Transformation...
How America’s Coal Industry is Changing for the Better

In this issue
The Real Fuels of the Future | The Value of Precombustion Cleaning | The 2010 ACC Buyers’ Guide
The fuel handling marketplace is changing
The need to contain cost, increase efficiency, and ensure MSHA and OSHA compliance is more urgent than ever. Benetech has you covered. We're committed to helping you face today's tough challenges with our innovative, proven technologies and over 25 years of leading industry experience.

Real solutions
Leverage the power of our Total Dust Management (TDM®) technologies and the expertise of our highly trained team of Plant Professionals (P²), and you'll have everything you need to implement effective solutions for risk mitigation, asset optimization, fuel flexibility, and combustible dust compliance. Trust the company with more than 195 projects relating to coal conversion, blending, and plant assessments for safety improvements. Trust Benetech. We're on your side.

With Benetech on your side, you know you’re covered

Get to know Benetech. Call 800-THE-COAL x241, or visit BenetechUSA.com

Governmental Compliance and Safety Assessments
Experienced Engineering, Fabrication and Project Management
Industry-leading Technologies and Products
Plant Services and Maintenance
CONTENTS

Message from ACC President ..................................... 3
Message from ACC CEO ........................................... 7
Message from ACC Communications Director ................. 9
ACC Vision and Mission Statement .............................. 12
2010 Board of Directors ............................................ 12
ACC Member Companies ........................................... 13
ACC Champion & Patron Sponsors ................................ 13

Spotlights
Co-firing with Biomass as an Emissions Reduction Tool ....... 15
Pre-combustion Technologies Blending Biomass with Coal to Produce . . . . 19
Repercussions of the BP Oil Spill ................................ 21

Features
The Real Fuels of the Future ..................................... 27
Book Review:
The Myths of “Green” Energy & the Real Fuels of the Future .......... 27
Natural Gas Markets: How Much is There? Projections for the Future .... 35
Less is More: The Bentek Study ................................... 39
Coal Ash: EPA Moves Continue to Threaten Recycling Industry ....... 43
Carbon Financing: Business Opportunities that Catalyze GHG Reduction . . . 47
Using Modeling to Increase Power Plant Efficiency ................ 51
The Value of Pre-Combustion Cleaning for Power Plants ............... 55

Index to Advertisers .................................................. 60
Jennmar is a multi-national, family owned company that’s leading the way in ground control technology for the mining and tunneling industry.

Jennmar Corporation offers coal and hard rock producers the industry’s finest, most technically advanced line of roof control products for the mining and tunneling industry. But that’s only part of the reason for our success and primary-source status among mine operators. Jennmar will do everything we can to improve roof control operations. We believe in developing a closeness to our customers and keeping the lines of communication open at all levels. Jennmar is a customer-oriented company, and that’s the only way that we do business.
Transformation:
Battling past the confusion
New strategies for new realities

Jeff Wallace, ACC President, Vice President Fuel Services Southern Company

As we have moved through the past few years, it seems that the legislative and regulatory world surrounding the coal industry has become increasingly murky. These issues continue to slow industry attempts to update aging infrastructure and build new generation and transmission resources.

Bowed, but not beaten, we’re using this edition of American Coal to discuss how the industry is moving beyond the roadblocks to remain a primary source of American energy.

We need to stay educated on these issues, so it is worth highlighting some of the challenges we face. As Janet Gellici noted in her CEO’s message in the last issue, there are numerous legislative, regulatory, and judicial challenges being aimed at the industry. The majority of those issues continue to hang over us.

• Clean Water Act-related permitting issues continue to threaten coal mining, and along with it tens of thousands of jobs and an essential energy supply in the Central and Northern Appalachian regions.
• Pending coal ash regulations are still pending and could see ash regulated as “toxic” waste. Such a designation could potentially destroy a $6 – $11 billion per year recycling and clean building products industry.
• EPA’s moves to replace the Clean Air Interstate Rule (CAIR) with the new Transport Rule have effectively nullified the market rules underpinning the SO₂ cap and trade program. That change has caused the price of SO₂ allowances to plunge to near zero, all but killing what has been an effective market-based means of controlling SO₂ emissions.
• Energy and climate legislation, long stalled in Congress, finally made it through a Senate committee. However, this energy bill ignored Green House Gas (GHG) emission caps and focused instead on regulating off-shore drilling, subsidies to encourage efficiency-related home improvements, and subsidies to push transportation toward the use of natural gas. Threats are now circulating through Washington that a lame-duck Congress, effectively freed from further voter reprisals, could ram through a far stricter GHG bill after the November elections.
• Congress has not yet acted to address GHG emissions, or to restrict EPA jurisdiction over GHG emissions. So, as we learned in presentations at the ACC’s Fuel Flexibility Conference in Chicago (July 20-21), the implementation of the new EPA tailoring rule, aimed at limiting greenhouse gas (GHG) emissions, will be a legal nightmare. Legal experts, utilities, engineers, elected officials … pretty much everybody is struggling to understand what the Best Available Control Technologies (BACT) for GHG will be and how to apply the National Ambient Air Quality Standards (NAAQS) to GHGs, along with a host of other legal and environmental questions. No one can be sure what control equipment they will need to install to control which emissions, or in what quantities. Meanwhile, the lawyers on all sides of the issue are sharpening their pencils. At the same time as we are dealing with the uncertainty from these and many other
pending legislative changes, we are getting further mixed messages from a federal government that appears to support the coal industry in one move, while it changes the rules of the game in another. Just one example will help to explain.

On what initially seems to be a positive news cycle for the industry, Energy Secretary Steven Chu recently announced that $1 billion in stimulus funding was being targeted to restart the stalled FutureGen project. Readers will remember that the FutureGen project was to build a new, state-of-the-art Integrated Gasification Combined Cycle (IGCC) facility in Mattoon, IL. This facility would have gasified coal to produce synthetic gas, which would then be used to power a combined cycle generation plant. Carbon dioxide from the clean burning process would be captured and stored underground in favorable Illinois geological sinks.

The updated plan – being tagged FutureGen 2.0 in the press – is to retrofit an existing oil-fired plant in Meredosia, IL to an oxy-fuel concept (where coal is combusted in a pure oxygen environment, thus making a pure stream of CO2 for storage). Senator Dick Durbin (D-IL) defended the change in plans, noting that FutureGen was to be a “research effort” and since gasification plants are now being built commercially in the U.S., there was no longer any need to test the concept.

Given the nature of the geology under the previously approved Mattoon site, that area will still be needed for the physical sequestration of the CO2, so a pipeline will be built to transfer it from the Meredosia site.

So while many are hailing the FutureGen 2.0 plant as a success and a proactive move toward keeping coal in the mix, some critics are claiming this is a “far cry” from what was originally proposed and see it as a move sideways rather than forward.

With all of the issues listed above, it is easy to wonder what the industry will do to remain vital as it moves through this confusion. That is why this issue of American Coal is focused on “transformation.” We are looking at the proactive moves being proposed and implemented by the industry, and tying them in with the themes being considered at the Coal Market Strategies Conference in Tucson, AZ (October 5 – 7).

In this issue and at Coal Market Strategies, experts from industry, academia, and government will consider “new strategies for new realities.” Changing political realities, rapidly changing domestic and international markets, environmental regulations, myths and misinterpretations about how energy is produced and what it costs, competing fuel sources … all of these issues and more are coming together in a completely unique manner to challenge us to move beyond the “old ways” and to come up with transformative means of providing the affordable, abundant/secure, and environmentally sound energy that this country needs to succeed. ◆
As improved safety and environmental standards require better performance from conveyors, the inherent flaws of traditional conveyor design become more apparent, and more costly.

Introducing **EVO® Modern Conveyor Architecture**.
The standard in conveyor technology for the 21st century.
Since 1903, Roberts & Schaefer has been a global leader in coal beneficiation and bulk handling technology. Projects built by R&S more than 40 years ago are still operating at their original design capacities. That's because R&S facilities are thoughtfully designed, and built with the highest quality materials. Our plants work right the first time, every time, for a long time.

