jackson Resort, Nov. 19, 2003
U.S. Department of Energy, Energy Information Administration,
http://www.eia.doe.gov/iaf/aeo/figure80.html
http://www.eia.doe.gov/cneaf/electricity/epa/eqat4p5.html
http://www.eia.doe.gov/emeu/cabs/usa.html
Coalition for Affordable and Reliable Energy, www.carenergy.com/fueling growth/◆

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The National Research Center for Coal & Energy is located at West Virginia University in Morgantown, West Virginia. The Center advances ideas about energy and the environment through its partnerships with research faculty at the University and at higher education institutions and private and public sector organizations across the country.

The authors gratefully acknowledge the contributions of their colleagues, Jeff Watkins, President, Hill & Associates, and Richard A. Bajura, Director, WVU NRCCE, in preparing this article.
Computers, fax machines, garage door openers, security systems, multiple televisions, home theater systems, digital equipment, and numerous kitchen gadgets are commonplace in homes across America.

In the workplace, computer technology has automated manufacturing processes and business systems. In hospitals and schools, technology supports critical functions.

Not too long ago, we couldn’t imagine the extent to which we’d be using electricity today. It powers so much more than lighting and warmth in our homes and businesses. Electricity brings us automation, efficiency, entertainment, comfort, and convenience.

In today’s electrically dependent world, even a momentary interruption of electric service is a major inconvenience. The August 2003 blackout in the northeastern United States and Canada gave millions of people a taste of life without electricity – loss of modern conveniences at home, loss of revenue for businesses, and the shutdown of public transportation.

Investing in electric reliability

A sound and reliable electric infrastructure is a fundamental underpinning of a region’s economy and the daily life of its citizens. A reliable supply of electricity is so basic to our way of life today that we only tend to think about it when it’s not there. The past reliability of the nation’s electric system has given us a false sense of security. The fact is the majority of the existing transmission system was not built to accommodate the vastly expanded amounts of energy flows that have developed in recent years.

Major investment in electric transmission is necessary to support two key benefits to society – reliability and economy of electric supply. These two benefits are tightly intertwined.

Fundamentally, transmission connects power producers to power consumers (see Understanding Electric Transmission illustration). Without transmission, every consumer would have to generate their own electricity on site and exactly match their production to their usage at all times. This is not economically or logistically feasible, or socially desirable, and, in fact, is why the transmission system evolved in the first place. Transmission allows for the movement of power to many consumers.

Transmission is a network of wires with many power plants and distribution substations interconnected at various locations. This network provides multiple paths to get power from producers to consumers. Having multiple paths to move power lessens the chance that consumers will be negatively affected by outages of various network elements. Transmission provides the means to balance constantly varying electric production.
and usage over broad areas, allowing uninterrupted electric supply on demand for consumers. Because of the transmission network’s configuration and ability to provide access to more distant sources of power, not as many local sources are required to provide the same level of electrical service reliability to consumers.

Transmission also provides the ability to transport emerging “green” sources of power, like wind energy from wind farms being developed in remote areas to more populous areas where consumers live and work. Transmission infrastructure in a community also provides the opportunity for area economic development and growth; without local transmission it is difficult to provide the necessary electrical services to support growth in a timely or economic fashion.

Siting transmission facilities

While there is great need for new transmission, not much transmission was built in the recent past due to various factors, including:

- Competition for capital within vertically integrated utilities.
- The economics. Electric generation projects provide a higher return than transmission projects, and vertically integrated utilities typically have made greater investments in generation.
- Confusion about who pays for transmission projects. The Federal Energy Regulatory Commission (FERC) continues to debate the future pricing policy of who will pay for tomorrow’s transmission system upgrades.
- Concern that building transmission would allow independent power producers to compete with the local utility.
- Well-organized groups opposing the location of transmission lines.

Clearly, improving the transmission network takes great cooperation—among transmission owners, regulators, local officials, landowners, and other interest groups. It takes money, and it takes time.

A single transmission project can take five to seven years to complete—longer than siting and building power plants. Transmission lines can run for miles through multiple municipalities or even states, and it takes time to work with communities and landowners impacted by transmission facilities balancing their concerns with the need to keep the lights on for millions of people.

Another reason is in the planning. Transmission planners conduct studies evaluating current and future power flows, and how population, employment and economic development changes may have an impact on future energy demand. With the wholesale electricity market, transmission planning today must occur on multiple levels—local and regional—so that it can effectively address the varying needs of transmission users. Successful proposals also must maximize the use of existing rights-of-way to minimize the impact on the environment and landowners.

Generating Solutions, Fueling Change

CONSOL Energy Inc. is the largest producer of high-Btu bituminous coal in the United States, and the largest exporter of U.S. coal. CONSOL Energy has 22 bituminous coal mining complexes in seven states, two Canadian provinces and Australia. In addition, the company is one of the largest U.S. producers of coalbed methane, with daily gas production of approximately 145 million cubic feet. The company also produces electricity from coalbed methane at a joint-venture generating facility in Virginia. It won the Platts 2001 Financial Times Global Energy Award as Coal Company of the Year.

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Alternatives?
Siting and building transmission can be long and complicated, but still necessary. The aging transmission network needs attention to keep up with today's energy usage. What are the alternatives?

- **More conservation efforts.** While conservation is an important piece of the energy picture, it alone is not keeping pace with the increase in demand. An outdated system will still need new investments in order to operate reliably and safely. The transmission system in the Midwest, for example, currently is operating at its limits, and conserving energy does not address the need to modernize outdated facilities.

- **Distributed generation.** Although often touted as an alternative to transmission, distributed generation is typically designed to meet local needs through a small generator located near the load. While there's a niche for them to meet local need, they cannot replace transmission designed to bring power across long distances and serve multiple needs.

Returning to a society less dependent upon electricity isn't a likely alternative. Few are willing to get by without the electric garage door opener at home or the computers at work. Most have become too accustomed to the automation, efficiency, entertainment, comfort, and convenience that electricity provides in our daily life to ever go back. A strengthened electric transmission will help ensure we have energy people need when they need it.

In 2001, American Transmission Company became the first multi-state, transmission-only utility. Through its 8,900 miles of high-voltage electrical lines and 450 substations, it operates the electric transmission system in portions of Wisconsin, Upper Michigan and North Central Illinois, ensuring that people, communities and businesses have access to power when they need it.

ATC annually issues a 10-Year Transmission System Assessment that identifies electric transmission needs, existing and anticipated constraints to its transmission system, and potential solutions. The 2003 Assessment proposes $2.8 billion in projects over the next 10 years. ATC recognizes that its proposals potentially impact many communities, and consequently welcomes public input so that the ultimate solutions are mutually beneficial.

Find out more about ATC and its 10-Year Assessment on the company's Web site: atcllc.com
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Milestones in Safety

The last two years have been the two safest on record in the nation’s mining industry. In 2002, the mining industry saw the lowest numbers of mining fatalities ever recorded and the lowest overall rates of mining injuries as well.

Shortly after achieving this milestone, the U.S. Department of Labor’s Mine Safety and Health Administration (MSHA) celebrated its 25th anniversary. The Federal Mine Safety and Health Act of 1977 gave MSHA three fundamental tools to improve safety and health in the nation’s mining industry: enforcement, education and training, and technical assistance.

MSHA has, in the last three years, set specific goals to reduce injuries and fatalities among our nation’s miners. Our goals include a 15 percent reduction in fatal injury rates and a 50 percent reduction in all-injury rates over five years.

In addition, MSHA has been systematically working through a road map developed with input from our stakeholders. That roadmap has led to a planned and organized process of change in the safety and health culture in MSHA, and that, in turn, has encouraged changes in the mining industry.

MSHA, today, makes balanced use of all three tools provided in the law, in what we call the “Triangle of Success.”
MSHA has integrated compliance assistance into every aspect of the “Triangle of Success.” When mine operators succeed in reducing hazards, injuries are reduced and a healthier work environment is obtained.

MSHA has also entered into several new kinds of professional partnerships, with overall goals of promoting prevention activities and technical expertise to protect miners, identify and promote best practices, and encourage mine operators to develop and utilize safety and health management programs. As a result of these alliance agreements, we are seeing mines with exemplary safety records demonstrating initiative and sharing their own techniques with other operations.

Above all, we have encouraged mine operators and miners to recognize that safety adds value. We are working to promote a culture of prevention throughout the mining industry.

The Triangle of Success

A few illustrations from the Triangle of Success will help to demonstrate MSHA’s defining culture, as well as the balanced approach we have taken using enforcement, education, and training, and technical assistance to achieve the prevention of mine accidents and injuries.

The first element in the Triangle of Success is enforcement. The law requires MSHA to inspect every underground mine, at least four times a year, and every surface mine at least twice a year. Currently that requirement covers about 1,900 coal mines, employing more than 110,000 men and women. Of these, about 1,300 are surface and 600 are underground mines. In fiscal year 2003, the agency’s inspection completion rate at coal mines was the highest in several years, approximately 99 percent.

Moreover, we have focused on the quality of inspections by emphasizing “Inspection with a Purpose.” Our inspectors are spending more time at each mine and incorporating compliance assistance into each visit. They review the mine’s record before visiting. They talk with miners and supervisors about accident prevention. They help to identify root causes of hazards that can lead to both violations and injuries.

We hold the mining industry to a high standard – that’s our job. But, we also provide advice and assistance to those who are working hard to improve safety performance. This approach is contributing to accident reduction in measurable ways.

The second element of the Triangle of Success is education and training. Training programs offer many opportunities to improve safety records through increased job knowledge, safer work practices and better skills.

One special segment of the coal industry consists of more than 500 small operations with five or fewer employees. MSHA has established a Small Mines Office to address the specialized needs of small mines like these. Small businesses are in a different situation than large companies. A large company is likely to have an in-house safety department, a management plan and resources dedicated specifically to safety and health. Small mines typically do not have these resources.

The staff of the Small Mines Office personally visit small operations and distribute our “Starter Kit,” containing all the requirements a small mine operator needs to know in a convenient format. They offer small mine operators simplified model forms to help them develop training plans and meet other paperwork requirements.
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Our plans for the Small Mine Office call for continuing contacts, development of additional training materials and finding other ways to address the specialized needs of the small mining operations. So far, indications are that this class, of very small businesses, is eager for help and is benefiting from MSHA’s assistance.

MSHA’s Tri-State Initiative, staffed by experienced mine safety and health professionals, addresses coal mine safety and health concerns in Kentucky, West Virginia, and Virginia along with the state mine safety and health agencies. This three-state area produces nearly 30 percent of the nation’s coal and, since 1999, has accounted for more than 60 percent of all coal-mining fatalities.

Over-the-road contractor coal haulage truck drivers’ incidents have been an early focus of the Tri-State initiative, since this classification has accounted for a significant portion of the accident rate in the three states. Activities have included training truck drivers and mechanics how to do pre-operational checks. The Tri-State group developed a truck haulage CD that illustrates common safety deficiencies found on truck inspections and information on accident prevention.

One of our most exciting training projects is an enhanced Job Task Analysis (JTA) with two key features. One feature is the use of computer graphics that make the analysis very visual and easy to grasp. The second is the human element. It brings in all of the individuals involved with a task together to conduct the analysis as a group. The results are exactly tailored to the mining operation and employees have ownership of the final product.

To make this compliance assistance available to everyone, we’ve placed an interactive Job Task Analysis page on MSHA’s Web site.

The third aspect of the Triangle of Success is technical assistance. MSHA engineers and other specialists provide technical help to solve problems at specific mines, and to help bring new technology into the mining industry.

For instance, MSHA engineers, last year, used computer modeling and remote sensing to help evaluate roof control plans at several mines in southeastern Kentucky.

We are working with the National Institute for Occupational Safety and Health (NIOSH) to test production prototype models of a personal continuous dust monitor for use in coal mines. If successful — and it looks very promising — this device will be able to give an immediate readout of a miner’s current and extrapolated exposure to respirable coal mine dust. It would be a quantum leap from the present method of taking full-shift samples and sending them to a laboratory for analysis with results received weeks later. Miners and mine operators will have greater assurance that exposure is controlled below the applicable standard.

MSHA recently announced $3.9 million in grants to 13 states to establish an electronic system of digitizing underground maps of abandoned mines. Another $6 million in grants will be awarded for proposed void detection research projects. Altogether, grants through MSHA will provide $10 million in funding to states for collecting and digitizing mine maps and to researchers for projects in detecting and mapping the perimeters of abandoned underground mines. This research will help to prevent mine inundations, such as the one that occurred in the Quecreek mine in 2002.

Outreach and Partnerships for Prevention

One of the most important things we can do to advance safety and health is to bring together individuals and organization with information and tools they can use. We do this through information technology, outreach efforts and innovative partnerships.

Mine operators now get safety alerts by e-mail from their MSHA district offices. We also have a ListServ on MSHA’s Web site where readers can sign up to receive news releases, policy updates and hazard alerts. Today, a total of 16 MSHA forms can be filed online. We have interactive training programs, Web-based as well as on DVD. We have recently used Web casting as a new method to reach stakeholders with current safety alerts, or simply to allow stakeholders to pose questions to our senior managers.

Outreach concerning current safety trends has become increasingly important. In July 2003, MSHA held the first-ever national “Coal Mine Safety Awareness Day” on the anniversary of the Quecreek inundation and sent some 600 enforcement personnel on special mine visits to alert mine operators and miners to the current trends. In the latest alert, MSHA combined direct mailings, radio and television public service announcements — with Secretary of Labor Elaine L. Chao — to alert miners and mine operators about cold-weather hazards and the need to stay focused on safety during the holiday period.

MSHA recently began entering into alliance agreements with mining and related safety and health organizations. We signed agreements with four organizations in 2003, including the National Safety Council and the American Society of Safety Engineers. One of the most exciting aspects of these agreements is the commitment to specific results and specific activities that will benefit safety and health in the industry as a whole.

The Sentinels of Safety program, cosponsored by MSHA and the National Mining Association (NMA), has existed since the early 20th Century. Today, we are building on it in a new way. Last year, we asked one of the Sentinels of Safety winners to lead a committee of stakeholders in developing recommended best practices for the quarrying sector. Their best practices are now on MSHA’s Web site.

In the coming year, new committees, led by the latest Sentinels winners, are already forming to develop best practices for all categories of mines. Leaders of these committees for 2004 include Powell Mountain Coal Co., Inc., whose Creech #1 Mine in Kentucky most recently led the underground coal category, and...
Industry Again Set New Safety Records in 2003

Mining fatalities in 2003 reached the lowest level on record, according to preliminary data released by MSHA. Overall mine fatalities decreased 18 percent from 2002 figures. Coal-mine fatalities totaled 29 in 2003 versus the previous low record of 27 in 2002.

