Issue 1 • 2009

American Coal

ECONOMIC, ABUNDANT/SECURE AND ENVIRONMENTALLY SOUND

ACC American Coal Council

Cleaning up the Confusion Over Coal

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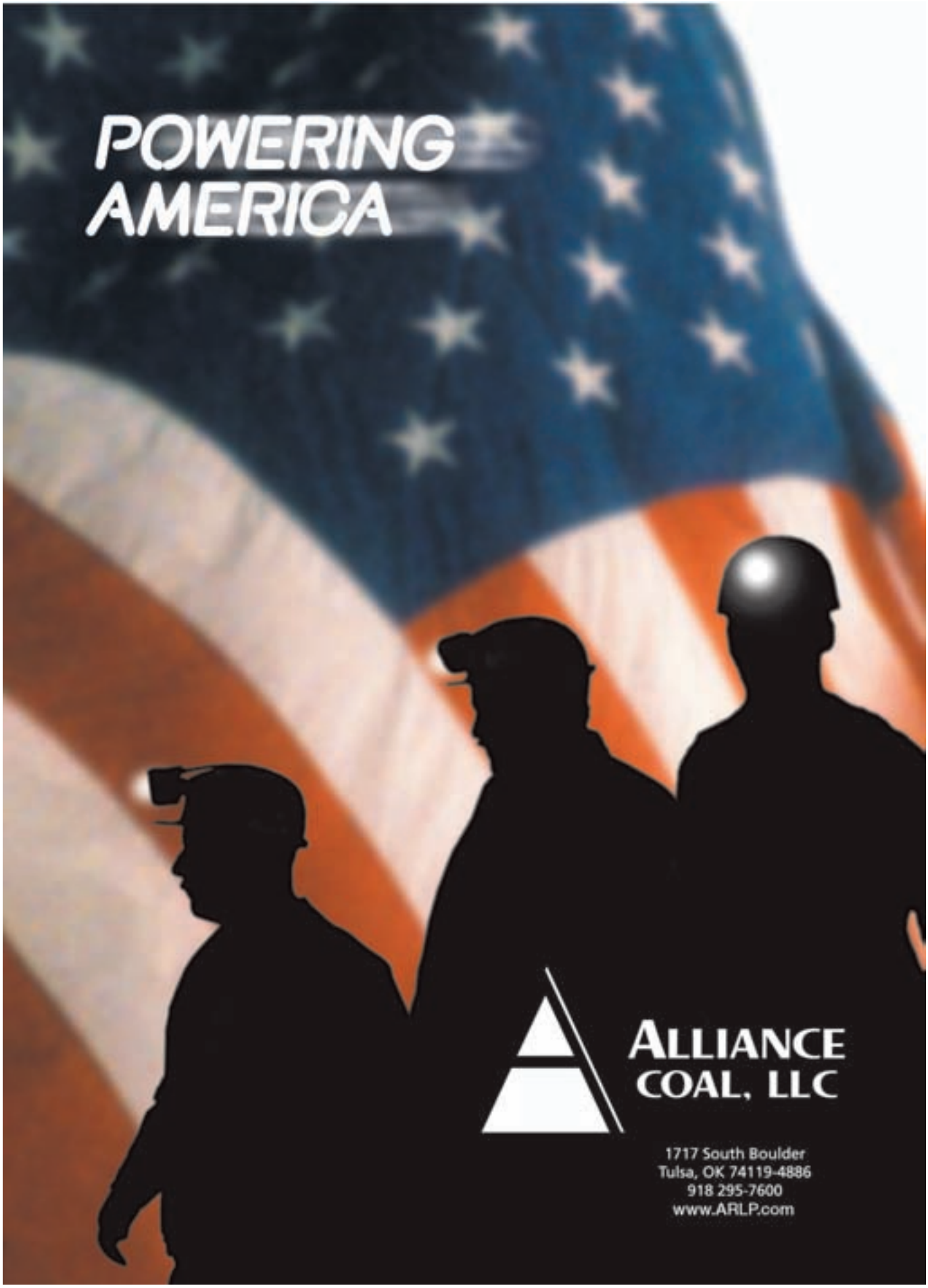
CONTENTS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Clean Coal, Progress, and the Classics

Stephen Miller, ACC President & President, COALTRADE, LLC

The past year has been a period of unprecedented change in the economy, energy industry, and for environmental issues. Leadership companies in our industry are focused now – more than ever before – on the "three E's" of society: energy security, economic growth, and environmental solutions.

In the present dynamic global energy market, coal remains the fastest growing fuel in the world. Currently, 209 gigawatts of coal-fueled power plants are being developed in numerous countries around the world. In the U.S., 17 gigawatts of new coal-based generation are under construction and expected to be on line over the next several years, adding 70 million tons of new U.S. coal demand. Clean coal is the ultimate solution for re-energizing the U.S. and world economies, creating millions of green jobs and building long-term, sustainable energy security.

In recent years, clean coal has been a tremendous success story. And clean coal is important to carbon management. Encouragingly, clean coal technologies (CCS) received major support through $3.5 billion for fossil fuel R&D in the U.S. stimulus package. Much of this investment will be focused on carbon capture and storage advancement. CCS also received a $20 per tonne of CO_2 tax credit for deep storage and $10 per tonne for enhanced oil recovery.

In the U.S., our industry needs additional investment as well as regulatory clarity to foster carbon capture and storage. Technology must be in place before hard carbon dioxide goals make sense if we are to truly balance the three "E's" discussed above.

Globally, Europe has been returning to coal generation. China and India are leading many countries around the world toward electrification of their economies through coal. And Australia, China, and Europe all have major carbon capture and storage initiatives underway.

Long-term, coal with carbon capture and storage will be the low-cost, low-carbon solution to the need for a better quality of life in the U.S. and throughout the world.

Our job as leaders in this industry is to transform the changes underway into sustainable progress, progress toward a better balance among energy security, renewed economic growth, and cost-effective environmental solutions. This message of transforming change into progress is as fresh and important today as the presentation made to us by author and motivational speaker Dean Lindsay at our 2009 Spring Coal Forum in Tampa (Clearwater), Fla. and as classic as the word of Marcus Aurelius in the second century. Emperor Aurelius, in his Meditations, noted "What can exist without change? What's closer to nature's heart? Can you take a hot bath and leave the firewood as it was? Eat food without transforming it? Can any vital process take place without something being changed?" Progress is when change creates a process vital to the well-being of people.

Changing coal into clean electricity and a better quality of life for people around the world is **progress** that we can all be proud of. ◆

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COAL EXPERTISE & PROJECTS WORLDWIDE

Then and Now

Janet Gellici, CAE, Chief Executive Officer, American Coal Councill

Memories, it seems, are very whimsical things – infinitely adaptable to us help weather the hard times and more greatly appreciate the good times.

Recall complaining, when you were a child, about having to get up early to catch the school bus. Your grandparents would respond with stories of how when they were growing up they had to walk 27 miles to school – one way – in blizzards, floods, searing heat and pestilence. Of course, those same grandparents bemoan today's living expenses and pace of life, harkening back to halcyon days when houses cost less than the price of a car, mail was delivered by a postman – not electronically and only once a day, and parents weren't in constant motion running their kids to soccer practice, gymnastics and play dates.

It's frustrating trying to compete with a memory, especially one embellished, for better or worse, with the veil of time. I remember dismissing my parents' and grandparents' reminiscences with the curt rejoinder, "that was then, this is now." I'm reminded of those exchanges these days, as policymakers, the environmental community, the media and industry variously respond to today's challenges based on somewhat skewed recollections or an unwillingness to let go of entrenched perceptions.

The classic example and challenge we face in the coal industry, of course, is overcoming the perception that we're still operating our grandfather's coal mines and power plants, without regard for employee safety, environmental stewardship or innovation. History is brandished as a reason for punishment today, irrespective of recent efforts and current facts demonstrating progress on all counts. That was then, this is now.

Policymakers, the environmental community and much of the mainstream media also appear to have forgotten what life was like before the widespread beneficial use of low-cost electricity became commonplace. Many seem unwilling to recognize the ongoing efforts by industry, universities and entrepreneurs to ensure a continued supply of affordable, reliable and environmentally sound electricity generated by coal. That was then, this is now.

As a nation, we seem intent on maintaining our lifestyle while downplaying the concerns and needs of developing nations to advance their own economic development and their own citizens' well being. We're justly proud of our historic development and leadership role in global affairs. Other nations are entitled to those same qualities of life, along with the inherent responsibilities that accompany them in an increasingly globalized economy. That was then, this is now.

The coal industry might be forgiven for some sentimentalizing about more recent history, before the current economic meltdown and before increased public pressure for control of greenhouse gas emissions. Domestic and international markets were strong for coal and electricity, public policy was clear on what was required to manage emissions and shareholders were pleased with corporate earnings.

That was then, this is now – yet every now and then it's good to remember that we've been through this before. The resiliency of the U.S. coal industry – our producers, utilities, industrial users and transportation companies – is a memory worth resurrecting. We've endured the vagaries of energy policy, the fickleness of Wall Street and the vacillations of public support; we've weathered natural disasters, market fluctuations and environmental community assaults; and we've overcome technological challenges and challenged autocratic technocrats.

We'll still be here when the global economy rebounds, when U.S. citizens demand affordable and reliable energy, and when policymakers start making policy instead of politics. We'll still be here because, as the articles in this issue of *American Coal* demonstrate, we're not about "then" – we're focused on "now." I hope you'll enjoy reading about today's coal industry – what we're doing in response to today's challenges and, more importantly, what we're doing in preparation for the future. ◆

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Definitions Can Be Funny Things

Jason Hayes, ACC Communications Director/Editor of *American Coal*

In our ongoing energy policy discussions, we hear a few words that keep getting tossed around; words like "change" and "clean," and words like "progress," and "green." But, it seems like those words have different meanings for different people, depending on the situation.

For example, because of its widespread campaign use, the term "change" has become highly politicized. It conjures up different feelings and expectations for different people. Some see it as a rallying cry; a starting point for actively altering moods, policies, and economics. Many others see it as an ambiguous term that leaves questions unanswered and heightens expectations beyond real-world possibilities.

At our 2009 Spring Coal Forum in Tampa (Clearwater), Fla., we heard a presentation from author and motivational speaker Dean Lindsay. His remarks detailed a way to work around the potential ambiguities of this term. Change, he noted, is not always positive. For example, if you are involved in a car wreck, your insurance rates will "change." However, that "change" will likely burden, rather than help you. To help clarify things, Dean encouraged people to use the term "progress" to indicate a desire to better their condition over time.

In the energy industry, we're working around similar ambiguities and dealing with "change" as we watch the development of energy policy and climate change regulations in the Congress, the EPA, and White House. Depending on the nature of one's education and experience there are a variety of opinions as to whether this impending "change" is viewed as positive or negative – i.e., progress or regression.

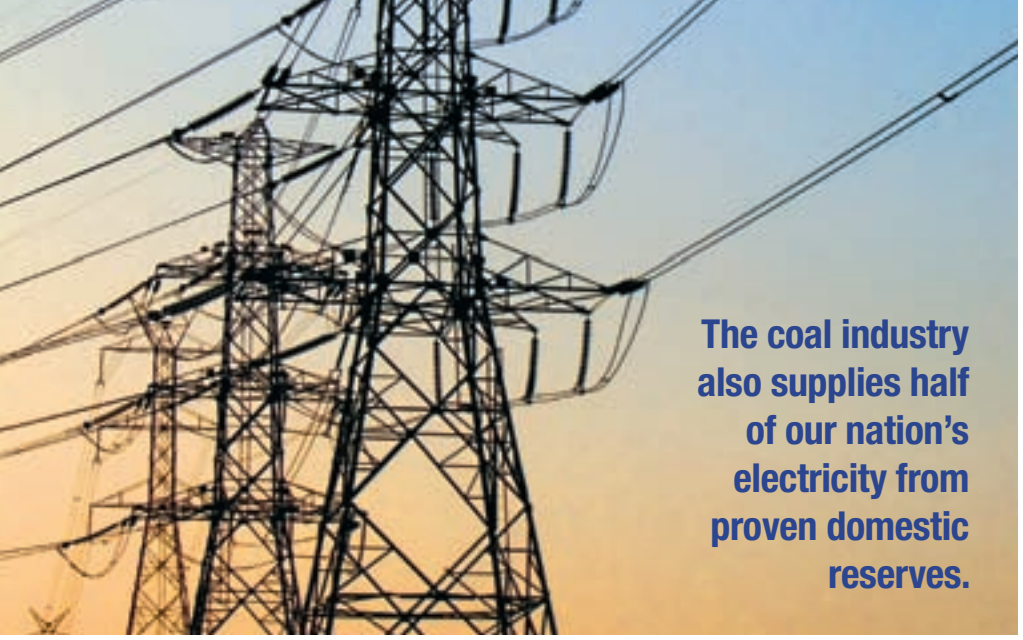
Some would like to see regression, as opposed to progress, for the coal industry and it's hard to miss the massive outlays of marketing dollars that the anti-coal forces are pouring into print, TV, and online advertising. When it comes to getting half-truths and outright falsehoods into the public arena, there is no denying the anti-coal groups have been very effective.

It is, therefore, essential that the coal industry does an even better job of getting fact and balance into the public debate. We need to be even more actively educating government officials, educators, and the public at large about the "progressive" and beneficial role that coal plays in their lives. We need to advocate for energy policy that balances a mix of pressing economic, environmental, and national security concerns. We also need to step up and speak out proudly for coal when the opportunity arises.

First, we need to openly share stories on our industry's efforts to improve efficiency and to better our environmental record. We have done amazing work in reducing emissions, cleaning up generation stations, reclaiming mine sites, replacing aging infrastructure, and training employees. But we're not stopping there. We're continuing to lead the charge for better efficiency and reduced emissions. You know that the green groups will highlight any minor mistake we might make, so, we need to balance their input and trumpet our successes to the media, government, and public.

Throughout this issue of *American Coal*, we have examples of our industry doing just that. From clearing up the confusion over what "clean" actually means, to showing the beneficial uses of coal combustion products, to capturing and storing CO_2 emissions, to reducing fugitive emissions from mines, and capturing carbon credits while doing so, we're not backing down from the real progress that our industry is making on these fronts.

Second, we continue to provide substantial economic benefits as well as some of the lowest-priced electricity available to



rate payers across the country. At a time when many are teetering on the brink of foreclosure and staring layoffs in the face, we can proudly say that we provide hundreds of thousands of high-paying professional jobs and allow electricity users to enjoy some of the lowest electricity prices on the planet. Three of our editorials demonstrate that this progress is not just limited to our own shores. Around the world, coal is playing a pivotal role in bringing people out of poverty and providing them with a cleaner, healthier environment and lifestyle.

The coal industry also supplies half of our nation's electricity from proven domestic reserves. While many other industries are shipping jobs to other countries, our mines, railroads, utilities, and transportation companies are employing people locally and producing domestic energy here and now.

Sure, you'll hear the myths and stories from the anti-coal forces. You'll see the flashy commercials that tens of millions of dollars in ad buys can create. You'll hear about their efforts to stop coal use, and be left wondering what their plan to provide affordable energy to over 530 million North Americans might be.

What you won't hear from them is "reality." As they strive to redefine and re-engineer common terms, you will never hear them admit the simple fact that coal plays a pivotal role in acting as an agent of "progress" for all electricity users. Coal provides abundant/secure, affordable, and increasingly clean energy for people around the world.

This edition of *American Coal* makes it clear that when you seriously consider the facts, when you look at coal's improving environmental record, when you look at the economic benefits of producing and using a secure, domestic natural resource; when you admit that coal is improving the lives of billions of people in the developing world; it's natural that you would have chosen words like "progress" or "clean" to better describe coal.

Playing with definitions won't change that reality. ◆

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The ACC facilitates the lawful exchange of ideas and information regarding the American coal industry. It serves as a 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.

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American Coal Council

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The American Coal Council (ACC) strives to serve as the pre-eminent business voice of the American coal industry.

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The American Coal Council (ACC) is dedicated to advancing the development and utilization of coal as an economic, abundant/secure and environmentally sound 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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Equivocating Clean

By Jason Hayes, M.E.Des., American Coal Council

Merriam-Webster defines "equivocal" as "subject to two or more interpretations and usually used to mislead or confuse." One who equivocates, therefore traffics in this realm of confusion by employing multiple definitions of a widely used term as a means of clouding the conversation.

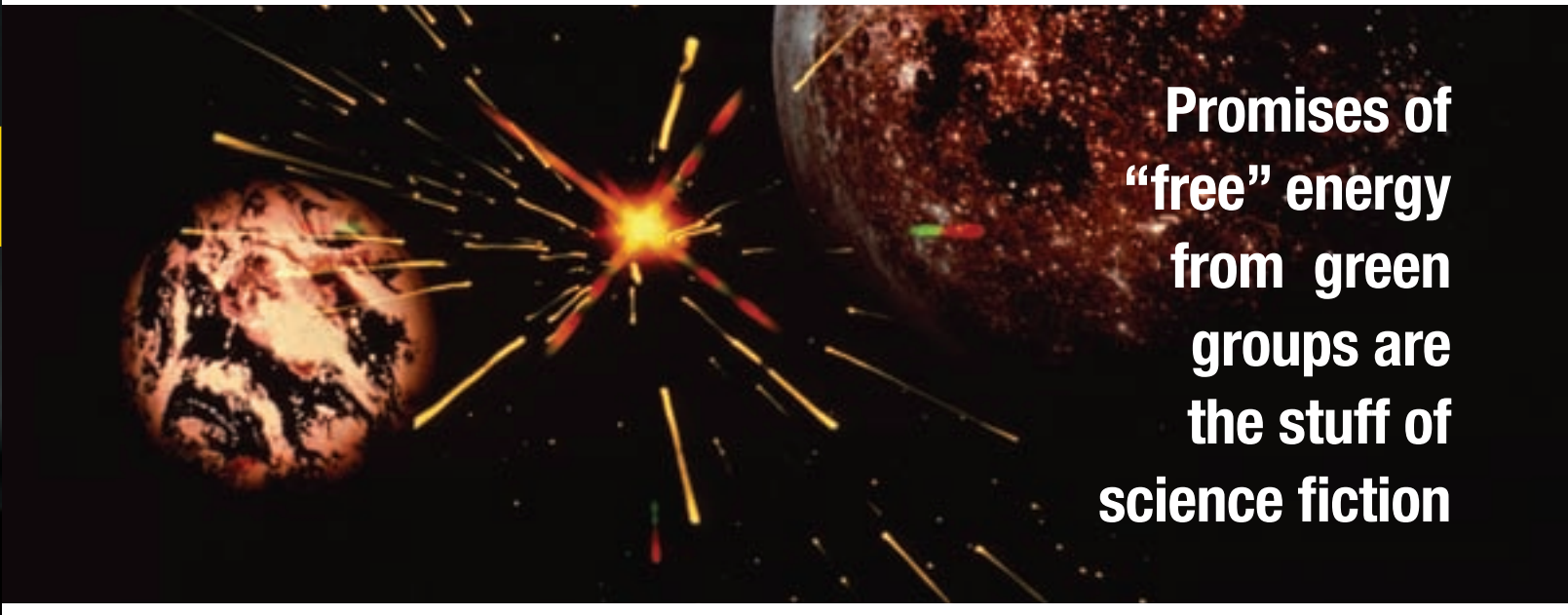
Working from that definition, the term "equivocal" perfectly describes the semantic games played by some in the environmental movement over the term "clean coal" as anti-coal non-governmental groups (NGOs) like the Reality Campaign[1] repeatedly change the definition of "clean" to suit the needs of their latest marketing campaign.

Throughout their information and publications we are informed that there is no such thing as clean coal and that no clean coal plants exist in the U.S. We also are instructed that the coal industry has not "accepted responsibility" for having emitted pollution from generation stations.

On top of that, we are then promised that as we stop using coal, we can simply move to " abundant, **free**, and clean sources of energy."[2] It is through this type of misdirection, myth-spreading, and promises of "free" energy that the discussion is clouded and expectations are raised to unrealistic heights.

Few, if any, would argue against the long-term goal of developing limitless, environmentally benign, and free energy. However, the promises of these green groups are the stuff of science fiction and they're not Captain Kirk or Luke Skywalker. Their unyielding demands for an ever-increasing reliance on renewable energy options – that simply cannot meet the energy output or cost estimates they are forecasting – confuses fact with reality. While no one can fault their desire, we can and must question whether their policy options are really the best choice for producing abundant/secure, affordable, and clean energy.

Since the environmental movement has opened the door, it is a worthwhile effort to engage the discussion and to offer some basic facts as balance to the above noted myths.



Is there such a thing as "clean coal?"

The coal industry has a clear track record of addressing environmental concerns as they are brought to the public attention. Additionally, the coal industry has been providing increasingly clean energy for decades. However, as each environmental concern has been addressed by the coal industry, green groups have rushed to create another, increasingly restrictive definition for the word "clean." Then they've insisted that the industry immediately meet the conditions imposed by their new definition, claiming that, until it does, there could be no such thing as "clean coal."

With their rapidly fluctuating standards it appears that they are working more toward an ideological end of stopping the progress of new technologies and cleaner, coal-based energy instead of the provision of abundant, clean, and affordable electricity.

To help clean up the confusion over "clean coal," we can look to the definition of the term that was provided by the congress over 20 years ago.

> *"The term 'clean coal technology' means any technology ... deployed at a new or existing facility which will achieve significant reductions in air emissions of sulfur dioxide or oxides of nitrogen associated with the utilization of coal in the generation of electricity."*
>
> *-U.S. Senate Bill 911, April 1987*

Not surprisingly, the coal industry has been willing to expand the definition of the term "clean coal" – and as a consequence their financial, legal, and ethical responsibilities – as environmental concerns have been raised and as technologies have improved. At the time that definition was coined, acid rain and the gases that caused it were a primary environmental concern. As that issue was addressed, other environmental issues were brought to the forefront. They have also been addressed by industry.

Today, the term "clean coal" also includes the reduction of particulate matter (PM10 and PM2.5), and mercury. As the American Coalition for Clean Coal Energy (ACCCE) noted in a March 2009 blog posting titled "Behind the Plug," the coal industry has "also gone further … clean coal technologies will soon include technologies that capture and store CO_2."

For the foreseeable future, we will keep relying on the abundance and affordability of our domestic coal reserves for the bulk of our energy supply.

Industry has allowed for the expansion of the scope of and expectations for clean coal technologies at almost every turn. And, to the industry's credit, we have also built and installed a broad suite of very effective clean coal options and technologies. We have shown throughout the pages of this issue of American Coal, as well as previous issues, that integrated gasification combined cycle (IGCC), super- and ultra super-critical, and fluidized bed coal plants, along with pre-combustion technologies, scrubbers, electro-static precipitators, and flue gas desulfurization all play a role in decreasing emissions intensity, while also allowing our utilities to affordably meet the public's continuously growing demand for affordable electricity.

In fact, Environmental Protection Agency (EPA) data indicates that despite having almost tripled our coal use in the U.S. over the past three decades, emissions of five major criteria pollutants in the atmosphere have decreased by over 77 percent.[3]

Clearly we've not only accepted responsibility for the environmental impacts of using coal, we've been quite effective at cleaning up our act. Whether the green groups admit it or not, clean coal exists in the here and now. Thanks to technological advances found in projects like FutureGen (U.S.), ZeroGen (Australia), and GreenGen (China), it is only going to get cleaner as we move toward near-zero emissions coal plants.