We have designed some of the most advanced large-scale coal preparation plants in the world, with wash capabilities up to 3,800 TPH. We've completed thousands of material handling projects in 15 countries on five continents in just the last decade. Our designs and flow sheets work exactly like we said they would, which is why we stand behind our work.

Call your Roberts & Schaefer representative today, and put our quality and longevity to the test.
“Improbable” Transformation is Underway

Janet Gellici, CAE, ACC Chief Executive Officer

In June of this year, I had the opportunity to participate in a National Women’s Leadership Summit in Anchorage, Alaska, hosted by The Louisiana Center for Women & Government and chaired by Senator Lisa Murkowski (R-AK) and Senator Maria Cantwell (D-WA). I was invited to speak on a panel that posed the question – Is it possible to replace American energy that comes from fossil fuels?

It was quite obvious to me that the answer is, in a word, “no.” In preparing my presentation, however, I realized that not everyone finds the answer to this question to be quite so obvious. There were, in fact, a number of women at the Summit who believe that renewable energy resources can and will replace coal, oil and natural gas – some even believe that this will happen in the near term; that conservation and efficiency initiatives will preclude the need for fossil energy in the future; and that all sources of biomass and biofuels are carbon neutral.

I’d say the folks that believed these things were in the minority at the Summit. In fact, I was impressed by the pragmatism of those in attendance – especially those who lived and worked in Alaska – regarding the need to balance developmental and environmental objectives. In that sense, Anchorage was the perfect setting for the Summit. The surrounding mountain peaks, pristine water and abundant wildlife, co-existing with Alaskan residents’ efforts to thrive in an times challenging environment, were very visible reminders of how important it is for us to address our national economic, energy and environmental goals in concert.

I noticed that those not necessarily sharing these more pragmatic perspectives were also cynical about our ability to develop and deploy clean coal technologies. They doubted the value of these clean energy investments for job creation, for the advancement of U.S. export trade, and for our national security.

There are lots of folks out there today who are doing the improbable, already doing what we thought was unlikely to be done. Take Margie Brown, CEO of Cook Inlet Region Inc. (CIRI), who is developing a commercial-scale underground coal gasification (UCG) project just outside of Anchorage.

Take our newest ACC member, Calera Corporation, which is advancing technology to capture massive volumes of CO₂ and other emissions and convert them into sustainable building materials and water.

Take the technologies being developed by ACC Coal 2.0 Alliance members to develop clean solid fuels that combine coal and biomass products that can be used in existing boilers with higher efficiency and lower emissions.

Oscar Wilde once noted that the world seems divided into two categories – those who believe the improbable and those who do the improbable. Although a promising source of supplemental electricity, how is it possible that renewable power which comprises less than 1% of our energy can be considered a practical replacement for coal? Although its contribution to meeting demand will likely provide a cost-effective and immediate benefit, how is it possible that energy efficiency can stem the burgeoning requirement for electric power?

Why is it so improbable that we can transform a resource and beneficially use it to our advantage? Why is it so improbable that an industry with a long history of meeting our nation’s energy needs can transform itself to meet current economic and environmental objectives?

These projects and others described in this magazine and prior editions, are just a few examples of what the future of clean coal energy looks like. It’s a possible future – not improbable.

The modern environmental industry is four decades old; we’ve been using coal for centuries. Younger industries may look upon us as unwavering or unwilling to change; they may judge us solely by our past and not be willing to acknowledge our transformational efforts.

History documents that our industry has adapted to change and has achieved results in terms of safety, efficiency and environmental performance. I believe we’ll continue to do so in the future. But I’m part of that older industry, so what do I know …?

Oscar Wilde also said, “I’m not young enough to know everything.” ◆
While we were building America, you were powering it.

Union Pacific understands the vital role coal plays in our nation’s industries and homes. We are proud to be part of the supply chain that “lights up” America.
Transformation: moving beyond what we think we “know” to achieve what we need

A MESSAGE FROM THE ACC COMMUNICATIONS DIRECTOR

Jason Hayes, M.E.Des., ACC Communications Director/Editor of American Coal

Over the past several months the ACC has been actively engaging several popular myths and misconceptions related to energy generation. On the Coalblog and our social media outlets, on the ACC website “Issues” page, in past issues of American Coal, in our Coal Q&A program, and in public presentations, we have questioned what is taken as conventional wisdom on energy. Along with those questions, we have provided answers where we could – balanced and factual information to respond to the broad media attention that these myths have received.

Among the myths are the ideas that natural gas can replace coal, that wind and solar can replace gas and coal, and that the construction of wind-based energy will necessarily reduce carbon dioxide emissions. We have also reviewed the higher costs of other energy choices, the rapid fluctuations in the prices of competing sources, the environmental impacts of other options, the inability of the ephemeral resources to provide baseload energy, and the lower reserves of gas vs. coal, among other issues.

Each time we have shown how well coal fares in any honest and open discussion of full environmental and economic life cycles.

Despite these very favorable comparisons to other energy sources, the myths keep getting published. So many have not yet heard that while we continue to reap the benefits of our coal-fueled generation infrastructure – low cost, reliable, and increasingly clean energy – it is easy for well-funded special interests to toss around concepts like banning coal. It is easy to demand ever increasing levels of regulatory compliance from coal-fueled utilities and coal mines. It is easy to pretend that renewable energy could simply move in and take over where a mothballed generation station or stalled generation construction project had left off. Attacking coal as “dirty” was the easy, the default response, but the reality was that there was no serious, affordable, or even remotely workable alternatives.

Those attacks cost the anti-coal special interests very little in the short-term, but are able to bring substantial short-term benefits for them. Coal won’t be immediately shut down, and they know it. The impacts of their demands take years to be realized, as new construction and upgrades are stopped, old plants are considered for closure, and overall energy costs go up. In the short-term, those attacks are a simple means of gaining a headline, sewing up a few more “green” votes, scaring a few more “green” membership dollars out of concerned citizens, and winning over a few more “green” investment dollars. While electricity is reliably flowing and bills are kept low by coal-fueled power, special interests can afford to be carefree and reckless. Eventually, however, the bills mount and have to be paid.

In this issue of American Coal, we look at a pair of issues that relate to these growing bills. First we consider the proactive moves by the coal industry to “transform” itself as the pressures of ambiguous and often conflicting legislation continue to mount. Secondly, we continue to address the myths we discussed above, and provide more balanced and factual information that you can use in your day-to-day operations to support the continued use of coal.

The industry is smart in that, in many cases, it is working to move ahead of pending regulations and meet the most stringent measures being considered. Therefore, in my article, we consider the potential costs and benefits of co-firing with biomass as an emissions reduction tool. We also consider how computer modeling, fuel flexibility, and targeted maintenance can allow utilities to achieve maximum efficiencies, reduce emissions, reduce downtime, and reduce fuel costs. We also look at the valuable role pre-combustion technologies can play in improving plant efficiencies. Emission associated with coal combustion are the key area used to attack the industry, so it makes economic and environmental sense to consider higher BTU coals that have had ash, sulfur, and mercury removed before combustion. Higher coal qualities have a direct effect on public perception, plant efficiencies, and ROI.

Next we take a look at innovative financing methods, designed to promote and pay for greenhouse gas (GHG) reductions. A consistent theme heard throughout policy circles is that GHG legislation is a certainty. With rapidly changing political realities there are reasonable questions as to whether that is an accurate assessment. However, many in the industry are still considering ways to prepare, and
innovative financing measures may help to pay for those added costs. As we work to get balanced information on coal out, we will investigate the myth that we can afford to phase out coal, or more broadly, hydrocarbons in a review of Robert Bryce’s book, *Power Hungry*. Mr. Bryce has also authored an article for this issue and agrees that we will not be able to stop our use of hydrocarbons without critically impacting our economy and ability to compete internationally. While it overlooks a few key coal-related facts, and expects more from natural gas than it may be able to provide, *Power Hungry* does decisively debunk the claims that renewable energy is a cost-effective means of replacing fossil fuel-based energy. *Power Hungry* also accurately portrays the need to prioritize cheap energy and adaptation to potential climate-related challenges.