For the first time ever recorded, the coal industry saw no fatalities in December as MSHA continued its safety outreach campaign to alert miners about winter weather and the hazards it can bring to the workplace. Coal mine fatalities due to roof falls, previously a leading cause of deaths, dropped to two in 2003.

“We are encouraged by the improvements over the past three years, yet we will not be satisfied until every miner goes home safely to his or her family every working day,” said Dave D. Lauriski, assistant secretary of labor for mine safety and health.

The Future

The past few years have seen exciting new innovations and partnerships develop as stakeholders are working together and finding new ways to create positive results in safety and health.

In 2004, we, in MSHA, expect to see more mines achieving higher standards. We look forward to expanding our partnerships and building on past successes. Most important of all, we look forward to achieving the vision that all of us share: that every miner should return home in a safe and healthy condition each working day, and at the end of a productive and rewarding career.

The mission of the Mine Safety and Health Administration (MSHA) is to administer the provisions of the Federal Mine Safety and Health Act of 1977 (Mine Act) and to enforce compliance with mandatory safety and health standards as a means to eliminate fatal accidents; to reduce the frequency and severity of nonfatal accidents; to minimize health hazards; and to promote improved safety and health conditions in the Nation’s mines. MSHA carries out the mandates of the Mine Act at all mining and mineral processing operations in the United States, regardless of size, number of employees, commodity mined or method of extraction. Visit www.msha.gov.
U.S. Coal Swaps Market Just Around the Corner

By Stephen Nesis, Evolution Markets LLC

The U.S. OTC coal market is in need of an active swaps market to sort out the increasingly complex web of physical transactions. American coal traders can learn a few lessons from their European counterparts who predominantly trade in financial instruments. Hopes are high that swaps will make a strong debut in the U.S. in 2004.

Avoid the Daisy Chain

The U.S. consumes more than one billion tons of coal each year and OTC participants trade nearly 200 million tons. Virtually none of this is financially traded. Only about 20 percent of OTC trades end up settling physically, in which a counterparty takes delivery of the coal. In fact, many U.S. market participants are using the OTC coal market as a hedging instrument — but doing so with a complex web of transactions designed to simulate the same end result as a financial swap with a flattened out position, where the trader is neither long or short coal.

This trading churn makes for considerable administrative headaches at the end of the day. At the close of each month, traders conduct “book out,” in which they settle trades. During the “book out” process, counterparties will offset trades for similar products and net the difference. After “book outs,” deliveries need to be scheduled. A trader may call his original counterparty, which in turn may indicate he traded the position to a third party. This third party might also have traded away the position. The daisy chain goes on.

At the end of the chain is the physical settlement, but it is rarely a smooth process. Natural buyers or sellers often have unique coal specification needs that may not survive through the web of transactions, creating administrative difficulty upon delivery or shipment.

Given that most U.S. OTC trades are not conducted with the intent to take physical delivery, an active swaps market might provide an opportunity to conduct more efficient transactions. The dreaded “book out” process could be reduced to one or two counterparties, allowing traders to avoid the daisy chain.

Speculate, Hedge, Balance

U.S. OTC coal market participants could learn a few things from their European counterparts’ use of financial instruments, and these lessons can do much more than make transactions cleaner. More importantly, a U.S. coal swaps market would be an essential complement to an active physical OTC market. At its core, swaps afford traders the opportunity to speculate, hedge price risk and balance their coal portfolio.

In any commodity market, companies trading for their own profit, and not against assets, are essential. Speculators often play the role of market maker, buying and selling whenever necessary and ensuring liquidity for all market participants. At the very least, speculators are active traders that help support market volume. Speculators, however, prefer not to take physical delivery of the commodities they trade. In the current U.S. OTC coal market, speculators must trade in and out of physical positions and then endure lengthy “book out” procedures.

An active swaps market would enable speculators to participate in the OTC coal market, without the fear they could ultimately be saddled with physical coal deliveries.

Perhaps more importantly, financial swaps are the ideal tool for both coal producers and end users to hedge price risk. Buyers constantly worry that prices will go up, increasing their costs, and sellers are concerned with downward movements in price that eat into profit margins. Essentially, both coal buyers and sellers want to minimize the risk that prices will move against them by ensuring current prices without committing to physical delivery. Financial swaps can do this and present an opportunity to profit from market swings.

A typical swap entails one counterparty paying another a fixed price, in exchange for payments based on a monthly or weekly index of coal prices. Also known as a “fixed for floating swap,” this transaction allows the buyer to pay a set price — and benefit from increases in price over time. Conversely, the seller of a swap receives a set price, and profits if future prices fall below this level.

Seller’s Hedge

A coal producer must sell his supply at a later date, but he wishes to hedge the risk that the price of coal will decrease over time, thereby decreasing his profits from the sale. The producer can sell a swap that will ensure a fixed payment over the life of the contract, while paying the counterparty an amount based on an indexed price for coal. When it comes to sell his supply, the producer commits to a physical contract and then buys a swap to flatten out his position. If the cost of coal fails, the producer makes money on his swap that will supplement the revenue from his physical contract and enhance the bottom line.

Whether you are a buyer or a seller of a swap depends on your market position, anticipation of the future direction of coal prices and risk profile. Explanations of typical “buyer’s” and “seller’s” hedges are included in text boxes accompanying this article.

Despite the inherent advantages of financial swaps, they have been slow to take hold in the U.S. In part, this is because the U.S. OTC coal market is dominated by market

continued on page 30
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participants with a natural position in coal markets—either a producer or an end user—who have yet to ascend the learning curve to paper trading. These participants have considerable coal portfolios that they fine-tune and to some extent hedge exclusively in the U.S. physical OTC market.

In fact, financial swaps should be an actively used tool in any strategy to manage and adjust coal portfolios. Financial swaps are well suited for market participants that want to keep their existing physical contracts but manage the price risk they represent.

Balancing a coal portfolio in the OTC swaps market is simple. For example, coal buyers can sell swaps to essentially switch from payments based on a fixed price contracts to payments based on a floating price tied to an index. The swap can be sold to a third party (i.e. a financial institution) without changing the terms of their physical contract. In an industry where coal contracts are often still negotiated directly and relationships are cultivated over long periods of time, the ability to hedge outside of physical contracts can be beneficial.

Lessons Learned

If a swaps market is to develop in the U.S., we should look to the European experience for guidance. Such perspective indicates the importance of a strong benchmark and the entrance of financial institutions.

Central to the development of a viable — and now thriving — swaps market in Europe was the price of physical coal as delivered to the major import hub of Amsterdam-Rotterdam-Antwerp (ARA). The price is decided by an average of the price published by two major coal trade media outlets, McCloskey’s and Argus Media. Both outlets laid out their methodology for determining price and agreed to stick with it, providing a consistent and trackable basis for settling swaps.

In the last few months, the U.S. OTC coal market has started to coalesce behind a similar index that is based off of prices submitted by OTC brokers for various coal products, including a NYMEX look-alike, eastern rail and western Powder River Basin coal. Competing indices from Argus Media and Platts are currently offering prices. Discussions are underway for consolidating methodologies and providing a core index for use by swaps market participants.

Lastly, the European market offers a wider range of counter parties. Sure, utilities and producers initiated the market, but the entrance of financial institutions gave European swaps an added dimension. The financial institutions are generally of very good credit and able to manage substantial risk. This makes them ideal counter parties and market makers.

At the very least, they contribute considerable market volume, which is the lifeblood of a vibrant swaps market.

Some financial institutions have expressed interest in the U.S. OTC coal market. Many are still waiting for the market to come together on a strong benchmark and provide more transparency. End users and producers may also need to initiate active swaps trading, demonstrating the viability of paper trading, before financial institutions weigh in.

With these elements now coming into place, many market participants are hoping financial swaps will begin to take hold. Indeed, 2004 should see the emergence of swaps trading in the U.S. - the depth of which remains to be seen.

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Today's fashions may appear to be revivals from the days of disco, but the subtle differences in design and material make them different—and better in the eyes of young consumers. They say that everything eventually comes back into style. If that's true, then the use of coal to generate electricity could be considered almost fashionable.

Designs, materials and technology make today's coal-based power plants cleaner and more efficient than ever before. Like marketers who push new styles that resemble your old high school wardrobe, utility companies, like Milwaukee-based We Energies, also must convince the public that the new "styles" in coal-fueled generation are different than their predecessors.

The big selling point of coal has always been low-cost, plentiful supplies. And, through the decades of growth and development of the manufacturing industry in the United States, those attributes were good enough for just about everyone. According to the American Coal Foundation, 23 of the 25 lowest cost-electric generation power plants, operating in America today, are fueled by coal. The relatively low cost of coal-based electric power has given the United States an important advantage in a competitive world marketplace. Inexpensive electricity leads to lower operating costs for businesses, which ultimately boosts the economy and helps moderate inflation. These benefits have always been in style with consumers.

Environmental awareness has led to the understandable demand for cleaner sources of electric power, but consumers, and those concerned about a healthy economy, are reluctant to sacrifice the cost and supply advantages of coal in exchange for clean power. Fortunately, they don't have to. Today's technology allows utilities to offer both affordability and improved environmental performance. The same evolution of technology that we're seeing in renewable-based power generation—and for that matter in all aspects of our lives—can also be seen in devices and innovative systems that boost the environmental performance of power plants using coal.

Over the past three decades, America's electricity providers that use coal to generate electricity have developed ever-improving technologies to reduce emissions and boost efficiency. We've seen the results in the numbers.

Since the passage of the Clean Air Act in 1970, energy consumption in this country has increased 42 percent, while coal use has increased 75 percent. During the same period, aggregate emissions of the six principal pollutants have been cut 48 percent. Between 1970 and 2002, emissions of sulfur dioxide and carbon dioxide have fallen approximately 50 percent, nitrogen oxide by 17 percent, and particulate matter by 34 percent. The new and emerging clean-coal technologies now permit the efficient use of a valuable and vast natural resource to meet our nation's growing demand for electricity, while we continue to make great progress in improving our air quality.

**Power the Future strategy**

For these reasons, coal is the cornerstone of Wisconsin Energy Corporation's Power the Future (PTF) plan. Proposed in 2000, PTF is a progressive and responsible long-term strategy to help meet the demand for reliable, reasonably priced electricity in Wisconsin. It adds more than 2,000 megawatts of new electric generation to the current capacity of approximately 6,000 megawatts, using both natural gas-based and coal-based units, along with a substantial increase in renewable energy sources and conservation.

While the need for additional generation was clearly demonstrated in the company's growth projections, the issue of how the new power plants would be fueled became the question of considerable debate—and countless headlines. Some environmentalists questioned the fuel mix, blacklisted coal, and instead proposed exclusive use of natural gas, green power, and conservation measures as alternatives to meet growing energy needs.

The company argued that coal offered stable prices and plentiful supplies along with significant improvements in environmental control technology, making the use of coal both an environmentally and economically sound choice for baseload generation.

Three years later, in November 2003, the Public Service Commission of Wisconsin (PSCW) approved construction of two additional coal-fueled power plants—the first to be built in Wisconsin.

By Jerry Abood, Vice President – Commodity Resources, We Energies
in the state in more than two decades. The decision paves the way for Milwaukee-based Wisconsin Energy to move ahead with plans to build two 615-megawatt coal-fueled units at the site of its existing Oak Creek Power Plant, just south of Milwaukee. The PSCW had previously approved Phase 1 of the company’s Power the Future plan, which involves re-powering the company’s 60-year-old power plant in Port Washington, Wisconsin, converting it from coal to two natural gas, combined-cycle units. Construction of the first unit began last summer and is targeted for completion in mid-2005.

The company’s generation strategy is based on a few considerations and criteria:

- Energy demand is increasing at a small, but relentless rate—about two to three percent per year.
- Meeting the growing demand requires two types of plants: baseload plants that operate continuously, and intermediate load plants that operate primarily on weekdays.
- New generation must complement the existing portfolio of plants and strengthen overall efficiency, reliability and environmental performance.
- Supply, price, transportation, environmental impact and public opinion were to be considered in the types of plants to propose.

Building support for coal

Wisconsin Energy and its utility subsidiary, We Energies, faced the expected public opposition, thousands of data requests and reams of documentation during the three-year review and approval process on the coal units. Convincing the public of the need for more baseload generating capacity was relatively easy compared with making a case for the use of coal to fuel the new units. Coal was challenged in many circles, and the opposition quickly organized for the long battle. It took an enormous effort to neutralize the stigma attached to burning coal, communicate factual information about advancements in coal technology and convince people of both the economic and environmental benefits of coal.

Among the hurdles was the public’s love affair with natural gas generation, which was apparently still in the honeymoon stage. The public had become accustomed to natural gas as the fuel of choice by watching how regional electricity shortages had been successfully addressed in recent years. The need for power was quickly filled by turning to natural gas as a matter of convenience and practicality, rather than thoughtful long-term planning.

The industry did a good job of selling the benefits of natural gas generation to regulators, environmentalists and the public. Building natural gas plants was the path of least resistance because they’re relatively clean, cheap to build and can be constructed quickly. With those advantages, natural gas-fueled plants began popping up like Starbucks coffee shops.

When strategy leaders at We Energies determined that electric supplies in Wisconsin would be inadequate by 2016, they weren’t convinced that a construction plan relying solely on natural gas generators was the answer. Uncertainty about natural gas supplies, delivery, and unstable prices pointed the planners toward a more forward-looking strategy for cost-effective, reliable supplies of generation: a fuel-diverse plan that includes coal.

That strategy was based on a few basic factors:

- Coal leads to long-term affordable electricity costs for consumers.
- Emission control technology makes coal a responsible choice for the environment.
- Coal-fueled baseload plants have the potential for a long-term positive impact on the state’s economy.

With those factors in mind, several company executives visited facilities in Germany, Japan, China, and Australia to see, first-hand, the technological advances in coal-combustion. Among those executives was We Energies’ Vice President of Environmental Programs Kris Krause—and she was impressed.

“The modern equipment we observed in the newer coal plants was remarkable,” she said. “We were absolutely convinced we could pursue a strategy that included coal because both our environmental goals and our need for cost-effective power could be met with the new technology.”

With a platform of adding the right generation…in the right amount…at the right time to balance economic and environmental needs, the Power the Future strategy began to take shape. The generation portion of the strategy, which adds about 2,200 megawatts of power, includes natural gas, coal and renewable energy, along with improvements to existing power plants and upgrades to the electricity delivery system.

Making the case for new baseload generation, particularly using coal as a fuel, meant clearly demonstrating that alternative supply options had been explored. Peaking plants, efficiency improvements and conservation measures had filled some of the void. The remainder of the shortfall had been filled with purchased power. However, Wisconsin’s severe transmission constraint problems limited (and continue to limit) the ability to import additional power into the state from other regions.