Are renewables abundant, free, and clean?

Despite the fact that coal is becoming increasingly clean, green groups continue to press for the removal of coal-based energy options. At the same time, the country is suffering through a historic economic downturn, with millions being laid off and millions more staring foreclosure and bankruptcy in the face. For those people who will face layoffs and skyrocketing energy prices, the anti-coal NGOs have nothing serious to offer as a replacement.[4]

In 2008, American families faced some of the largest increases in energy costs this country has ever seen. Those families living on incomes of $50,000 a year or less spent 20 percent of their after-tax earnings on energy. Energy costs made up 25 percent of after-tax expenses for families living on $30,000 a year or less.[5]

At a time when finances are tight, the options being presented by these groups will mean fewer energy choices and higher energy costs for everyone.

While renewables are loudly touted as a replacement for fossil fuels, a more realistic look at our options suggests that the NGOs plans will not be possible for decades into the future. Energy Information Administration (EIA) data shows that currently non-hydro renewables make up approximately 2 percent of our total generation mix. That is expected to grow to 3.5 percent by 2030. The EIA predicts that renewables will supply just 2 percent of world primary energy in 2030. EIA data also predicts that coal will grow from 50 percent of U.S. energy supply to 54 percent by 2030.[6]

Of course, renewables do play an important role in meeting our energy needs and there is no doubt that they will continue to play an increasingly important role over time. However, it will be many decades before they can even begin to meet our growing energy demands, let alone replace over half of our current generation capacity.[7] For the foreseeable future, we will keep relying on the abundance and affordability of our domestic coal reserves for the bulk of our energy supply. Using our technological advantage to make sure that energy is supplied as cleanly and efficiently as possible is the only reasonable option.

Despite the existence of numerous clean coal facilities in operation in the U.S. and around the world, a demonstrated history of improving environmental performance, the clear commitment of the coal industry to increasing efficiency and employing

new technologies like carbon capture and sequestration (CCS), as well as the open and repeated support – financial and verbal – for clean coal technologies by both of the major parties in Congress and the Obama administration[8], the anti-coal NGOs continue to confuse people with their arguments that there is no such thing as clean coal and their demands to phase out coal-based energy.

History shows us that the coal industry is investing billions in clean coal technologies and working to provide abundant, affordable, and clean electricity to the public. At the same time the demands of the anti-coal NGOs will actually limit reasonable energy options. While the coal industry is willing to work within reasonable timelines to expand the definition of "clean," the NGOs have a habit of ignoring successes in reducing emissions and focusing on the environmental boogeyman of the day; currently, CO_2. Without their arbitrary stamp of approval on an immediate 100-percent solution to that specific issue, they refuse to admit that coal could be "clean" and continue to lobby for its demise.

Their refusal to admit to the existence of clean coal technologies and their refusal to allow reasonable timelines for new technologies to be added to our generating infrastructure will only add to overall energy costs and limit our options. What they're doing actually flies in the face of reality. ◆

Jason Hayes is communication director for the American Coal Council (www.americancoalcouncil.org)

References

1 http://www.thisisreality.org/

2 The Reality Blog, "Coal's Clean Conscience" March 23, 2009 (emphasis added)

3 See http://www.americaspower.org/The-Facts/77-Percent-Cleaner - EPA data tracks the emissions of carbon monoxide, volatile organic compounds, sulfur dioxide, nitrogen dioxide, and particulate matter - http://www.epa.gov/airtrends/sixpoll.html

4 This Heritage Foundation blog post provides more reality on the argument that so-called green collar jobs will be able to mitigate the economic and social damage of losing mining and utility jobs across the country - http://blog.heritage.org/2009/03/18/the-green-job-myth-exposed/

5 http://www.americaspower.org/News/Research/The-disproportionate-impacts-of-energy-costs-on-lower-income-and-minority-families

6 EIA Annual Energy Outlook 2009 Reference Case

7 This, of course, does not deal with the intermittency factor associated with renewables. Wind-based load factors throughout the world are between 20 percent to 25 percent, meaning that most wind turbines are not producing electricity as much as 290 days of the year.

8 Republican residential candidate and senator, John McCain also openly supported the development and widespread use of clean coal technologies throughout the recent presidential campaign.

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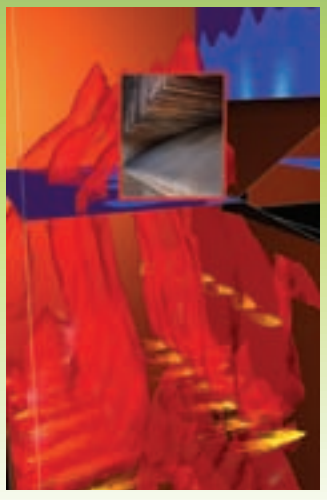

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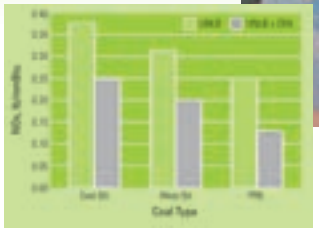

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Coal Power Saves Lives

The benefits of coal-generated electricity must no longer be ignored in public policy debates

By Paul Driessen, Congress of Racial Equality

There is no such thing as "clean coal," environmentalists insist. They claim burning coal to generate electricity emits soot and other pollutants that cause respiratory problems, lung cancer and heart disease, which kills 24,000 Americans annually.

It's the kind of assertion that eco-activist Bruce Hamilton says "builds the Sierra Club," by generating cash and lobbying clout for his and similar groups.

It's also disingenuous, unethical and harmful to human health and welfare.

Since 1970, unhealthy power plant pollutants have been reduced by almost 95 percent per unit of energy produced, notes air quality expert Joel Schwartz. Particulate emissions (soot) decreased 90 percent below 1970 levels, even as coal use tripled, and new technologies and regulations will nearly eliminate most coal-related pollution by 2020.

Today, the majority of power plant particulates are ammonium sulfate and ammonium nitrate. "Neither substance is harmful, even at levels tens of times greater than are ever found in the air Americans breathe," Schwartz says.

The bulk of U.S. airborne mercury comes from other countries, and coal-related mercury is dwarfed by emissions from natural sources like volcanoes and forest fires. In fact, mercury emissions from American power plants may account for as little as 0.002 percent of total annual worldwide mercury emissions.

The alleged deaths from coal are based on speculative links between pollution and disease, and unwarranted extrapolations

Thanks to coal-based electricity, CT scans, X-rays, colonoscopies and other examinations detect cancer, heart disease and other health threats, saving numerous lives every year.

from responsible estimates to levels that generate headlines and contributions. The alleged risks also ignore the enormous benefits.

Coal helps keep American homes, businesses, factories, airports, schools and hospitals humming. It provides a myriad of other benefits that are rarely admitted by anti-coal factions. So, even if we accept these groups' assertions as fact, the benefits of coal should certainly be considered in any policy debate – just as we acknowledge (and strive to reduce) motor vehicle deaths, but recognize the value of transporting people, products and produce.

Coal generates half of all U.S. electricity, and 60 percent to 98 percent in 20 states, according to the Energy Information Administration. Consumers in those states reap many benefits from paying an average of 7.1 cents per kWh – versus 13.1 cents per kWh in the 10 continental U.S. states that derive 0 percent to 25 percent of their electricity from coal.

Modern, state-of-the-art, low-pollution coal-fueled generators have replaced both antiquated power plants and the monstrous industrial furnaces that were the backbone of our nation's steel-making and industrial might just two generations ago. They build and power thousands of products that improve and save millions of lives.

Imposing excessive new regulations, or closing coal-fueled power plants, would produce few health or environmental benefits. But it would drive up electricity prices, exact huge costs on society – and bring factories, offices and economies to a screeching halt in states that are 80 percent to 98 percent dependent on coal: Indiana, Kentucky, Missouri, North Dakota, Ohio, Utah, West Virginia and Wyoming.

Coal's reliable, affordable electricity creates millions of high-paying jobs, which provide health insurance, rent and mortgage money, nutrition, clothing and retirement benefits for countless families. It keeps people warm (and alive) on freezing nights, and comfortable during summer heat waves like the 2003 scorcher that killed 15,000 elderly French citizens who didn't have air conditioning.

Thanks to coal-based electricity, CT scans, X-rays, colonoscopies and other examinations detect cancer, heart disease and other health threats, saving numerous lives every year. Life-saving and enhancing surgeries are performed because doctors have lights, lasers, computers, and sterile operating rooms and equipment. Premie wards and life-support systems carry people through critical illnesses, thanks to electricity from coal.

Children and adults get vaccinations that are created in modern laboratories and remain viable because of dependable refrigeration. Millions avoid deadly intestinal bacteria, due to refrigerators and freezers that preserve food, and water that is sterilized and piped in large measure because of electricity.

American families live in houses that are built from stronger materials and to higher standards, because of electricity. Tens of millions have been warned of natural disasters, and given time to flee, thanks to radios and televisions. Equal numbers have been saved from raging infernos, by firetrucks built in Oshkosh, Wis. and other plants powered by coal-based electricity.

Indiana gets 94 percent of its electricity from coal, enabling it to be the number 1 manufacturing state in the nation. In Indiana, Cummins Engine, Chemtura chemical, Guidant medical devices, Eli Lilly pharmaceuticals, Kimball office and

Wind turbines provide a mere

1 percent

of all U.S. electricity

Wind turbines require:
Wide expanses of land;
700 tons of steel;
concrete and fiberglass for each 1.5-MW (rated capacity) GE turbine;
millions of tons of steel;
concrete and copper for ultra-long transmission lines;
and millions more for backup generators that burn natural gas 24/7 while on standby.

healthcare furniture, and hundreds of other companies employ thousands and create vast arrays of products that improve, enrich and sustain lives.

President Obama and other politicians want energy prices to "skyrocket," to compel companies to slash carbon dioxide emissions by 80 percent (to levels last seen in the United States in 1905) – to reduce speculative global warming by perhaps 0.2 degrees by 2100.

Congressional Budget Office and other studies indicate this means increased energy costs of $1,300 to $4,000 per year for an average Indiana family. Poor families might get $500 per year in energy assistance, but most would get nothing – and would have to pay the extra out of food, medical, vacation, restaurant, college, retirement, charity, and rent or mortgage budgets.

Hoosier State supermarkets and department stores would face sticker shock increases of $15,000 or more a month. Manufacturers' electricity costs would soar by millions per year. Corporate productivity, competitiveness and profits would plummet. Thousands of workers would receive pink slips.

School districts would have to find millions more for buses, heating and lighting – and strapped families would have to foot those bills, or vote to cut sports, music and other programs. Churches and charities would see contributions fall, as demand for soup kitchens and homeless shelters rises. Hospitals, offices, airports and every other sector of Indiana's economy would confront similar pain.

Similar impacts would reverberate across the USA.

Environmentalists talk glibly about replacing America's 600-plus coal-fueled power plants, and the 2 billion megawatt-hours of electricity they generate annually. But with what?

Most greens detest nuclear power as much as they hate coal. They want to dismantle dams, not build new ones. They oppose drilling for natural gas that could partially substitute for coal, and fuel essential backup generators for wind farms. They support geothermal energy in theory, but rarely in practice.

They oppose construction of new state-of-the-art coal-fueled plants that America needs to supply more baseload power, to serve a growing population and electricity-hungry products and equipment of every description. Most environmentalists do support wind energy – and it must also play a role.

However, right now, wind turbines provide a mere 1 percent of all U.S. electricity. Wind power leader Texas gets just 2 percent of its electricity from breezes – versus 36 percent from coal. On blistering summer afternoons, when they most need reliable air conditioners, Texans can count on wind turbines to generate at only 2 percent to 9 percent of their installed capacity, because that's when the wind blows least. Compare that to 80 percent to 95 percent reliability for coal, gas and nuclear.

Wind turbines also require wide expanses of land, and enormous amounts of raw materials: 700 tons of steel, concrete and fiberglass for each 1.5-MW (rated capacity) GE turbine; millions of tons of steel, concrete and copper for ultra-long transmission lines to carry power from wind corridors to distant cities; and millions more for backup generators that burn natural gas 24/7 while on standby and in prodigious amounts every time they ramp up to electrify cities, whenever the wind stops cooperating.

Each turbine, generator and transmission line will have to be manufactured somewhere, from limestone, metal and petroleum deposits whose development will most assuredly be contested by environmentalists.

All this raises very basic questions.

How exactly will Texas replace 36 percent of its electricity with renewable energy? How exactly will Kentucky and North Dakota replace the 93 percent of the low-cost electricity that they get from coal?

What happens to all those benefits when coal power is legislated, regulated, litigated, protested, priced, taxed or cap-and-traded to the sidelines? To lives that are improved and saved with that electricity?

Specific answers, honesty and moral clarity are needed here. We rarely get it from environmental activists – who excel at denigrating and opposing mining and energy production, but do little to generate anything but hot air, cash and political power.

However, we should demand nothing less from our judges, representatives and government regulators. America requires real energy; it cannot operate on hot air or empty promises about renewable energy.

24,000 speculative deaths versus 6 million very real deaths is hardly a fair tradeoff, hardly an example of morality and environmental justice.

If we are going to end the recession, retain American jobs and living standards, and rejuvenate our economy, we will need vast quantities of electricity from coal – and every other energy source – now and for decades to come. The rest of the world also needs coal, to lift people out of poverty and save lives.

In impoverished countries, 2 billion people rarely or never have electricity. Al Gore uses more electricity in a week than 28 million Ugandans together use in a year.

Four million infants, children and parents die every year from lung infections – caused by smoke, soot and other pollutants from open fires that heat their homes and cook their meager food, because they don't have electricity. Two million more perish from intestinal diseases, caused by unsafe water and spoiled food, because they lack refrigeration, sanitation and water treatment.

Radical environmentalists trumpet the exaggerated death count from producing electricity here in the United States. Yet they callously battle every proposal to build coal, gas, hydroelectric or nuclear projects in these destitute countries.

24,000 speculative deaths versus 6 million very real deaths is hardly a fair tradeoff, hardly an example of morality and environmental justice.

America and all nations need to implement policies that honestly reflect the costs, benefits and power-generating capabilities of traditional and alternative energy options that exist in the real world. ◆

Paul Driessen is senior policy advisor for the Congress of Racial Equality and Committee For A Constructive Tomorrow, and author of Eco-Imperialism: Green power · Black death.

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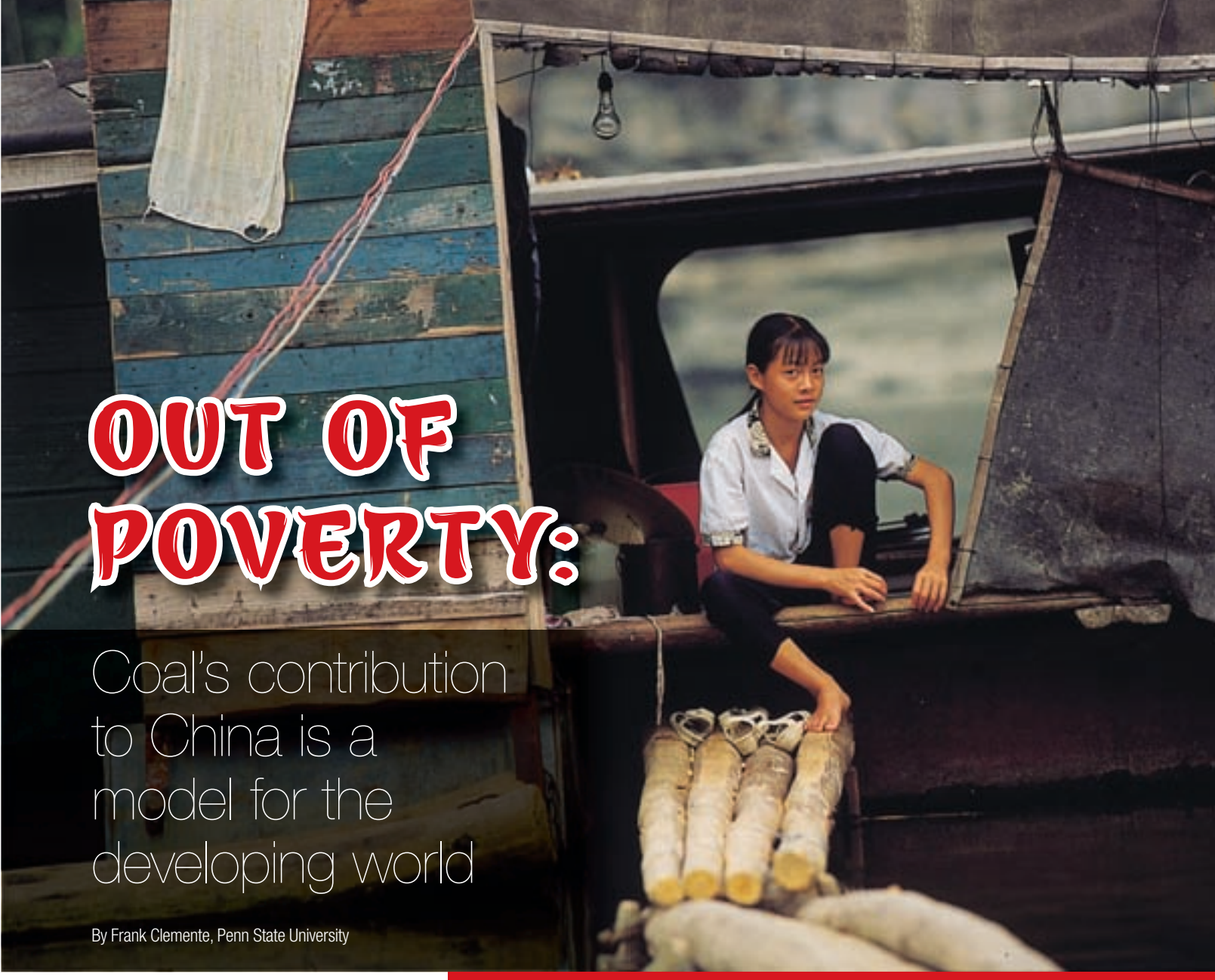


OUT OF POVERTY:

Coal's contribution to China is a model for the developing world

By Frank Clemente, Penn State University

"Every single one of the United Nations' Millennium Development Goals requires access to electricity as a necessary prerequisite"

– Berkeley Science Review, 2008

Energy in general, and electricity in particular, represent the lifeblood of modern society. Both economic and social progress depend upon energy that is available, adequate, reliable and affordable. Across the globe, energy deprivation takes a heavy toll on the human condition as billions toil grimly in the dark. People in nations without access to sufficient energy are far more likely to live shorter lives, drink contaminated water, fall ill, suffer hunger and be illiterate than their more fortunate counterparts in other parts of the world.

As the debate over the impact of energy development continues, it behooves us to remember the cost of not having enough energy can be measured in the most bleak terms – hunger, illness, poverty, despair and premature death.

The Coal-driven Sea Change in China

In 1970, China was in the world's socio-economic backwater:

- Over 600 million people lacked electricity
- The under 5 death rate was 120 per thousand children
- Only one in 500 people had a telephone
- The GDP per capita was $122

Through a series of energy-oriented five-year plans, however, China utilized increased energy production, especially coal-based electricity, to catapult itself to the center of the world's economic stage. In just 15 years, for example, China's coal provided access to electricity to over 450 million people – one and one-half times the population of the United States.

This unprecedented expansion of the coal-based electricity supply system positively impacted virtually every community, institution, business, family and individual in China. The electrification of both the cities and the countryside established an energy infrastructure that underlies China's historic move toward modernization and sets a role model for other developing countries.

"Electrification in China is a remarkable success story… the electrification goal [is] part of its poverty alleviation campaign… the most important lesson for other developing countries [is] that electrified countries reap great benefits, both in terms of economic growth and human welfare … China stands as an example." IEA, 2007

Coal is Fueling China's March Out of Poverty

To meet the burgeoning need for energy China turned to its most plentiful, stable, versatile and affordable resource – coal. China has only 3 percent of the world's oil and natural gas but has over 12 percent of the world's coal reserves.

Chinese policymakers recognized this asset early on and are committed to making the country a "moderately well off society" by 2030. Coal is seen as the continuing lever to move forward.

"Coal is a basic industry in China, and it is an urgent need to increase supply capacity … reduce environmental pollution, increase resource utilization efficiency and build a new coal industry … China is the largest developing country in the world, and developing the economy and eliminating poverty … remain the main tasks for the Chinese government." State Council of the People's Republic, 2007

It is undeniable that this plan is working. In terms of absolute numbers, no nation has made more progress toward the U.N. Millennium Development Goals than China. Coal consumption has grown from 13 quadrillion Btu in 1980 to 20 quads in 2005. By 2030, Chinese coal consumption will reach 95 quadrillion Btu.

Utilization of its coal resource enabled China to double energy output from 1990 to 2005. Coal provided 65 percent of that increase – i.e., more energy than Japan produces in an entire year. Further, coal will fuel over 60 percent of the increase through 2030.

China Is Using Coal to Develop its Industrial Base

The key element behind China's remarkable economic growth since 1980 has been the utilization of locally abundant coal supplies. The scale of industrial growth in China is unmatched in human history. China is now the world's leading producer of steel, non-ferrous metals, cement, and various other materials, which are contributing to the construction of a modern manufacturing base and associated technology, communication, and service industry infrastructure. As a result, China is the largest consumer of food and raw materials in the world. China generates most of its electricity from coal and more than half of China's electricity use occurs in manufacturing.

Further, the industrial use of coal is also expansive in China. Coal-based industrial development is the direct result of an explicit national development strategy that takes advantage of China's rich coal resource endowment.

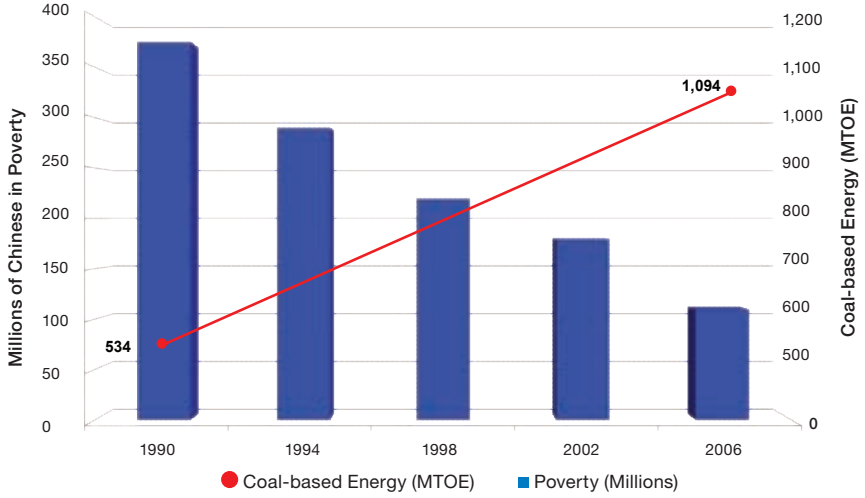
For example, steel is the most prevalent industrial material in the world and is used in a wide array of manufactured products, including automobiles, bridges, buildings, containers, and thousands of other durable goods. Steel is synonymous with strength, providing the backbone of infrastructure, such as skyscrapers and bridges. It is very versatile because it is easy to shape into many different forms.