Taking a contrary tack to Bryce’s reliance on natural gas as a potential replacement for coal, the American Public Power Association reprises the findings of its recent report, “Implications of Greater Reliance on Natural Gas for Electricity Generation,” demonstrating that massive investments in infrastructure would be needed to meet increased demand for gas. However, before that demand could be met, storage and supply limitations would cause significant price limitations and sustained gas prices of over $10 per MMBTU.

Bentek representatives take a look at their study of Colorado’s electrical grid and the impacts of imposing renewable portfolio standards (RPS) on overall state emission levels and generation efficiencies. For those who haven’t kept up on the latest news, an RPS may have the perverse unintended consequence of increasing total emissions and reducing system-wide efficiencies.

While so many remain committed to our demise by any means, we need to stay educated and be willing to boldly defend the foundation of half of our country’s energy, hundreds of thousands of jobs, and multiple billions in benefits to our economy.

We also turn to our partners at the American Coal Ash Association to review the latest news on the (STILL) pending EPA coal ash regulations. Bipartisan pressure is building in Congress and many have taken a bold stand against EPA desires to regulate coal ash under Subtitle C of RCRA.

They are encouraging the EPA to consider the profound impacts the wrong regulatory decisions could have on coal, recycling, and the construction industry.

Once again, we’ve worked hard to bring you a diverse and interesting group of authors who will perk your interests, challenge your perceptions of energy, and motivate you to get involved in the fight to support coal.

With so many changes occurring around us, the industry needs to stay on its toes. While so many remain committed to our demise by any means, we need to stay educated and be willing to boldly defend the foundation of half of our country’s energy, hundreds of thousands of jobs, and multiple billions in benefits to our economy.

We’re committed to helping you move forward in your work and to getting accurate information out on coal. Join us. ◆
Membership Coupon

Join the 170 companies that recognize the importance of belonging to an association that serves as the pre-eminent business voice of the American coal industry and advocates for coal as an economic, abundant/secure and environmentally sound fuel source.

The American Coal Council (ACC) is an alliance of coal, utility, trading, transportation, terminal and coal support service companies, advocating a non-adversial, partnering approach to business.

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

Membership benefits include educational programming and technical seminars, advocacy support, broad-based networking, website, electronic and printed membership directory inclusion, newsletter and members-only electronic updates, database resources, policy input, referrals and discounts on events and industry publications.

Yes, please send me membership information!

Name ____________________________
Title ________________________________
Company ____________________________
Address ________________________________
City __________ State ___________ Zip ______
Phone __________________ Fax __________________
E-mail ________________________________

Mail or FAX to: American Coal Council
1101 Pennsylvania Ave. N.W., Suite 600 • Washington, D.C. 20004 • 732-231-6581 ~ Fax

2010 & 2011 Event Dates

• Coal Market Strategies
  October 5-7, 2010 – Tucson, AZ

• Coal Trading Conference
  December 6-7, 2010 – New York, NY

• Spring Coal Forum
  March, 8-10, 2011 – Clearwater (Tampa), FL

For additional information, visit www.americancoalcouncil.org or call 202.756.4540.
Vision Statement
The American Coal Council (ACC) strives to serve as the pre-eminent business voice of the American coal industry.

Mission Statement
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.

Coal Suppliers
Tim Whelan
Vice President Sales
Alliance Coal LLC (2008-2010)
Mark Canon
Vice President Sales
Arch Coal Sales (2009-2011)  Membership Chair 2010
Mike Kelley
Director Sales & Marketing
Cloud Peak Energy (2010-2012)

Coal Consumers
Jeff Wallace
Vice President Fuel Services
Southern Company (2008 - 2010)  ACC President 2010
Caryl M. Pfeffer
Director Corporate Fuels & Byproducts
E.ON U.S. (2009-2011)
Charles Matthews
Vice President Wholesale Energy & Fuels
Wisconsin Electric Power Company (2010-2012)

Energy Traders
Matt Levar
Director Coal Marketing
EDF Trading (2009-2011)
Harry Papadopoulos
Portfolio Director Coal & Emissions
NRG Energy (2010-2012)

Transportation
Mike Brashier
Manager of Utility Sales & Specialty Contracts
AEP River Operations (2009-2010)
Louis M. Muldrow
Director Coal Sales & Marketing
CSX Transportation (2009-2011)
Doug Glass
Vice President & General Manager Energy
Union Pacific (2010-2012)

Coal Support Services
Scott Hutter
President & CEO
David Smercina
Sr. Vice President & Business Manager
SGS North America (2009-2011)
Scott Stallard
Vice President Asset Management Services
Black & Veatch (2009)

Past President
Steve Miller
President
COALTRADE, LLC (2010)
ACC President 2009

American Coal Council
2010 Board of Directors

Thank You Editorial Review Board
• David Byford, Dynegy, Inc.
• Jennifer Cannon, APS
• Rick Felde, Martin Engineering
• Trygve Gaalaas, Hawk Consulting
• Janet Gellici, American Coal Council
• Jason Hayes, American Coal Council
• Beth Sutton, Peabody Energy
American Coal Council
Member Companies

ADA Environmental Solutions, Inc.
AEP MEMCO LLP
AEP River Operations
AEP River Operations LLC
AEP/Cook Coal Terminal
Alliance Coal, LLC
Alliant Energy Corporate Services
allmineral LLC
Alpha Coal Sales Co. LLC
ALSTOM Power, Performance Projects
Ameren Energy Fuels & Services Co.
American Coal Ash Association
American Coalition for Clean Coal Electricity (ACCCE)
American Crystal Sugar
American Electric Power
Arch Coal Sales Company, Inc.
Arch Coal, Inc.
Argus Media, Inc.
Arizona Public Service Company
B&R W Resources, Inc.
Benetech, Inc.
Black & Veatch
BNSF Railway
Boral Material Technologies
Buchanan Ingersoll & Rooney
Calera Corporation
Canal Barge Company, Inc.
Cargill, Incorporated
Carpeter Creek, LLC
Central Coal Company
Charah, Inc.
Chevron Mining Inc.
Cloud Peak Energy
Coal Marketing Company (USA) Inc.
Coal Network, Inc.
CONSOL Energy, Inc.
Constellation Energy
Crounse Corp
CSX Transportation
David J. Joseph Company
Dayton Power & Light Company
Dominion Energy
Dominion Generation
Drummond Company, Inc.
DKT Energy Coal Services
Dynegy
E.ON U.S.
East Side River Transportation
Emerco
Energy
Energy, Nelson Plant
Ernst & Young
Evolution Markets LLC
Faculty of Agriculture, Annamalai University
FirstEnergy Generation Corp
Fisher Mining Company
FreightCar America
Fuel Tech, Inc.
Glencore Ltd.
Glensview Capital
Global Commerce Forum
Golder Associates Inc.
Golder Associates, Inc.
Great River Energy
Green River Collieries, LLC
Hallador Energy Company
Headwaters Incorporated
Hellerworx, Inc.
Helm Financial Corporation
Hill & Associates, A Wood Mackenzie Company
Holcim (US) Inc./Holcim (Canada) Inc.
ICAP United, Inc.
Ingram Barge Company
Integrity Coal Sales Inc.
Integrity Coal Sales, Inc.
Interlake Steamship Company
James River Coal Co
James River Coal Sales, Inc.
JMP Coal Holdings LLC
JMP Coal Holdings, LLC
John T. Boyd Company
Kansas City Southern Railway
KCBX Terminals Company
Kiewit Mining Group
Kinder Morgan Terminals
Koch Carbon LLC
L & I Energy, Inc.
Lakeland Electric
Lower Colorado River Authority
Luminant Energy
MacArthur Energy
Marquette Transportation Company
Martin Engineering
McLanahan Corporation
MdAmerican Energy Company
Midwest Energy Resources
Minnesota Power
MinTech Enterprises
MinTech Enterprises LLC
Montana Rail Link, Inc.
MRT, a CEMEX Company
Murray Energy Corporation
Nebraska Public Power District
Newmont Mining Corp.
NexGen Coal Services, Ltd.
Norfolk Southern Corporation
Norwest Corporation
Noutera Corporation
NRG Energy, Inc.
Nucoor Corporation
Oglethorpe Power Corp
Omaha Public Power District
Patriot Coal Corporation
Peabody COALTRADE
Peabody Energy
Peelr Coal Sales Co., Inc.
Platte River Power Authority
Platts
Portland General Electric
PPL EnergyPlus, LLC
PricewaterhouseCoopers LLP
Progress Energy
PSEG Energy Resources & Trading
Rhino Energy LLC
Richwood
River Basin Energy
Roberts & Schafer Company
Salt River Project
Savage Services, Inc.
SCANA Corporation
SCANA Services, Inc.
SCH Terminal Co., Inc.
SGS Minerals Services
SGS North America Inc.
Southern Company
Standard Laboratories, Inc.
Storm Technologies, Inc.
Taggart Global, LLC
Tampa Electric Company
TECO Coal Corp
The Cline Group
The Coal Association of Canada
The David J. Joseph Company
The McCloskey Group
The Saint Consulting Group
Traxys
Traxys North America
Tucson Electric Power Company
UCG Partnership
Union Pacific Railroad Company
United Maritime Group
University of Kentucky - Center for Applied Energy Research
University of North Dakota, Energy for Applied Energy Research Center
Utah Energy Company
Virginia Coal Assn.
We Energies
West Virginia University
Westar Energy
Western Research Institute
Westmoreland Coal Company
Westmoreland Coal Sales Co.
White Energy Coal North America, Inc.
Xcel Energy
Xcoal Energy & Resources