After exhausting the cheapest supply options, attention turned to the construction of new generation. The common belief that only emerging technologies like solar and wind power or generation fueled by natural gas are environmentally friendly led to a push from the public for natural gas and renewable energy to fuel any new power plants. Convincing the public that emissions would decrease, while power generation increased, even with coal in the fuel mix, proved to be a tough sell. While both natural gas and renewable energy facilities were included in the Power the Future plan, neither could compete with coal for baseload generation to offer the desired combination of environmental benefits, reliable fuel supplies, low-cost production and long-term affordability for consumers.
Environmental benefits

The two new coal-fueled units at Oak Creek, which are expected to be operational in 2009 and 2010, will mean cleaner air for southeastern Wisconsin. The use of advanced environmental technologies will remove more than 95 percent of the sulfur dioxide, 85 percent of the nitrogen oxides, and 80 percent of the mercury from the emissions, while adding 1,200 megawatts of capacity. The new technology used in the supercritical pulverized coal units relies on higher boiler temperatures and pressures to burn bituminous coal at significantly greater efficiencies and with lower emissions.

The new emission controls will utilize a complex set of systems that include selective catalytic reduction for nitrogen oxides, a fabric filter baghouse that captures small particulate matter and mercury, a wet flue gas desulfurization device for sulfur dioxide, and a wet electrostatic precipitator. By 2013, when additional environmental improvements are made to the existing Oak Creek units and when the new units are up and running, total emissions from the facility will be reduced by more than 60 percent from 2000 levels, making it among the cleanest coal plants in the country.

While plans for the new units have been the center of attention, the company has also been busy making improvements to its three other coal-fueled power plants. These improvements are a critical component of the Power the Future plan and the company’s environmental objectives. The company already has made significant progress.

In addition to meeting or exceeding every federal and state emission standard, between 1980 and 2000, the company’s total power plant emissions dropped by approximately 50 percent. An $80 million selective catalytic reduction system installed in 2003 at the company’s plant in Kenosha, Wis., (between Milwaukee and Chicago) is reducing nitrogen oxide emissions by more than 85 percent. The company signed agreements with the Wisconsin Department of Natural Resources and with the U.S. Environmental Protection Agency in 2002 and 2003, respectively. These agreements call for investments of more than $600 million to cut emissions by another 65 percent over the next 10 years. The EPA is expected to formalize the agreement in 2004. This commitment translates to investments equivalent to $164,000 every day over the next 10 years, and it also provides assurance that environmental initiatives fully meet clean air regulations today and into the future.
The bottom line is that coal is generating vital electric power more cleanly and efficiently today than ever before. With an increased energy output on We Energies’ system of approximately 50 percent by 2013, combined with a reduction of system-wide emissions of more than 65 percent, coal-fueled generation is making a remarkable comeback in Wisconsin.

**Economic prosperity linked to energy, coal use**

With nearly 72 percent of the state’s electric supply consumed by industry, commercial businesses and farms, the health of Wisconsin’s economy is tied closely to energy cost and reliability. Wisconsin Governor Jim Doyle, last Spring, told a group of business leaders that a sound energy policy was needed in Wisconsin. “Low cost, reliable power is the foundation of our economy, and the cornerstone of growth and job creation in Wisconsin,” he said. Doyle has since asked the PSCW to look at ways to streamline the regulatory process to ensure that needed infrastructure projects—both generation and transmission—get the support, review and consideration needed to avoid future reliability problems in the state.

Today, industries use energy cost and supply, as critical factors, when making expansion and relocation decisions. By removing the threat of inadequate or unreliable future energy supplies and by keeping energy costs competitive, businesses in the state are free to consider expansion plans, and the state is better positioned to attract new business from out of state. Without reliable, competitively priced power, businesses will likely choose to grow elsewhere.

We Energies believes that the savings to consumers, over the lifetime of the new coal units, will be a significant factor in stimulating the state’s economic growth, creating jobs and attracting new businesses. An analysis conducted by the Public Service Commission of Wisconsin and the Wisconsin DNR concluded that the continued operation of coal-based plants, as part of the company’s generation portfolio, will save electric consumers more than $1.9 billion (in present value terms) over the life of the units compared with plants using natural gas. That savings translates directly to the monthly energy bills of every consumer and business in the state. For the company’s shareholders, coal-based facilities represent the kind of cost-management that leads to lower expenses, higher profits and better returns on investment.

As coal makes its comeback in Wisconsin, the critics of coal may learn that the technology does exist to produce power with coal—efficiently and economically—and do it in a way that reduces environmental impact and emissions. The state of Wisconsin may never lead the nation in setting fashion trends, but when it comes to coal-fueled generation, the state’s new power plants will be showing consumers, businesses and political leaders the latest styles in efficiency, reliability and cost-effectiveness. Such benefits always remain fashionable, even when associated with a fuel that’s been around a lot longer than platform shoes and bell-bottom pants.

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We Energies serves approximately 1 million electric customers in Wisconsin and Michigan’s Upper Peninsula and more than 980,000 natural gas customers in Wisconsin. The company currently operates six coal-fueled facilities, representing more than half of the company’s 6,000 megawatt capacity. We Energies is the principal utility subsidiary of Wisconsin Energy Corporation (NYSE: WEC). We Energies: www.wwenergies.com, Wisconsin Energy Corporation: www.WisconsinEnergy.com.
Fueling America’s Future: Coal’s Vital Role in National Energy Security and Economic Growth

By Deck S. Slone, Vice President Investor Relations & Government Affairs, Arch Coal, Inc.

Take a look at present day energy issues and it’s easy to see why America now finds itself at an energy crossroads. High natural gas prices, concerns about future blackouts, increasing foreign fuel consumption… all the while we’re becoming more and more dependent on electricity to fuel our economy.

This is a juncture that cannot be paved with short-term energy fixes. It is crucial that we recognize coal’s vital role in national energy security and economic growth.

**Nuclear system reaches a plateau**

One of the most significant structural changes involves the nation’s nuclear power system. After years of steadily increasing output to keep up with demand, U.S. nuclear plants are now achieving utilization rates in excess of 90 percent. That’s an impressive accomplishment and a testament to the skill of America’s nuclear operators. But, there is little more that can be wrung out of these plants in the way of efficiency gains. Given necessary outages for refueling and maintenance, nuclear output is close to its effective limits. In other words, it appears the best case for U.S. nuclear plants is maintaining current output levels, which, given the advancing age of many of these units, will be a challenge in itself.

**Other fuels also face constraints**

New hydro-electric dams face a host of challenges, including limited prospects, enormous capital requirements and strong environmental opposition. Oil is expensive and does little to advance the nation’s energy objectives. Wind and solar – with a market share of approximately three-tenths of one percent – could increase tenfold and still occupy only a niche. Renewables have certain fundamental problems. Sunlight and wind aren’t always available to supply energy on demand, and storing power is not practical at this time.

**Over-reliance on natural gas**

Prior to 2003, conventional wisdom held that natural gas was the fuel of the future for U.S. power markets. So, when power shortages arose and power prices soared in 2000-2001, power generators began adding gas-fueled generation capacity. All that new capacity placed tremendous pressure on U.S. gas markets. In the past three years, natural gas prices have, in some cases, quadrupled from levels experienced in the 1990s. Today, high natural gas prices are driving up home heating costs and creating a real drag on the industrial economy.

The long-term problem is that North American natural gas fields are mature, decline curves on new wells are accelerating at alarming rates, and the best prospects for new wells are located in areas where drilling is either too expensive or restricted. In fact, industry participants are beginning to question whether North American gas production can expand at all.

Natural gas does have an important role to play in U.S. power markets. In fact, no other fuel is better suited to the task of supplying additional electrons to the power grid during periods of peak demand. But natural gas cannot carry the burden on its own.

If we can’t produce enough gas to meet baseload demand, utilities will be faced with two options – don’t run all that new gas capacity that was built in the ’90s, or obtain gas in liquefied form from overseas sources. This is a slippery slope toward greater dependence on foreign markets, which we know carries its own host of challenges, including political, currency, and transportation risks.
A coal-rich nation

Fortunately, the United States is a coal-rich nation. One-quarter of the world’s coal reserves are found in the U.S. According to U.S. Department of Energy’s Energy Information Administration (EIA), our nation has more than 250 years of proven recoverable coal reserves, approximately 276 billion tons. That’s almost 40 times the total known reserves of natural gas, and more than 50 times the known reserves of oil.

Coal utilization is not only in the country’s best interest – it’s vital to it. Coal is already the workhorse of the nation’s electric power industry, supplying more than half the electricity consumed by Americans.

As the largest source of electricity in the U.S., coal plays a crucial role in today’s energy mix. And electricity from coal must continue to play an important part in our nation’s future energy supply. The U.S. will face increasing demands for abundant and affordable sources of electricity, and electricity from coal can meet these needs.

The good news is that public policy makers are increasingly aware of the fact that coal must play a central and growing role. The EIA already supports the assumption that coal consumption will grow over time. In its Annual Energy Outlook for 2004, the EIA says that, “The coal share is projected to increase from 50 percent in 2002 to 52 percent in 2025.” This recognition, by itself, is important given that the Annual Energy Outlook in prior years assumed coal’s role would decline.

The key to energy independence

In today’s uncertain world, electricity from coal improves energy security in America. As we rely more on domestic energy resources like coal, we lessen our reliance on imported oil and natural gas. That means our computers, air conditioners, and televisions are almost entirely insulated from geopolitical risk.

The volatile history of oil prices, over the past three decades, provides enough evidence of what lies ahead if the fuels used for electricity generation move down the same path. Despite the fact that natural gas imports (using liquefied natural gas technology) would total only about two percent of the fuel for electricity production by 2025, it is certainly enough to have a broad effect on electricity prices in the future. Global markets are subject to rapid unexpected change, especially given the added number of variables that come with reliance on imported fuels.

Other arguments, in favor of utilizing U.S. coal, include sustaining jobs and preventing growth of the trade deficit. Direct employment in the U.S. coal industry is roughly 78,000 people. This does not include the thousands of support jobs created in the “multiplier effect.” In addition, today’s coal mining jobs offer excellent pay and benefits, as well as a safe work environment.

Energy independence also involves the prevention of unnecessary expansion of the overseas trade deficit. In 2003, the government estimates that U.S. imports exceeded exports by $42 billion. Further reliance on overseas fuels for electric power generation will do nothing more than magnify that gap.

Coal offers powerful economic advantages

Coal is one of the most affordable sources of electricity. To resume robust growth in the future, the U.S. economy will need a reliable, secure and low-cost source of power. Coal delivers. Increased competitiveness in the global arena can result from a stronger domestic economy.

The U.S. has more known reserves of coal than Saudi Arabia has oil. One of America’s largest and most productive mines, Arch Coal’s Black Thunder mine in Wyoming, produces the coal equivalent of 565,000 barrels of crude oil, each and every day.

Over reliance on natural gas, when supplies are increasingly limited, contributed to a doubling of natural gas prices in recent years. This, in turn, cut deeply into the plants’ profit margins, making U.S. manufacturers less competitive and increasing costs for U.S. agriculture, small businesses, and residential consumers. Worse yet, high-energy prices may contribute to a more rapid decline in the U.S. industrial base.

Platts estimates that coal-fueled electricity cost just $17.96 per MW hour in 2002. By comparison, oil and natural gas rates would equate to an additional 200 percent may well be in range. Achieving such rates would equate to an additional 200 million tons of coal consumption per year.

Fuel for the future

When you consider coal’s many advantages, it should be obvious that Americans must find ways to continue to use coal. The argument against coal has always been its perceived environmental costs. What is too often overlooked is the tremendous progress that has been made to reduce emissions at coal-fueled power plants in recent years.
According to the Department of Energy (DOE), in a 30-year period between 1970 and 2000, the U.S. reduced emission rates of sulfur dioxide from coal-based power generation by over 75 percent, and cut emission rates of nitrous oxides nearly in half. That's an impressive record on its own. Now consider that during that same period, electric generation using coal has increased three-fold.

These reductions have been achieved both through investments in emission control technologies and a shift toward lower sulfur coals. Industry and government are working together to find ways to deliver even greater advances in reducing and eventually eliminating emissions from future coal-fueled power plants.

Energy Secretary Spencer Abraham recently told the DOE's Clean Coal and Power Conference attendees, “The more the development and application of new technologies achieves, the more opportunities we see for even greater accomplishments. “We are moving ahead on a broad front, pooling resources, knowledge, experience and capital in an unprecedented, cooperative, international effort to make clean energy the cornerstone of economic growth, improved health and standards of living, and closer ties among nations,” said Abraham.

The truth is that we need all the energy sources currently available to us, and then some. That means we must take advantage of our nation's most reliable and abundant fuel source. There is no substitute for coal and no way to replicate the enormous advantages it creates for our security, economy and quality of life.

Sources:
EIA Annual Energy Review 2000
EIA Annual Energy Outlook for 2004
Coalition for Affordable and Reliable Energy
Americans for Balanced Energy Choices
U.S. Department of Energy
Platts/RDI
Abraham's speech www.fossil.energy.gov/news/speeches/03/03 sec cleancoal 1117.03.html.

Arch Coal is the nation's second largest coal producer and mines low-sulfur coal exclusively. Through its subsidiary operations in West Virginia, Kentucky, Virginia, Wyoming, Colorado and Utah, Arch provides the fuel for approximately 6 percent of the electricity generated in the United States.

Coal: The right fuel, right here.

At We Energies, we believe coal fills a critical need in our own fuel mix and in our nation's energy and economic future. Now, more than ever before, we have the technology needed to take advantage of our country's abundant coal supplies. We can produce the power we need efficiently and economically, while continuing to make great progress in improving air quality.

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The Results Are Clear...
Productivity: Be Very Careful This Year!

By Conrad Houser, PE, JD, Vice President, Norwest Corporation

Have you any doubt? Productivity improvement in the coal industry has been profound.

According to Mine Safety & Health Administration (MSHA) records, the increase-weighted average was 6.8 percent per year from 1983 through 2000 for all U.S. coal mines. Mines with production over 100,000 tons per year increased at an annual rate of 7.6 percent.

What is productivity? For purposes of this article, it’s the rate at which coal is produced. Arbitrarily, we use tons of coal produced by a mine per reported employee. Coal produces revenue. Employees are a cost. The productivity rate, therefore, is a measure of mine economics.

Productivity is made up of three general factors: geology, capital and management. The geology of coal is generally becoming more difficult and expensive each year. Capital is expended to provide new and generally more productive replacement equipment and facilities. Management is responsible for setting the culture and style of an organization.

The coal industry has enjoyed a wonderful ride up the productivity curve as shown by the red line in Figure 1. The foreboding plateau, at the right end of the red line, is of great interest to the industry.

![Figure 1: Coal Prices and Productivity](image)

Conversely, in years following each price decrease, the rate of productivity improvement increases. Also, in the second year of modest price increases, the rate of improvement sometimes accelerates (i.e.1991 and 1998).