The growth in steel production in China over the past decade has been explosive. During the late 1990s China began to consistently exceed 100 million tons in raw steel production, slightly ahead of total U.S. steel production. During 2006, China produced four-times that amount, nearly 420 million tons, more than a third of world output of 1.24 billion tons. Steel production is energy intensive and coal gives China an important advantage.

The broad use of a wide array of chemical products is the hallmark of an advancing economy. These products are used in thousands of consumer and producer products. To meet this higher demand for chemical feed stocks, China is leading a renaissance of coal-based chemical production.

This expansion in the use of coal for chemical production in China will continue. For instance, coal-based ammonia production is expected to more than double in coming years. These planned facilities alone will require more than 20 million tons of additional coal per year. The use of coal to produce chemical fertilizers will help insulate China from cost-push inflation of raw material costs that is currently weighing heavily on North American and European manufacturers of these products and which is contributing to a migration

Out of Poverty: Coal-based Energy has Propelled China Forward



Note: Poverty measure follows World Bank Definition of $1 per day income
Source: IEA, 2007; EIA, 2008

A Hong Kong ghetto

of these industries to access natural gas reserves in the Middle East.

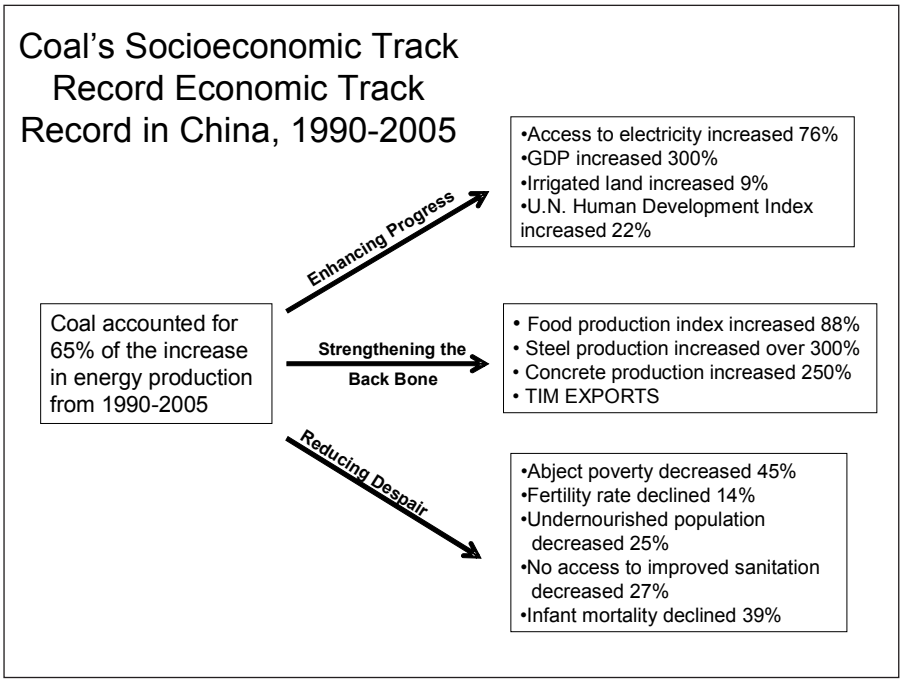
China is also pioneering the production of dimethyl ether (DME) synthesized from methanol produced from coal. DME is an excellent substitute for diesel fuel oil and liquid propane gas (LPG). The energy infrastructure requirements for DME are very similar to LPG. The extensive LPG network in China will likely facilitate widespread adoption of DME. China plans to produce more than 7 million tons of DME per year. The associated coal requirements would approach 30 million tons per year.

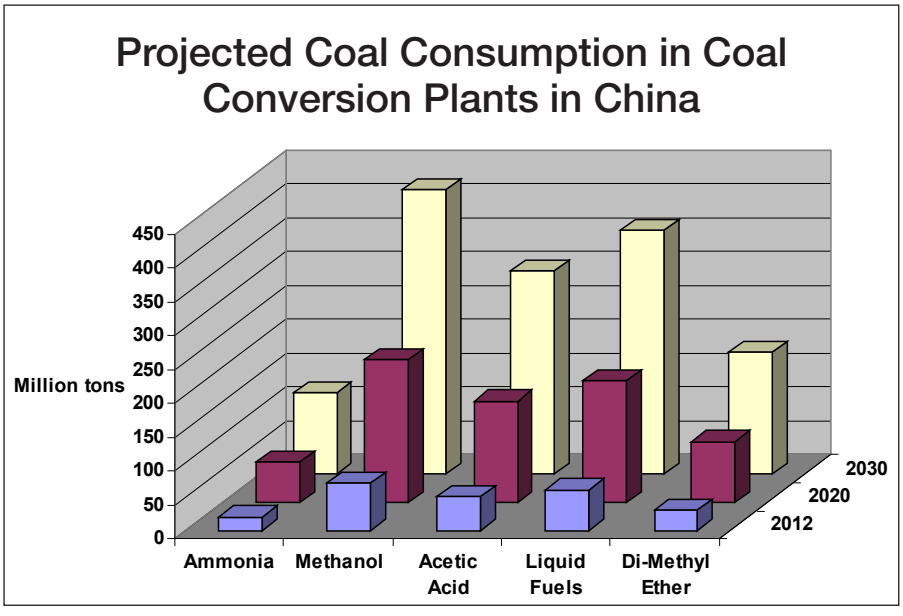
This supportive policy environment and favorable economic conditions imply a robust future for coal conversion to fuels and chemicals in China. Within five years, China will likely consume over 230 million tons of coal annually in these activities. This market could triple by 2020 and approach 1.5 billion tons in 2030.

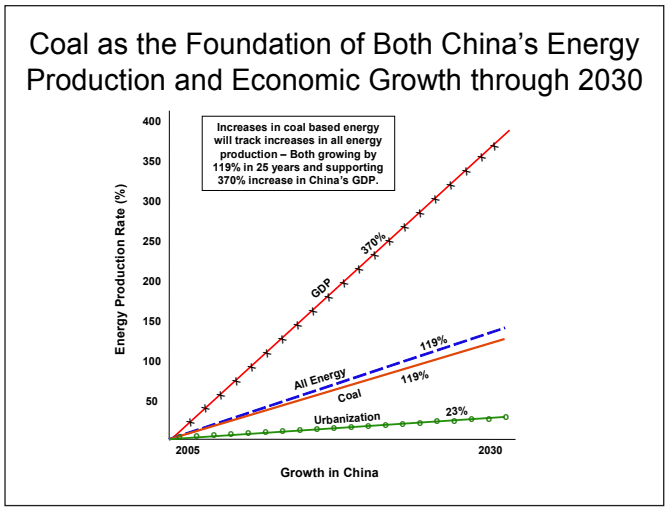
In China, the Energy Future Belongs to Coal

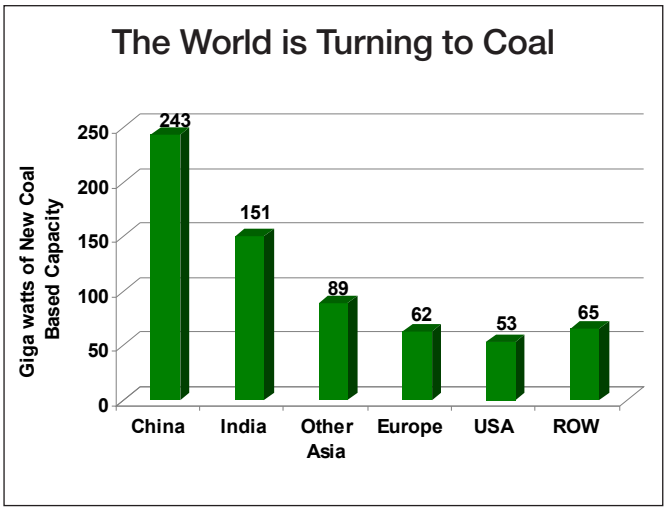
Given the confluence of: (1) escalating demand for energy, (2) availability and affordability of coal, (3) recognition of the asset base by officials, (4) the versatility of coal conversion and (5) the continuous emergence of clean coal technologies, there is little doubt that coal will maintain and expand its role as the cornerstone of China's energy supply – especially electricity.

To attain this growth, China is moving ahead with clean coal technology. "**GreenGen**" will be the first near-zero









emissions coal-fueled power plant with carbon capture and storage (CCS) in China.

The US$1-billion GreenGen project will use advanced coal-based technologies to generate electricity for Chinese families and businesses using China's most abundant energy resource. It will be capable of hydrogen production and will advance carbon dioxide capture and storage, providing a clean energy prototype to address carbon dioxide concerns. Led by managing partner China Huaneng Group, with Peabody Energy as an important partner, the GreenGen Company will design, develop and operate an integrated gasification combined cycle (IGCC) power plant near Tianjin, southeast of Beijing. A 250-megawatt plant will be built in the initial phase, expanding to 650-megawatts in later phases.

And Coal Is the Fuel of Choice for Billions Across the World

China is providing a template of how coal can be used to pull people out of poverty and propel an entire society toward higher living standards. India and many other countries around the world are learning from China's example. They, too, are using low cost coal resources to fuel the production of material-intensive infrastructure, providing electricity to millions of households, and developing complex manufacturing and service industries on modern electricity grids utilizing the latest information technology. As billions around the globe are demonstrating today that,

- Although coal and electricity industries are capital intensive, they greatly expand the scale of energy availability with economies of scale that drive costs down.
- These price declines allow households to switch from subsistence fuels to commercial energy services, generating significant improvements in human welfare and substantial increases in the quality and quantity of labor services.
- More productive labor and low-cost energy allow the production of energy-intensive materials for developing the infrastructure and the industrial base.
- With infrastructure in place, such as electricity, transportation, and communication networks, manufacturing and service industries prosper.
- The economy then achieves take-off and the development process accelerates with coal as the key foundation underlying this growth. ◆

Frank Clemente, Ph. D. is a professor of sociology at Penn State University

Liquids From Coal:

Opportunities and Challenges

By Dr. Roger H. Bezdek, Management Information Services, Inc.

Energy Security

During the U.S. "oil addiction" and reducing our dependence on oil imports will be very difficult, since:

1. The U.S. consumes more than 21 million barrels of petroleum products per day, over 60 percent of which is imported;
2. Oil accounts for 95 percent of the energy used in the U.S. transportation sector;
3. Over 7.7 million households, primarily in the northeastern U.S., heat their homes with distillate fuel oil;
4. Refined petroleum products are the basic feedstocks required in the production of many manufactured products, such as plastics;
5. Oil refining produces asphalt and road oil and virtually all lubricants used in transportation and industry;
6. The U.S. agricultural system is highly dependent on oil to seed, grow, manufacture, preserve, and ship food products, and fertilizers, pesticides, herbicides, irrigation, and farm equipment all depend on oil;
7. National security depends on the timely movement of military personnel and equipment.

Developing unconventional liquid fuel supplies, such as coal-to-liquids (CTL) could help ease America's dependency on oil.

Petroleum accounts for about 40 percent of U.S. energy consumption, and that percentage has grown consistently over the past two decades due to steady increases in fuel consumption. EIA projects this 40 percent figure will persist in American society through 2030 as the nation maintains its dependence on oil.[1] Transportation accounts for more than two-thirds of U.S. oil consumption, and this portion is increasing. Further, 95 percent of U.S. transportation is dependent on liquid fuels, and this dependence will persist for decades to come.[2]

The U.S. faces the prospect of extended long-term oil supply shortages, rising prices, continued large trade deficits, and economic and national security vulnerability unless industry and government act decisively to develop unconventional U.S. liquid fuel supplies, such as coal-to-liquids (CTL). There are four factors that highlight U.S. vulnerability:

1. The nation is dangerously dependent on the OPEC cartel and other oil suppliers;
2. A growing number of experts, including some major oil companies, believe that within the next decade world conventional oil production will peak and begin a steady decline, and some contend that we have already reached the peak;
3. The U.S. faces unprecedented global competition for oil from China, India, and other nations, and this competition will grow more intense as supplies tighten and oil-importing countries strive to secure oil supplies;

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4. The current U.S. liquid fuels infrastructure is vulnerable to natural disasters (as demonstrated during Hurricane Katrina) and to terrorism. To insure against these risks, and to provide for price stability and future economic prosperity and national security, the U.S. must reduce its growing dependence on foreign oil suppliers by producing its own liquid fuels using technologies such as CTL.

Superior Air Quality Values of CTL Fuels

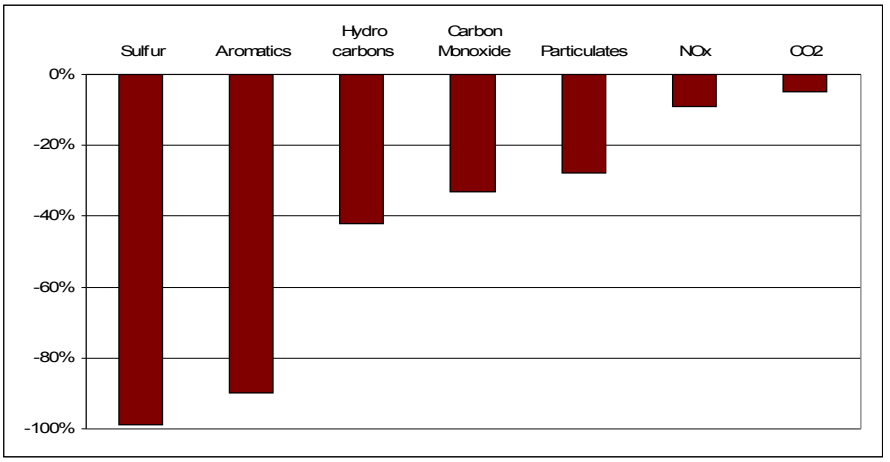
The CTL industry has a 60-year world history, and the chemical science has been tested and is well-documented. CTL with carbon capture and storage (CCS) will have resultant life cycle emissions comparable to the life-cycle emissions of gasoline and diesel currently in use. In addition: Co-generating and providing electricity for the local community will decrease life-cycle CO_2 emission by 35 percent; Co-processing with 10 per cent to 50 percent locally derived waste biomass can further decrease life-cycle plant CO_2 emissions to zero; CTL fuels are biodegradable, clean, clear, and colorless and provide an immediate replacement fuel for vehicles and aircraft;[3] and CTL emissions originate from a single source and can be controlled to levels below current petroleum refinery standards.[4]

When compared to the diesel fuel currently used in vehicles, CTL-derived diesel has a lower emission profile. As shown in Figure 1, compared to typical diesel emissions the cleaner Fischer-Tropsch (FT) diesel will have an estimated 99 percent less sulfur, 90 percent less aromatics, 42 percent less hydrocarbons, 33 percent less carbon monoxide, 28 percent less particulates, 9 percent less nitrous oxides, and 5 percent less carbon dioxide.

Further, as shown in Figure 2, utilizing advanced CCS technology, life cycle CTL greenhouse gas (GHG) emissions can eventually be reduced to levels below those of imported oil, which is a critical factor in securing federal government support and for prospective military use of CTL.

Figure 1

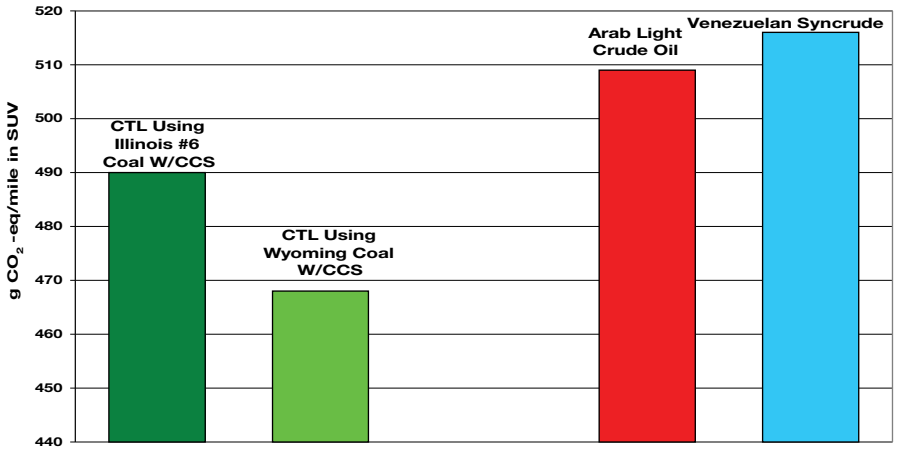
CTL Emissions Reductions Relative to Typical Diesel Fuel



Source: Rentech, Inc., "Emissions and Environmental Performance of Coal-to-Liquids Fischer-Tropsch Fuels," April 12, 2007.

Figure 2

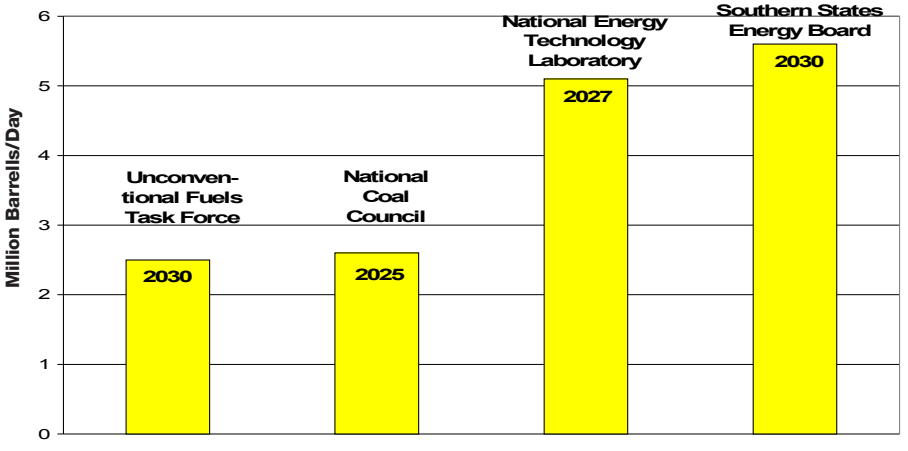
Potentially Achievable Life Cycle GHG Emissions



Source: John J. Marano and Jared P. Ciferno, *Life-Cycle Greenhouse-Gas Emissions Inventory For Fischer-Tropsh Fuels,* report prepared for the U.S. Department of Energy, National Energy Technology Laboratory, 2001, and Management Information Services, Inc., 2008.

Figure 3

Estimates of U.S.CTL Potential



Source: Management Information Services, Inc., 2008.

CTL plants in the U.S. and in Other Nations

The status of CTL plant development in the U.S. is summarized in Table 1 and Figure 4

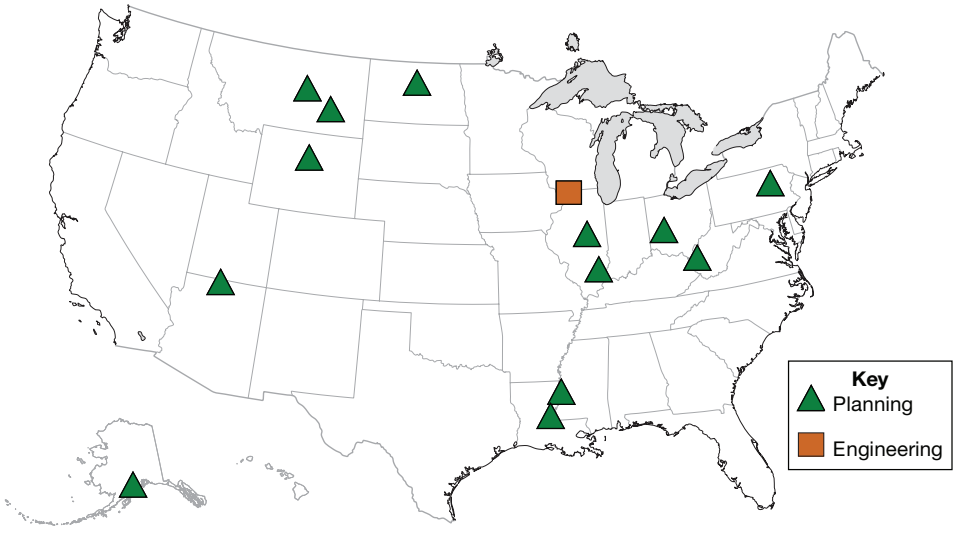
Table 1

CTL Activities in the U.S.

Project Lead	Project Partners	Location	Feedstock	Status	Capacity (bpd)	Cost
American Clean Coal Fuels	None cited	Oakland, IL	Bituminous	Feasibility	25,000	NA
Synfuels, Inc.	GE, Haldor-Topsoe, NACC, ExxonMobil	Ascension Parish, LA	Lignite	Feasibility	NA	$5 billion
DKRW Advanced Fuels	GE, ExxonMobil	Medicine Bow, WY	Bituminous	Permitting	18,000-20,000	$2-5 billion
AIDEA	ANRTL, OPC	Cook Inlet, AK	Sub-bituminous	Feasibility	80,000	$5-8 billion
Mingo County	Rentech	WV	Bituminous	Feasibility	20,000	$2 billion
WMPI	Sasol, Shell, DOE	Gilberton. PA	Anthracite		5,000	$612 million
Rentech/ Peabody	NA	MT	Sub-bituminous /lignite	Feasibility	10,000-30,000	NA
Rentech/ Peabody	NA	Southern IL Southwest IN Western KY	Bituminous	Feasibility	10,000-30,000	NA
Rentech	Kiewit Energy Co., Worley-Parsons	East Dubuque, IL	Bituminous	Construction (2010)	1,800	$800 million
Rentech	Adams County	Natchez, MS	Coal/ Petcoke	Feasibility	10,000	$650-$750 million
Rentech	Baard Energy	Wellsville, OH	Sub-bituminous	Feasibility	35,000	$4 billion
Headwaters	Hopi Tribe	AZ	Bituminous	Feasibility	10,000-50,000	NA
Headwaters	NACC, GRE, Falkirk	ND	Lignite	Feasibility	40,000	$3.6 billion

Figure 4

Status of CTL Plant Development in the U.S.



CTL Fuels Compatible With Existing Liquid Fuels Infrastructure

CTL produces ultra clean liquid fuels that are compatible with the existing transportation liquid fuels infrastructure. In addition, CTL can provide a drop-in fuel for military and civilian aircraft, which have highly specialized fuel requirements. Unlike biofuels, which are not compatible with aircraft requirements, CTL fuels meet current aviation specifications and require no aircraft redesign. Coal-derived aviation fuels are presently being used in South Africa.

U.S. CTL Potential

The U.S. is endowed with the largest coal reserves in the world, and recoverable reserves are estimated to be about 270 billion tons. In 2005, the U.S. produced 1.13 billion tons of coal, second only to China. Based on EIA's 270-billion ton reserve estimate, the U.S. has more than a 200-year supply of coal at current production rates. Even if production were to be doubled, the recoverable reserve base estimated by EIA would last for more than a century. Potential coal resources are even larger, and according to EIA: Estimated Recoverable Reserves (ERR) total 267.3 billion tons;[5] the Demonstrated Reserve Base (DRB) totals 494.4 billion tons;[6] Identified Resources total 1,730.9 billion tons;[7] and Total Resources are 3,968.3 billion tons.[8]

In summary, the U.S. has significant coal resources – far more than any other country – available for its domestic power generation and transportation fuel needs. Several recent studies of U.S. CTL potential have been conducted and, as shown in Figure 3, all estimate substantial potential over the next several decades:[9] 1) the Southern States Energy Board (SSEB) Study (July 2006) estimated 5.6 million bpd by 2030;[10] 2) the USDOE/ National Energy Technology Laboratory Study (July 2006) estimated 5.1 million bpd by 2027;[11] the U.S. National Coal Council Study (March 2006) estimated 2.6 million bpd by 2025;[12] and the USDOE Unconventional Fuels Task Force (November 2006) estimated 2.5 million bpd by 2035.[13]

Preliminary estimates indicate that CTL plants are viable if oil is selling in the range of $60 to $80 per barrel.