Thank You ACC
Champion & Patron Sponsors

2010 Champion Sponsors

Stevan Bobb
Group Vice President-Coal Marketing
P.O. Box 561051
Ft. Worth, TX  76161-051
www.bmf.com  Phone: 817-867-6242

Chris Smyrniosits
VP Advanced Technology & Fuel Chem Development
27601 Bella Vista Pkwy
Warraville, IL  60555
www.frek.com  Phone: 630-845-4461

James Turner
Vice President Sales & Marketing
One Martin Place
Nepauernt, IL  61345
www.martin-eng.com
Phone: 309-594-2384 x. 295

Marc Rademacher
Vice President Business Development West
4665 Paris St., B-200
Denver, CO  80239-3117
www.u-s-sgs.com/coal
Phone: 303-373-4772

Patron Sponsors

Michael Durham, Ph.D.
President
8100 SouthPark Way, Unit B
Littleton, CO  80120
www.adacn.com  Phone: 303-734-1727

Rafi Minkara, PhD., PE
Vice President – Technology
204 Lakeside Drive
Kennesaw, GA  30144
www.headwaters.com
Phone: 801-984-9400

Plant Professionals

Christopher Blazek
Vice President Marketing
1851 Albright Road
Montgomery, IL  60538
www.plant-professionals.com
Phone: 630-844-1300 x214

Global Headquarters
2 Penn Plaza, 25th Floor
New York, NY  10121-2298
support@platts.com
www.platts.com  Phone: 1 800 PLATTS 8

Andrew Cox
424 Lewis Hargett Circle, Suite 250
Lexington, KY  40503
www.rhinoenergylc.com
Phone: 859-519-3610

AMERICAN COAL COUNCIL
13
Call us. We deliver on quality, with a vision for the future.

Low sulfur, high quality, subbituminous coal.

Cloud Peak Energy’s Sales and Marketing Group is located in Colorado. Please contact our Marketing Department’s sales staff at the following numbers:

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mike Kelley</td>
<td>(720) 566-2906</td>
</tr>
<tr>
<td>Director, Sales and Marketing</td>
<td></td>
</tr>
<tr>
<td>Steve Read</td>
<td>(720) 566-2916</td>
</tr>
<tr>
<td>Mary Lou Risley</td>
<td>(307) 685-6130</td>
</tr>
<tr>
<td>Leslie Thorn</td>
<td>(720) 566-2915</td>
</tr>
<tr>
<td>Bill Wallace</td>
<td>(720) 566-2909</td>
</tr>
<tr>
<td>Mindy Watson-Ward</td>
<td>(720) 566-2914</td>
</tr>
</tbody>
</table>

Headquarters Office:
505 South Gillette Avenue
PO Box 3009
Gillette, WY 82717
(307) 687-6000

Colorado Office:
385 Interlocken Crescent, Suite 400
Broomfield, CO 80021

www.cloudpeakenergy.com
Biomass Co-firing With Coal as an Emissions Reduction Strategy

By Jason Hayes, American Coal Council

Editor’s note: This article is an expanded version of the information found in the Issues section – Biomass Co-firing page – of the the ACC website. We encourage all of our readers to make use of this section for essential information on important energy and policy issues. Please also take a moment to contact us at jhayes@americancoalcouncil.org with any suggestions for new issues that should be added to the website.

The current situation

Actions speak louder than words and current government policies are practically screaming that environmental protection is THE number one priority. Regardless of continuing fiscal woes, policies ostensibly aimed at slaying a host of environmental hobgoblins and directly impacting the production of abundant and affordable energy are being placed well ahead of the economy and jobs. Where there is no clear environmentally-themed motive for delaying or stopping baseload energy development, simple uncertainty is having the same effect as these green policies and slowing the construction of new generation.

While there is a solid stream of talk around the notion that jobs and the economy are top priorities, policy proposals, pending legislation, and regulation all demonstrate that jobs and energy take a back seat to environmental and climate policy.

This means that the energy industry – not just coal – is facing a host of rapidly changing EPA (Environmental Protection Agency) and OSM (Office of Surface Mining Reclamation and Enforcement) regulations, chronic Clean Water Act (CWA) permitting issues in the Central Appalachian region, pending changes to coal ash regulations, the incoming EPA Transport Rule, continued EPA pressure on greenhouse gasses (GHG), as well as rumors of rising pressure for strict climate/energy legislation in the post-election lame duck session.

You can toss in on top of that sticky morass of federal green tape the fact that states have their own string of increasingly stringent legislation and regulations. Key among those policies are renewable portfolio standards (RPS), now being implemented in thirty five states, which mandate that between 10 and 33 percent of all energy generated in these states must come from renewable sources at some time between 2015 and 2025.1 (Recently proposed federal legislation also attempted to establish a national renewable energy/efficiency standard of 20 percent in 2020.

1 Sadly, as described in the “How Less Became More” article by BENTEK Energy, LLC in this issue, well-intentioned state RPS policies are having the perverse unintended consequence of potentially raising overall CO2 emissions.
The use of biomass at low to moderate biomass to coal ratios appears to produce the best performance enhancements and can result in overall life-cycle energy consumption reductions, as well as reduced solid waste generation.

That legislation would have forced the remaining states to hop on the RPS bandwagon as well. 

Coal-consuming utilities and industrial operations are exploring biomass as an option for keeping the lights on and the power flowing despite the untamed imposition of these rapidly morphing environmental regulations. EIA data shows biomass-based energy generation to 2009 made up more than 25 percent of all non-hydro renewable energy generated in the U.S. It is also expected to make up a substantial chunk of efforts to meet RPS policies. JP Morgan reports that biomass is likely to make up 6-4 percent of the targeted 15 percent federal RES/RPS by 2020. Unfortunately, however, recently proposed EPA maximum achievable control technology (MACT) standards for major hazardous air pollutants (HAP) may now even endanger biomass generation. 

What is biomass? 

Biomass used in co-firing setups is typically woody (wood chips, sawdust, etc.), agriculture waste (corn cobs and stover), industrial wastes (paper, cardboard), or purpose grown fiber (switchgrass). More broadly, “biomass” refers to any natural or biological, and renewable fuels such as wood, agricultural residues, food wastes, animal wastes and remains, and industrial wastes. Biomass is derived from living or recently living organisms. 