There is no noticeable change in the rate of productivity improvement in the same year prices change direction, either up or down. But, watch out! Average improvement for the year following price increases is a dismal three percent while the average in the year following price decreases is an energetic nine percent.

**Does the renewed price rise of 2003 indicate the rate of productivity improvement will again drop in 2004? Time will tell.**

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<td>0 %</td>
<td>10%</td>
</tr>
<tr>
<td>2001</td>
<td>135.9</td>
<td>16%</td>
<td>3%</td>
</tr>
<tr>
<td>2002</td>
<td>129.0</td>
<td>-5 %</td>
<td>6%</td>
</tr>
<tr>
<td>2003</td>
<td>131.4</td>
<td>2 %</td>
<td>4%</td>
</tr>
<tr>
<td>Red avg.</td>
<td>129.5%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Black Avg.</td>
<td>122.6%</td>
<td>-4 %</td>
<td>9%</td>
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Predictably, productivity plateaued in 2001, showing a growth of only four percent through the third quarter of 2003. Predictably? Yes. The proof of the pudding can be seen in Table 1. Notice, *every time spot prices show an upward inclination after a year or more of decreasing prices, the rate of productivity improvement decreases the next year.*

Figures 2 and 3 show the latest *Coal Daily* data on spot coal pricing in the PRB 8800 Btu and the Central Appalachian CSX sectors. Both show strong upward trends, during 2002 and 2003, compared with the doldrums of the 1980s and 1990s. The price spikes of 2001 have had a ratcheting effect with post-spike prices never reaching earlier levels and with prices trending upward ever since bottoming out in 2002.
Focusing on the past seven years, Figure 4 illustrates performance in surface, longwall and other underground mines. The latest MSHA data for the first three quarters of 2003 show, as could have been predicted, a slight rebound in productivity in 2003 in response to lower delivered average spot coal prices in 2002.

Is there a regional bias? Productivity, and its rate of improvement, varies significantly by region but, other than the jump in PRB productivity in 1998 (see the number in blue), the tenet holds. In the year after a delivered spot price increase, the rate of productivity improvement declines. What is worrisome is that, in all three regions, productivity improvement across 2001 – 2003 is flat to negative.

Why does the rate of productivity improvement decrease the year after a spot price increase?

The key to understanding this dynamic lies in the three facets of productivity: geology, capital, and management.

Geology is a major factor in mine productivity. Impressive productivity improvements during the 1980s and 1990s have occurred, however, in spite of the negative impact of more difficult geology, such as increasing strip ratios in surface mines and longer haul distance in underground operations. The general long-term trend shown in Figure 1 demonstrates that mine operators have overcome these obstacles through the application of capital, effective management, and improved mining techniques.

New capital-intensive projects pile up waiting for implementation during lean periods. Increased capital availability and spending for more efficient equipment or facilities brings productivity rewards, but generally a year or two later. This might be in part why there is a recovery of productivity two years after a price increase. Catching up on maintenance and reclamation in times of margin increases would have the same effect.

Higher prices also revitalize contract-operated mines with their generally lower productivity. However, reviewed data show no correlation between prices and an upturn in production the same or the following year.

Does a price increase cause optimistic hiring of additional employees who, for a period of time, are less productive? There is some statistical support for this argument. Employment has been steadily decreasing for the past nine years (a reduction of 42 percent). The year of a price uptick corresponds to decreased employment. Employment the next year, however, on average remains steady as opposed to an overall 20-year average decrease of five percent per year.

The third factor is management. The conclusion, simplistically stated, is that when spot prices improve, management refocuses its attention. After periods with high pressure to reduce costs, there is finally a merciful promise of positive net margins. Mine operators turn to a plethora of issues needing attention, from new projects to postponed maintenance, as discussed above.

This article presents a view of the subject from 20,000 feet. There are undoubtedly other causes to the observed effect of spot prices on productivity. We invite you to contribute your ideas. Send them to the author at chouser@norwestcorp.com.

Watch out for 2004! If spot prices continue strong through year end, there is every indication that productivity gains next year may be minimal at best. Continuing the upward trend in productivity through next year will require specific management attention.

Norwest Corporation is a premier energy, environmental, and mining consulting group with offices from Salt Lake City, Denver and Ashland in the U.S. to Calgary and Vancouver in Canada, and overseas in London and Brisbane, along with project offices in India, Indonesia and Columbia. With 100 professionals, Norwest provides full spectrum services to strengthen and support its clients. Learn more about Norwest at www.norwestcorp.com.
The year 2004 could prove to be an important turning point for the coal industry, presenting a unique opportunity to permanently expand the industry’s share of the U.S. energy market. To take maximum advantage of this opportunity, however, may require swift, bold action by industry leaders, mixed with a heavy dose of political pragmatism.

At issue is how the U.S. responds to the emerging national crisis involving the price and supply of natural gas. Natural gas prices have risen to far-higher-than-expected levels during three of the past four winters.

The first severe price spikes occurred in the winter of 2000/2001, when natural gas prices quadrupled at a time when no one in the energy industry was predicting a significant run-up. This price explosion was a major precipitating cause of the California energy crisis in the last few months of 2000. It also played a significant role in the meltdown of the power marketer industry during the next year.

In the winter of 2001-2002, natural gas prices remained moderate due primarily to an exceptionally mild winter (i.e. literally close to a 1 in a 100 year-type year). But, prices exploded again in each of the last two winters. Further, throughout 2003, prices remained at far higher levels than most Wall Street analysts or private forecasters predicted before the year began.

These episodes generally have been dismissed as short-term dislocations, not necessarily indicative of any long-term trend. Instead, just the opposite is true.

The recent natural gas price shocks are not aberrations. Instead, they should be seen as unmistakable warning signs of a much deeper problem that is going to be facing the U.S. economy for much of the next decade – a severe, ongoing mismatch between supplies of natural gas and projected U.S. demand.

This unexpected deficit has arisen suddenly. But it is huge.

By 2010, it’s likely to reach at least six trillion cubic feet (Tcf) a year – the equivalent, in BTU terms, to the total amount of oil the U.S. imports each year from the Middle East. And, it will continue to grow every year until at least 2015 – potentially crippling the U.S. economy unless we begin taking action immediately to reduce our dependence upon natural gas. If decisive action is taken quickly, however, this emerging crisis offers unique opportunities for the coal industry.

As a practical matter, the only way the potential adverse impacts of this emerging deficit can be overcome is by an urgent, “highest priority possible” effort to rapidly and massively expand the use of coal-fueled plants and rapidly deploying state-of-the-art, low emission coal gasification technology on a major scale in every region of the U.S.

However, these steps are not likely to be implemented in a timely manner without strong leadership at the national level. Further, as a practical matter, much of that leadership needs to come from the coal industry, since no other industry better understands the critical role of coal in the U.S. economy or stands to benefit more from the implementation of these measures.

How then did this emerging crisis arise? And, how can the coal industry best help to bring about a timely, cost-effective solution?

Critical link between electricity production and economic growth

Economists have long recognized that there is a direct link between the health of the U.S. economy and our ability to successfully expand supplies of reliable, low cost electricity. Since 1980, for example, demand for electricity has grown by more than 75 percent. Even with the increase in energy efficiency, electricity production still must be expanded by 0.70 to 0.75 percent to achieve each 1 percent growth in GDP!

Assuming a normal growth rate for the economy, electricity demand is projected to grow by at least 30 percent over the next 15 years. Either supplies of electricity must be expanded or the economy is likely to stop growing. The link is that direct.

Despite the huge growth in demand for electricity, however, during the 1980s and most of the 1990s, the power industry was able to serve increased demand largely by generating additional megawatt hours from existing coal and nuclear units. Even during the 1989 - 1997 time frame, for example, more than three-fourths of our incremental electricity supplies came from existing units.
The recent natural gas price shocks are not aberrations. Instead, they should be seen as unmistakable warning signs of a much deeper problem that is going to be facing the U.S. economy for much of the next decade — a severe, ongoing mismatch between supplies of natural gas and projected U.S. demand.

This ability to meet incremental demand from existing generation resulted from the huge capacity surplus left over after the oil price shocks of the 1970s and from the power industry's ability to operate existing plants more efficiently, dramatically improving the availability factor of many plants.

By the late 1990s, however, it no longer was possible to significantly increase the output of most existing plants – at least without a major effort to modernize and upgrade these units. Instead, construction of new generating capacity was required. At the time, many believed it would be possible to substantially expand supplies of natural gas without any major impact on price.

In response to the perceived need for new capacity, therefore, beginning in the late 1990s, the power industry initiated an unprecedented construction program – ultimately adding more than 220,000 MW of new generating capacity at a cost of more than $100 billion. More than 97 percent of this new generating capacity was gas-fueled.

This focus nearly exclusively on the construction of new gas-fueled units effectively forfeited the opportunity to build a more diversified portfolio that included new coal-fueled units and renewable energy – a lost opportunity for which we may now pay a heavy price.

Now that this construction program is largely completed, more than 40 percent of total U.S. generating capacity is gas-fueled — almost twice the percentage just a few years ago. (The U.S. now has sufficient gas-fueled capacity to serve total European demand for electricity during most hours of the year solely with gas-fueled generation.)

Many of these generating units are not yet being fully utilized and may not be for several years.

As a result of the decision to build these units, however, and forfeit the opportunity to build other types of generation, the U.S. is now dependent upon its ability to expand production of electricity from natural gas-fueled generating units to meet virtually all of its incremental electricity requirements for at least the next seven to 10 years.

Relying upon a single type of fuel (i.e. natural gas) inevitably will put tremendous pressure on demand for natural gas in the U.S. market.

A study recently completed by Energy Ventures Group attempts to quantify the likely magnitude of this increase. The results are stunning: compared to last year, demand for natural gas is likely to increase by a minimum of 3.7 Tcf by 2010 (an increase of > 15 percent vs. 2003) and by more than 6.0 Tcf by 2015 (an increase of > 25 percent prior to taking into account likely demand increases in other sectors).

There is no precedent for being able to achieve supply increases of this magnitude — especially in such a compressed time frame. Achieving this steep of an increase, therefore, would present a formidable challenge even if natural gas fields in the U.S. and Canada were still at a relatively early stage in their development, with many of the largest pockets of natural gas remaining available to be tapped. Instead, just the opposite is true.

The National Petroleum Council (NPC) has recently completed the most comprehensive assessment ever undertaken of supply and demand of natural gas in the North American market. (The NPC’s Report is available on its Web site at www.npc.org.) The results of the Council’s investigation are startling.

After 18 months of intensive evaluation, the Council concluded that most major fields in the U.S. and Canada are aging at an increasingly rapid rate. Total reserves have fallen, the decline rate is accelerating, the size of most new wells is plummeting, and the number of attractive prospects for new drilling is a small fraction of what is was just two or three years ago.

As a result, the Council concluded it is no longer realistic to expect the oil and gas industry to be able to achieve any significant increase in production from “traditional North American sources of supply” at any point in the 26-year period covered by the Council’s investigation. (The Council defines “traditional North American sources” to include every source “south of the Arctic Circle.”)

In short, at the very time when we need a massive increase in supplies of natural gas to fuel the growth of the U.S. economy, there is a significant risk that supplies available from the lower 48 states and from Canada will decline; in fact, the potential that the decline will be sudden and severe cannot be entirely ruled out.

In its report, the Council identifies certain measures that, over time, potentially can offset a portion of this massive, previously unanticipated deficit in U.S. supplies of natural gas. These measures include: 1) construction of a 3,400-mile long pipeline to bring natural gas from Prudhoe Bay in Alaska into the lower 48 states; and 2) massive increases in the amount of Liquefied Natural Gas (LNG) imported into the U.S.
Nearly every discussion of the natural gas crisis tends to start by focusing on long-term solutions. Given the urgency of the crisis...it may be critical to focus first on steps that can help ameliorate the crisis in the near to medium term.

Many questions have been raised regarding these proposals and many hurdles would have to be overcome before they could be implemented.

For present purposes, however, the most important point relates to timing. The Alaskan pipeline, even if it is built, will not be completed until well into the next decade (in all likelihood 2015 or later). Further, the lead time for LNG projects is long and the number of new LNG supply projects already underway in the Atlantic Basin is small relative to potential aggregate U.S. and European demand. Realistically, therefore, it is likely to take at least seven to 10 years before imports of LNG can be increased sufficiently to make a major contribution to U.S. supply (assuming all of the hurdles to increasing imports of LNG into the U.S. market can be successfully overcome).

In the interim, there is a massive hole in expected U.S. natural gas supply for which there is no apparent source of supply. The NPC estimates the size of this gap to be 6.0 Tcf by 2010 and 7.5 Tcf by 2015. This is substantially greater than total U.S. oil imports from the Middle East.

As of yet, there is no plan to overcome the natural gas supply shortfall; indeed, the question of how to respond to this deficit is not even on the domestic agenda as a major, high priority issue.

Key Role for Coal

How then does all of this impact the coal industry?

Nearly every discussion of the natural gas crisis tends to start by focusing on long-term solutions. Discussion of this issue is important – and coal has a major role.

Given the urgency of the crisis we face and the potential near-term risks to the U.S. economy from inadequate energy supplies, however, it may be critical to focus first on steps that can help ameliorate the crisis in the near to medium term (i.e., the next two to five years).

There are five actions that I believe should be initiated immediately on a national scale and with a sense of urgency:

1. Efforts to dramatically improve energy efficiency – with a particular emphasis on efforts to reduce waste in commercial office buildings, retail shopping malls and other retail stores (where there is the greatest “low hanging fruit” and major reductions in energy use can be achieved by focusing on a relatively small number of facilities);
2. Efforts to deploy renewable energy;
3. Efforts to modernize, improve the efficiency of and wherever possibly expand the rated output of existing coal-fueled plants – with the goal of increasing the availability factor of existing coal-fueled units industry wide to at least 94 percent and expanding output by at least 20,000 to 40,000 MW;
4. Efforts to rapidly deploy coal gasification on a massive scale, in order to fuel to gas-fired combined cycle units that may otherwise sit idle and reduce the risk of power shortages due to natural gas supply curtailments in future years; and
5. A crash effort to modernize and upgrade the nation’s existing Transmission & Distribution System, in order reduce line losses (which currently result in the loss through inefficiency of seven to 10 percent of all of the electricity generated in the U.S.).

I believe these measures are best presented as a package. For this package to be taken seriously, it will be critical both to lay out in clear, readily understandable terms what realistically can be accomplished by instituting a program along these lines and why it is essential to begin immediately implementing this program on an urgent basis.

Further, at least in my judgment, it also will be necessary to meet objections head on that are certain to be raised by opponents of expanded use of coal in a way the average American can readily accept as “going the extra mile” to act responsibly.