Economic and Financial Analysis of CTL

Estimating the Cost of a CTL Plant

There are several factors affecting the assessment of CTL plant costs:

1. There are few plants in operation, and therefore insufficient data exist on which to base cost estimates;
2. Costs will change significantly depending on whether it is the "first of a kind" plant or the "Nth plant;"
3. As plants are built, costs will tend to come down;
4. Plant costs will vary with plant size, location, capacity factor, climate, product slate, and coal type;
5. Plant commercial viability will be affected by whether or not there is an established infrastructure of labor force, roads, railway, power supply, etc.;
6. Differing assumptions may be made about the economic factors such as interest rates on any capital borrowed, the debt/equity ratio, how near to full capacity the plant will run, and other assumptions; and
7. Engineering estimates are often made by contractors and development organizations who do not have the perspective of a plant owner or investor.

Assessing Commercial Viability

To assess the commercial viability of a CTL plant the following factors must be considered: CAPEX and operating costs, inflation rates, initial plant output, debt equity: and interest, depreciation, tax rates, on-stream time, coal requirements and cost relative to the power value of electricity produced, co-products value, the discount rate, the plant life, siting and permitting schedule and costs, the construction period, and others. Once reasonable values for the above variables are specified, sensitivity analyses need to be conducted to ascertain the significance of the different factors in determining the profitability and commercial viability of the plant.

Preliminary estimates indicate that CTL plants are viable if oil is selling in the range of $60 to $80 per barrel. However, given the large capital investment required, the length of time needed to bring production online, and the many plant-related economic and technical uncertainties, in-depth analysis of each specific plant is required to estimate potential profitability and to facilitate financing. ◆

Dr. Roger H. Bezdek is president of Management Information Services Inc. (MISI) and coauthor of Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management (the Hirsch report)

References

1 U.S. Energy Information Administration, *Annual Energy Outlook,* 2008, December 2007.

2 EIA projects that world unconventional production (including oil sands, bitumen, biofuels, coal-to-liquids, and gas-to-liquids) will increase by 9.7 million barrels between 2003 and 2030, representing 25 percent of the total world liquid fuel supply increase. See U.S. Energy Information Administration, *International Energy Outlook,* June 2006.

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5 DOE,EIA, "Recoverable Coal Reserves at Producing Mines, Estimated Recoverable Reserves, and Demonstrated Reserve Base by Mining Method," 2004, Table 15.

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7 EIA, "EIA Coal Reserves Data," [http://www.eia.doe.gov/cneaf/coal/reserves/chapter1.html#fig2], 1997. The estimates were actually compiled by the USGS.

8 Ibid.

9 The estimates in Figure 3-6 differ based on the degree of aggressiveness assumed in the studies concerning CTL development efforts. For example, the SSEB study examined options for eliminating U.S. oil imports by 2030, and the NETL study assumed a crash effort beginning in 2006 to address peak oil concerns. On the other hand, the NCC and Unconventional Fuels Task Force assumed less aggressive CTL development initiatives.

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Doing What's Never Been Done

Basin Electric moves forward with CO_2 capture demonstration project

By Andrea Blowers, Basin Electric Power Cooperative

Antelope Valley Station near Beulah, N.D.

It's not new for Basin Electric to tackle projects that have never before been commercially demonstrated. The cooperative is known for initiating "serial number one" projects – meaning the very first application for that kind of technology.

So, it's no surprise Basin Electric Power Cooperative, in Bismarck, N.D., is working to demonstrate carbon dioxide (CO_2) capture technology on an existing commercial-scale coal-based power plant. To date, that hasn't been done. But, while uncertainty is part of the commercialization process, Basin Electric continues to move forward.

"We're very excited about being involved with this innovative project," says Ron Harper, Basin Electric CEO and general manager. "At a time when our nation is facing an energy crisis, it's thrilling to be part of a unique project that will use a homegrown, abundant energy source."

A Dual Purpose Project

In summer 2007, the cooperative solicited technology companies for the CO_2 capture demonstration at its existing Antelope Valley Station near Beulah, N.D. Antelope Valley consists of two coal-based electric generating units, each rated at 450 megawatts. Basin Electric chose Antelope Valley Unit 1 because of the plant's close proximity to the cooperative's subsidiary, Dakota Gasification Company's Great Plains Synfuels Plant, which has the largest CO_2 capture project in the world.

The commercial demonstration will draw the equivalent of a 120-megawatt slipstream from the unit and will be designed to capture up to 90 percent of the incoming CO_2. Powerspan's ECO_2™ capture process was, at that time, identified as the most promising low-cost option for commercial deployment and for its perceived ability to best integrate with Basin Electric's operations.

It's a post-combustion process that uses an ammonia-based solution to capture CO_2 from the flue gas of a power plant. Once the CO_2 is captured, the ammonia-based solution is regenerated to release CO_2 and ammonia. The ammonia is recovered and sent back to the scrubbing process, and the CO_2 is in a form ready for geological storage.

The captured CO_2 is intended to be delivered by pipe to the existing compressor facility at the Synfuels Plant and injected into the 205-mile pipeline system. The Synfuels Plant captures 4.5 million tons of CO_2 each year, and has captured more than 16 million tons to date. The plant currently delivers on average about 152 million standard cubic feet (mmscf) of CO_2 every day to two Canadian oil fields (Weyburn and Midale) where it's used for enhanced oil recovery.

The pipeline that runs from the Synfuels Plant to Canada passes through the heart

"Laying just 5,000 feet of pipe from Antelope Valley and connecting it to the Synfuels Plant's CO_2 pipeline would create an immediate use for the CO_2 captured at Antelope Valley"

– Mike Paul, Basin Electric vice president of engineering and construction

of North Dakota's oil country, and when it was laid, 11 tap points were installed.

"Laying just 5,000 feet of pipe from Antelope Valley and connecting it to the Synfuels Plant's CO_2 pipeline would create an immediate use for the CO_2 captured at Antelope Valley," says Mike Paul, Basin Electric vice president of engineering and construction. Approximately 1 million tons of CO_2 will be captured and sequestered annually from the Antelope Valley project.

Success Afforded Opportunity

The logistics of moving forward with demonstrating CO_2 capture at the Antelope Valley Station would have been much more complex without the carbon capture achievements at the Synfuels Plant.

The plant is recognized globally as being part of the largest CO_2 capture and sequestration project in the world. The other part of the project is based in Canada, in the above noted Weyburn and Midale oil fields.

In October 2000, Dakota Gasification Company began sending CO_2 from the Synfuels Plant to oil fields in Canada, where it's injected into oil formations to increase production and lengthen the life of the field. The CO_2 is compressed by eight-stage centrifugal compressors manufactured by GHH Borsig – now MAN Turbo – each powered by 20,000 horsepower Alstom motors. The CO_2 is then shipped through 12- and 14-inch diameter carbon steel pipe to Weyburn and Midale.

The CO_2 is expected to be permanently sequestered and is being monitored by the International Energy Agency Weyburn-Midale CO_2 Monitoring and Storage Project.

The original project began as a $25-million study to find out what happens when the CO_2 goes into the ground. The success of the first phase of the study (2000-04), helped to build the framework to encourage the implementation of CO_2 storage on a worldwide basis. Currently in its final phase (2005-11), this international project is the world's first CO_2 measuring, monitoring and verification initiative.

The success at the Synfuels Plant has opened up opportunities for Basin Electric to pursue other projects, specifically the one at Antelope Valley Station.

Where It's At

In 2008, Basin Electric completed the feasibility study for the CO_2 capture demonstration project at Antelope Valley and is preparing to move into the front-end engineering and design (FEED) study phase. This study will provide Basin Electric with engineering detail and cost estimates to evaluate the economic viability of the demonstration project.

According to Jim Sheldon, project manager, once the FEED study is complete, the project team will make a

recommendation to the Basin Electric board of directors whether or not to move ahead with the project. Sheldon said if a project commitment is made in the third quarter of 2009, commercial operation of the demonstration project is scheduled to be accomplished in late 2012.

The estimated cost of the project is $300 million. With such a large price tag, Harper says it's imperative the federal government help support a demonstration project like this one.

"If we're going to revolutionize the way coal is used in the future, the government needs to help meet this challenge and share in the risk."

And to its credit, it is. In January, the U.S. Department of Agriculture announced up to a $300-million loan to Basin Electric for the project. The announcement was made by then-USDA Secretary Ed Schafer.

Harper says the loan is vitally important for three reasons.

"One, it helps to keep consumer costs affordable by providing low-cost funding. Second, it helps for the continuing development of clean coal technologies. Third, it sets an example for other federal agencies to emulate."

The cooperative has also submitted an application for funding assistance in the third round of the U.S. Department of Energy's Clean Coal Power Initiative (CCPI). Basin Electric is seeking $100 million for the Antelope Valley project.

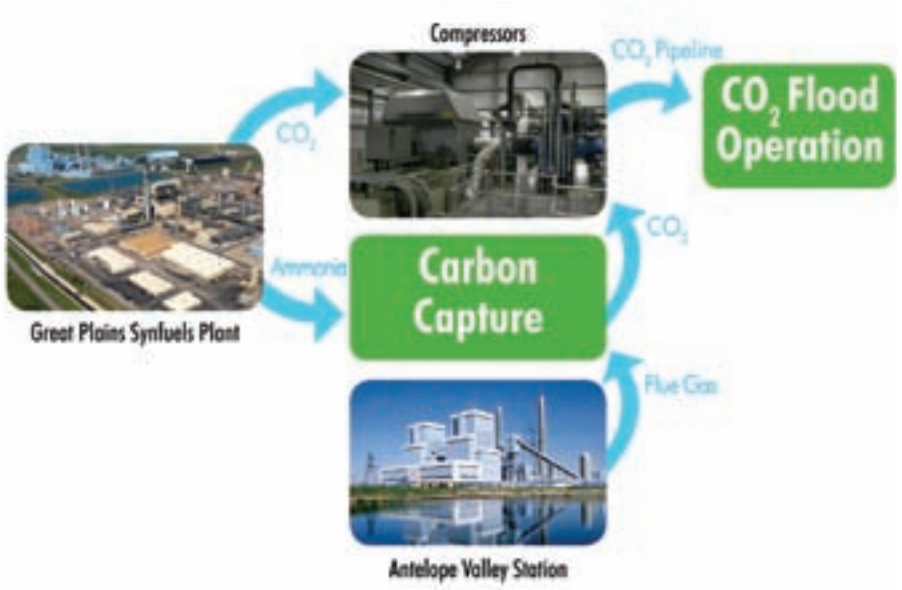
The CCPI is a cost-sharing collaboration between the U.S. government and industry to increase investment in clean coal technology by demonstrating advanced coal-based, power generation technologies. Its primary goal is to accelerate the readiness of advanced coal technologies for commercial deployment.

Though Basin Electric has a diverse energy portfolio and runs extremely clean coal-based plants, the cooperative is ready to move to the next level.

"The greatest reductions in CO_2 emissions from the power sector can be achieved by developing and proving a technology that can be retrofitted to the hundreds of existing coal-based power plants in the U.S. This is an important first step to achieving that goal," Harper says. ◆

Andrea Blowers is a staff writer/editor with Basin Electric Power Cooperative

Carbon Capture Optimization Project



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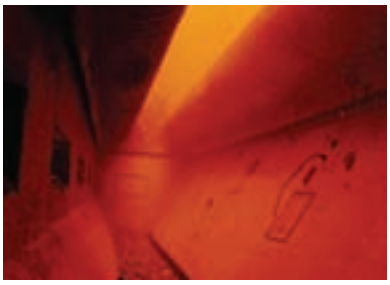

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Coal ash is not toxic, staying "informed" may be

By Melissa Hendricks, American Coal Ash Association

Watching children's sitcoms on Disney Channel with my 9-year-old daughter is entertaining, with a lot of cringe factor. These shows indulge superficial values and dispense smart-aleck banter requiring lots of "parental guidance." Yet, I do want my daughter to have some pop-culture exposure so she's not too geeky and can relate to friends.

Adults are more sophisticated. We relate by keeping up with current events. We read major daily newspapers, listen to National Public Radio, watch the "fair and balanced" version of TV news, and scan other sources to stay "informed."

Can we with confidence say the public is truly informed on energy issues? The news media cater to our hunger for drama, desire to be entertained and need to belong. How interesting would news be if reporters didn't ponder the inane possibilities? "Is coal ash evil?" asked a *New York Times* reporter during a recent interview. Do we really have to give these questions the time of day? Unfortunately, the answer is "yes, we certainly do." We must answer these queries and attempt to get our message afloat in a sea of muck keeping the masses ignorant of the complexities we face around energy policy and technology.

Today's public demands instantaneous, multimedia information sifted through rushed journalists who leave out key particulars, data, facts, and what energy professionals would deem the bare essentials. Attempts to counter misperceptions or set facts straight are relegated to small "oops, we goofed" corrections buried in the paper or a "too little, too late" op-ed after the gaff was replicated on the Internet for the ba-zillionth time.

We in the coal ash industry are experiencing front-line frustration. Activist groups that reign over causes from dolphin-safe tuna to poison ink exposure are delighting their funding sources by taking on another bankable issue receiving a lot of attention following the spill in Tennessee: "toxic coal ash." Coal ash is related to an even larger, more bankable issue: coal-fueled energy.

CRINGE FACTOR: Children's TV shows may indulge superficial values, but news coverage can be worse, leaving out key particulars, data, facts and what energy professionals would deem the bare essentials.

Coal ash is not toxic. For a start it's not a single entity. Coal ash is the generic term referring to several very distinct materials produced when we combust coal to produce electricity. Our industry refers to these materials as "coal combustion products" or "CCPs" to emphasize that they have significant commercial value. A multi-billion-dollar industry has arisen over the past 50-plus years around the use of these materials, which include fly ash, bottom ash, boiler slag, and various forms of flue gas emission control/desulfurization materials.

Each of these materials varies further by coal source and composition, combustion technologies, emissions controls technologies, and other significant complexities. Yet, media coverage has deemed "coal ash" a single entity to fear, a threat to human health and the environment. Reporters long jaded since journalism school are spoon-fed a diet of simplistic slogans from activists filling their coffers "green" with popular causes.

Fly ash, the substance that spilled in Tennessee, has an elemental composition comparable to the soil in the average American's backyard. Unless we're willing to sift up every yard in America, perhaps journalists ought to ponder the meaning of "toxic." Take drinking water. Our taps deliver parts-per-million of chlorine, lead, arsenic, mercury, fluoride and other substances proven harmful to humans. Does this mean our drinking water is "toxic"? Absolutely not. It means we must place our exposure levels in the context of quantity and in the context of reality. In reality coal ash offers our society extraordinary environmental and economic benefits without harm to public health and safety when properly managed.

In 2007, the United States produced 130 million tons of coal combustion products. While 43 percent were used beneficially, nearly 70 million tons were disposed of. By using coal ash instead of disposing of

Coal fly ash is expected to continue to play a major role in the concrete market by replacing 15 percent to 35 percent of portland cement in most applications.

it in landfills we are avoiding the environmental degradation and energy costs associated with mining virgin materials. We are building stronger, longer-lasting structures that save taxpayer dollars and minimize environmental impacts.

For every ton of fly ash used in place of portland cement about a ton of carbon dioxide is prevented from entering the Earth's atmosphere. Also, it takes the equivalent of 55 gallons of oil to produce a single ton of cement.

Another significant benefit of using fly ash is that it requires less water than portland cement, conserving a limited resource, while also reducing a project's water and equipment costs.

Boiler slag, which replaces sand in blasting grit, has the benefit of being free of silica which eliminates the potential health risk of silicosis. Flue gas desulfurization materials are used in 30 percent of U.S. wallboard products, avoiding the need to mine gypsum. Environmentally and economically, it makes more sense to use existing materials than to mine new ones.

The markets for coal combustion products have grown steadily. Coal fly ash is expected to continue to play a major role in the concrete market by replacing 15 percent to 35 percent of portland cement in most applications. Coal ash use in other building products is also expected to grow as green building becomes more prominent and more end users understand the benefits of coal ash utilization.

Programs that promote coal ash use include the EPA's Coal Combustion Products Partnership (C2P2), Green Highways Partnership, and U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED®) program, as well as many other local, regional and international sustainability programs. Other programs such as the Industrial Resources Council connect industry associations together to achieve similar goals, e.g. CCPs, foundry sand, construction and demolition debris, and rubber.

The U.S. Department of Energy and U.S. Environmental Protection Agency set goals to increase coal ash utilization to 50 percent by 2011. Given the downturn in the economy and threat of uninformed political decisions, this goal may be difficult to achieve. If coal ash were deemed "hazardous," the consequences would be enormous. Coal combustion products constitute a multi-billion-dollar industry, with hundreds of thousands of jobs at stake. The U.S. Bevill Amendment to the Resource Conservation and Recovery Act concluded coal ash did not warrant federal hazardous waste regulation and left the management of coal ash in the hands of individual states, which are best suited to address unique regional complexities.

The American Coal Council with the American Coal Ash Association is featuring several fact sheets in this issue to help support and deliver the important message that coal ash is ***not toxic***. Please also see our Web site: www.coalashfacts.org for more information. ◆

Melissa Hendricks is the Communications Director at the American Coal Ash Association.

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Coal combustion products are not hazardous and are safe for human health when managed properly

- Coal ash has been studied extensively for decades by universities and government regulatory agencies. The U.S. Environmental Protection Agency and other government bodies have determined that it is non-hazardous.
- Designating coal ash as hazardous or toxic is counter to scientific evidence and would seriously limit the current widespread uses of these materials today.
- The chemical constituents of coal ash are commonly found in many everyday products and natural materials, including soil.

Beneficial use of coal combustion products can result in significant societal and environmental benefits

- Coal ash use is supported by the federal government and many states as a way to reduce the impact of our industrial practices on the environment.
- Coal ash can be used beneficially in a variety of applications – many that are sustainable construction practices, as in materials such as concrete. Each ton of fly ash used in the production of concrete can offset the production and use of up to a ton of cement. That, in turn, could eliminate almost a ton of carbon dioxide emissions from cement production.
- Beneficial use of fly ash in concrete production reduced U.S. greenhouse gas emissions by as much as 15 million tons in 2007 alone. Furthermore, using CCPs saves the energy needed to extract and process other materials for these same uses.
- Fly ash in concrete reduces water requirements for mix designs, reduces the energy needed to produce concrete, and creates longer-lasting, more durable products that do not have to be replaced as frequently.
- Coal ash that is beneficially used does not need to be disposed of in landfills thus reducing the need for new or expanded disposal facilities while at the same time conserving natural resources for other uses.

Beneficial use of coal combustion products has increased steadily since the 1960s and contributes to economic growth

- The U.S. utility and construction materials industries have nearly doubled beneficial use of coal ash from 22 percent in 1989 to 43 percent in 2007.
- Annually the production and use of CCPs contribute more than $4 billion to the U.S. economy and provide jobs for thousands of workers.

Significant environmental and social benefits would be lost and volumes of material being disposed of would increase substantially if they were classified as hazardous.

For more information please visit www.coalashfacts.org

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FS #1 3/10/09

Coal Combustion Products: Not a Hazardous Waste

Coal ash has been studied extensively for decades by universities and government regulatory agencies. The U.S. Environmental Protection Agency and other government bodies have determined that it is non-hazardous.

- Based on all of the available information, EPA has concluded that regulation of the four large-volume fossil-fuel combustion wastes as hazardous waste under RCRA Subtitle C is unwarranted. (U.S. EPA, August 9, 1993)
- "In today's action, we are determining that regulation of fossil fuel combustion (FFC) wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA) is not warranted." (U.S. EPA, May 22, 2000)
- Mercury is strongly retained by the resulting coal combustion residues and is unlikely to be leached at levels of environmental concern. (U.S. EPA, January 2006)

Designating coal ash as hazardous or toxic is counter to scientific evidence and would seriously limit the current widespread uses of these materials today.

- After studying coal-fired utility wastes in 1993, the EPA decided to permanently exclude large-volume coal-fired utility wastes, including fly ash, bottom ash, boiler slag and flue gas emission control waste from the definition of hazardous waste. (US EPA RCRA Orientation Manual, 2008).
- Studies have shown that although trace elements may leach from coal ash in prolonged contact with the water table, they do not migrate far from the ash site and are present in very low concentrations, and therefore do not present a health threat. (Electric Power Research Institute, 1998)

The chemical constituents of coal ash are commonly found in many everyday products and natural materials. They are present in soil, rock and other parts of the earth's crust.

- The ranges of major elements in coal fly ash and soils have been evaluated and are available in National Bureau of Standards Certificate of Analysis Standard Reference Material 1633a, January 5, 1985. The comparison shows that the constituents in coal fly ash fall within the typical ranges of those in soils found across the U.S.
- Fly ash is commonly used as an additive to concrete building products, but the radioactivity of typical fly ash is not significantly different from that of more conventional concrete additives or other building materials such as granite and red brick. (US Geological Survey, October, 1997)

...see reverse.

Public policy should encourage greater beneficial use of coal combustion products

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FS #2 3/10/09

Concrete of the Roman Empire was made with volcanic ash, a silicious material like fly ash, which is used to increase strength and durability.

The chemical constituents of coal ash are commonly found in many everyday products and natural materials. They are present in soil, rock and other parts of the earth's crust.

*Typical Values for Selected Elements as Contained in Soils and Fly Ash**

	Arsenic	Barium	Cadmium	Lead	Mercury	Selenium
RANGE						
Soils	0.1-100	10.0-7000	0.01-7	8-1000	0.01 - 10	0.10 - 10
Ash	0.0003-391	0.02-10850	0.01-76	0.02-273	0.013-49.5	0.0003-49.5
AVERAGE						
Soils	50	800	1	50	0.05	0.5
Ash	100	1000	3	90	0.1	10
MEDIAN						
Ash	4.6	806.5	3.4	56.8	0.1	7.7

** all data shown in parts per million (ppm)*

Data sources: EPA, NIST, USGS

Coal Combustion Products:
Environmentally & Socially Beneficial

Coal ash use is supported by the federal government and many states as a way to reduce the impact of our industrial practices on the environment.

- Using CCPs in an environmentally safe manner saves virgin resources, and reduces energy consumption and greenhouse gas emissions (GHG). In addition, it helps reduce the need for landfill space and new landfills. Using CCPs also makes good economic sense; they are often less costly than the materials they replace.
  (U.S. EPA: http://www.epa.gov/epawaste/partnerships/c2p2/use/benefits.htm)

- Coal utilization byproducts (CUB) use improves the economies of power generation, conserves natural resources, avoids the consumption of increasingly scarce landfill space, and reduces emissions of carbon dioxide (CO2). (U.S. Department of Energy August 2006).