Fossil fuels are also originally derived from plants or living organisms. However, they differ from biomass – as it relates to GHG emissions – in time scale. While fossil fuels are comprised of biological organisms that removed carbon dioxide from the atmosphere in the distant past, biomass has the potential to remove carbon dioxide from the atmosphere as it grows today or in the very near future.

What is Co-firing with biomass? 

The simplest definition of co-firing is mixing two or more fuel sources together to produce energy. Three types of biomass co-firing are in use around the globe; 1) direct co-firing, 2) indirect co-firing, and 3) separate biomass boilers. 

1. Direct Co-firing is the most common co-firing option chosen. Biomass is added to the coal stream before or as it enters the boiler. It is possible to use the same feed systems, or separate coal and biomass feeds/mills can be used depending on fuel characteristics. 

2. Indirect co-firing converts biomass from a solid fuel to a gaseous form before firing. The gas is then burned in the boiler with the coal. 

3. Separate biomass boilers separate biomass and coal combustion. The additional boiler(s) increase the steam capacity of an existing coal boiler. 

Who can use biomass co-firing? 

As co-firing requires large volumes of biomass fuels, this option typically works best for large coal-fueled utilities that already have made significant investments in materials handling capability and training. Industrial users – cement plants, heating plants, etc. – with similar material handling skills could also make use of biomass co-firing.

What are the benefits? 

Biomass costs compare very favorably to other renewable options and co-firing can help to reduce emissions associated with coal-fueled generation, without the added costs of building new infrastructure. Presentations at the ACCs 2010 Fuel Flexibility conference in Chicago (July 20-21) indicated that wood chips cost between $4-$8/mmbtu, pelletized biomass will cost $10-$12/mmbtu, and torrefied pellets will cost $18-$20/mmbtu. 

As it is typically a solid fuel, biomass can be handled with pre-existing infrastructure at coal plants. Additionally, actual fuel costs can be very low – even free – as producers may be happy to avoid land filling or disposal costs for their byproducts. 

When biomass to coal ratios are kept relatively low, utility and industrial users can experience lowered emissions of \( \text{SO}_x \), \( \text{NO}_x \), and mercury. Biomass is considered to be “carbon-neutral,” so its use can also have a proportional reduction in GHG emission. Decreased solid waste generation and lower overall energy consumption are further benefits associated with biomass use. 

Finally, the addition of biomass to a coal-fueled boiler is not likely to, or will at worst, have only a minimal negative impact on generation efficiency (depending on fuel preparation measures taken).

---

4 These cost considerations are in contrast to the construction of new wind or solar renewable options.
6 Fox indicated that torrefied (charcoal) pellets have much higher btu/lb, have far lower moisture content, are hydrophobic (resist water absorption), and are stable in storage and transport.
What are the challenges?

The physical characteristics of biomass make it uncompetitive with coal (or other fossil fuels) as a stand alone fuel option. While actual fuel costs may be low, high moisture levels and a strong tendency to absorb water make biomass transportation and handling extremely expensive. This fact limits supply options and means that the majority of biomass must be locally sourced. High moisture levels also ensure that biomass fuels tend to have low thermal efficiencies and low bulk energy density meaning large amounts of these fuels must be used to produce energy.

It is important to recognize that if not closely managed, the makeup and structure of biomass fuels can cause substantial cost increases, decreased efficiency, as well as maintenance problems and outages brought on by slugging, fouling, and increased corrosion in the boiler.

Widely variable chemical compositions ensure an equally wide range of potentially negative impacts on boiler and milling equipment, as well as ash usability. For example:

- Higher alkali levels in many biomass fuels mean higher potential for increased corrosion rates in boilers.
- Far lower ash fusion temperatures – as low as 750 Celsius for biomass vs. over 1,000 Celsius for coal – leads to increased potential for boiler slugging.
- American Society for Testing and Materials (ASTM) specifications for recyclable fly ash require that it be made up solely from coal combustion byproducts. The differing chemical makeup of biomass fuels could impact coal ash recycling if ash specifications are not updated to recognize and approve biomass-containing ash.
- Research of Selective Catalytic Reduction catalysts – completed in Europe – indicate biomass co-firing may rapidly deactivate catalysts if not managed carefully.

Recently proposed EPA rules may have even more far-reaching impacts on biomass use. Rules released in late April this year would apply maximum achievable control technology (MACT) limitations, on a pollutant-by-pollutant basis, to reduce emissions of hazardous air pollutants (HAPs) from industrial, commercial, and institutional boilers. The rules would impose strict emissions limitations on sources “emitting 10 or more tons per year of any single air toxic or 25 tons per year or more of any combination of HAPs.” The rule is expected to impact more than 10,000 existing fossil- and biomass-fueled boilers as well as any new boilers built after the rule is put into effect. Industry representatives are calling the new rule “uneconomic and unachievable.” They are also stating that existing biomass facilities will be unable to comply and proposed facilities are now being shelved until the rulemaking process is completed.

Conclusions

Faced with ever-increasing layers of environmental regulations, the energy industry has considered co-firing coal with biomass as a potential tool to help decrease greenhouse gas and other emissions in coal-fueled boilers. The use of biomass at low to moderate biomass to coal ratios appears to produce the best performance enhancements and can result in overall life-cycle energy consumption reductions, as well as reduced solid waste generation.

However, there are many potential obstacles to biomass use that can decrease efficiencies, as well as increase overall costs, hike maintenance (corrosion, slugging, etc.), and boiler down time if biomass use is not managed very carefully. The addition of new strict and unwieldy EPA regulations aimed at biomass generation will only add to the difficulty of finding workable solutions to keeping affordable and secure electricity flowing.

Jason Hayes, M.E.Des. is Communications Director for the American Coal Council and editor of American Coal magazine (www.americancoalcouncil.org)

Centrifuges/Dryers
Continuously separate and dewater coal, salt, sand, etc. Units available in coarse and fine solids design, with capacities up to 500 tons per hour.

Screening Machines
Complete line of multi-slope “Banana” and horizontal machines in single and double deck designs. Units up to 4.3 meters wide and 10 meters long.

Sampling Systems
Automatic mechanical sampling systems for precise and accurate samples of bulk commodities from moving conveyor belts 12” to 96” in width. Meets all ASTM and ISO standards.

TEMA Systems Inc.
7806 Redsky Drive, Cincinnati, OH 45249
Phone: 513-489-7811 Fax: 513-489-4817
Call to speak with one of our application engineers or visit our web page: www.tema.net
At the recent ACC Fuel Flexibility Conference in Chicago, there was considerable discussion relating to variations in fuel. Historically, boilers were designed for a specific fuel, usually the closest or most economically available. Periodic regulation, emissions standards, transportation logistics and changing coal prices have forced utilities to purchase coal from farther afield to remain in compliance. These variations in fuel characteristics create new problems with burner operations, including grindability, ash and slagging inefficiencies.

Additionally, with few tools previously available to clean up fuel prior to combustion, costly systems to clean up off gases post-combustion (scrubbers) were added to meet emissions standards. As a result, to date most technologies employed have focused on combustion tuning and optimization, and the removal of the pollutants out of exhaust gasses post-combustion.

A second major theme at the Fuel Flexibility Conference was the morass of conflicting regulations facing anyone burning solid fuel today. For example, the U.S. EPA has a program covering the use of Land Fill Gas (LFG) for generation, but the proposed Minimum Achievable Control Technology (MACT) rules for industrial boilers restrict carbon monoxide, without exempting LFG with its high CO footprint. The installed fleet of coal-fueled plants produces 40 percent of global electricity, and coal combustion will grow at least through...
2030 to meet increasing demand, according to EIA forecasts. Thus, since the world will be significantly dependent on solid fuels for the existing installed base for at least the next 50 years, it is imperative that we have regulations that foster burning solid fuels as cleanly as possible. The regulators should allow industry to choose the best alternative between reducing methane as a GHG and an offsetting increase in less polluting CO. **We must look for opportunities to utilize clean renewable solid fuels, including biomass, in our existing solid fuel-burning infrastructure.**

Conference participants heard presentations on a range of issues facing variations in fuel characteristics, as well as the use of solid biomass fuels. Attempts to co-fire moist low-BTU biomass as a fuel in coal-fueled plants have failed many times. Upon reflection, such attempts seem analogous to introducing leftover paint, solvents or cleaning fluids with combustion value into the gas tank of a car or the tank for a home oil burner. For safety and efficiency reasons, there must be a serious focus on pre-treating solid fuels to meet energy and emission goals.