This might be accomplished, for example, by developing a comprehensive program of control measures that over time ensures a zero net increase in emissions, or even a net reduction in emissions despite the increase in coal utilization that results from the program.

The costs for the control measures necessary to offset the increase in emissions that otherwise would occur as a result of the program potentially could be funded out of the cost savings achieved as a result of the program. These savings are likely to amount to tens of billions of dollars per year, compared to the costs for natural gas and electricity that are likely to be incurred if we fail to act.

The natural gas crisis confronts us with a unique challenge. But, if we act boldly and pragmatically, there is still an opportunity to use the crisis that is emerging to ultimately strengthen our economy by building a strong energy infrastructure and, in so doing, to avoid the irreparable harm that will otherwise occur to our economy.

The only question is whether we have the will to act and the ability to do so with the sense of urgency required, given the risks posed to our economy by a massive, previously unanticipated shortfall in supplies of natural gas. ◆

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In recent years, there has been increased interest in recovering usable coal from waste coal slurry ponds. The reasons for this renewed interest include economics as well as concern for the environment and the safety of the public.

Although the Federal government began keeping statistics on coal production as far back as 1807, its regulation of the industry did not begin until Congress passed the Surface Mine Control and Reclamation Act of 1977 (SMCRA). SMCRA’s main purpose is to protect society, prevent damage to the environment and to collect funds to restore damaged impoundments (waste coal slurry ponds) prior to the enactment of SMCRA.

The reclamation fees established in the 1977 Act are deposited in an Abandoned Mine Land (AML) Reclamation Trust. Through early 2003 this trust fund has paid out $6.7 billion for impoundment reclamation and research. Based on the 1977 act, 50 percent of the funds collected from each state are to be allocated back to that state for reclamation and research. The balance (the other 50 percent) is used by the Office of Surface Mining (OSM) to complete high priority and emergency projects under its Federal Reclamation Program. As of March 2003, the fund had a balance of $1.4 billion.

Other methods available for the disposal of coal slurry, other than impoundments, include: incised ponds, slurry cells, combined refuse piles, co-disposal of fine and coarse refuse and injection into underground mines. All of these methods are affected by topography and geology and are, thus, very site specific in their application. Each has its own disadvantages and drawbacks.

- Incised ponds are similar to slurry impoundment, but without an embankment. This method is used in flat topography areas.
- Slurry Cells have design limitations of usually less than 20 acre-feet.
- Combined refuse piles require the dewatering of the fine refuse for combining with coarse refuse. The mechanical dewatering process to reach a satisfactory moisture level is frequently a problem.
- Co-disposal of fine and coarse refuse has been used in areas of low population and rainfall. Questions still remain about its suitability in steep terrain and areas of high rainfall.
- Injection into underground mines requires large amounts of water. Other issues include surface ownership, permits, and surface layout and drainage. Blow-out is also a concern with underground mine injection.
reinforced the need to eliminate or reengineer high-risk slurry impoundments. The ability to recover usable coal from these impoundments can provide all or part of the financing needed to reduce the risk of impoundment failures.

According to the Mine Safety and Health Administration (MSHA) and Abandoned Mine Lands databases, there are more than 1.5 billion tons of coal slurry impoundments in 28 current and former coal-producing states. Estimates range as high as three billion tons of coal in these ponds. Approximately 20 to 30 million tons of additional slurry are placed in impoundments annually.

Where do these slurry ponds come from? The depositional environment in which coal deposits formed also contained relatively non-carbonaceous quiet areas where fine-grained sediments, composed primarily of aluminum silicates, were deposited as shale and clay partings within the coal seams. When mined, especially underground, coal is diluted with shale from the mine roof, floor and partings. These impurities are then typically removed in part by washing in a coal preparation plant.

Although larger coal particles can easily be separated from mineral matter with various coal cleaning technologies employing centrifugal force or flotation in a dense medium, fine coal particles and clay-sized minerals are held together tightly by chemical bonds that cannot be easily broken. Froth flotation circuits in today’s preparation plants clean down to between 100 and 325 mesh material with the minus sizes being discarded in waste slurry ponds. Since fine coal circuits are a relatively modern invention, many older mines used to discard coal less than one-quarter inch in diameter.

Recent interest in recovering fine coal has resulted in the development of new fine coal cleaning machinery. Several of these technologies show promise for recovering and washing some higher carbon content waste coal.

The increased use of column flotation units has resulted in somewhat higher recovery of fine coal. However, the cost of column cells is somewhat higher than conventional froth flotation cells. Desliming ahead of froth flotation and froth washing technology also provide some improvement in fine coal recovery.

Researchers at Virginia Polytechnic Institute have demonstrated in laboratory and pilot-scale experiments that applying chemical reagents to fine coal can promote more efficient mechanical de-watering. By reducing the final moisture, a more marketable product can be produced from coal slurry.

The Lloyd-Turner Process (CENfuel™) reportedly produces an “ultra-clean” coal using a fluorine acid cleaning process. However, this process has not yet been commercialized.

Edward H. Greenwald, Sr. of Lawrence, Pennsylvania, has patented a process that applies a chemical reagent in a high-energy environment to break the chemical bonds between coal and clay particles. Clay particles are held in a colloidal suspension while coal particles are removed by conventional cleaning methods. This process is called peptization and is also used in the clay processing and other industries.

DTE Energy is commercializing the PepTec® process invented by Greenwald and has built the first commercial scale plant near Cadiz, Ohio. This plant is capable of processing up to 200 tons per hour. Coal quality is significantly improved compared to the raw slurry.

As noted earlier, SMCRA requires that coal producers be responsible for the safety of the neighboring community and the environmental area. The coal mine owner is responsible for the content, maintenance and safety of coal prep by-product impoundments. The ability to reclaim the land from coal impoundments is one of the benefits of the PepTec process. The removal of coal fines from the impoundment leads to a significant reduction in the size of the impoundment. This can provide the community with the reassurance of a safer environment and decrease liability for the impoundment owner. In addition, reclamation is addressed because the PepTec slurry is capable of sustaining growth of plant matter.
In 2000, OSM and the Department of Energy (DOE) encouraged a market-based reclamation approach. The goal of this program encourages state mine reclamation programs, coal producers and power plants to form public-private partnerships to develop projects on either abandoned or active mine lands.

The ability to produce a usable product from slurries contained in waste ponds should be the necessary catalyst for eliminating or reengineering many coal impoundments.

DTE Coal Services is a full-service provider of transportation and energy supply needs to utility, independent power and industrial customers throughout the U.S. The company is involved with coal supply and rail transportation, coal and emissions trading, coal tolling, rail car maintenance and rail car fleet management, and waste coal recovery. In 2003 the DTE Energy enterprise moved 70 million tons of coal. For more information visit www.dtecs.com. DTE Coal Services is a subsidiary of DTE Energy.
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This began to break down during the summer of 2000. Spot shortages of electricity occurred in California and, although prices have receded, the base cause of this problem — too little energy supply chasing too much energy demand — has not been addressed. Three years later, we again see soaring natural gas prices and the real possibility of natural gas shortages that may lead to electricity curtailment.

High prices and unreliable energy supplies three years ago were followed by a slow-down in the economy, and high natural gas prices now threaten to forestall economic recovery. Experiences of the last several years reinforce the relationship between affordable energy and economic growth. To ensure our economic future, Congress and the Administration must enact a national energy policy that balances energy supply with energy demand, while simultaneously encouraging efficiency and greater protection of our environment.

According to the Department of Energy’s (DOE) Energy Information Administration (EIA), energy use will increase by 1.5 percent per year (a total of 42 percent) between 2000 and 2025. Consumption of all sources of energy will increase: petroleum by 47 percent, natural gas by 49 percent, coal by 30 percent and renewable energy by 46 percent. Importantly, EIA projects the economy will become even more dependent upon electricity over the next 20 years. Thus, a viable National Energy Policy must include a strong component to support expansion of our electricity generating capacity and the fuel resources to drive it.

The Need for Coal — Coal is Electricity

We learn in grade school that a person needs three things to survive: food, water, and shelter. It is interesting that oxygen is not on that list, probably because oxygen is ubiquitous and we take it for granted. We can live for days without water and weeks without food and shelter, but only minutes without oxygen. In the U.S. economy, and throughout much of the world, electricity is the equivalent of oxygen. Without electricity, the economy would grind to a halt within minutes.

The power outage in the Northeast, in August 2003, further demonstrated the degree to which our society and economy depend on electricity. Throughout most of the world, electricity is power and coal is electricity. Coal is the fuel for over 50 percent of the electricity used to run U.S. businesses and to help us enjoy our everyday lives. Other countries, such as Poland, China, India, and South Africa are even more dependent on coal, using it for more than three-fourths of their electricity generation, and this dependence is growing. For example, China plans to increase its coal consumption from 1.5 billion tons/year today to 3.5 billion tons/year by 2050. Coal is, and will continue to be, one of the cornerstones of our nation’s energy strategy, for its importance in fueling our domestic
Coal will continue to play a major role in meeting future energy demands because it constitutes more than 90 percent of the United States' fossil fuel resources, enough to last more than 250 years at current consumption rates.

The Need for Clean Coal Technologies

The analogy between electricity and oxygen is appropriate for another reason. One of the principal reasons for developing new coal-fueled generating technologies is to ensure that electricity from coal does not compromise the quality of the air we breathe. Because of its chemical composition, coal poses more environmental concerns than other fossil fuels. Fortunately, the means are available to control emissions to levels that meet current regulatory limits. A wide range of technologies is already deployed on many coal-fueled power stations to control SOx, NOx and particulate emissions. Although there are presently no commercial methods to control emissions of mercury or carbon dioxide from coal-fueled power plants, these are active research areas.

Like other nations, the U.S. faces the challenge of meeting our need for low-cost energy, while continuing to reduce the environmental impact of energy production and use. The federal and state governments are likely to impose new environmental regulations that will reduce SO2, NOx and mercury emissions from existing power plants to levels below current regulatory limits. This will require widespread deployment of improved technology to further reduce SO2 and NOx emissions at an acceptable cost. Mercury emissions are substantially reduced as a co-benefit of SOx and NOx control, but in the future, it may be necessary to develop and deploy technology to achieve further mercury emissions reductions.

There are also opportunities to improve the efficiency of existing generating units. Increasing efficiency can reduce emissions, because less fuel is required for each unit of electricity generated. Efficiency improvement is currently the only method available to reduce CO2 emissions from coal-fueled power production.

In the future, we will need new coal-fueled power plants to meet electricity demand growth and to replace existing facilities as they reach the ends of their economic lives. Notable among these new technologies are ultra-supercritical pulverized coal combustion, advanced combustion, integrated gasification combined cycle (IGCC), and various hybrid power systems. These technologies hold the promise of high-energy efficiency and minimal environmental impact if they are developed and successfully deployed at an acceptable cost.

For example, IGCC technology is currently being demonstrated at several sites, but it must still be considered pre-commercial technology because of its high capital cost and relatively poor reliability. Nevertheless, IGCC systems can produce electricity with emissions approaching those of natural gas power plants. As with all technologies, the full benefits of potential design optimization will not be gained until a sufficient number of full-scale commercial units have been built and operated.

The Role of the Federal Government in Technology Development

The Federal government has had a significant role in the development of clean coal technologies. The DOE Office of Fossil Energy, through its Coal and Environmental Systems program, has been appropriated $176 million for fiscal year 2004 to co-fund coal-related R&D. In addition, Congress appropriated $172 million in FY 2004 to fund the continuing Clean Coal Power Initiative (CCPI) demonstration program.

The original Clean Coal Technology (CCT) and the current CCPI programs support the first-of-a-kind demonstrations of new coal-use technologies, including environmental controls, new power generating facilities, and fuel processing. Forty projects were conducted in the original CCT program, with a total value of $5.4 billion — $1.8 billion in federal funds and $3.4 billion in non-federal funds.

In January 2003, the Department of Energy selected eight projects to receive $316 million in funding under Round 1 of the CCPI program. This was the first in a series of competitions to be run by DOE to implement President Bush’s 10-year, $2 billion commitment to clean coal technology. Private sector participants for these projects will contribute over $1 billion, well in excess...
of the Department’s requirement for 50 percent private sector cost sharing. The DOE is now preparing to issue a second CCPI solicitation. These large-scale demonstration projects are essential to reduce the technical and economic risks of new advanced clean coal technology, and are an integral part of the Clean Coal Technology Roadmap.

In some cases, research and demonstration projects have been sufficient to bring important technologies to the marketplace. For example, over $1 billion in low-NOx burners have been installed at U.S. power plants since being demonstrated in the CCT program. Other CCT program technologies, such as IGCC systems, have not been commercialized at their current stage of development because of their technical and economic risks. Large-scale demonstrations are essential to understand the technical and economic performance of these new technologies and to provide potential owners and investors with sufficient confidence to attract financing. In addition, further incentives may be needed to ensure that demonstrated technologies are replicated in the marketplace.

The Clean Coal Technology Roadmap

The term “Clean Coal Technology” (CCT) is used to describe systems for generating electricity, and in some cases, fuels and chemicals from coal, while minimizing environmental emissions. This is accomplished through increased efficiency, equipment for reducing or capturing potential emissions, or a combination of the two.

Currently available CCTs include the efficient pulverized coal-fueled boiler (supercritical type) equipped with a full complement of fully developed, state-of-the-art pollution control technologies, such as selective catalytic reduction (SCR) for NOx, flue gas desulfurization (FGD) for SO2 and a particulate collection device. Many coal-fueled generating units are now equipped with these CCT systems.

Clean Coal Technology also refers to high-performance technologies that are well along the development path, but not yet fully demonstrated to be commercially acceptable because of either technical or economic risks. Examples include IGCC and advanced combustion power plant technologies.

“Advanced” Clean Coal Technology refers to technology concepts that are in development for future use, such as advanced IGCC or ultra-supercritical boiler technology. In this context, the term “advanced” refers to improvements in costs, efficiency and performance that are expected at some future date, assuming successful development.

Moving advanced clean coal technologies to full commercial operation will take a continuing commitment to research, development and demonstration, and a strategy to ensure that developed technologies will be deployed commercially. To provide a means of planning future research needs, and to chart progress toward meeting them, the industry, largely through the efforts of the Clean Coal Technology Research Council (CURC), the Electric Power Research Institute (EPRI) and DOE, has devised a Clean Coal Technology Roadmap that sets cost and performance targets and a timeline for new coal technology (Tables 1 and 2).

These research targets are not intended as a basis for regulatory requirements, and progress along the Roadmap will require adequate funding. However, if the Roadmap is followed, technology would be available in the near term to allow operators of existing coal-fueled power plants to meet increasingly stringent environmental regulations, such as those of the Clean Skies Act. Again, if the Roadmap were followed, it would be possible, in 2015, to design a high-efficiency power plant, capable of carbon capture, with near-zero emissions. By 2020, the first commercial plants of this design would be built.