Fly ash is more than a high-performance material, it meets policy goals for sustainability

- Fly ash has been used in roadways and interstate highways since the early 1950s. In 1974, the Federal Highway Administration encouraged the use of fly ash in concrete pavement with Notice N 5080.4, which urged states to allow partial substitution of fly ash for cement whenever feasible. (U.S. Department of Transportation, June 2003).

- Federal concrete projects used an estimated 5.3 million metric tons of coal fly ash in 2004 and 2005 combined. This substitution yields a number of environmental benefits, including avoided energy use of approximately 25 billion megajoules; avoided water consumption of 2 billion liters; and avoided carbon dioxide equivalent emissions of 3.8 million metric tons. Energy and water savings represent two significant impacts that can be monetized using market prices. Results indicate that the beneficial use of coal fly ash in 2004 and 2005 resulted in energy savings valued at approximately $700 million, and water savings valued at approximately $1.2 million.
  (The U.S. EPA Report to Congress, June 3, 2008).

...more on reverse.

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FS #3 3/10/09

Current green building practices encourage using recycled materials such as coal ash and other industrial byproducts.

- Green building rating systems encourage the use of materials locally available, with recycled content that contribute to innovation and reduction of the consumption of other resources such as water. (US Green Building Council, Leadership in Energy & Environmental Design (LEED) and Green Building Initiative Green Building Assessment Protocol for Commercial Buildings.)

- Coal combustion products used in construction practices and concrete products are required to adhere to consensus standards such as the American Society for Testing and Materials, the American Concrete Institute, the American Association of State Highway and Transportation Officials, state departments of transportation and others.

- The cost of a ton of ASTM C618 compliant fly ash is often half the price of portland cement. Using fly ash instead of portland cement can reduce the cost of a concrete in a project while improving its overall performance and durability. (American Coal Ash Association, 2009).

Public policy should encourage greater beneficial use of coal combustion products.

Coal Combustion Products: Creating Economic Sustainability

Construction project managers across America are learning that recycled-content construction products are cost-effective, reliable, easy to obtain, and environmentally friendly.

- Coal combustion products contribute a direct economic impact to the U.S. of over $2.2 billion annually and a total (direct and indirect) economic impact of nearly $4.5 billion annually. (American Coal Council, 2005)
- Green building rating systems encourage the use of materials locally available, with recycled content that contribute to innovation and reduction of the consumption of other resources such as water. (US Green Building Council, Leadership in Energy & Environmental Design (LEED) and Green Building Initiative Green Building Assessment Protocol for Commercial Buildings.)
- Organizations such as the Collaborative for High Performance Schools (CHPS) support the use of concrete containing fly ash in building construction. (California CHPS, November 2008; Texas CHPS, November, 2008; and Colorado CHPS February 2009)

The federal government has taken a leadership role in encouraging and supporting sustainable practices through the use of industrial byproducts, such as coal ash, in its construction processes.

- Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" requires federal agencies to purchase green products and services, including recycled content products and environmentally preferable products and services.
- Federal Comprehensive Procurement Guidelines (CPGs) and Environmentally Preferable Purchasing (EPP) encourage and assist federal agencies in purchasing environmentally preferable products and services. The Ronald Reagan Building is cited as a case study which used fly ash in concrete for the construction of this facility. (US EPA http://www.epa.gov/epp/)
- Federal concrete projects used an estimated 5.3 million metric tons of coal fly ash in 2004 and 2005 combined. This substitution yields a number of environmental benefits, including avoided energy use of approximately 25 billion megajoules; avoided water consumption of 2 billion liters; and avoided carbon dioxide equivalent emissions of 3.8 million metric tons. Energy and water savings represent two significant impacts that can be monetized using market prices. Results indicate that the beneficial use of coal fly ash in 2004 and 2005 resulted in energy savings valued at approximately $0.7 billion, and water savings valued at approximately $1.2 million." (US EPA Report to Congress Study, June 3, 2008).
- The US Army Corp of Engineers has specifications for concrete containing fly ash (www.usace.army.mil) and the Federal Aviation Administration supports the use of fly ash in many construction applications. (http://www.faa.gov/search/?q=fly+ash&x=33&y=14)
- States such as Wisconsin, Texas, Pennsylvania, Illinois, Iowa, Minnesota and others have state guidance pertaining to the use of coal combustion products in construction and transportation activities. Cites such as Denver, Seattle, New York City, Columbus (Ohio), and San Diego support green construction practices, including the use of coal combustion products. (American Coal Ash Association, 2008)

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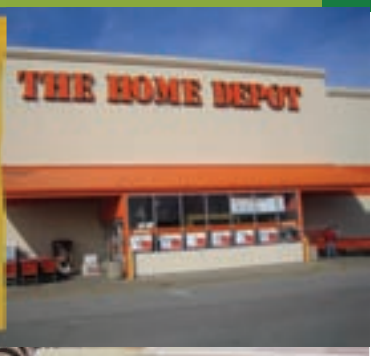
To classify coal ash as a hazardous waste would be contrary to proven science and would result in significant job losses and shut down a multi-billion dollar industry that supports sustainable practices.




THE POWER
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Making History:

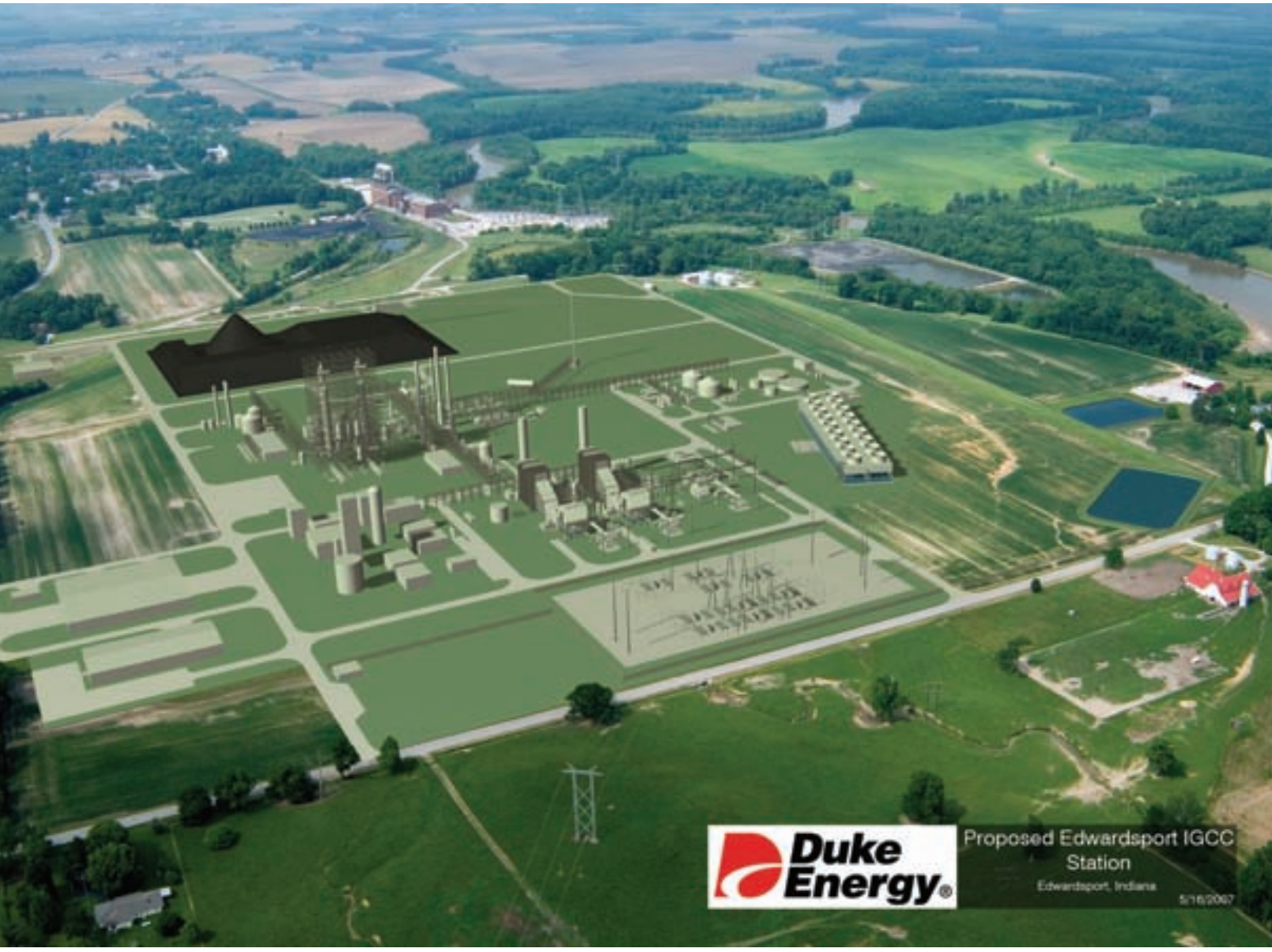
Duke Energy builds the world's largest facility to use IGCC technology to produce electricity

By Jim Stanley, Duke Energy Indiana

While Washington debates our energy future, real work on cleaner coal technology is already happening in a small town in southwest Indiana.

Duke Energy is constructing a large-scale, 630-megawatt coal gasification plant on 220 acres of land along the White River in Edwardsport, Ind. We are building the plant adjacent to Edwardsport Generating Station, a 160-megawatt pulverized coal plant with units built between 1944 and 1951. As the new plant nears completion, the existing units will be retired.

The project is technologically important not only for Indiana, but also the nation. Once completed, the Edwardsport plant will be one of the cleanest coal-fired power plants in the world. The plant uses advanced technology to gasify coal, strip out pollutants, and then burn that cleaner gas to produce electricity. The new facility will produce nearly 10 times as much power as the existing plant at Edwardsport, with dramatically less environmental impact, including 45 percent less carbon dioxide emissions per net-megawatt hour.



The project and surrounding geology also shows strong potential for the addition of carbon capture and permanent geologic storage technology – one of the possible answers to future restrictions on carbon dioxide emissions.

Designed to use Indiana bituminous coal from the Illinois Basin, the Edwardsport project capitalizes on our domestic energy supplies. We expect to complete the plant and begin commercial operation by 2012. The facility will make history as the largest in the world to use integrated gasification combined cycle (IGCC) technology to produce electricity.

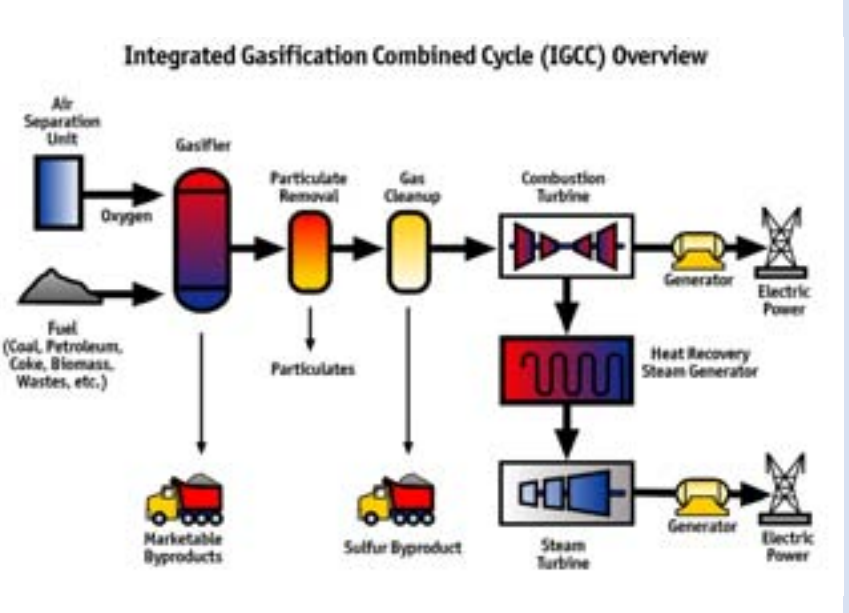
How did we get to this point?

Need and Homegrown Resources. Duke Energy needed to build new generation to meet growing customer demand. The Edwardsport plant will be the first major power plant built in Indiana in more than 20 years – a much-needed addition to the state's energy sources. As we decided what kind of generation to build, fuel cost and availability were major considerations. In Indiana we have abundant coal reserves, a relatively low-cost option compared to other fuels.

Meanwhile, environmental regulations continue to tighten around air emissions, and federal legislation to limit carbon dioxide emissions appears likely. We chose to pursue coal gasification because it helps us control emissions as environmental regulations become more stringent. It also shows potential for the capture of carbon dioxide in the future at a lower cost than pulverized coal. The carbon dioxide can be separated from the fuel prior to combustion – leaving far less volume to "clean." High-pressure carbon dioxide already is used for enhanced oil recovery in some parts of the country and that is a possibility. Deep geologic sequestration of the carbon dioxide will also be considered in conjunction with further study of carbon capture at the project.

Finally, we have experience with coal gasification technologies. We participated in the Wabash River Coal Gasification Repowering Project in 1995 in West Terre Haute, Ind. At the time, that was considered a demonstration project and since then the technology has matured.

All of these factors brought us to the point where in October 2004 we signed a letter of intent with General Electric Company and Bechtel Corporation to study the feasibility of constructing an IGCC electric power plant.



How Coal Gasification Works

Coal is ground, mixed with water, and fed to a gasifier (reactor) as slurry. Oxygen from a cryogenic air separation unit is also provided to the gasifier. The coal slurry and oxygen react to produce raw syngas that consists primarily of hydrogen and carbon monoxide. Inside the gasifier, the syngas is separated from the slag, (primarily ash in the coal). The raw syngas from the gasifier is partially cooled by producing high-pressure saturated steam which is superheated and supplied to a steam turbine to generate power. Following cleanup of the syngas, it is burned in a combustion turbine with the waste heat generating steam for the steam turbine. The two turbines drive generators to produce electricity. Pollution controls include diluent combustion and selective catalytic reduction for nitrogen oxide control, a carbonyl sulfide hydrolysis and Selexol system for sulfur capture, and activated carbon absorption of mercury.

Support. A feasibility study estimated that the cost of an IGCC plant would be 10 percent to 15 percent higher than a conventional pulverized coal project. In order to offset the plant's costs, which are estimated at $2.35 billion, we worked with state and local governmental entities to develop financial incentives for the project. Critical sources of support were:

- *Indiana Senate Bill 29 enacted in 2002* – Encouraged clean coal and renewable energy technologies and authorized mechanisms for timely recovery of their costs.
- *Indiana Senate Bill 378 enacted in 2005* – Provided an investment tax credit for IGCC projects using coal as a primary fuel.
- *Local tax abatement and Tax Incremental Financing* – Local Knox County authorities passed all the necessary resolutions to support the project in May 2006.
- *Federal tax incentives under the Energy Policy Act of 2005* – The Edwardsport Project was one of two projects nationwide to be awarded a $133.5 million federal investment tax credit. It is the only project today under construction.

In total, the project has received more than $460 million in federal, state and local tax incentives. The steadfast support and leadership from Governor Mitch Daniels and state lawmakers has been critical to the effort. They know that finding ways to burn coal cleanly is not only good public policy, but homegrown energy is good for an Indiana economy.

Then there's the local factor. I recall driving into Knox County on a rainy, late-December night in 2007 for our air permit hearing. It turned out I didn't need directions to the high school where the hearing was; all I had to do was follow the rows of "IGCC Yes" signs in front yards lining the route to the hearing. We were a little concerned about how many supporters

Some would like to turn away from coal completely. We don't believe that's realistic given that it powers half our nation's energy needs. It's imperative we find ways to burn it cleanly …

might turn out on a rainy night during the holiday season, but then I noticed that practically every car coming down the road was turning into the high school parking lot. And they turned out to virtually all be supporters of this project.

Environment. The numbers tell a powerful story: The current 160 megawatt coal- and oil-fired steam plant operates about 30 percent of the time and emits approximately 11,000 tons annually of sulfur dioxide, nitrogen oxide, and particulates. The new 600-megawatt IGCC plant operating 100 percent of the time will emit significantly less than 2,900 tons annually of the same emissions. In addition, mercury emissions will be dramatically reduced.

Other environmental advantages:

- We've committed to add **selective catalytic reduction equipment** to the plant to remove nitrogen oxide – which would make it the cleanest IGCC plant in the nation.
- There is **less solid waste** produced, and it has the potential to be marketed. The main byproducts from the coal gasification process are elemental sulfur, useful in agriculture, and vitrified slag, similar to gravel.
- One of the reasons we chose the Edwardsport site is because preliminary studies show the geology is **conducive for sequestering carbon dioxide** in the future. We have received approval from state utility regulators to study capturing a portion of the plant's carbon dioxide emissions, and we also have filed a request to study sequestering those emissions deep underground. Our strong interest in making this project one of the nation's first demonstrations of carbon capture and permanent underground storage has earned the support of the Clean Air Task Force and the Indiana Wildlife Federation for the project.

As we consider coal's future, Edwardsport is a site to watch.

Some would like to turn away from coal completely. We don't believe that's realistic given that it powers half our nation's energy needs. It's imperative we find ways to burn it cleanly, and the Edwardsport project will be part of the solution. ◆

Jim Stanley is president of Duke Energy Indiana (www.duke-energy.com)

Realizing a Cleaner Coal

By Judy Tanselle, White Energy Coal North America

Editor's Note: In the fall 2008 issue of *American Coal,* we printed a general fact sheet that described the opportunities for using Pre-Combustion technologies. As an extension of our commitment to the development of pre-combustion technologies, this article will take a look at a specific technology, developed by White Energy. We invite other members of the Pre-combustion Innovations Alliance to offer similar editorials on their technologies for future issues.

Today, coal is estimated to account for 24 percent of the world's total energy mix.[1] In the U.S., coal fuels approximately 50 percent of the nation's electricity. The global demand for coal is now greater than ever before and it is expected to be a dominant energy source well into the foreseeable future. In fact, by 2100, it is projected that nearly half of the world's energy will come from coal.

With growing environmental concerns, coal needs to be cleaner to remain viable. To meet the world's energy demand and minimize CO_2 and pollutant emissions, advanced technologies need to be deployed. These technologies must allow coal to be burned more efficiently and minimize its impact on the environment. According to John Grasser, communications director at the Federal Department of Energy's Office of Fossil Energy, widespread commercial availability of advanced technologies such as carbon-capture/sequestration is expected sometime between 2020 and 2025.[2]

There are, however, technologies available today that are commercially viable that offer meaningful progress towards the end goal of clean, energy-efficient coal. White Energy Company's current technological solution and continued focus on developing cleaner coal for use in the growing energy sector today are cause for great optimism.

Overcoming High Moisture Coals

While it's true that there is an estimated 847 billion tonnes of proven coal reserves worldwide – enough coal to last over 130 years at current rates of production[3] – 49 percent of these reserves are in the form of sub-bituminous and brown coals. These lower-grade forms of coal are high in moisture and low in energy content. This renders them economically and environmentally inefficient and difficult to transport over long distances. If moisture levels in lower-grade coals can be reduced economically and prevention of spontaneous combustion achieved, then lower-grade sub-bituminous and brown coals can compete in markets previously dominated by higher-grade and value-bituminous coals.

White Energy Company offers the technology to make this possible.

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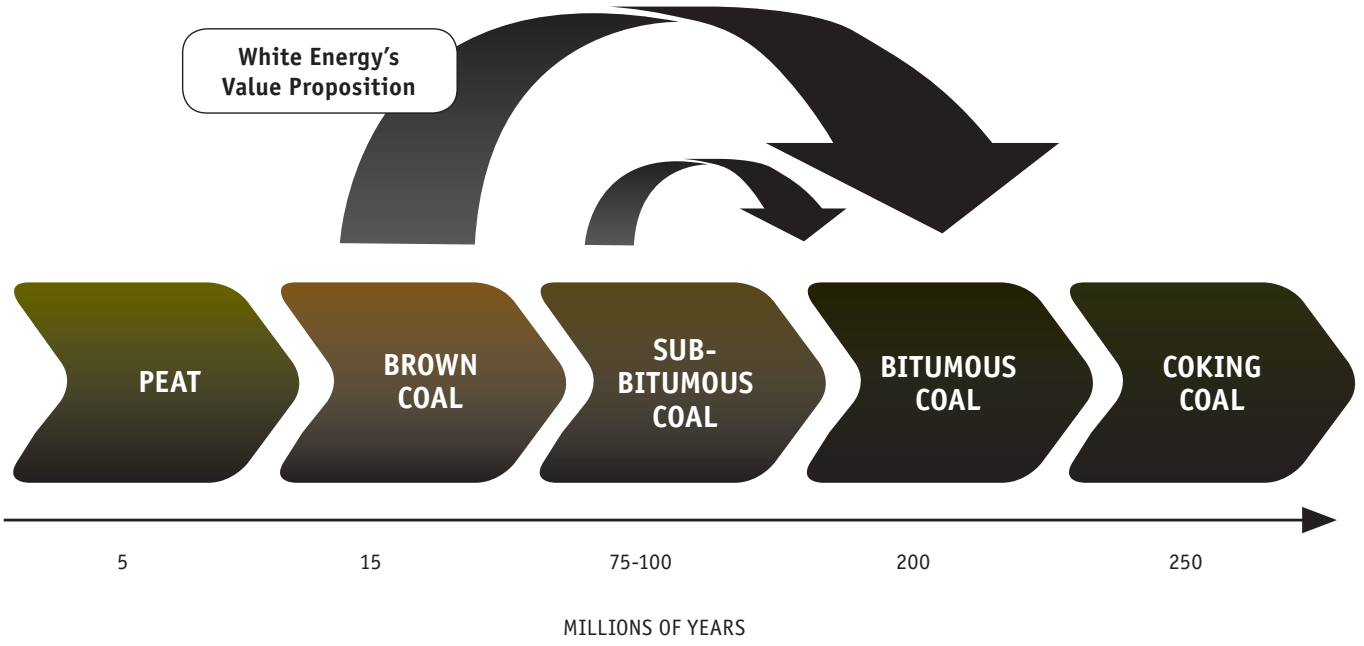


White Energy's Technology

White Energy is the exclusive worldwide license holder of the Binderless Coal Briquetting process called White Coal Technology. This process removes moisture from lower-grade coals to significantly improve heat energy content and compresses the dried coal into a stable coal briquette. Lower-grade coals are effectively upgraded into higher-grade coal briquettes with properties similar to higher-value bituminous coals. This process can, therefore, make the more than 400 billion tons of the world's lower-grade coal reserves more usable, cleaner and more efficient.

Developed over a number of years by a consortium led by the Commonwealth Scientific and Industrial Research Organization in conjunction with White Energy, the White Coal Technology

By 2100, it is projected that nearly half of the world's energy will come from coal

can process low-cost, lower-quality subbituminous coal into higher quality (from ~8,000 BTU/lb or 4,500 kcal/kg to ~11,000 BTU/lb or 6,200 kcal/kg as delivered to the customer) and higher-value coal (from US$12/tonne to over US$50/tonne).

White Energy's patented technology accelerates the maturation of lower-grade coals. As shown in the diagram on page 53, a natural process that would organically take hundreds of millions of years, White Coal Technology makes possible in minutes. And, it is a relatively simple process that has been proven to be cost-effective.

How Does It Work?