**Pre-combustion technology solutions currently exist to address variable fuel characteristics.** The primary properties of any solid fuel that are most important to a boiler operator are BTU content (dry), pollutants (Cl, Hg, S, heavy metals), grindability, ash, slagging propensity and, more recently, qualification as a renewable fuel. Pre-combustion technologies exist to remove moisture, mercury, chlorine, heavy metals, sulfur, and ash to aid in emission compliance. Selectively and economically deploying these technologies and careful blending can tune the fuel to meet the optimal burning characteristics of each individual boiler and its present post-combustion cleanup in the existing fleet. Research has shown that many biomass species can be prepared to mill and combust effectively without modifications to fuel handling or to the boiler. Importantly, the high costs of fuel switching and/or implementation of further post-combustion technologies make now the time for commercializing pre-combustion technologies.

Many forms of biomass are generally available; however, only purpose-grown biomass can assure consistent supply. Algae have demonstrated the capability of growing the highest calorific value yield of all purpose-grown fuel crops. MacArthur’s biomass processes employ CO₂ that is immediately available from the flue gas of the boiler client burning partially renewable fuel grown with Nitrogen, Phosphate, Potassium (NPK), and water. The flue gas provides ambient heat that supports algae growth. NPK are generally available in waste streams from farms, ranches, or municipal water plants nearby. The algae are grown in closed bioreactors that minimize contamination and evaporative water loss and support a proprietary harvest and concentration system.

The dewatering of biomass is accomplished as it mixes with coal in a low cost mechanical, non-thermal system. Nutrient-laden water is recycled to the algae growth bioreactors after alkali removal. Finally the CoalBio fuel is upgraded with the removal of the chlorine and mercury present in the raw coal. This fuel can either be the entire fuel mix for the boiler, or it can be blended with raw coal as it is conveyed to the boiler depending on specific boiler requirements. The resultant fuel can have a range of desired properties. For example, a 50/50 mix of high lipids chlorella and Powder River Basin (PRB) coal produces a fuel that is:

- 50% renewable
- Absorbent of one ton of CO₂ for each ton produced
- About 12,000+ BTU/lb (dry)
- About 0.3 percent sulfur
- About 1.5 10⁻⁶ Mercury
- About 2.3 10⁻³ Chlorine
- HGI in the 50s
- Not friable
- Sized for either stoker or pulverizer
- Priced 15-20 percent above coal with similar BTU and Sulfur content

MacArthur systems are modular, and range from a demonstration plant utilizing 15-20 acres under cultivation and producing about 10 tons per day to multiple commercial size modules producing about 10 tons per hour with 400 acres under cultivation.

For more information email Info@MacArthurEnergy.com or telephone 347-414-9267.◆

Peter Rugg is chief executive officer of MacArthur Energy (www.macarthurenergy.com)
Will an Oil Spill Kill Affordable Energy?

Regulatory changes for oil and gas remain under consideration in Congress

By Steve Everley, American Solutions

On April 20th, 2010, an explosion occurred aboard the Deepwater Horizon, a British Petroleum-leased oil rig in the Gulf of Mexico, killing or injuring 28 people and causing a massive spill that threatens local economies and ecosystems. While those in the Gulf wrestle with this tragedy, lawmakers inside the Beltway see it as an opportunity to impose new taxes and regulations. Many of these changes target the oil and gas sector, though their impacts will touch all fossil fuels, of which coal is no exception.

One such change is President Obama’s six-month moratorium on deepwater oil and gas drilling. The ban was intended to cover only those wells in water deeper than 500 feet, although industry has seen a total cessation of leasing with the moratorium in place. The ban has been met with near unanimous opposition from Gulf coast residents and lawmakers, while drilling experts and even the courts have issued their own arguments against it.

The administration tried to tweak the ban to quell the political uproar, but the fluctuating regulatory environment has already had an impact. Two rigs owned by Diamond Offshore recently left the Gulf and signed contracts with Egypt and Congo, taking with them hundreds of jobs and millions of dollars in revenue. Diamond’s CEO said that “uncertainties surrounding the offshore drilling moratorium” were the reason for the exodus, and more rigs are expected to abandon the Gulf as the moratorium continues. The ban threatens to kill up to 150,000 jobs, in addition to massively reducing domestic fuel production.

Other regulatory changes for oil and gas remain under consideration in Congress, including raising the liability cap for future spills. Some lawmakers have proposed removing the cap altogether, a plan met with serious pushback from Republicans and moderate Democrats. Although removing the cap would be regulatory
redundancy (under the Oil Pollution Act of 1990 oil companies are already liable for all spill-related cleanup costs), the production impact could be significant. Independent companies, which account for two-thirds of domestic oil production and nearly 80 percent of natural gas, will pay more to get insured and bonded under an unlimited-liability mandate. These costs would be on top of the already-rising price of insurance for offshore operations, which could rise as much as 30 percent according to Lloyd’s of London.

Currently these liability changes are attached to a broader drilling reform and energy efficiency package that passed the House but remains stalled in the Senate. Final passage is uncertain, and the leadership’s unwillingness thus far to consider amendments demonstrates a dangerous political motive guiding the whole process.

Another major regulatory change worth noting is the Environmental Protection Agency’s proposal on July 6th to replace the 2005 Clean Air Interstate Rule (CAIR) with a new “Transport Rule” to reduce sulfur dioxide and nitrogen oxide emissions. The proposal, which targets coal-fired power plants primarily in the Midwest, aims to lower SO2 by 71 percent and NOx by 52 percent below 2005 levels through a new, limited cap-and-trade system.

Though proclaimed as a step toward cleaner air, industry worries that good intentions (i.e. pollution reduction) are replacing all economic consideration with the new rule. The EPA contends the stricter regulations are based upon available technologies, but many companies strongly dispute this claim. This is in marked contrast to the 1990 Clean Air Act amendments for these emissions, which were developed based upon the availability of on-the-shelf products such as smokestack scrubbers and low-sulfur coal.

According to a study by Bernstein Research, the Transport Rule could force the retirement of up to one-fourth of the U.S. coal fleet. A former EPA administrator made a similar conclusion: “It’s not clear whether it will be possible to achieve the standards set by the rule while still providing affordable and reliable electric power,” he said.

Meanwhile, Senators Lamar Alexander (R-TN) and Tom Carper (D-DE) have proposed legislation to reduce SO2 and NOx that, according to lawmakers, would be a less expensive replacement for EPA’s mandates. That bill already has several Republican supporters and may come up for a vote sometime next year.

While SO2 and NOx reductions have no causal connection to the Gulf spill, anti-fossil fuel hysteria in Congress arising from BP’s accident suggests these new restrictions are unlikely to face prolonged opposition, regardless of their merits, making this perhaps the first major impact on coal in the wake of the spill.

Still, capping carbon remains the greatest threat to fossil fuels and Americans’ access to affordable energy, a proposal that lawmakers have speciously connected to a proper Gulf spill response. Two methods are on the table currently: EPA regulation or cap-and-trade through legislation.

Direct regulation would be the least efficient of these options and the most economically damaging. One study found EPA regulation could cost the economy $7 trillion by 2030 and kill 500,000 jobs per year, in addition to dramatically raising electricity prices. The EPA assumed the power to regulate carbon under the Clean Air Act last December with its finding that carbon poses a threat to human health.

That judgment is being challenged in the courts and even in Congress.