The Roadmap, which can be found on the CURC Web site (www.coal.org), contains considerable detail on the specific technological advances that are necessary to meet the Roadmap goals. Notably, the Roadmap makes it possible to estimate the cost of the research, development and demonstration programs necessary to achieve performance targets. The values listed in Table 3 represent the total cost of the research programs, including both federal funds and private sector cost shares.

The cost for carbon capture and sequestration research is shown with a question mark to denote the relatively greater uncertainty in the estimate of the cost of research in this unprecedented area. It could be substantially higher, particularly because a number of large-scale, long-term demonstrations will be needed to understand the technical, economic, and environmental feasibility of carbon sequestration technology.

Unfortunately, current funding levels are not sufficient to meet the Roadmap goals. Table 4 compares the funding levels required to follow the Roadmap with Congress’ FY 2004 appropriations.
Although it varies by program area, the overall R&D funding appropriated by Congress is well below that called for in the DOE/CURC/EPRI Roadmap. In addition, the funding level for the Clean Coal Power Initiative (CCPI) demonstration program also falls well below the Roadmap requirements. This continues a pattern of past years of under-funding clean coal research and demonstration. Unless research and demonstration funds are increased, it is unlikely that the needed technology will be developed on the Roadmap schedule, if at all.

The FutureGen Project

In February 2003, the DOE announced plans to build a prototype of a coal-based power plant of the future. Dubbed “FutureGen,” this research facility would have the capability to produce electricity, convert synthesis gas into hydrogen, and capture and sequester up to one million tons a year of carbon dioxide, all at “near zero” emission levels.

The FutureGen project is discussed in detail in an accompanying article in this magazine. A few points are worth highlighting here.

The vision of FutureGen as a research platform is particularly significant because it can be used as a test site to bring promising technologies out of the core R&D program and accelerate their testing at scales up to full commercial implementation, without the need for separate stand-alone test facilities. FutureGen is not, however, a substitute for either the core R&D program or the CCPI demonstration program for several reasons.

First, the FutureGen facility will not be operating for at least five years. During that time and beyond, we must continue research efforts to bring new technologies to the point they can be tested at FutureGen and elsewhere.

Second, we need to continue R&D on technologies, such as combustion-based systems, that are not part of the FutureGen design, and on technologies that can be applied to existing units to improve efficiency and reduce emissions. As the FutureGen concept is further defined, industry, and government should work to coordinate the R&D program, CCPI and FutureGen to produce the greatest benefits at the lowest possible cost.

Finally, although the exact cost is not known, DOE has estimated the project cost as $1 billion, with 80 percent provided by the federal government and 20 percent provided by the industrial alliance and its partners. Both the 80/20 cost share ratio and the ability of the government to commit its full cost share to the project before major costs are incurred are critical to the project’s success.

<table>
<thead>
<tr>
<th>Technology Program (all figures in $millions)</th>
<th>FY 2004 Appropriation</th>
<th>CURC Roadmap Annual R&amp;D Budget</th>
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<tr>
<td>IGCC/Gasification</td>
<td>51</td>
<td>106</td>
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<td>Advanced Combustion Systems</td>
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<td>(for syngas from coal) 15</td>
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<tr>
<td>Innovations for Existing Plants</td>
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<td>43</td>
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<td>Carbon Capture/Sequestration</td>
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<td>Clean Coal Power Initiative</td>
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<tr>
<td>TOTAL</td>
<td>348</td>
<td>520</td>
</tr>
</tbody>
</table>

* This number is 80% of the total R&D amount required and represents the federal contribution

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Incentives for Clean Coal Technology Deployment

While the CCPI and enhanced core Fossil Energy funding are necessary for the continued development of new clean coal technologies, they are not, by themselves, sufficient to ensure that these technologies will find their way into widespread commercial use. When they are initially introduced, they will need to be built with substantial engineering contingencies, to assure their operability and reliability, which will increase capital and operating costs. Over time, as operating experience is gained, these costs will come down.

Congress has recognized the need for the core R&D program, the CCPI demonstration program and deployment incentives. In 2003, provisions authorizing research funding at levels consistent with the CURC Roadmap, and incentives for commercial deployment, were reported out of conference in the Energy Policy Bill (H.R. 6). While the future of that bill is uncertain, as of this writing, the 2003 conference report indicates that Congress acknowledges that research and demonstration authorizations and deployment incentives are essential steps in implementing the clean coal technology Roadmap.

Conclusions

There is little doubt that coal will continue to be used in the U.S. and abroad as a principal fuel for electricity generation, and coal’s use will grow over time. The interests of the economy, society, and the environment can be reconciled with our need for coal-based generation if we invest now in developing and deploying advanced clean coal technology throughout the world. By working with industry to develop a coal technology development roadmap, the DOE has aligned and continues to align its program along a logical path forward. The coal industry is committed to ensuring that coal remains an abundant, affordable fuel for power generation, and to help to advance the technology Roadmap to achieve its goals of societal, economic and environmental betterment.
FutureGen: The World’s First, Coal-based Near Zero-emission Electricity and Hydrogen Plant

By Ken Humphreys, Coordinator, FutureGen Industrial Alliance

An affordable, reliable and environmentally sound supply of electricity is critical to our nation’s future, and coal plays a big role. Coal generation currently provides over half of the electricity consumed in the United States. However, coal-fueled power plants also emit one-third of man-made carbon dioxide (CO₂) in the U.S.—the predominant greenhouse gas.

FutureGen: The Concept

Recognizing the need to protect the environment, while simultaneously preserving the energy and economic benefits of coal, in 2003, President George W. Bush created the $1 billion dollar FutureGen initiative to build the world’s first, near-zero emission coal-fueled energy plant. The initiative will be managed as a public-private partnership between the U.S. Department of Energy (DOE) and a consortium of coal-fueled power producers and coal companies.

The DOE envisions that the FutureGen project will employ coal gasification technology to co-produce electricity and hydrogen. The size of the plant will nominally be 275 MW equivalent electricity output. Power generation and hydrogen production will be integrated with the capture of carbon dioxide. The carbon dioxide would then be injected into a deep geologic formation where it would remain permanently. In addition to addressing carbon dioxide emissions, the plant would also reduce traditional pollutants (NOₓ, SOₓ and Hg) to ultra-low levels.

The co-generation of hydrogen from the facility is viewed as an important component of a comprehensive environmental and energy security strategy by the Bush Administration, in which hydrogen offers a clean transportation fuel that could reduce our dependence on foreign oil. If large-scale hydrogen production can be proven economically competitive, it offers the coal industry the promise of a significantly expanded market for its product.

Industry Viewpoint

In response to the President’s announcement of the FutureGen project, an alliance of 10 of the nation’s largest coal-producing and coal-fueled electricity generating companies have expressed their interest in designing, constructing, and operating the FutureGen facility. This includes monitoring, measuring and verifying carbon dioxide sequestration. These pioneering companies include:

- American Electric Power
- Cinergy Corp.
- CONSOL Energy Inc.
- Kennecott Energy Company, a member of the Rio Tinto group
- The North American Coal Corporation
- PacifiCorp, subsidiary of Scottish Power
- Peabody Energy
- RAG American Coal Holding, Inc.
- Southern Company
- TXU

Continued on page 75
When it comes to coal mines, most people are in awe of the mineral extraction process with its powerful earth-moving machinery and gargantuan haul trucks. What few realize is that what happens after the coal is removed is even more amazing.

While reclamation occurs after extraction, it’s definitely not an afterthought. And, the process of returning mined land to its pre-mining condition and use requires a huge commitment of time and finances.

Topography, geology and hydrology vary greatly among coal mining sites and there is no “formulaic” approach to reclamation work; each reclamation site has its own challenges and potential. Many citizens, unfamiliar with the role of coal in our nation’s energy inventory, are amazed to learn, that besides shovel operators and truck drivers, coal companies also employ environmental engineers, botanists, biologists, hydrologists – and even hire outside experts to assure the land is returned to its original condition (or better) after mining ceases.

All U.S. mining companies must adhere to precise state and federal laws governing reclamation activities. Indeed, reclamation plans must be approved before the first shovelful of dirt begins the mining process.

“Contemporaneous reclamation” is the term that describes the holistic cycle of mining and reclamation activities being equal parts of the same process. Kennecott Energy Company (KEC), with headquarters in the heart of the Wyoming-Montana Powder River Basin – source of low-sulfur, sub-bituminous coal – is one example of a leading coal company committed to go beyond its basic reclamation obligations.

At KEC, reclaiming land does not take a back seat to extraction. The company has achieved impressive results in reclamation work at its varied coal sites. KEC, part of the London-based Rio Tinto mining group, employs 1,650 people in three states and produces enough coal to generate six percent of the nation’s electricity. The ability to extract coal depends upon preliminary baseline environmental assessments, mine plan development and regulatory agency approved reclamation plan implementation.

Reclamation of the mined land for future uses illustrates one of KEC’s core business principles: a commitment to sustainable development and the ethic of “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

Jacobs Ranch Mine

Challenge: Demonstrating that reclaimed land can once again support wildlife and livestock in a naturally harsh environment.

In the heart of northeastern Wyoming cattle ranching country, the Jacobs Ranch Mine has implemented innovative livestock grazing management practices that have actually increased the vigor and diversity of plant communities on reclaimed private and public lands over pre-mining levels. This high-intensity, short-duration cattle grazing method effectively simulates the action of the bison herds that helped shape these grasslands over the centuries.

KEC recently received the Excellence in Rangeland Stewardship Award from the Wyoming Society for Range Management for this grazing program.

Even before mining activity begins, a reclamation plan must be in place and the mining company must obtain surety bonds to provide for land reclamation in the unlikely event the mining company cannot meet its obligations to return the land to its original conditions. As the mining company successfully achieves benchmarks in the reclamation process, partial releases are
allowed for the surety bonds on deposit. The bonds are the mining companies' financial guarantee to the public that commitments will be honored. Thanks in part to its successful reclamation work, Jacobs Ranch currently has final bond release on 68 acres of reclamation and partial bond release on an additional 3,960 acres. Vegetation sampling will begin in 2004 for final bond release on an additional 220 acres.

Bond releases are not frequently granted. In fact, of the 5.8 million acres permitted nationwide for coal mining through OSM in 2002, only 73,407 acres, or about 1 percent, were released from Phase III bond where reclamation is deemed complete.

**Antelope Mine**

**Challenge:** Increase biodiversity through symbiotic planning.

A second KEC site recently received national recognition for its reclamation accomplishments. Antelope Mine in eastern Wyoming, about 40 miles north of Douglas, won both state and national awards for successfully reintroducing prairie dogs on reclaimed lands – the first such success in the nation.

While the prairie dog is actually deemed a pest by the area's ranching community, the species was reintroduced to help establish habitat for the mountain plover, a candidate species for threatened status. In spite of its name, the bird likes the prairie terrain in northeastern Wyoming and tends to nest within prairie dog colonies because the mammals keep the vegetation short – both as a food source and a security measure for the colony.

It took three years and several learning episodes before the transplanted black-tailed prairie dogs were persuaded to stay in their new homes. Project coordinators built temporary wooden holding chambers and started a tunnel system connecting the chambers before successfully releasing 50 dogs on reclaimed land. These tactics resulted in the first-ever successful prairie dog reintroduction on reclaimed land.

Antelope was presented a reclamation excellence award in June 2003 by the Wyoming Department of Environmental Quality and, in October, was awarded the prestigious OSM Excellence in Surface Mining Reclamation Award.

**Spring Creek Mine**

**Challenge:** Return streambed to pre-mining functions in naturally difficult topography.

Spring Creek Mine in southeastern Montana has reclaimed two-thirds of the South Fork Spring Creek stream channel. A total of 13,500 feet of stream reaches has been mined, with about 8,400 feet reclaimed to date; reclamation of the remainder is in progress.

Once completed, water will begin flowing down the new channel, and South Fork Spring Creek will be the first restored stream channel in Montana.

The watershed reclamation plan was designed to produce a post-mining watershed with hydrologic functions and erosion stability similar to those of the corresponding original watershed.

The restoration design incorporates ravines, ox-bows and catch pools to help establish a diverse vegetative cover. Vegetation monitoring, in 2002, indicated the South Fork Restoration Area, as well as several others, were relatively equivalent to regional native undisturbed areas in terms of cover, vegetation productivity, and species density.

The South Fork Restoration area also serves as a plant refuge for the purple prairie coneflower (Echinacea angustifolia). In 1999, Spring Creek entered into a cooperative planting plan with the Montana Department of Environmental Quality to help replenish the plant’s population. Intense herbal marketing of Echinacea has generated a high demand for the plant, causing over-harvesting elsewhere in the state.

**Cordero Rojo Mine**

**Challenge:** Restore complex meandering stream channel to improve local habitat.

KEC is involved in another significant hydrologic reclamation project at another of its sites in Wyoming’s Powder River Basin region. Cordero Rojo mine currently is working to restore about 18,000 feet of the Belle Fourche River channel that was diverted in 1996.

At Cordero Rojo near the headwaters of the stream, the Belle Fourche River is classified as an intermittent stream, characterized by flows in response to precipitation events and remnant pools that remain throughout most summer months. These pools serve as important watering areas and habitat for regional wildlife and warm-water fish species, and are an equally important part of stream restoration.

Reclamation has closely followed the completion of the coal mining process. The mine has reclaimed some 1,500 feet of that river channel thus far, including completion of two pools, with continuing progress on another section of 6,000 feet of stream and six pools anticipated for completion in 2004.

The reclamation plan contains specific designs and features to return all of the surface waters and groundwaters in the disturbed areas to approximate pre-mining conditions and functions. Eleven stock-watering reservoirs that originally existed within the permit area will be replaced to maintain the post-mining land uses of livestock grazing and incidental wildlife use.

**Colowyo**

**Challenge:** Conserve topsoil resources in steep slope mining operations.

Kennecott Energy operates Colowyo Coal in the mountainous area of northwest Colorado’s Uinta Basin. The local area includes sections of steep slopes, narrow ravines and varying depths of topsoil. Advancing mining operations requires meeting the challenges of extremes in terrain.

Colorado regulations provide for a deliberate and safe approach to salvaging and protecting the topsoil resource. At Colowyo,
extremely steep slopes and rock outcrops are left undisturbed to protect shallow topsoil and ensure human safety. Gentle slopes of adjacent ridgelines allowed relatively easy recovery of shallow topsoil, and greater efforts were applied to salvaging greater topsoil depths often found in swales off ridges and on the lower reaches of ravine slopes.

Additionally, the Colorado Division of Minerals and Geology and the Colorado Mining Association has recognized the Colowyo operation for its use of a Computer Aided Earthmoving System (CAES)/Global Positioning System (GPS) to improve land reclamation processes. The use of this technology replaces and supplements traditional survey techniques.