The White Energy process involves the crushing and drying of low-value coals resulting in the removal of water content. Compaction then generates close bonding between the dried coal particles and eliminates nearly all voids. This forms a high-density, higher-energy content briquette with very low permeability – a key factor in providing stability against spontaneous combustion. The process can also be used as a means of producing stable and transportable lump coal from unwanted, undersized fractions of high-energy bituminous coals. Binderless briquettes are held together by the natural bonding mechanisms of coal; they do not require the binders that are normally used to briquette coal, which substantially reduces production costs.

Reforming dried coal into larger lumps, or briquettes, has been attempted for over 100 years. The challenge has always been to stabilize the dried coal and limit risk of spontaneous combustion. The White Coal Technology meets these requirements.

What makes the White Coal Technology process different and more successful than past briquetting attempts is its ability to generate close bonding between the coal particles. The White Coal Technology consists of two distinct sub-processes: drying and briquetting. The drying process provides coal with the correct characteristics as an input to the briquetting process. Hot drying gases are produced through separate combustion of a small proportion of the coal. The briquetting process is a purely mechanical procedure involving material distribution, compaction, cooling and storage. Very high compaction rates in the briquetter enable high production rates in an economically acceptable way.

Benefits of White Energy's Coal

The result of White Energy's technology is a low-cost coal that compares favorably with bituminous coals and offers many benefits to power plants. As compared to burning lower-grade coals, White Energy's upgraded coal results in increased boiler efficiency, decreased plant forced outages and reduced carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_X) and mercury (Hg) emissions. Its low sulfur content offers utilities an alternative for meeting stricter environmental regulations, potentially deferring an investment in scrubbers while uncertainties surrounding the regulatory environment sort themselves out.

White Energy has successfully addressed the stability problem that has challenged the coal industry in the past. The White Coal Technology produces a dense, less porous briquette that is not as susceptible to moisture re-absorption, thereby significantly reducing the risk of spontaneous combustion. In fact, the ignition temperature of White Energy's coal is higher than that of typical bituminous coals.

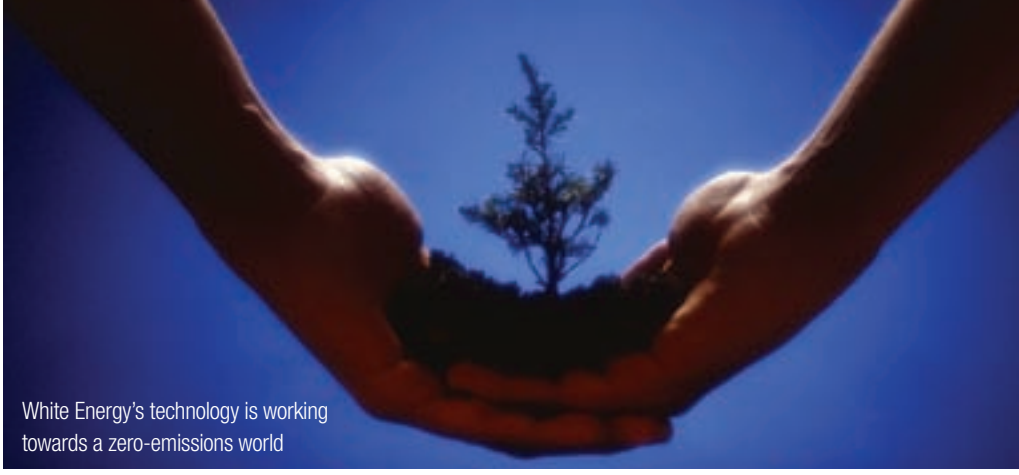
White Coal Technology Today

To date, coal samples from China, the U.S., Australia, Indonesia and South Africa have all been successfully upgraded using the White Coal Technology. White Energy operates a 90,000 metric tonne per annum plant in Australia and is in the process of commissioning a 1 million metric tonne per annum binderless coal briquetting facility in Indonesia.

In January, White Energy announced plans to develop its first coal-upgrading facility in the U.S. through an agreement with Buckskin Mining. The estimated $80-million facility, which is expected to be operational in 2010, will use White Energy's technology to

upgrade coal purchased from Buckskin's sub-bituminous mine in the Powder River Basin near Gillette, Wyo. The facility's total annual output is expected to be 1 million tons of binderless coal briquettes. The upgraded Buckskin coal will have a heat content of 11,300 Btu/lb, an increase of 35 percent over the non-upgraded coal.

White Energy is committed to developing and acquiring synergistic technologies in coal upgrading and emissions reductions in response to the growing global market for coal and related end products. Developing a unique suite of coal-upgrading and emissions-reductions technologies will enable White Energy to partner with a growing number of players in the coal value chain and aid in the advancement towards a zero-emissions world.



White Energy's technology is working towards a zero-emissions world

Conclusion

Global demand for coal is expected to grow significantly through 2030. However, deliverability of high-quality coals is declining. Both North America and Asia have witnessed reduced production of high-thermal value/low-emission coal. But the reality remains: Coal is a vital resource option for meeting the world's sustainable energy needs. This fact, coupled with the global emphasis on emissions reductions means White Energy's technology represents not just a solution, but arguably the technological breakthrough we have been waiting for around the world and, in particular, the U.S. ◆

Judy Tanselle is president of White Energy Coal North America (www.whitecoal.com).

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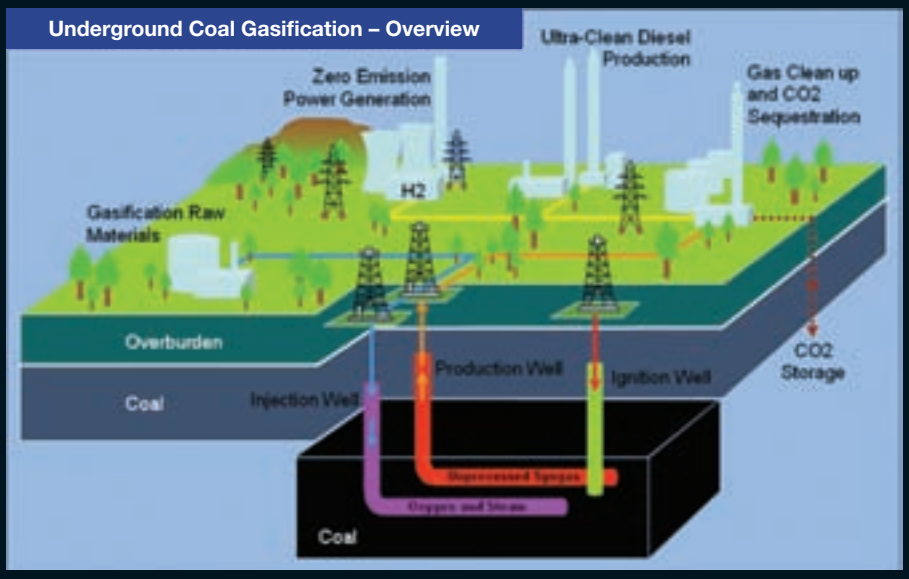
Introduction to Underground Coal Gasification

By Julie Lauder, Underground Coal Gasification Partnership

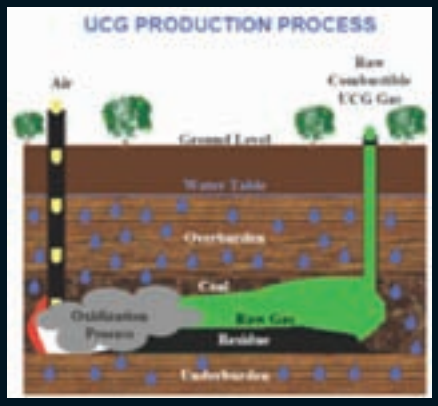
The world is facing major challenges in meeting future energy needs. Security of supply remains a critical issue, as does global emissions. Yet, fossil fuels will continue to dominate the world's energy mix well into the future. Coal is the world's most abundant fossil fuel. However, nearly 85 percent of known coal reserves are deemed unmineable using standard surface mining techniques, so many countries are now turning to underground coal gasification (UCG) to fully utilise their valuable coal resources.

UCG technology allows nations that are endowed with coal to fully utilise their resource from otherwise unrecoverable coal deposits in an economically viable and environmentally safe way. The process produces clean power, liquid fuels, syngas, fertilizers and other chemical feedstocks. Additionally, UCG promises to be one of the most efficient long-run solutions for capturing carbon while utilizing these valuable resources.



What is UCG?

UCG is a method of converting unworked coal – while still in the ground – into a combustible gas that can be used for industrial heating, power generation or the manufacture of hydrogen, synthetic natural gas or diesel fuel. The basic UCG process, pioneered by the Soviets in the 1930s, has two wells drilled into the coal: one for injection of oxidants and another to bring the product gas to surface, where it is harnessed to turn turbines for energy generation, or for the production of chemicals.



Due to dwindling oil and gas reserves, UCG has resurfaced as a viable energy development option. Modern UCG relies on the major advances in drilling technology – horizontal and directional techniques pioneered in the oil and gas industry – to make the practice both safe and reliable and the economics attractive. Tests have demonstrated that it is possible to have greater control of deep drilling and to create larger cavities in the coal seam for gases to pool and provide more efficient combustion. UCG also ensures lower emissions as coal is not brought to the surface.

Research is currently underway in many parts of Europe to determine the possibility of storing CO_2 in the cavity left where coal has already been gasified; results look promising. As an added benefit, UCG was once criticized for generating large quantities of hydrogen (a "useless byproduct"). However, hydrogen now sees strong demand as a feedstock for the chemical industry.

Renewed Interest

China is believed to have conducted more trials of the process than any other country over the past 10 years; one estimate counts at least 17 trials since 1991. A Chinese-built chemical plant in Inner Mongolia uses the process to produce a diesel-fuel substitute. The company that built the plant has plans for a much larger sister plant in China itself. India,

The UCG plant in Chinchilla, Australia

meanwhile, plans to use underground gasification both to generate more power and to produce pesticides and chemicals.

UCG is attractive in an environmental sense in that it produces no sulfur oxide or nitrogen oxide, has lower levels of mercury and particulates, and retains the ash underground. The technology is especially suitable for low-rank coals like lignites and sub-bituminous, which produce less heat than higher rank coals when burned due to their high ash content. The 35 percent to 50 percent ash contents found in Indian coals have driven interest in UCG in that country.

Other countries such as the U.S., U.K, South Africa, Poland, Vietnam, Indonesia, Russia and Australia have all shown renewed interest in the UCG process. Eskom Holdings Ltd., the biggest power generator in South Africa, performed a trial at the Majuba coal field north of Johannesburg, which has reserves of 1.2 billion tons. U.S. energy companies are studying the possibility of using UCG in the Powder River Basin, along the Wyoming-Montana border, the largest source of mined coal in the U.S. In Britain, officials hope the process will provide access to vast coal reserves under the North Sea. As an initial step toward that goal, the first UCG license has been granted in the U.K..

Benefits of UCG

UCG offers many benefits:

Financial Benefits

- Capital and operating costs are lower than in traditional mining.
- Reduced cost of plant installation - no surface gasifier.
- Syngas can be piped directly to the end-user, reducing need for rail/road infrastructure.
- Lowers the cost of environmental cleanup due to solid waste being confined underground.
- CCGT power plants using UCG product gas instead of natural gas can achieve much higher outputs.
- Additional revenues can be realized from manufacture of chemicals such as ammonia and fertilizers.
- Synthesis of liquid fuels at a predicted cost equivalent to US$17 per barrel.
- Enhanced oil recovery (EOR).
- In demonstrating the economic benefits of UCG, Eskom, successfully produced gas at a significantly reduced cost of $1 per million BTUs at its Majuba operation. (Between one-third and one-sixth of the cost of gas produced in an equivalent surface gasifier.)

Environmental Benefits

- Most notably UCG does not require an external water source to operate – a major environmental advantage over other, water-intensive coal mining operations and pulverised coal-fueled energy production methods.
- Lower emissions – Gasification in UCG is underground. Therefore, the

facilities produce no sulfur oxides or nitrogen oxides and particulates are generated at half the rate of their surface equivalents and stay underground.
- Lower fugitive dust, noise, and visual impact on the surface.
- Low risk of surface water pollution.
- Reduced methane emissions.
- No dirt handling and disposal at mine sites.
- No coal washing and fines disposal at mine sites.
- Smaller surface footprints at power stations.
- No mine water recovery or surface hazard liabilities related to abandonment.

Ongoing Developments and Projects

China currently has about 30 projects in different phases of preparation. So far, there is only one plant operating – a methanol plant in Inner Mongolia, operated by ENN Group. However, the company is drawing up plans for a similar plant in Liaoning province that will be 15 times larger. This plant will produce 300,000 metric tons of methanol per year, for conversion to dimethyl ether – a diesel substitute. India, plans to use UCG to access an estimated 350 billion tons of coal that was discovered by state-run Oil & Natural Gas Corp. in the states of Gujarat and West Bengal.

There is also huge interest and activity in Australia, with companies such as Linc Energy, Carbon Energy and Cougar all very active in UCG developments. Vietnam, Indonesia, Brazil and Canada are also all keen to explore this technology along with all parts of Europe. Security of energy supply plays a large role in those interests.

The UCG Partnership – a non-profit organization promoting UCG technology, globally

Much of this work is being spearheaded by The UCG Partnership, the leading worldwide professional body for the Underground Coal Gasification Industry. The partnership provides information on all aspects of UCG to industry, governments, energy associations, academia, investors, bankers and others to promote UCG as a primary energy source. They are also active in developing training and education programs, workshops and seminars to encourage greater understanding of the process and to help grow required skills.

The UCG Partnership has now held four annual conferences, each more successful than the last. In fact, the 2009 conference and workshop accommodated over 125 delegates from 28 nations. Each successive conference has helped to better define the UCG industry, better information exchange, and highlight the level of global interest in UCG. ◆

For more information on UCG technology or the UCG Partnership please contact:
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BNSF RAILWAY

New Environmentally Friendly Technology Drops Out Heavy Metals and Other Contaminants from Coal Tar

By Michael Smallwood, Planet Resource Recovery, Inc.

Editor's Note: *We are printing this article on a new soil remediation technique as a means of broadening the scope of information found in American Coal. ACC member companies may also find a use for this technology when addressing legacy sites on or near their operations, or when dealing with soil clean up and remediation in their operations.*

For almost two centuries, manufactured gas plants have provided light to America's cities. These plants used petroleum or coal to generate gas that then lighted homes and businesses, hospitals, streets, military bases and government offices. By the time they were supplanted by newer technology there were an estimated 50,000 or more of these plants, both public and private.

One of the byproducts of manufactured gas was coal tar – a heavy oil substance that was typically dumped, pooled or spilled in the plant yard. Poor containment and disposal resulted in contaminated soil and a threat to the groundwater. Remediation efforts have been undertaken at some sites but are hampered by the cost and logistics involved. New technology now promises to reduce the cost and time involved by enabling on-site treatment and decontamination of the original soil.

The Rise and Fall of Manufactured Gas

In the early 1800s, manufactured gas plants began providing light to residences, streets and businesses. These plants, built in every major city in the U.S., heated coal or petroleum in an oxygen-deprived process that generated gas to be piped to

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consumers. Also produced in the process were heavy coal tars that had as many as 3,000 compounds in them, many of them toxic. Manufactured Gas Plants (MGPs) made serious efforts to generate pure gas, ironically intensifying the toxicity of the waste coal tar.

The coal tar was deposited into tar separators, cisterns, wells, tar ponds and underground storage tanks. None of these dumping areas were well contained, with only simple masonry or nothing at all to keep the waste from contaminating the soil and migrating toward the groundwater.

In the 1970s, MGPs were identified as a major source of coal tar emissions. Clean up of the roughly 8,300 plants owned by utilities became the responsibility of those utilities, and about one-third have been remediated. Clearly there is a long way to go before all these plants and the other tens of thousands of non-utility plant sites are cleaned. The plants are often in prime locations, but the value of these sites cannot be realized until the contamination is removed.

Coal Tar Toxicity

The soil surrounding MGPs is often contaminated with a wide range of toxins, beginning with a range of oils, pitch and carbon plus heavy metals such as arsenic, chromium, cyanide and mercury. A recent test from Public Service Electric & Gas (PSE&G) of New Jersey, for example, showed over-limit levels of arsenic, chromium, cyanide, lead and mercury in addition to very high concentrations of hydrocarbons.

Remediation requires removal of all hydrocarbons and other contaminants from all the effected soil at the site. With traditional methods, this also requires removal of the effected soil itself—the site is excavated, the soil hauled off and new soil is transported to the site. Initially coal tar-laden soil was dumped in landfills, down vertical mine shafts and in mined-out rock quarries.

Contaminants bled into surrounding soil and even water supplies. Now, the contaminated soil is typically incinerated, eliminating and destroying the hydrocarbon fraction, but exasperating the metals, leaving the soil a continued liability for generations to come.

The process of removing, destroying and replacing soil is costly. Depending on transportation fees, it can run between $85 and $100 per ton. This does not include the cost of the replacement soil. Airborne heavy metal contaminants that escape the scrubbing equipment and concentrate in the ash are bringing the thermal processing facilities under increased scrutiny from the EPA. In a broader sense, the process is wasteful, because resources are completely destroyed.

New technology for coal tar remediation

Many years ago scientists began researching ways to separate hydrocarbons from their environment using a renewable, clean method. An aqueous solution called PetroLuxus™ was developed by Planet Resource Recovery, Inc. that targets hydrogen, oxygen, and carbon elements. The multi-faceted chemical breaks the bond of hydrocarbons to any other material. It is not an emulsifier and greatly reduces further environmental issues.

The savings in transportation and disposal costs alone can dramatically reduce the cost of this remediation process, and with implementation of this clear and simple approach an estimated 35 percent can be saved.

PetroLuxus has been tested extensively for the separation of hydrocarbons and heavy metals from rocks and soil. In house lab testing, third-party lab verification and application-specific pilot tests have shown that PetroLuxus products can be applied to multiple hydrocarbon recovery and removal applications. In the oil field, PetroLuxus products enhance oil field production by encouraging their release from oil-bearing rock. These same products improve cleaning of storage tank bottoms, remediation of sludge and tailing ponds and treatment of heavy oil. They are particularly suited to remediating coal tar at manufactured gas plants, because the remediation can be done on site and without introducing any new toxins.

Rather than consider MGP-contaminated soils to be treated by either thermal destruction or with other harsh toxins, this approach relies on innate chemical properties to encourage hydrocarbons to migrate away from the rock or soil to which it previously adhered. Using an ionic exchange mechanism that makes hydrocarbons both colloidal and hydrophobic, soil can now be restored on site and without generating contaminated byproducts of its own.

In January 2009 a certified laboratory in Fairfield, N.J., ran before and after analysis on coal tar soil samples gathered from Public Service Electric and Gas in Newark, N.J. The power facility, which is an MGP, has been instructed by the EPA to remediate the site.

New Process Leaves Soil In Place After Remediation

A typical remediation project using this new approach brings together several leading technologies at the site. The costs of the excavation will remain the same, and instead of leaving the site in trucks, it is sorted, classified and sized, and then typical soil-washing methods are implemented.

PetroLuxus preferentially displaces hydrocarbon contamination from a surface rather than the usual surfactant reaction of dissolving and emulsifying contaminants. PetroLuxus contains a demulsifying and defoaming element which is significant in soil washing because of the ease of liquid phase separation. After the cleaning process, the materials enter a three-phase separation process where the hydrocarbons are easily recovered. During an extensive remediation, the concentration of the chemical in the water medium is monitored to ensure efficiency.

Recharging the solution by adding additional concentrate allows continued reuse and operation. The solution can be saved for further use at other sites.

The separated oil can be mixed with bunker fuel oil and used as part of the utility feedstock. Generally the blended oil has a lower viscosity, which can save money in the winter when steam energy typically must be diverted to heat the fuel to keep it flowing. Less of this energy is required for the lighter blend.

PetroLuxus separates the hydrocarbon material, or "oil," from the coal tar debris, drops the heavy metals, and decontaminates the soil. When applied, the formulation separates the materials allowing for the recovery of hydrocarbons, while simultaneously separating the debris from the oil, which is isolated and collected in a separate phase. Through the use of a special PetroLuxus blend, remediation of the toxic materials can be conducted at the site where the contamination exists. The savings in transportation and disposal costs alone can dramatically reduce the cost of this remediation process, and with implementation of this clear and simple approach an estimated 35 percent can be saved. Excavation, monitoring and engineering oversight costs typically remain the same. ◆

Michael Smallwood serves as chief science officer for Planet Resource Recovery, Inc. (www.planetresource.net).

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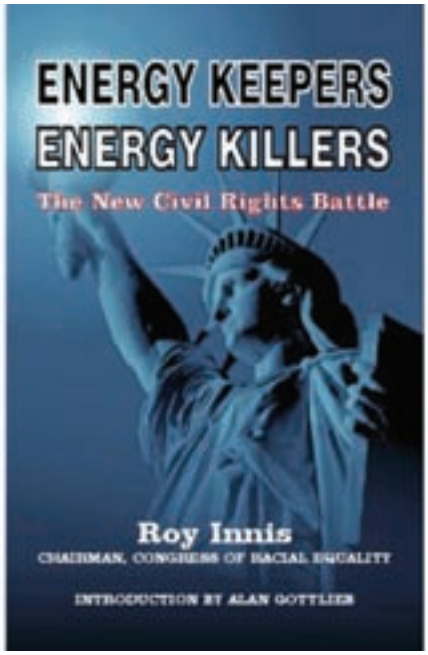
Author Examines the Impacts of Energy Choices on Civil Rights



Review of: *Energy Keepers Energy Killers: The New Civil Rights Battle*

By Roy Innis, Chairman, Congress of Racial Equality

Merril Press, 2008, 103 pages

Review by Jason Hayes, M.E.Des., Communications Director, American Coal Council

Abundant/secure, affordable, and clean energy has suddenly become a whole lot more than just an energy issue.

In his latest book, *Energy Keepers Energy Killers: The New Civil Rights Battle,* Congress of Racial Equality Chairman, Roy Innis demonstrates convincingly how energy supply issues are moving into the area of civil and human rights.

In this book, Innis has focused more than six decades of experience in the civil rights arena, his indomitable spirit, and an unfailing commitment to the cause of working class and minority rights on the issue of energy production. After demonstrating that much of the energy we use in the U.S. comes from reserves on public (federal and state) lands, Innis argues that the owners of those resources – the citizens of the country – have every legal and moral right to see their energy resources developed. He argues that the supply of secure and affordable energy is the basis upon which our entire economy flourishes. Therefore, if we are to maintain a thriving economy, it is essential that these valuable national resources be developed.

To the extent that those resources are developed sustainably, he recognizes that all citizens (especially minorities and the poor) benefit from the stable supply of energy. Where these resources are locked up in "Energy Graveyards" (or protected areas), or their development is hampered by a never-ending string of legal challenges, environmental regulations, and legislative hurdles, energy prices increase, harming all citizens (but, once again, especially the poor and minorities). Innis argues that an elite group of politicians and environmentalists – the "Energy Killers" – have made blocking the development and supply of affordable, abundant/secure energy into a multi-national and multi-billion dollar business.