In June, Senator Lisa Murkowski (R-AK) proposed a resolution that would have stripped this authority from EPA, but the measure was thwarted (final vote: 47-53) by an intense lobbying effort that used the Gulf spill as a foil. One television ad even argued that Murkowski’s resolution would make the spill worse, a connection Senate Majority Leader Harry Reid (D-NV) and EPA administrator Lisa Jackson also made to derail the effort.

Senator Jay Rockefeller (D-WV), however, has a separate bill that would suspend EPA’s power to regulate carbon from stationary sources for two years. Though not as broad as Murkowski’s measure, several Democrats are co-sponsoring Rockefeller’s measure, including some who opposed Murkowski’s resolution. Thus, the two-year time-out from EPA regulations stands a decent chance of passing the Senate (assuming Majority Leader Reid allows a vote), but President Obama would likely veto it.

The legislative path for capping carbon (cap-and-trade) briefly enjoyed support
after the spill, but the push ultimately failed. Supporters hoped images from the Gulf spill would spur action: Senators John Kerry (D-MA) and Joe Lieberman (I-CT) proclaimed that “tragic events in the Gulf underscore the need to move without haste” toward passing cap-and-trade. President Obama similarly called upon lawmakers, “... in the midst of this crisis,” to pass a carbon cap.

Like EPA regulation, cap-and-trade would disproportionately target coal power. President Obama famously stated that his ideal cap-and-trade plan would bankrupt the coal industry, which would make electricity prices “necessarily skyrocket.” In addition to the President’s stated goals, precipitously shifting to intermittent renewable sources with cap-and-trade could force rolling blackouts for millions of Americans. Unfortunately, many lawmakers refuse to acknowledge that coal provides what no renewable source can: affordable, abundant, and reliable energy.

The only option left for Congress to pass cap-and-trade is during the lame duck session this winter. The White House and Senator Kerry have mentioned this possibility, and Representative Henry Waxman (D-CA) recently vowed to fight for it in conference committee. The struggle, however, remains convincing moderates to support final passage, including key Senators who are up for re-election in 2012.

While cap and trade is the biggest threat to coal, other requirements in the pipeline, including mercury regulations, mine safety reforms and Clean Water Act changes, will impose additional costs on America’s most affordable energy source. Future modifications to the Transport Rule in 2012 have also injected uncertainty into the market and increased price volatility. Predictably and unfortunately, it is consumers who will bear the cost of this relentless attack on American coal.

The threat of future carbon pricing has also impacted investment, particularly by encouraging a switch from coal to natural gas. Many lawmakers may claim to support this, but they must reconcile that goal with their own fierce opposition to more drilling, including hydraulic fracturing in shale, which many environmentalists contend pollutes drinking water (the EPA has ruled twice since the 1990s that it does not.)

It’s important to note, of course, that not all of these regulations materialized as a result of the Gulf spill. EPA’s Transport Rule, for example, was already in its planning stages when the rig exploded, and Congress has been debating a carbon cap for years.

But with the Gulf covered in oil, fossil fuels will have to bear the cost of congressional knee-jerkery, which means additional mandates and higher taxes. Tragically, the fact that many of these restrictions are designed to increase the cost of coal suggests that this legislative and regulatory push is more about attacking the fossil fuel industry than cleaning up the Gulf.

Amidst this uncertainty, one thing remains clear in the wake of the spill: The ability to score political points by attacking America’s most affordable and reliable source of energy is as entrenched as ever, even with dramatic safety and environmental improvements over the past decades. Since 1980, for example, per capita carbon emissions have fallen in the U.S. without a massive tax on carbon, a demonstrable commitment to efficiency that policymakers apparently have ignored.

Earlier this year, prior to a committee vote on oil drilling reforms, Senator Max Baucus (D-MT) urged his colleagues to “... think more deeply about what it is we’re doing on the margin,” worrying that Congress has become motivated by political opportunism instead of thoughtful analysis. When it comes to legislative or regulatory changes for fossil fuels, lawmakers would do well to heed Senator Baucus’ advice and focus on fixing problems, not capitalizing on environmental disasters for short-term political gain and creating new problems along the way.◆

Steve Everley is Manager of Policy Research at American Solutions (www.americansolutions.com) and a contributing author to Newt Gingrich’s latest book, To Save America (Regnery, 2010).
Switching Fuels?

Proven Boiler Performance on a Wide Range of Fuels

With Fuel Tech’s TIFI® Targeted In-Furnace Injection Technology™ you’ll enjoy fuel flexibility along with:

- Greater Boiler Efficiency
- Slag/Fouling Reduction
- Heat Rate Improvement
- SO₂ Plume & Opacity Control

Fuel Tech’s proprietary Fuel Chem® programs are currently installed on over 80 units burning coal and other types of fuels.

Contact us today for more information.

© Fuel Tech, Inc. 2010  TIFI and Fuel Chem are registered trademarks and Targeted In-Furnace Technology is a trademark of Fuel Tech, Inc.
Colorado Springs Utilities Martin Drake Station increased performance while decreasing its costs.

Improved Fuel Flexibility with an ROI of 4:1

Colorado Springs Utilities (CSU) has been very progressive in adopting and implementing benchmark technologies and operating strategies to help achieve these goals across its diversified generation portfolio, and in particular at four operating coal units representing 462 megawatts in the system. One key strategy employed at CSU’s Martin Drake Station has been to continuously evaluate and test alternative coal feedstocks which have potential to reduce cost while maintaining capacity, fuel supply security, availability, and efficiency.

These tests would not have been possible without the use of Fuel Tech’s Targeted In-Furnace Injection™ (TIFI®) technology to control slagging and fouling, reduce forced outages and load drops, and enhance unit efficiency. The TIFI process involves the use of two different forms of fluid dynamics modeling coupled with a virtual reality engine.

With TIFI installed on Units 6 and 7 at Martin Drake Station, the operators were able to blend Powder River Basin coal with design fuel up to double the percentages previously achievable. Using TIFI, the plant was able to maintain full load generation, better control slagging deposits, show improvements in heat absorption, and reduce attemperator spray flows over previous blend trials. Including the cost of the TIFI program, the station has demonstrated a potential annual operating cost reduction approaching $4.9 million. Effective return on TIFI program investment is 4:1.

For additional information on the success seen at CSU’s Drake Station, please visit www.ftek.com or contact Fuel Tech, Inc. directly at 1-800-666-9688.

Taken from “Improvements in Fuel Flexibility and Operating Cost Reduction at CSU Martin Drake Station with Targeted In-Furnace Injection Technology”
We’re focused on shipping coal.

At AEP River Operations, we ship 42 million tons of coal a year.

AEP River Operations and its affiliates have more than 70 years’ experience in safe, efficient coal transport. We ship coal for a wide range of customers and are experts in shipping all varieties of coal. We have one of the most modern fleets in the industry with many of our new barges built specifically to move coal. Our experienced team is ready to assist you and we are confident we can meet your coal shipping needs.

St. Louis Headquarters 636.530.2100
Mike Brashier, Manager, Open Hopper Fleet, wmbrashier@aepriverops.com
David Jahnke, General Manager, Bulk Sales, ddjahnke@aepriverops.com

Pittsburgh Sales Office 724.933.4660
Gretchen Chamberlain, Eastern Regional Sales Representative, gfchamberlain@aepriverops.com
Patrick Kelly, Eastern Regional Sales Representative, pmkelly@aepriverops.com

www.aepriverops.com

©2009. AEP River Operations
Coal In the Crosshairs

But The Fuel Retains Advantages on Cost and Scale

Coal is facing more regulatory uncertainty than ever before

By Robert Bryce

Renewable energy sources – wind and solar in particular – are the political darlings of the moment. In June, in his first speech from the Oval Office, President Barack Obama declared that the US has an “addiction to fossil fuels.” The president then went on to use the phrase “clean energy” six times while also giving nods to wind and solar.

Coal was conspicuously absent from the president’s speech. That’s not surprising. You shouldn’t expect to hear Obama – or many other politicians on the national stage – to say anything positive about coal; be it “clean” or any other type, either. But the harsh realities of the world’s enormous energy needs, along with soaring global demand for electricity, assures that the coal business will be around for many decades to come.