With GPS equipment mounted on track-type tractors and a rubber-tire loader, accuracy in spoil grading is greatly enhanced. Now operators are provided with a graphical interface that illustrates real-time comparisons of actual and design elevation and grade requirements. The use of CAES is meeting the promise of increased efficiency and timeliness of reclamation.

**Sequatchie Valley**

**Challenge:** Improve stream water quality.

KEC has aggressively worked to reclaim abandoned mine lands in the Sequatchie Valley of Tennessee even though the company never actually mined the property.

KEC acquired the abandoned coal mine lands that were polluting area streams as part of a larger acquisition in 1993. The Sequatchie Valley Coal Corporation recently partnered with the Tennessee Department of Environment and Conservation and Department of Agriculture to demonstrate how Best Management Practices can be utilized at sites mined prior to enactment of current mining regulations (Surface Mining Control and Reclamation Act of 1977) to mitigate pollutant discharges to area streams.

The entire project was completed in only four months with dramatic improvements of water quality in the affected streams reported only a few months after project completion. Iron loadings were reduced 50 percent, for example, and acid loadings by 100 percent in Dry Creek, a stream adjacent to the abandoned mined land.

For their efforts to reclaim the pre-Law mine lands and eliminate the pollutant discharges, the Tennessee Department of Environment and Conservation awarded KEC and the Sequatchie Valley Coal Corporation with the 2003 Aquatic Resource Preservation Award.

These and other projects being managed by KEC demonstrate that coal mining need not scar the land for future generations. Indeed, if well managed and cared for, the land and its natural plant and animal inhabitants can be reclaimed for enjoyment and use by future generations. ◆

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Coal consumers continually seek ways to improve the quality of their coal supplies. Typically, there have been few options outside of using the best quality coal from the current supplier’s mine, using coal from another mine or using a different rank of coal. However, a potentially viable option might be the coal right in a power plant’s own back yard – in its current stockpile!

A research project by Great River Energy’s Coal Creek Station seeks to do just that. Coal Creek Station – along with a number of research organizations – is looking at increasing the value of lignite coal from its current supplier – the Falkirk Mine – by using waste heat streams from the power plant to dry the coal.

If it’s found that a dried product can be produced cost-effectively, the higher-value lignite could not only improve performance of the Coal Creek Station, but also reduce emissions and increase reliability, availability and maintainability.

That’s a tall order, but one that shows promise.

“We first became interested in coal drying in the late 1990s. We knew that partial or incremental moisture reduction of lignite could have significant impacts on a power plant,” says Charlie Bullinger, engineering leader. “However, we needed to quantify it.”

Coal Creek Station conducts initial tests

Small-scale studies on lignite drying began at Coal Creek Station in the fall of 2001. The power plant dried about 13,000 tons of lignite, reducing moisture content from 38 down to 31 percent, and increasing the Btu content from 6,350 to 7,000 Btus.

The lignite was then used in the power plant, and because of its higher value, less lignite was required to generate the same amount of electricity. With less lignite moving through the system, operating and maintenance expenditures were reduced. Other benefits included a four percent gain in power plant efficiency, a 10 percent decrease in nitrogen oxide emissions, and a 34 percent decrease in sulfur dioxide emissions.

“The success of this early research gave us the confidence to move forward with the project,” says Bullinger.

Coal Creek Station conducts additional research

The next phase in the research project involved developing and testing a two-ton pilot dryer – from early September to mid-November 2003. During this phase, researchers dried about 300,000 tons of coal, and did 38 tests.

“Our target level was to reduce the moisture to 29.5 percent. However, preliminary results show that we were able to exceed those targets quite significantly as the dryer demonstrated the ability to reduce the moisture content of the lignite into the teens,” says Bullinger.

Preliminary results also show that the dried lignite was high in heating value and low in sulfur and mercury on a per million Btus basis. On the other hand, a dust collection stream from the dryer – containing about eight percent of the material – was high in ash, sulfur and mercury and low in heating value. This material was not used in the power plant.

A final report on this phase of the research project will be released in early 2004.

Project participants include the Industrial Commission of North Dakota, the Electric Power Research Institute (EPRI), Barr Engineering, Lehigh University, the Falkirk Mining Company and the Coteau Properties Company.

Next step is large-scale coal drying

The final phase of the coal-drying project is commercialization of the technology on Unit II at Coal Creek Station. Great River Energy has an $11 million cooperative agree-
ment through the U.S. Department of Energy’s (DOE) Clean Coal Power Initiative (CCPI) to conduct such a study at Coal Creek Station.

This includes the construction of six 75-ton dryers (one prototype dryer and five additional dryers). These dryers will use waste heat from the power plant to reduce the moisture in the lignite before it is fed into the boiler of the power plant. By reducing moisture content by 25 percent (from about 40 to 30 percent), researchers hope to show a substantial improvement in overall performance of about five percent, a 25 percent reduction in sulfur dioxide emissions and a seven percent reduction in other emissions such as nitrogen oxide, ash and mercury.

The contract for that project is expected to be finalized in early 2004. Participants include EPRI, Barr Engineering, Lehigh University, the Falkirk Mining Company and the Coteau Properties Company.

Expected completion date of the 45-month project is the fall of 2006.

**Project success would result in commercialization of technology**

If the final phase of the project is successful, Coal Creek Station will work in collaboration with EPRI to promote commercialization of the research for other power plants nationwide that use lignite or sub-bituminous coal.

“The value of this project is the widespread adoption of the technology in power plants that use lignite and high-moisture sub-bituminous coals,” says Bullinger. “For example, plants that have lost performance margins by switching from bituminous to sub-bituminous coal from the Powder River Basin, can expect to regain those margins, and in the process reduce their emissions.”

**Specific benefits include:**

- Increasing the net generating capacity of units that burn high-moisture coal;
- Increasing the cost-effectiveness of the nation’s electrical generation industry;
- Improving the environment by reducing emissions from lignite and sub-bituminous based power plants; and
- Increasing the value of the nation’s lignite and sub-bituminous reserves.

Bullinger points out that the U.S. has abundant lignite and sub-bituminous coal resources. Major lignite deposits are located in North Dakota, Montana, Texas and Mississippi, while major sub-bituminous deposits are located in the Powder River Basin of Wyoming and Montana.

Lignite and sub-bituminous reserves are expected to be a significant and perhaps dominant fuel source for electric power over the next 100 years. Demand for the two ranks of coal is expected to remain stable in the near future, but will then probably grow as the search for low-cost fuels intensifies and power producers keep pace with the forecasted electricity growth of more than two percent per year in the U.S.

If the coal drying process is successful and commercialized, Bullinger says that the higher value product will increase generation capacity and availability, reduce emissions and increase the value of the nation’s abundant lignite and sub-bituminous coal reserves.
That’s a tall order. But it’s one that shows promise and one that Coal Creek Station is devoting a lot of attention to because of the potential benefits.

Great River Energy is a not-for-profit electric cooperative providing energy and transmission services to 28 member distribution cooperatives in Minnesota and Wisconsin.

Great River Energy’s Coal Creek Station consists of two 546-megawatt lignite-based units that became operational in 1979 and 1981. The Coal Creek Station is a mine-mouth plant and receives approximately 7 million tons of lignite per year from the Falkirk Mining Company.

From the beginning, Coal Creek Station has been a top performer in several national rankings of power plants. The plant is not only one of the largest in the region, it is also one of the most reliable and cost-efficient in the country.

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INNOVATION - LEADERSHIP - FINANCIAL STRENGTH
Achieving Mercury Emissions “Co-Benefits”

By Michael Rossler, Manager Environmental Programs, Edison Electric Institute

On December 15, 2003, Environmental Protection Agency (EPA) Administrator Michael Leavitt signed the “Utility Mercury Reductions” proposal — the first-ever proposed rule to regulate mercury emissions from new and existing coal-based power plants and nickel emissions from new and existing oil-based power plants. The Utility Mercury Reductions proposal contains two alternative control plans:

- A two-phase market-based cap-and-trade approach, which relies on “co-benefits” reductions of mercury emissions in 2010, and a reduction to 15 tons after 2018 (a 70 percent reduction from current levels).
- A Maximum Achievable Control Technology (MACT) standard, which establishes separate emission limits for mercury for new and existing coal-based electric utility steam generating units.

EPA estimates that the MACT proposal will reduce national mercury emissions to approximately 34 tons. The Agency will promulgate a final rule by December 2004.

Electric utilities in the U.S. release about 48 tons of mercury per year, which is roughly one-third of the total anthropogenic emissions of mercury in the U.S., less than 10 percent of total North American emissions, and about one percent of total global mercury emissions.

EPA issued this proposed rule in tandem with its proposed Interstate Air Quality Rule (IAQQR). Both proposals form an integrated regulatory plan designed to reduce emissions of several pollutants from the utility sector and to provide a cost-effective approach to obtain the reductions by relying on the “co-benefits” achieved with technologies used to reduce NOx and SO2 emissions.

Defining “Co-benefits”

The mercury proposal recognizes that reliable, cost-effective control technologies designed specifically for capturing mercury from coal-based power plants are not yet commercially available. EPA, the Department of Energy (DOE) and others are in agreement that implementing further controls for reducing SO2 and NOx as required in the proposed IAQQR will result in significant additional reductions — “co-benefits” — in mercury emissions.

In the proposed rule’s cap-and-trade alternative, EPA proposes to set a near-term cap in 2010 at a level that reflects the maximum reduction in mercury emissions that could be achieved through the installation of flue gas desulphurization (FGD) and selective catalytic reduction (SCR) units that will be necessary to meet the 2010 caps for SO2 and NOx in the proposed IAQQR. This is how EPA is defining how to obtain “co-benefits.” Questions remain, however, as to the actual reduction these “co-benefits” of reduced mercury emissions will provide. EPA is therefore requesting comment and specific technical information concerning the “co-benefits” number for the first phase cap level in 2010.

Co-benefits from Existing Controls

Current air pollution control technologies being used to reduce particulate, NOx and SO2 emissions from coal-based power plants in the U.S. already capture, on average, about 40 percent of the 75 tons of mercury that enters the boilers with the coal. However, the removal rate of mercury for any particular plant can vary from less than 10 percent to over 90 percent, depending on the type of coal and the air pollution control device used. One possible cause of this large variation in mercury capture is that the speciation of mercury in power plant flue gas can vary significantly from plant to plant depending on coal properties and combustion conditions. Mercury in coal flue gas exists in one of three forms: elemental, ionic or particulate. The proportions of the three chemical forms of mercury have a great influence over the behavior of the mercury in the flue gas.

It is therefore possible to obtain some level of mercury control as a “co-benefit” of FGD systems (or scrubbers) designed to control SO2 emissions, perhaps in combination with SCR technology designed to control NOx emissions. An installed electrostatic precipitator (ESP) or fabric filter (FF) effectively removes particulate mercury.

In short-duration tests of the various pollution controls currently installed throughout the fleet of U.S. coal-based power plants, mercury reductions have ranged from zero to 99 percent. Maximum removals across different controls are about 50 percent for cold-side ESP, 80 percent for FFs, 70 percent for cold-side ESP followed by a wet FGD, and greater than 95 percent for a spray dryer FGD combined with a FF.

As the wide differences in removal indicate, many challenges and obstacles exist with respect to the ability to remove mercury from the diverse fleet of coal-based generating units in the U.S. The complex mercury chemistry coupled with a lack of data on the chemical reactions which occur in the flue gas greatly hinder the understanding of how to effectively control mercury emissions.

A major difficulty lies in successfully capturing the two gaseous forms of mercury: elemental and ionic. The design of the boiler and combustion system, the chemical form of the mercury, the properties of the fly ash, the presence of other chemicals and the relatively low concentration of mercury in flue gas must be considered. In addition, the type of coal being burned is critical. For example, plants burning...
eastern bituminous coal with a FGD in combination with either a cold-side ESP or FF may be able to achieve 70-90 percent mercury removal. Finally, the type of downstream conventional control equipment in place will determine how much and what species of mercury is removed.

**Mercury Co-benefits with FGD**

One of the most important factors in determining the efficiency of mercury capture appears to be the form of the mercury in the flue gas that enters the scrubber. Ionic mercury tends to be soluble in water and is captured along with SO₂, while elemental mercury, being insoluble in water, passes through most of the scrubber processes and escapes out the stack. Wet FGD units currently installed on about 25 percent of coal-based power plants in the U.S. remove about 80-95 percent of gaseous ionic mercury but virtually none of the elemental mercury. The co-benefits mercury reductions by SO₂ control processes is, therefore, dependent on the fraction of the mercury that has converted from elemental form to ionic form.

The form of the mercury in the flue gas is dependent on the chlorine content of the coal. Coals with high chlorine levels tend to produce flue gas that is typically higher in ionic mercury. The rank of the coal is a good predictor of chlorine content. A majority of coal found in the eastern U.S. is bituminous coal. Most of the coal found in the western U.S. is either subbituminous or lignite, however, bituminous coal is found in Colorado and New Mexico. Almost all of the coals found in the western U.S. are characterized by their low-chlorine content. The fraction of ionic mercury, and consequently the level of mercury captured in a scrubber, will be much higher for eastern coals than for western coals.

Notwithstanding the ability of SO₂ control processes to capture mercury, there appears to be a problem with capturing mercury in wet scrubbers. At some power plants with wet scrubbers that were tested for mercury species, the high capture rate of ionic mercury was offset by an increase in the amount of elemental mercury found in the flue gas. It seems that some of the ionic mercury is converted back to its elemental form and escapes from the scrubber through the stack after being captured in the scrubber. This scrubber mercury re-release is not yet well understood. Analysis of the phenomenon indicates that this effect is present at some times, and not at others, indicating that the overall capture of mercury by a wet scrubber may be less over time than what the short test periods to date might indicate.

Another process for SO₂ control, used widely for low-sulfur western coals, is a lime-based spray dryer followed by a FF that collects the reacted lime along with the coal ash. This technology is only effective for SO₂ control from low-sulfur coals, and is seldom used. In addition, it is more expensive than alternative technologies, and creates a large waste stream that has to be carefully handled for disposal. This spray dryer/FF FGD process may be more efficient at removing mercury with bituminous coals, and may be used in a few power plants burning eastern bituminous coal for combined SO₂ and mercury control, but it is not expected to be widely used.

**Mercury Co-benefits with SCR**

It has been conjectured since the mid-1990s that an SCR installed for NOₓ reduction could significantly increase the oxidation of mercury in the flue gas. It would then follow that a coal-based power plant equipped with an SCR upstream of an FGD could potentially achieve significant removal of mercury from the flue gas.