In one example of their effective anti-energy campaigns, Innis describes the off-limits supplies of natural gas locked up under the Rocky Mountains. Some 167 trillion cubic feet of "recoverable natural gas … enough to heat 64 million homes for 40 years" exists under the mountains. However, over 40 percent – 69 trillion cubic feet – of that resource "has been put off limits by environmentalists lobbying and legal actions."

He continues by describing the convoluted politicking and ideologies that were involved in the creation of the Grand Staircase-Escalante National Monument in Utah. While the preservation of this 1.7 million-acre landmass certainly protected valuable natural landscapes, it also locked up some 7 billion tons of valuable bituminous coal. Innis writes, against the wishes of the elected representatives of Utah, the creation of this protected area locked up essentially seven years worth of the nation's coal demand, trillions in economic benefits, thousands of jobs, and countless other economic and social development opportunities with the stroke of one presidential pen.

Since their actions have such a profound and disproportionate impact on the poor and minorities, and since the majority of the Energy Killers do little to nothing to reduce their own gluttonous consumption of energy and resources or to stem their production of greenhouse gas emissions, Innis is convinced their actions are the latest form of institutionalized racism and class warfare. He is further convinced that it is up to the rest of the people to stand up and stop the Energy Killers from making affordable energy a thing of the past.

In the early part of the book, Innis describes the makeup of our energy consumption and supplies. He asks the reader to consider what life without "abundant, reliable, affordable energy" would be like and then suggests that our supply of "energy transforms the civil rights enshrined in our Constitution into civil rights we enjoy in reality."

While most simply take our well-being and rights for granted, Innis contends that unless the energy and policy options offered by politicians and environmentalists, 1) provide more energy, and 2) lower the cost of energy, Innis argues they are not realistic solutions. Their polices will, in fact, damage our ability to survive by

forcing people to choose between energy and food, or "heating and eating," as Innis puts it.

Innis provides a wealth of energy-related statistics, such as the fact that fossil fuels currently provide almost 85 percent of all American energy. He notes that the remainder of our energy use is powered by nuclear supplies (~8 percent) and renewables (~7 percent). He also takes a poke at the politics and science (and politics and politics) surrounding global warming by pointing out the historically variable nature of Earth's CO_2 levels and climate and the "almost unanimous" fear of global cooling that plagued scientists just three decades ago. With a solid array of examples, he demonstrates that much of the debate surrounding climate change has moved into the realm of hyperbole and scare tactics. He provides science and statistics on global climate, questions our increasing reliance on computer models over real-world data, and likens the heightened state of climate change rhetoric to ads for upcoming horror flicks – complete with fire, flood, famine, and fatalities.

While we hear many concerned calls to remove fossil fuels from our energy supply as a means of stopping "human-caused catastrophic climate chaos," Innis demonstrates that we cannot simply replace 85 percent of our energy supply without extensive costs and social/economic/environmental disruption. Additionally, he argues forcefully that were we to somehow accomplish this titanic goal, few of our competitors and customers around the world would follow in our footsteps.

In *Energy Keepers Energy Killers,* Innis has put together a strong argument for giving the issue of energy development a long, hard second look.

Projections for fossil energy use around the world continue to grow. So, by restricting our own energy use and abandoning the development of more efficient fossil fuel technologies we would effectively hamstring our industry and ensure our inability to compete in world markets. Innis's thesis is, therefore, that the "Energy Keepers" must "keep and protect" fossil fuel use from the activities and plans of the "Energy Killers."

In *Energy Keepers Energy Killers,* Innis has put together a strong argument for giving the issue of energy development a long, hard second look. While many previous works have dealt with the science, or the economics of changing energy policies, few have seriously considered the impacts of our energy choices on civil rights, or the rights of the poor or minorities, or the fact that the middle class majority – already stretched thin in the current economic downturn – will foot the bill for most of the green energy policies being bandied about various capital cities.

Innis clearly has the background and experience to address the issue and his in-your-face call to action has the potential to motivate the silent majority of citizens and energy users into the public policy realm. ◆

PROSPECTS

for Global Steel Markets in 2009

By Pat McFadden, Nucor Corporation

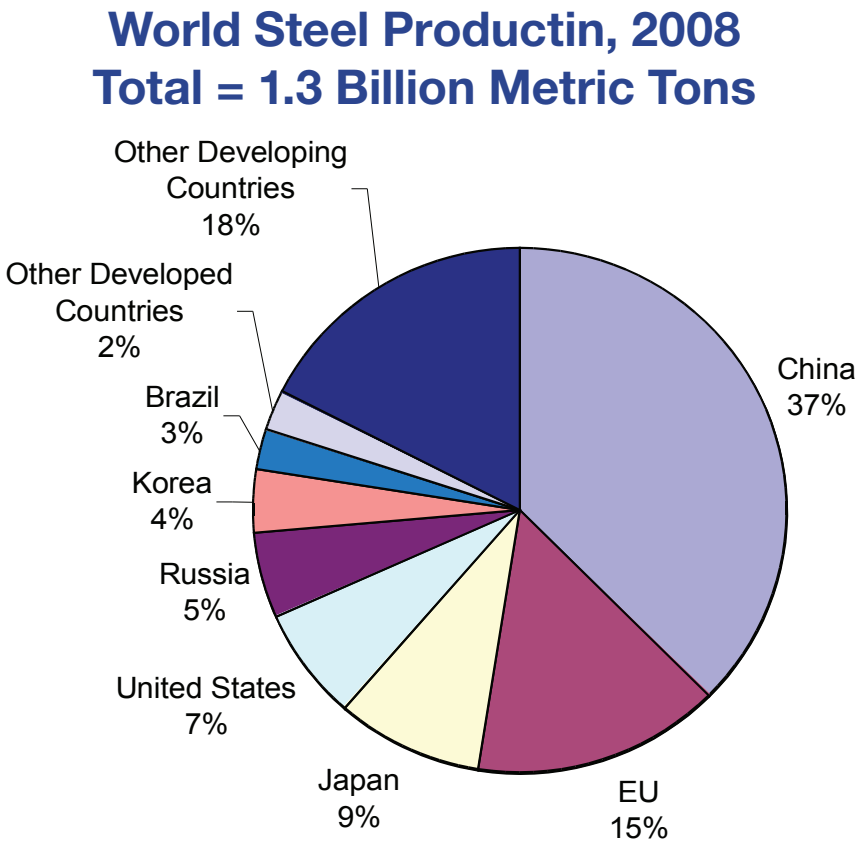
The world's steel producers are facing the most challenging environment they have encountered since the early 1980s, if not since the Great Depression. American and world steel production have plummeted in response to sharp declines in transportation and construction sector demand. The outlook for the United States and Europe is particularly grim. Even China, where steel production has exploded over the past decade, is likely to see softening demand. Until the ongoing credit crisis is resolved, and the world economy as a whole begins to recover, steel production is likely to remain at low levels.

The Steel Industry

In 2008, the steel industry produced over 1.3 billion metric tons of raw steel, in a wide range of products, including steel sheet, bars, beams, rods, pipes and tubes, as well as dozens of other products. The major markets for steel include transportation equipment (including cars and trucks), construction, heavy machinery and energy.

China is by far the world's largest steel producer; in 2008, it became the first country ever to make more than 500 million tons of steel. The next largest producer, the European Union, made fewer than 200 million tons that year, while the United States, the fourth largest producer, made only 91 million tons. The chart to the right shows the distribution of world steel production in 2008.

Steel producers in other countries are major customers of American coal producers. In 2008, exports of metallurgical coal alone were worth over $5.7 billion. With the notable exception of China, the United States exports metallurgical coal to practically every major steel-producing country. The chart shows the leading foreign markets for U.S. metallurgical coal.



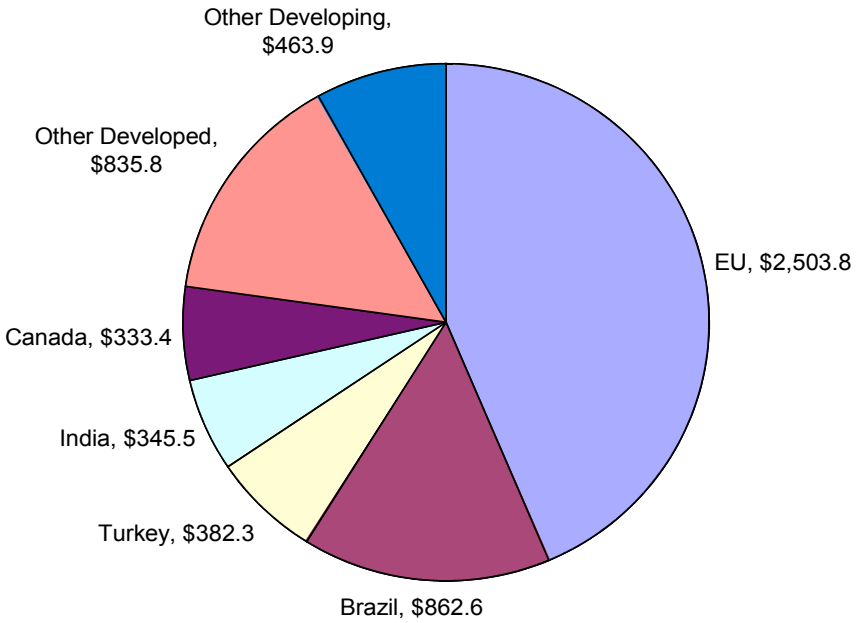
The Steel Industry and the World Financial Crisis

The economic downturn that began in September 2008 has had a devastating effect on steel producers worldwide. Although total global production of steel in 2008 was down only 1 percent as compared to 2007, the monthly figures show a different story.

Global production was relatively strong and stable through September 2008. Then, as the financial crisis began to hit throughout the world, production began to fall. Total monthly global steel production in December 2008 was 31 percent below its high point in May. The drop in production was nearly universal; China was the only major steel producer to increase production in 2008. Virtually every segment and product of the steel industry has been adversely affected by the global economic crisis.

The World Bank predicts that in 2009, the world economy will shrink for the first time since World War II. Global steel production was up slightly in January 2009 compared to December 2008, but it is too early to conclude that a recovery in production has begun. Indeed, some predict that global steel production in 2009 could be 17 percent below 2008 levels, and 26 percent below 2008 levels in the developed countries. A survey of individual markets reveals that the industry's worldwide prospects for 2009 are bleak.

U.S. Exports of Metallurgical Coal, 2008 (US$ Million)



North America

While 2008 started strongly for North American steel producers, NAFTA monthly steel production fell by a staggering 53 percent from May to December 2008. Monthly U.S. production fell by 55 percent over the same period. The chart on page 71 shows the precipitous drop in American steel production at the end of 2008.

Recovery in the steel sector will depend directly upon recovery in the steel industry's two major customers: transportation and construction. Neither sector appears likely to expand anytime soon. U.S. automakers, for example, have recorded horrendous sales figures over the past few months. The financial woes of General Motors and Chrysler are well known. The possibility that one or both could undergo some sort of bankruptcy makes it less likely that vehicle production in the U.S. will increase in the near future.

A quick recovery in construction is equally unlikely. Construction activity is directly related to the availability of credit. Until credit begins to flow freely again in the U.S. economy, construction will languish. The one ray of hope in the construction sector is the recently passed stimulus bill, which allocates nearly $90 billion for repairs and improvements to infrastructure. While this may increase demand for steel by 3 to 4 million tons per year, it will offset the drop in production only to a small extent.

While it is possible that a recovery could occur in 2009, the latest statements from the Federal Reserve forecast the recovery in the United States to begin in 2010. Meanwhile, if the production rate for the first two months of 2009 continues, the United States will make less than 50 million tons of steel, compared to 91 million tons in 2008.

The European Union

The EU, as a whole, is the largest export market for U.S. metallurgical coal. Trends in the EU steel industry are almost identical to those in the United States, with monthly production down by nearly 52 percent between May and December 2008. As in the United States, the automotive and construction sectors in the EU are unlikely to recover until the global credit system revives.

Unlike the United States, the members of the EU (with the notable exception of Spain) have not implemented broad stimulus plans. Because of this fact, the Australian Bureau of Agricultural and Resource Economics (ABARE) projects that the EU's demand for metallurgical coal will fall by around 8 percent in 2009. Given current steel production levels and continued economic turmoil in the EU, this projection may be optimistic.

Brazil

The Brazilian steel industry is the single largest importer of American metallurgical coal in the world. The experience of the Brazilian industry in 2008 mirrored that of the United States. Production was at high levels through October, and then fell rapidly. Brazilian production in December 2008 was nearly 50 percent below its July levels.

The overall situation in Brazil also parallels that of the United States. Both automotive production and construction are down sharply. Brazil is a major exporter of manufactured goods, so falling demand in the United States and EU has decreased demand for steel within Brazil. Absent a quick recovery in the Brazilian economy, steel production in 2009 is expected to be significantly below its 2008 levels. ABARE projects Brazilian imports of metallurgical coal will decline around 8.5 percent in 2009; again, this projection may be optimistic.

China

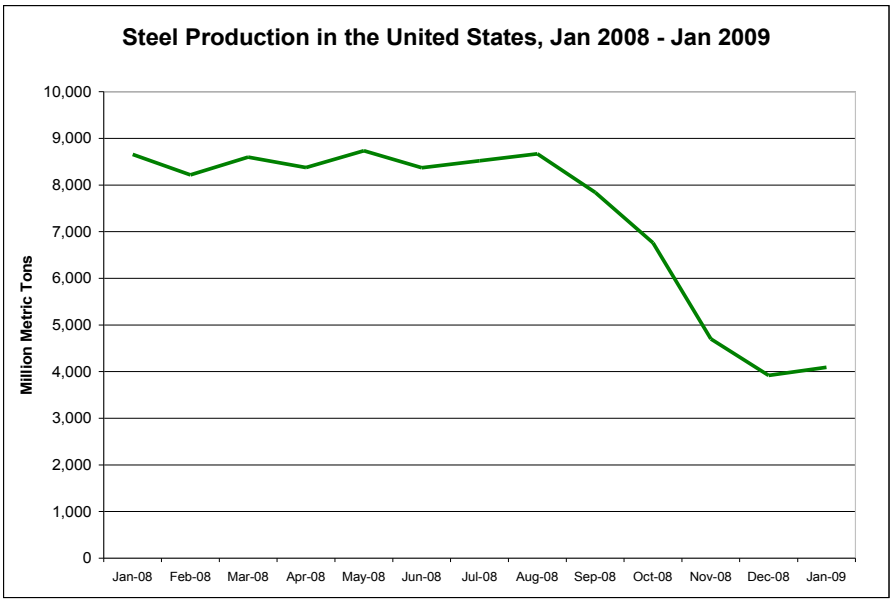
China is by far the world's largest steel producer. However, it is largely self-sufficient in metallurgical coal. While it had another record year for steel production in 2008, it has not escaped the global slow-down. Chinese monthly production declined moderately (11 percent) between May and December 2008. This decline is a marked contrast to the production increases of over 300 percent between 2000 and 2008.

While China is the world's largest exporter of steel, this explosion was driven largely by breakneck construction activity in China, and, to a lesser extent, by the expansion of the Chinese auto industry. The Chinese government expects its economy to continue to grow in 2009, but at a greatly reduced rate. The Chinese manufacturing sector is largely export-driven, but exports have fallen dramatically as a consequence of the economic crisis in the United States and Europe.

Although China continues to build new steel mills, Chinese steel production in 2009 could actually be lower than in 2008; some sources expect it to fall by as much as 9 percent, to around 450 million tons.

India

India is the world's fifth-largest steel producer and a substantial market for U.S. coal. Unlike the United States and the EU, India's steel production was relatively stable throughout 2008, declining only modestly in the last few months of the year. India's steel production nearly doubled between 2000 and 2008, driven largely by domestic demand in construction and the automotive sector. India has been relatively untouched by the world economic crisis, and its economy is much less export-dependent than China's. Thus, the Indian steel industry is relatively well situated to ride out the current troubles. However, it is likely that Indian steel production in 2009 will remain flat in comparison to 2008 production levels.



Conclusion

Prospects for steel production in 2009 are discouraging. Production in the United States, the EU, and Brazil has fallen by as much as 50 percent from earlier levels. Only when the economy as a whole begins to recover are steel makers likely to expand production to more normal levels. When will that happen? As Dan DiMicco, the chairman, president, and CEO of Nucor has said, "anybody speculating on how 2009 will end up is kidding themselves." ◆

Pat McFadden is director of government affairs at Nucor Corporation (www.nucor.com)

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Coal's role in Italian and international scenarios

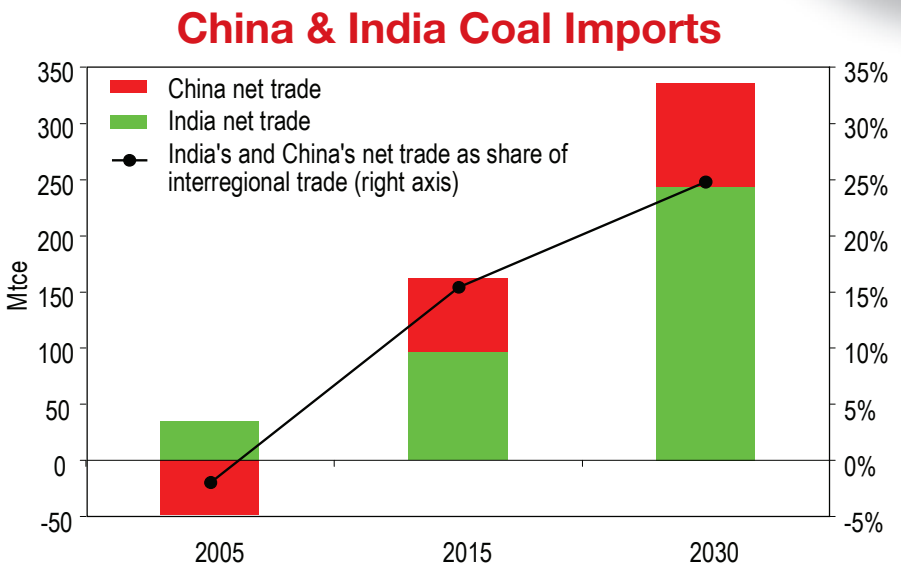
By Andrea Clavarino, Assocarboni

According to estimates in the International Energy Agency's (IEA) 2007 World Energy Outlook 2007, worldwide demand for energy will grow from 11.4 billion TEP in 2005 to 17.7 billion TEP by 2030.[1] Over that same time period, fossil fuels will continue to act as the world's primary energy source, providing 84 percent of the total demand increase.

Coal is expected to see the highest demand increase, growing by 73 percent. Worldwide, the use of coal for primary energy will grow from 25 percent to 28 percent, thanks to Chinese and Indian demand, which is four or five times higher than the current values and represents 45 percent of total world demand. Overall, coal use will grow from 2.9 billion TEP in 2005 to 5 billion TEP in 2030.

Despite being primary producers, both China and India have significantly increased their demand for imports. Forecasts to 2030 suggest that Chinese imports will reach 133 million tons – or 3 percent of world demand. India is also expected to increase its imports of coal and coke from current levels of 39 million tons in 2005 to 54 million tons in 2015 and 151 million tons in 2030.

Natural gas use will also grow, shifting from 21 percent to 22 percent of world demand. Oil will continue to be the most used fossil fuel. However, world demand for oil will decrease from 35 percent to 32 percent.



China recently became a net coal importer like India, with both increasing pressure on international coal markets

Italian energy infrastructure weaknesses are mounting and the structural weakness of our gas supply and storage system is a constant issue. Italy continues to rely on pipelines for 100 percent of its natural gas supply. This situation is unique throughout Europe as most countries rely on regasification of LNG for 50 percent of their total consumption. Over $22 billion will need to be invested in infrastructure upgrades to meet growing demand. Financing these investments clearly represents one of industry's main challenges.

Adding to the challenge, neither Italy or the rest of Europe were prepared to deal with an activist Russian energy policy, or its tendency to reinforce demands for gas and oil industry re-nationalization and the downstream integration of European markets, or its impacts on gas and oil prices.

To address these challenges, European policy must first check the entire gas cost chain – from extraction to final consumers – as a means of reinforcing market power, profits, and demand reliability. Second, policymakers must "encircle" the European market by signing an "iron deal" with Algeria that can guarantee up to 70 percent of imports and 50 percent of the total European demand.

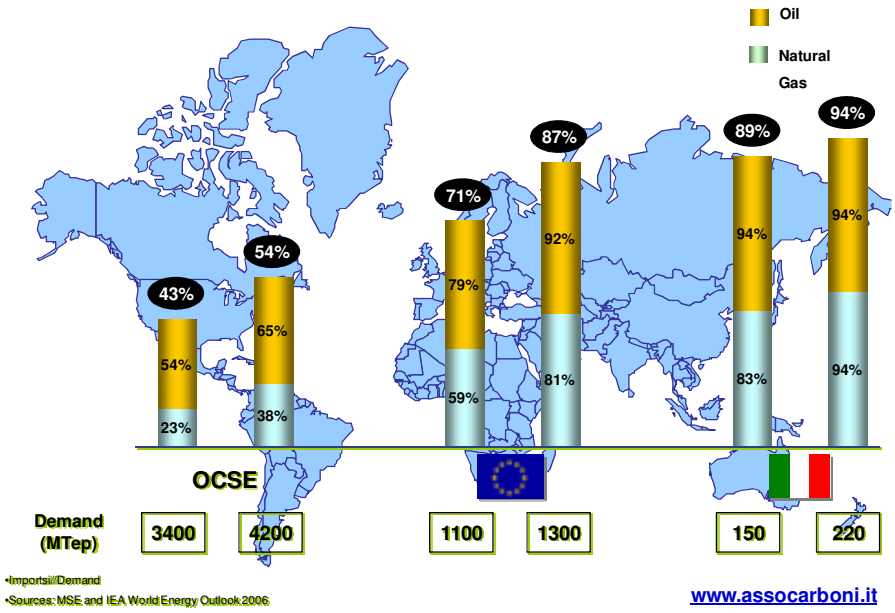
Attacking Russia and Algeria is difficult as their supplies are irreplaceable in

1 1 MWh of electrical power = 0,285 TEP (Tonne Equivalent Petrol)

the European market. But, this is something that we should have seen coming. We could have prevented the European power system from relying so heavily on imported natural gas. However, our choices and a total lack of initiatives on the part of the European Union, have served to reinforce Russian negotiation power. As a matter of fact, Brussels Governments and bureaucracies have done nothing to address the issue, even after the methane crisis in 2006 and 2007.

As the impacts of this crisis diminishes, Italy still depends on two methane pipelines and two suppliers – Russia's Gazprom and Algeria's Sonatrach – for more than 60 percent of our total gas supply. It is no surprise then that, according to Eurostat data (July, 1 2007), Italy pays 55 percent more per MWh of electricity than the other 25 European countries. Higher costs and decreased energy security are why Assocarboni is asking the government again in 2009 to allow coal to play a larger role in power production. With more coal in the energy mix, Italy can enjoy lower costs and obtain a better geopolitical diversification of supply.