Based on a report from a German utility which claimed that SCR catalysts were extremely effective in converting elemental mercury to the ionic form, EPA concluded: that any power plant with this combination of pollution controls, burning any type of coal, would have nearly all of the elemental mercury converted to ionic mercury; that almost all of the ionic mercury would be captured in a scrubber, with no mercury re-released from the FGD process; that this combination would uniformly result in an estimated 95 percent reduction in overall mercury emissions.

Tests during the last several years at operating power plants have shown that these assumptions are not always true. Changes in mercury speciation are dependent on operating temperature, the concentration of ammonia in the flue gas, the gas velocity, a function of the chemical composition of the coal, and are coal-specific.

In addition, it is known that an SCR catalyst’s ability to remove NOₓ diminishes over time — a catalyst typically needs to be replaced every three to five years when the SCR is being run seasonally. Exposure to flue gas degrades catalytic activity due to ash particles plugging the catalyst surface and/or by chemicals in the flue gas poisoning the catalyst’s active ingredient. It is not known how this process may affect a catalyst’s ability to oxidize mercury or how mercury in the flue gas would affect catalyst performance. Only limited testing has been performed to date in order to assess the effect of SCR catalysts in oxidizing mercury in the flue gas.

Also to be considered is that an SCR would need to be operated continuously in order to control mercury; this could further accelerate decreased catalyst performance. Any estimate of the long-term potential for the co-benefits of SCR and FGD for mercury reduction must consider the possibility of catalyst aging and the subsequent potential loss in mercury oxidation and NOₓ removal.

SCR mercury oxidation does not appear to occur for low-rank western coals. The low chlorine content and alkaline ash typical of low-rank coals may cause the acidic chlorine present in the flue gas to be neutralized by the fly ash before it reaches the SCR catalyst. Also, since the majority of the mercury found in the flue gas from western coals is elemental in form, the addition of an SCR would not significantly improve the control of mercury emissions for plants burning low-rank coals. Therefore, co-benefits from an SCR/FGD combination for lignite and subbituminous coals will be much less than for bituminous coals.

**Conclusions**

A consensus of what is known about the limitations and ability of FGDs and SCRs to achieve mercury “co-benefits” reductions was summarized in a recent review of the DOE/NETL mercury control technology research program:

- Coal properties (e.g., chlorine and sulfur content, ash characteristics) greatly influence the ability of existing pollution control technologies to capture mercury.
FGD systems have been successfully demonstrated to capture oxidized mercury. Potential reduction of a portion of the oxidized mercury to elemental mercury within the wet FGD may reduce overall capture in some applications. Although mercury oxidation across SCRs has been demonstrated, it appears to be highly variable depending on coal properties and SCR catalyst factors including type, sizing and age. Uncertainties remain regarding mercury capture effectiveness with different coal ranks and existing pollution control device configurations, and balance-of-plant impacts. Significant variability in mercury capture co-benefits of existing pollution controls has been observed at similar units as well as at individual units tested at different times, even while burning the same coal.

Despite the fact that there are no currently available commercial technologies designed exclusively for mercury control from coal-based power plants, currently installed pollution controls for particulates, NOx, and SO2 have been demonstrated to control mercury emissions by varying degrees. By integrating the Utility Mercury Reductions proposal with the proposed IAQR, EPA has recognized that scientifically justified and verifiable mercury reductions can be achieved while at the same time providing the electric utility industry some flexibility to achieve those reductions. Focusing on the co-benefits associated with existing pollution control technologies used to reduce SO2 and NOx emissions will continue to reduce mercury emissions and will allow adequate time for the development and commercialization of mercury-specific control technologies that are currently in progress.

EEI is the association of the United States investor-owned electric utilities, combination gas & electric utilities, industry affiliates and associates worldwide. Its U.S. members serve 90 percent of all customers served by the investor-owned segment of the industry.
Many Americans know that coal-based power plants produce more than half of our nation’s electricity. Fewer people know that these same power plants make another vital contribution to the country’s economy and environment by producing valuable raw materials for construction.

Coal combustion products – or CCPs – include the fly ash, bottom ash, boiler slag, and flue gas desulfurization material that remain after coal is consumed to generate electricity. In the past, these materials largely went unused and were disposed of in landfills. Today, a steadily increasing amount of CCPs find their way into a range of building products – including engineered fill materials, wallboard, blocks, mortars, stuccos, paint and, most importantly, concrete.

In fact, CCPs are now one of the most widely reused resources in America. According to data published by the American Coal Ash Association (ACAA) and U.S. Geological Survey (USGS), overall CCP utilization for 2002 is estimated at about 45.5 million tons, compared to 37.1 million tons in 2001 – an increase of more than 18 percent.

ACAA estimated overall 2002 CCP production at 128.7 million tons. That means 35.4 million tons of all CCPs were used beneficially and that CCPs rank third among available mineral commodities in the United States – behind sand and gravel and crushed stone, but ahead of portland cement and iron ore.

Rising utilization of CCPs can be attributed to several factors, including:

• Commitment by electricity generators and CCP marketers. Utilities and companies that market CCPs for them have invested millions of dollars in technologies and facilities to ensure CCP quality and availability. Today, CCPs are often transported hundreds of miles to markets where they can be used.

• Support from government agencies and the sustainable development movement. Federal agencies, such as the Army Corps of Engineers, Bureau of Reclamation, Department of Energy, and Federal Highway Administration are longtime supporters of CCP utilization. Since 1984, the U.S. Environmental Protection Agency (EPA) has recommended use of coal fly ash in all concrete funded by federal dollars. In 2003, EPA launched the Coal Combustion Products Partnership – or C2P2 – to actively promote higher CCP utilization. (See related story on page 73.) Private sector efforts to promote environmentally sensitive development – such as the U.S. Green Building Council’s LEED program – recognize the role CCPs play in improving environmental performance of building products.

• Growing awareness of the performance benefits of CCPs. CCP use is not just good for the environment. In many cases, CCPs improve the quality of the building materials they are used in.

Concrete is the most common building material benefiting from inclusion of CCPs. Approximately 12.6 million tons of coal fly ash was used in concrete in the United States during 2002. When coal fly ash is used to make concrete, the finished product shows increased durability, increased resistance to chemical attack and greater long-term strength. Coal fly ash accomplishes these benefits through both mechanical and chemical means.

Physically, fly ash is a powdery material comprised of microscopic, glassy spheres. These spheres fill small voids in the concrete, making it less permeable. The spherical shape of the fly ash also has
a “ball bearing” effect that allows concrete to flow with less water in the mixture. This not only conserves water, but it reduces the number of micro-cracks caused by excess water bleeding from the wet concrete.

Chemically, fly ash combines with free lime that is created in the concrete when cement is hydrated. This results in production of more of the durable binder that holds the concrete aggregates together.

These performance benefits make concrete containing coal fly ash appropriate for almost any application. From giant highways and dams to homes and commercial buildings, CCPs help improve concrete quality. For example:

- **California’s Olivenhain Dam.** When the San Diego County Water Authority began designing the Olivenhain Dam – the centerpiece of its Emergency Storage Project – it selected roller compacted concrete for a structure designed to withstand a major earthquake. More than 1.5 million cubic yards of concrete were needed to construct a dam that is 2,552 feet long and 308 feet tall – the largest roller compacted dam in North America. A high percentage of coal fly ash was included in the concrete mix for several reasons. The fly ash made the concrete easier to place, reduced the amount of water needed and reduced cracking associated with excess water and heat that would be expected in a standard concrete mix. ISG Resources supplied more than 152,000 tons of coal fly ash from Arizona to complete the project.

- **Chicago’s Wacker Drive.** Reconstruction of this two-level viaduct, in downtown Chicago, had to consider heavy use and harsh Lake Michigan weather in its design. The Chicago Department of Transportation set an ambitious goal for the $200 million project of producing a concrete structure designed to last 75 to 100 years. The final concrete design incorporated coal fly ash in concert with two other recycled industrial materials – silica fume and ground granulated blast furnace slag – to produce a high performance concrete expected to far outlive a conventional concrete structure. More than 10,000 tons of fly ash was used in this two-year construction project.

- **Florida’s Madera Community.** Sustainable building practices for residential construction are the focal point of this 88-home development by Green Trust, LLC. Built on a 44-acre site in Gainesville – adjacent to the University of Florida – the competitively priced homes constitute an environmentally friendly community. High volume fly ash concrete is one of the technologies used in the project to promote resource-efficient construction. Coal fly ash is used in home foundations, floors, and walls constructed with insulating concrete forms. Approximately 18 tons of fly ash is utilized in each home.

Perhaps the most significant environmental benefit from using coal fly ash in concrete is the reduction of carbon dioxide (CO₂) emissions. Fly ash often replaces a portion of the portland cement used in making concrete. For each ton of fly ash that displaces a ton of cement production, approximately a ton of CO₂ emissions are avoided. That is the equivalent of two months of CO₂ emissions from an automobile. In other words, the approximately 12 million tons of fly ash utilized in concrete during 2002 was the equivalent of removing two million cars from our roads for an entire year.

Coal is an American energy resource that is abundant, economical, and environmentally sound. Coal combustion products are American building materials that are abundant, economical and environmentally sound, as well.

The next time you drive past a coal-based power plant, remember that it is making more than electricity to benefit our communities. The very road you’re driving on may be constructed with performance enhancing coal combustion products.
The Coal Combustion Products Partnership – or C2P2 – is a new program of the U.S. Environmental Protection Agency (EPA) designed to encourage higher utilization of this strategic resource.

During a ceremony in January 2004, the American Coal Council (ACC) was one of the entities recognized as a charter member of the joint government and industry effort. ACC is enrolled in the program as a C2P2 Leader that will take actions to promote the environmental and performance benefits of CCP use.

EPA is a long-time supporter of the beneficial use of coal combustion products. Beginning in 1984, the Agency issued Comprehensive Procurement Guidelines that instruct federal agencies to use coal fly ash in concrete whenever it is technically and economically feasible.

Through the new C2P2 program, EPA has already participated in the publication of the latest edition of “Fly Ash Facts for Highway Engineers” – a popular technical guide co-published by the Federal Highway Administration (FHA) and American Coal Ash Association (ACAA). The C2P2 program is now working on a companion publication that will outline the environmental benefits associated with CCP use.

C2P2 is also promoting CCP use through publication of case studies, seminars, industry recognition, research projects and a variety of other activities. Companies may still enroll as C2P2 program participants. For more information, visit the C2P2 Web site at http://www.epa.gov/epaoswer/osw/conserve/c2p2.

The American Coal Council actively promotes CCP use through its Ash Special Interest Group. A coal fly ash fact sheet was the first technical paper published by ACC and the Special Interest Group is currently leading a study effort to assess the national economic impacts of the CCP industry. The Ash Special Interest Group is open to participation by all ACC members.
Bismarck State College
Energy Programs Put Fly Ash to Work

By Vicki Voskuil, Public Information Specialist, Bismarck State College

G reat River Energy’s Coal Creek Station near Underwood, North Dakota has been an industry leader in developing markets for fly ash, ranking among the top four of all fly ash sources in the country. As a result of a long-standing partnership with Great River Energy, Bismarck State College (BSC) is developing the concept of using coal combustion products to construct the Career and Technology Institute (CTI) to house their energy programs.

Demand for training in the power plant industry has fueled phenomenal growth in virtual classroom and on-site energy programs at BSC. The two-year North Dakota college provides degrees and certificates in five energy specialties developed largely through partnerships with utilities and energy associations across the United States.

Poised to become an international leader in energy technology training and education, BSC is the only degree-granting institution in the country that offers both online and on-campus instruction to the energy industry. Since 1990, growth of the energy programs has been dramatic with a 240 percent increase in enrollment. Today, three quarters of 400-plus energy students are studying online. Entering students or workers, already employed in the industry, can now take courses in power plant, process plant, electric power, electrical transmission systems and nuclear power technology.

BSC began its Power Plant Technology program in 1976 to meet a need for trained operators in central North Dakota. Steady increases in enrollment have been fueled by a rosy job outlook and the expected shortage of power plant workers over the next 10 to 15 years.

Nationally, as well as within North Dakota, the energy industry is facing anticipated technician worker shortages of up to 50 percent. Working in partnership with industry to deal with the approaching shortage of multi-skilled technicians, BSC has put in place the education and training necessary to prepare a workforce for reliable and safe generation, transmission and distribution of electric power.

Representatives from power and utility companies form an advisory board that assists BSC faculty in developing curriculum for the online classes. Because of the success of its campus program, BSC was able to convert the energy technology degree programs to an online format in 1999 with funding from the National Science Foundation (NSF). In 2002, another NSF advanced technology education grant of $900,000 launched the Electrical Transmission Systems Technology online program. Today, BSC and its energy programs have become nationally recognized with graduates working in 47 states at a placement rate of more than 95 percent.

Mike Hummel, president and general manager of BNI Coal Inc. in Bismarck, says North Dakota’s skilled worker turnover between 2008 and 2018 will be significant. Locally and nationally it is critical that the existing energy workforce be replaced with skilled workers. Industry leaders have indicated that workforce is not currently available, nor is there the time for a worker to develop the necessary knowledge on the job. BSC’s training offers industry an answer to its need for a skilled workforce, typically reducing on-the-job training time by up to three years.

“Our vision is to become a national energy center that brings together education, energy and the environment in new ways to provide educational and training opportunities to learners anytime, anywhere,” said BSC President Donna S. Thigpen.
Recognizing the importance of broad industrial participation in the effort, these charter companies welcome the participation of other coal-based electricity generators and coal producers who commit to the goals of the FutureGen project and the Alliance’s principles, and who would share co-funding for the project. As the project develops, opportunities for participation by technology vendors and the scientific community will be created.

The charter companies envision significant stakeholder involvement and educational activities as a vital component of the FutureGen project. As one of mechanisms for stakeholder involvement, the Alliance has formed associations with key industry organizations around the world, including:

- American Coal Council (North America)
- Central Research Institute for the Electric Power Industry (Japan)
- Edison Electric Institute (North America)
- Electric Power Research Institute (North America and worldwide)
- International Energy Agency Greenhouse Gas R&D Programme (Europe and worldwide)
- National Mining Association (North America)
- World Coal Institute (Europe and worldwide)

Over the life of the initiative, these organizations will serve as an indispensable outlet for dissemination of technical results.

Summary

While many uncertainties remain surrounding climate science and the levels to which traditional pollutants must be reduced, the future seems certain to bring ever-tightening regulatory constraints on coal. One of the best opportunities at our disposal for getting ahead of this trend is the development of cost-effective advanced technology. FutureGen promises to be one such technology that may give us the opportunity to cost-effectively address the potential risks of climate change and reduce traditional pollutants to ultra-low levels while simultaneously expanding domestic and global markets for coal.

Sources: U.S. Department of Energy and FutureGen Industrial Alliance. Author Ken Humphreys, Battelle, can be reached at humphreysk@battelle.org.
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