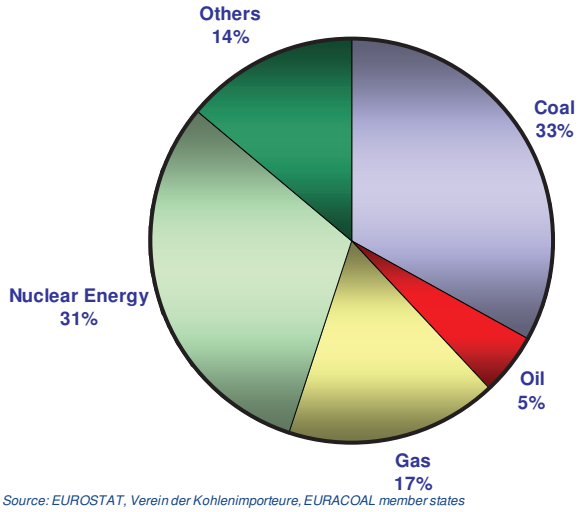
Energy Dependence 2004 – 2030



Assocarboni strongly supports the "German" example, of more renewable sources (which are, however, expensive and subsidized by taxpayers) and more coal (far less expensive and not subsidized). Together with nuclear, this mix provides Germany with a safe and competitive electricity supply.

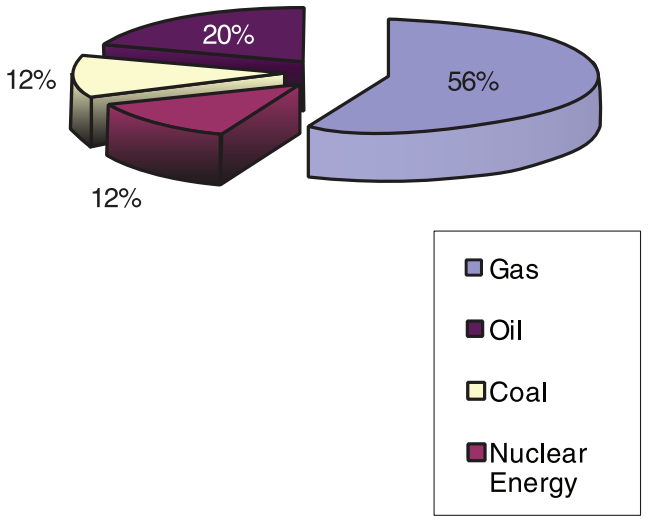
Continuing to rely solely on renewables and natural gas ensures Italy will have high-priced electricity and reduced development. In today's open market, this

Power Generation mix in EU-27



Source: EUROSTAT, Verein der Kohlenimporteure, EURACOAL member states

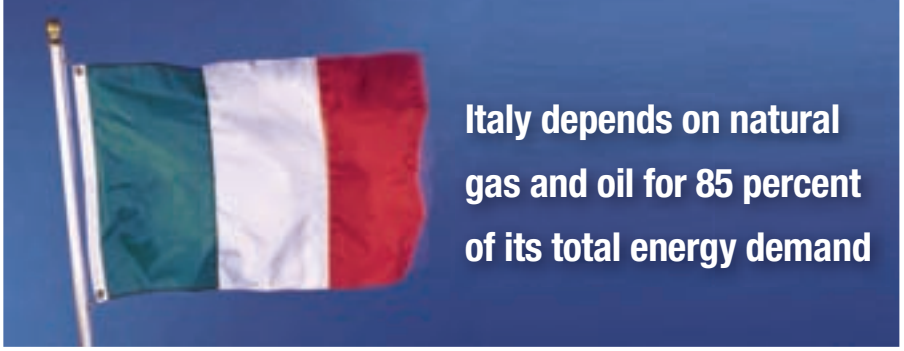
Italian Power Generation Mix 2007



policy also places Italy at the mercy of the most shrewd European producers.

Assocarboni is also demanding greater reliability for its electricity producers. We believe they should be helped, rather than encumbered in their activities. This is why we supported the conversion of Civitavecchia's Torrevaldaliga plant, from fuel oil to coal, despite continuous bureaucratic and administrative obstacles. Those obstacles ensured the final cost of the plant was higher than originally expected. However, Italy now has one of the most advanced and "eco-compatible" coal plants in the world.

Torrevaldaliga is now envied throughout the world and even European energy commissioner Andris Piebalgs, noted the advanced technical features of the plant, stating that it would help the EU "combat climate change."



Producing electricity from coal is appropriate and necessary for Italy. Natural gas prices are tied to the rapidly fluctuating price of oil and Italy relies on gas for nearly 60 percent of its electricity supply. Coal's low cost and security/safety of supply make it an obvious international energy choice.

Additionally, coal is supported by the development of advanced clean coal technologies, which drastically reduce CO_2 emissions and will allow for carbon capture and storage in the near future.

Italy depends on energy. However, it has limited natural reserves and, therefore, relies on other foreign countries. While Europe bases 60 percent of its electricity supply on a mix of coal and nuclear, Italy produces the same percentage with natural gas. In fact, Italy depends on natural gas and oil for 85 percent of its total energy demand; Europe averages less than 50 percent. Not surprisingly, Italy's choices have profound implications on reliability and competitiveness of supply.

Our primary energy supply comes from politically unstable regions and follows a rising cost trend. Additionally, our energy choices contradict the Markowitz portfolio theory, which is based on the idea that investments should be diversified. This theory was previously used on financial securities but also suits the energy portfolio of a country. Markowitz theory claims that in order to obtain a successful portfolio we need to identify a combination of assets able to minimize risks and maximize total yield by covering the single asynchronous trends. In the same manner we could refer to the Italian energy mix: diversifying sources on the basis of risks and advantages of each and choosing raw materials with inversely related prices.

To this end, Assocarboni's solution for a better-balanced energy mix in Italy encourages the use of coal in line with European levels, by pushing it up to 20 percent, instead of the current 12 percent. We also support the construction of new nuclear generation capacity, a strong push on renewable sources, and the construction of new LNG regasification equipment to help diversify our system away from the Russian and Algerian oligopolies. ◆

Andrea Clavarino is president of ASSOCARBONI – International Association of Coal Operators.

The Silver Lining of Climate Change Policy

Opportunities for gassy underground mines

By Jeffrey Liebert, Verdeo Group

The country has drifted into an economic recession, coal prices have dramatically fallen from historic highs in a matter of months, and the Obama administration is supporting the passage of a cap-and-trade program to reduce greenhouse gas (GHG) emissions that will likely result in higher energy costs in the economy. It is hard to imagine that the coal industry could see any positive effects from the implementation of a cap-and-trade program, particularly when it increases the cost of electricity generated by coal.

However, there is a silver lining to proposed climate policy that may directly benefit a sub-sector of the coal mining industry: an opportunity to generate new revenue streams by reducing methane emissions from gassy underground coal mines. This emission reduction creates what's called a carbon offset credit – an instrument reflecting the value of the reduction, avoidance or sequestration of one metric tonne of carbon dioxide equivalent (CO_2e) that is generated from an unregulated sector or facility. Fugitive methane emissions generated from coal mines will likely not be regulated under a cap-and-trade program and will likely qualify as eligible carbon offset credits. Therefore, those underground mines that can safely extract and capture coal mine methane (CMM) will be able to justify investments in gas-gathering and utilization systems with the added revenues from the sale of carbon offset credits.

Biothermica Technologies, 30,000 ft³/min pilot ventilation air methane mitigation system (VAMOX™), installed at Jim Walter Resources' No. 4 mine in Alabama.

PHOTO BY STEVE JURVETSON – *JURVETSON (flickr)*

The Obama administration is supporting the passage of a cap-and-trade program to reduce greenhouse gas (GHG) emissions. The silver lining: an opportunity to generate new revenue streams by reducing methane emissions from gassy underground coal mines.

Emergence of Cap-and-Trade

The concept of cap-and-trade was originally pioneered in the U.S. with the implementation of the cap-and-trade program for SO_2 emissions from electricity generators under Title IV of the 1990 Clean Air Act Amendments. The objective of a cap-and-trade program is to achieve an established level of reductions at the lowest overall economic cost. Regulated entities that can reduce emissions at lower marginal costs than others can sell excess reductions, thereby reducing overall compliance costs.

In addition, carbon offset credits, which represent reductions generated from uncapped sectors or facilities, are generally used to meet a percentage of the reduction requirements within the capped system. By providing capped entities with a lower-cost alternative means of meeting a compliance obligation, a well-designed carbon offset program encourages the most cost-effective reductions to be implemented first, thereby minimizing overall costs while providing time for new emission reduction technologies to be developed, or more expensive emission reduction technologies to become more economical.

Drawing on this concept, Senators John McCain (R-AZ) and Joe Lieberman (D-CT) circulated the first GHG cap-and-trade bill in the Senate in 2003. Following increased bi-partisan attention on the issue of climate change, Senators Joe Lieberman (I-CT) and John Warner (R-VA) in 2007 introduced another cap-and-trade bill, America's Climate Security Act, and a number of other climate change bills have been subsequently introduced in both houses of congress. While none of these bills has been approved, there is growing expectation that the next cap-and-trade bill introduced will have greater support. In addition, many of these bills have specifically categorized certain sectors or sources of emissions as eligible to generate offsets. By the time Representatives John Dingell (D-MI) and Rick Boucher (R-VA) released their draft climate change bill in fall 2008, CMM had become widely recognized as a potential offset category.

Fugitive methane is the single largest source of GHG emissions from operating coal mines. The EPA estimates that methane emissions from the mining sector, including abandoned coal mines, totals approximately 65 million tons of CO_2e per year[1], which represents approximately 1 percent of total anthropogenic GHG emissions in the U.S. While mines are a significant source of fugitive methane emissions, regulating coal mines for these emissions under a cap is undesirable. Emissions that are most effectively addressed under a cap are those that are generated from defined point sources that can be easily measured on a sector-wide basis. For this reason, GHG emissions from electric power plants and large industrial processing facilities are generally those targeted for regulation under a cap.

In contrast, methane from mines is distributed in a diffuse manner, where methane flow and concentration can vary greatly, and where in many instances (e.g., from surface mines or from underground mines with very low methane emissions) it is neither technically nor economically feasible to capture. Thus, the only safe and economically viable way to foster reductions of these fugitive methane emissions is by designating coal mines as a sector eligible to generate offsets under a cap-and-trade program.

Coal Mine Methane Offset Project Types

There are a range of CMM offset project types that can be developed in the U.S. market to abate and/or productively utilize methane. The primary methane combustion and processing technologies can be broken down into three main categories: incineration/oxidation, gas conditioning, and power generation.

Oxidation technologies, such as regenerative thermal oxidizers, are now being deployed on operating mines to abate methane emissions. The first commercial plant was implemented by BHP Billiton's Illawara Coal, West Cliff Colliery in Australia. This plant uses a combination of drainage gas and ventilation air methane to fuel a 6MW power plant that generates electricity from super-heated steam. The first oxidation technology installed on an operating mine vent shaft in the United States, the VAMOX™ ventilation air methane mitigation system, was recently commissioned by Biothermica Technologies at Jim Walter Resources' mine No. 4 in Alabama. The pilot plant has a capacity of 30,000 ft^3/min and is expected to achieve emission reductions of about 40,000 tCO_2e every year.

"We are very excited about offering mines a solution that abates a waste gas while actually generating revenues in a safe and non-intrusive way," said Nicolas Duplessis, director of development at Biothermica.

For the lower-quality, variant gob gas, the most commonly used abatement method is incineration using enclosed stack flares and thermal oxidizers. The higher-quality mine methane extracted from the post-mining gob vent bore holes and pre-mining in-seam horizontal and vertical bore holes can be channeled through a centralized gas gathering system. That gas can then be processed into pipeline-quality gas using such unconventional gas conditioning technologies including cryogenic, membrane, pressure swing absorption, and amine solution processing. Lastly, co-generation lean gas turbines and on-site boilers can be viable alternatives for low-quality gas utilization if there is on-site demand for the energy with the addition of carbon offset credits. For those gas utilization projects that have looked marginal on BTU values alone, the addition of carbon offset credits may make the difference in a mine's decision to allocate capital and develop the project.

Certifying Coal Mine Methane Offset Projects

A high-quality carbon offset project can be developed today at a U.S. mine using any of these established technologies following precedents in the international market. Carbon trading activity in the U.S. to date typically has been defined as a purely voluntary market, where individuals and companies not likely to be regulated have chosen to purchase carbon offset credits to reduce their GHG footprint and promote environmental sustainability. In addition to the voluntary carbon market, the "pre-compliance" market is starting to emerge based on legislative activity at the federal, state and regional levels.

The pre-compliance market in the U.S. is driven by buyers and sellers transacting carbon offset credits from certain project types and certification programs that are likely to be recognized in a future compliance program. In this market, entities that are unlikely to be subject to an emissions cap, including coal mines, livestock farms, and landfills, have begun selling offset credits to those entities that are likely to be regulated. These transactions have been driven by buyers who believe that acquiring carbon offset credits today will be a lower-cost alternative to making near-term capital investments in on-site air emissions improvements or buying future government allowances.

Despite the recent economic downturn, all indications are that federal climate change legislation will be passed in the next few years and go into effect in 2012 or 2013. The Chairman of the House Committee on Energy and Commerce, Rep. Henry Waxman, has committed to push a federal climate change bill through his committee before Memorial Day, and President Obama's fiscal budget includes revenues from the auction of allowances under a federal cap-and-trade program. The northeast Regional Greenhouse Gas Initiative's (RGGI) cap-and-trade program started operating in January 2009, and cap-and-trade program development actively continues in California, and under the Western Climate Initiative (WCI) and the Midwest Greenhouse Gas Reduction Accord.

A number of different certification bodies for carbon offset projects and credits

have emerged as leaders in the pre-compliance market. The Voluntary Carbon Standard (VCS), a program that allows project developers to use project protocols (i.e., a blueprint for developing an offset project) approved under the Kyoto Protocol's Clean Development Mechanism, has provided a means for certifying projects in the U.S., including CMM projects, following rigorous international standards. The Climate Action Reserve (CAR) is an independent organization that has developed and approved a range of protocols that many anticipate will be directly recognized under the State of California's program, as well as the WCI and a future federal program. CAR is currently in the process of developing a protocol for CMM projects, which is anticipated to be released in October 2009. Based on the expectation that projects certified under CAR will have a high probability of generating credits that trade in a future compliance market, CAR has recently surpassed VCS and other certification programs as the market leader in the U.S. In February, Environmental Finance magazine reported CAR credits trading at an average of $9.90/tCO$_2$e, a 50 percent premium to VCS average pricing of $6.60/tCO$_2$e.[2]

Several other certification bodies continue to hold a prominent role in the U.S. market, including the American Carbon Registry (ACR) and the Chicago Climate Exchange (CCX). ACR is managed by the Environmental Resources Trust, a program of Winrock International and a pioneer in the U.S. carbon market. CCX, which has gained the participation of a number of large prominent companies, operates a cap-and-trade market that allows member organizations to make voluntary but binding commitments to inventory, register and reduce emissions. Carbon offsets have been a central part of CCX's cap-and-trade system, and CCX has an approved protocol for CMM projects. Current prices for CCX credits have generally been trading between $1.00 to $2.25/tCO$_2$e, which is well below the capital cost required for most high-quality CMM capture and utilization projects, which tend to range in abatement cost from $2.00 to $4.00/tCO$_2$e.

Reasons to Act

Carbon offset credits from coal mines have an important role in a future cap-and-trade program, and demand in the pre-compliance market illustrates how real the current opportunity is. Companies, including utilities, IPPs and large industrials, will benefit from having access to high-volume, cost-effective offset credits that can be generated from the destruction of fugitive methane emissions from coal mines. This benefit is further enhanced by the fact that mines already supply coal to the very entities that are expected to be regulated. If coal mining companies are seeking to best serve their clients with a high-quality coal product, bundling an additional carbon offset credit could further add value to that relationship. At current market prices of $6-10/tCO$_2$e for the highest-quality certified carbon offset credits, even a simple project to abate gas from two gob wells flowing at 1,300 CFM with 70 percent methane could yield, on average, between $650,000 and $1.6M in revenues per year for a mine. At these numbers, there is a strong incentive for mines with significant methane liberation to consider turning that methane into tangible revenue today. ◆

Jeffery Liebert is managing director at the Verdeo Group (www.verdeogroup.com)
Marisa Buchanan contributed to this article

References

1 The carbon dioxide equivalent (CO$_2$e) is a unit of measurement that designates the global warming potential of a GHG emission. Carbon dioxide (CO$_2$) is the universally accepted reference gas by which other GHGs are measured. Methane is considered a particularly potent GHG that has 21 times the global warming impact of one unit of CO$_2$.

2 Marcello, Thomas. "Price Pressure" Environmental Finance. (February 2009)

Energy First!

Approaching Climate Compliance from the Inside Out

By Charles Reith, Remote Energy Solutions

Climate legislation has presented itself as a grim specter to the coal industry, creating responsibilities such as greenhouse gas (GHG) inventorying and financial concerns that include required purchases of credits in the form of emissions allowances and carbon offsets. Further, the carbon-intensive nature of coal will burden the entire supply chain, from mining through generation to power sales, the latter of which will be economically disadvantaged against technologies with lower carbon costs.

The seriousness of this financial threat to the coal industry's competitiveness should not be underestimated. Still, there are strategies that coal producers and power generators can adopt that will reduce the competitive shock of climate legislation. These include proactive (pre-) compliance activities, carbon liability assessment, and GHG emissions reduction, which will reduce that liability and the degree of competitive disadvantage that it confers. Further, if compliance planning is undertaken with the right mindset and approach, facilities may identify such significant opportunities for energy savings that the forthcoming climate spending may be largely or entirely offset by reduced energy spending. This article describes that approach, which we describe as "approaching climate from the *inside out.*"

What to Expect: Most of us have a general sense of the legislation's anticipated content, which will of course be variously reframed during rulemaking. However, it's worth summarizing from the perspective of the coal industry what can be expected as primary elements and consequences:

- Larger facilities, especially power plants, will be regulated in a way that requires GHG inventorying and subsequent carbon-related "fees" levied (purchases of allowances or offsets).
- Besides paying fees, facilities will also see "pass-through costs[1]" on purchased power and fuels such as diesel or natural gas.
- Coal-fueled power, because of regulation from mining through generation, will see a cost premium added and will bear a "more taxing" burden than competing sources of electricity.

Many have characterized this forthcoming situation as nothing less than a draconian source of extra spending. Consultants approaching carbon compliance from the perspective of GHG inventorying, and liability calculations just add to this perception. They address the problem from the *outside in,* quantifying a facility's emissions envelop and then calculating the formidable sum that will be required to "pay to pollute," either by purchasing allowances (per-tonne emissions permits) or offsets (pollution reductions elsewhere that compensate for that facility's "climate damaging" releases).

An approach we find far more constructive, optimistic and forward looking is to address climate from the inside out. Carbon emissions are, after all, byproducts of the power and fuel usage required to operate facilities. So, why not start the process by carefully examining energy usage with an eye toward identifying the most cost-effective reductions in energy spending or, conversely, increases in energy efficiency? A powerful tool for accomplishing this is energy mapping, which deeply dissects a facility's energy spend relative to each application's source, carbon intensity, and relationship to other applications. A highly generalized second-tier energy map for a coal mine is shown on page 83.

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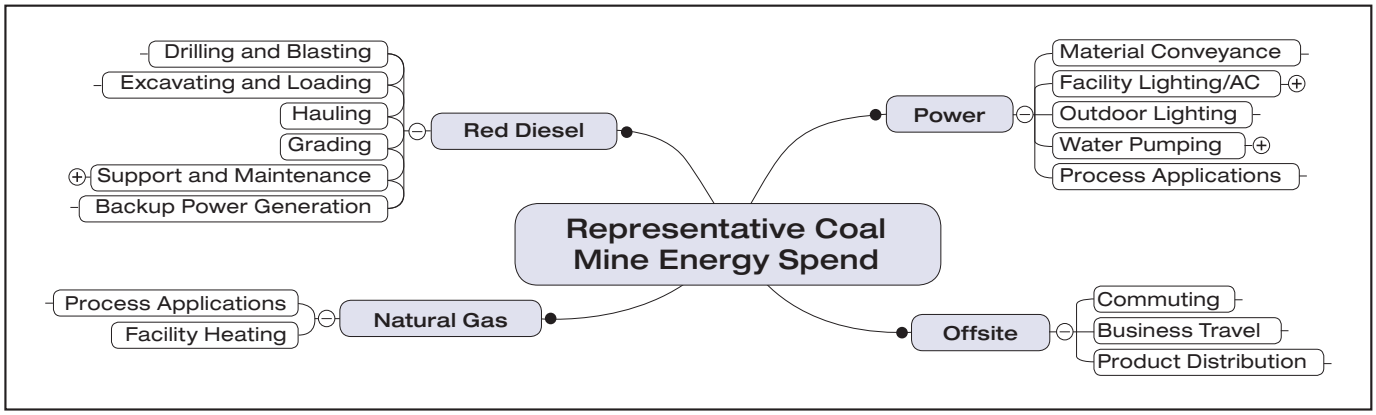

Putting Energy Maps to Work

Once an energy map has been fully developed, with each application quantified to the extent possible, the stage is set to identify and prioritize energy-reduction measures. These measures range from individual equipment change-outs to wholesale process modifications. In some cases, grid-powered processes at coal mines may be switched to fuel-powered, especially if the fuel comes from on site. In other cases, renewably powered self-generation might be warranted, for instance, using wind, micro-hydro, biomass, or solar, with a diesel gen-set for backup.

Energy maps provide a framework for making these determinations, and start with a birds-eye view of the entire energy spend and drill down as necessary to consider improvements at every level. This provides an opportunity to explore capital projects that not only reduce energy spending and GHG emissions, but eliminate other expenses and complexities as well. At one mine, for instance, we have identified and are evaluating an opportunity to replace a multi-unit heating process fueled by truck-delivered propane with a co-generation (combined heat and power) system fueled by piped-in natural gas. This solution not only obviates weekly deliveries and storage of a flammable gas, but also provides relatively "uninterruptible" power that would otherwise require diesel back-ups.

Shadow Pricing Prospective Efficiency Projects

Only after an energy map has been developed and efficiency opportunities identified does it become worthwhile to calculate a facility's greenhouse gas footprint and its potential liability under different carbon pricing scenarios. The

Ravenswood Power Plant in New York City

oft-depressing liability scenarios are not in fact meant to discourage, but rather to provide an economic context for considering improvements in energy efficiency. This is important because when prospective GHG emissions fees or compliance-driven pass-through costs are introduced to the equation, the returns on investment (ROIs) for efficiency projects can look altogether different. As I tell one client, a coal-fired power producer considering the expansion of its 20-year-old district heating system, "you're about to pay for your fuel twice: once to buy it and a second time to use it." This recognition of carbon's "shadow price" considerably shortens the ROI for energy efficiency and innovation for – in this case – energy-leveraging projects.

In summary, the challenge of climate compliance should be viewed as an opportunity to systematically examine the more fundamental economic liability: the reliance on energy to fuel business models. Rather than allow an already volatile spending obligation to balloon with carbon fees, now is the occasion to dissect, re-engineer, and optimize energy usage. The result will be to reduce energy spending today and carbon liability tomorrow. Regulated carbon will admittedly pose a considerable burden to every participant in the country's important coal economy, but the winners among us will use the preparatory process to improve energy usage from the inside out … to sharpen operations and increase competitive prospects. ◆

Charles Reith is principal investigator and project manager at Remote Energy Solutions (www.remote-energycorp.com).

1 Pass-through costs are anticipated markups of purchased resources due to the providers' carbon obligations.

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