That’s not a politically correct statement. Many environmental groups and politicians, both here in the US and abroad, would like to see coal become a thing of the past. They cite the coal sector’s carbon dioxide emissions, the damage done by strip mines, the dangers to miners, coal’s heavy metals content, and many other reasons to cut coal consumption. While those arguments may have some merit, the key issues are obvious: cost and scale. Coal remains the fuel of choice for electricity generation due to its relatively low cost; meanwhile the issue of scale works both to the advantage – and the disadvantage – of the industry.

Continued on page 28
I will discuss a few cost issues first, and then delve into the blessings and the
curses that the coal industry has when it
comes to scale.

Thomas Edison used coal to fuel the
world’s first centralized power plant, on
Pearl Street in lower Manhattan back
in 1882, because it provided him with
the lowest-cost, most convenient fuel
for producing electricity for mass con-
sumption. Today, nearly 120 years after
Edison first began lighting the world,
colc remains the fuel of choice. Today,
nearly half of US electricity, and about
41 percent of the world’s electric power,
comes from coal. And that dominance
will likely continue because global elec-
tricity demand continues to soar. Over
the past two decades, electricity use has
grown faster than any other type of fuel
consumption. Between 1990 and 2007,
electricity use increased by about 68 per-
cent. That’s nearly three times as fast as
the growth in oil consumption over that
time period.¹

And while regulators and politi-
cians in many countries are eager
to reduce coal’s role in the electric
c power sector due to concerns about
carbon dioxide emissions, coal-fueled
power remains secure because it is so
inexpensive. Recent reports from the
International Energy Agency, the US
Energy Information Administration,
and the Massachusetts Institute of
Technology, all calculated the levelized
cost of electricity from various sources
– coal, natural gas, nuclear, wind, solar, etc. – and all three determined
that coal-fired electricity production
was either the cheapest, or the second-
cheapest option.² (The EIA determined
that by 2016, combined-cycle natural
gas-fired generation would be cheaper
than coal.)²

The Challenges of Scale

Grasping the magnitude of global energy
production and consumption takes work. And
given the increasing focus on coal, we must
examine just how large coal’s role is in the
global economy and the US economy. Here
are a couple of ways to think about coal use:
• In 2008, global coal use averaged
  about 66 million barrels of oil
equivalent per day. That’s approxi-
mately equal to the daily oil output
of nearly eight Saudi Arabias.
• In 2008, the amount of energy
  America used in the form of coal
  nearly equaled the total energy con-
  sumption – from all sources, coal,
  oil, natural gas, hydro, and nuclear –
of all of the countries of Central and
  South America combined.³

While wind and solar energy are popular
among environmentalists and politicians,
the US continues adding new coal-fueled
capacity at a rate that is far faster than
those for new wind and solar additions.
Between 1995 and 2008, US wind out-
put increased dramatically, going from
3,164,000 megawatt-hours per year to
52,026,000 megawatt-hours per year, for
a total increase of 48,862,000 megawatt-
hours per year. That’s an increase of about
1,500 percent, an impressive growth rate
by nearly any measure. During that same
time period, solar power production
(which includes thermal solar and pho-
tovoltaics) increased by 69 percent, going
from 497,000 megawatt-hours to 843,000
megawatt-hours, for an increase of 346,000
megawatt-hours.⁴

Over that same time period, coal-fired
generation increased by a much more mod-
est percentage: just 16.7 percent. But once
again, it’s all about scale. And the amount
of energy in that 16.7 percent increase
is enormous. In 1995, coal-fired power
plants in the US delivered 1,709,426,000
megawatt-hours of electricity. By 2008,
c coal plants were delivering 1,994,385,000
megawatt-hours per year, an increase of
284,959,000 megawatt-hours.⁵

In other words, the absolute increase in
total electricity produced by coal was about

¹ Bryce, Power Hungry, 56.
epm/table1_1_a.html.
³ Ibid.
⁴ Ibid.
⁵ Goodell, Big Coal, 134.
5.8 times as great as the increase in output from wind and 823 times as great as the increase from solar. And yet, over the past decade, citizens in the US have been bombarded with the notion that wind power and solar power are the resources of the future.

**Increases in US Electricity Production From Solar, Wind, and Coal, 1995 to 2008**

The reality is that coal – even with its multitude of challenges – continues to be the fuel of choice for creating electricity for a simple reason: cost. And while critics contend that coal imposes many costs that are not paid in the final price of electricity – such as air pollution, ecosystem destruction, and heavy metals contamination, to name just a few – the reality is that those “external” costs, large though they may be, have become an accepted part of the tradeoff. The always-on, super-clean, super-abundant horsepower that electricity provides has so much value that citizens around the world are willing to ignore the heavy costs exacted by mining and burning coal.

That said, the coal industry is facing daunting challenges posed by its vast scale. When an industry grows so large that it is producing some 66 million barrels of oil equivalent per day, it becomes more difficult for that business to grow dramatically because it begins facing the tyranny of big numbers.

Put another way, the coal industry’s biggest foe is the very size of the coal industry itself. And that size is leading to problems with both neurotoxins and coal ash.

Coal-fueled power plants are the largest emitters of mercury in the US, pumping some 96,000 pounds of mercury into the air each year. Most humans who encounter the metal released by the power plants do so by eating fish caught from bodies of water that have been affected by airborne mercury. Mercury is a neurotoxin that is particularly harmful when ingested by pregnant women, children, and the elderly. Mercury exposure has been linked to higher risks for autism, impaired cognition, and neurodegenerative disorders such as Alzheimer’s disease. In addition to mercury, US coal plants release about 176,000 pounds of lead, 161,000 pounds of chromium, and 100,000 pounds of arsenic per year – all of which are extremely damaging to humans if they are ingested.

The Environmental Protection Agency estimates that coal-fired power plants account “for over 40 percent of all domestic human-caused mercury emissions.” It’s the global nature of neurotoxins that make them so worrisome and so difficult to control. Scientists have estimated that about 30 percent of the mercury that settles onto the ground in the US comes from other countries. And of those other countries, China is the most problematic. Every year, China spews some 600 tons of mercury into the air – and the majority of that volume comes from the country’s 2,000 coal-fired power plants. Scientists in Oregon have estimated that about 20 percent of the mercury that enters the Willamette River comes from overseas, and some of that, no doubt, is from China.

US regulators are imposing rules that will drastically reduce the amount of mercury that can be released from coal-fueled plants. The EPA’s Clean Air Mercury Rule, issued by the agency in 2005, aims to reduce the amount of mercury emissions from coal-fired power plants by about 70 percent. The agency plans to issue a final rule on the program by the end of 2011. The coal industry also faces the possibility of significant new regulations on its solid waste. In the US, coal-fueled power plants produce some 130 million tons of solid waste annually. That volume of material, which includes ash and scrubber byproduct, is about three times as much as all of the municipal garbage produced every year in the US. Increased regulation of coal ash holding ponds is likely thanks to the massive coal ash spill that occurred in Tennessee in 2008, a spill that flooded some 300 acres of land with waste contaminated with a variety of heavy metals.

In May, the EPA unveiled draft regulations that could require that coal ash be treated as special waste under federal hazardous-waste laws. Another proposal put forward by the agency could require that coal ash be treated in much the same way as household garbage.

The increasingly stringent environmental rules on emissions and ash will pose big challenges for the coal industry in the years ahead. And while some operators will be able to handle the costs of upgrading their equipment to meet the new mercury rules and the ash-handling rules, some will not. The result will be increased market share for natural gas and nuclear power.

The punch line here is obvious: coal is facing more regulatory uncertainty than ever before. But coal’s advantages on both cost and scale assure that any phase out of coal will be a decades-long, or even century-long process.

___


---

11. Goodell, Big Coal, 123.
At Allen-Sherman-Hoff, we know that every drop of water MATTERS...

...so call us today to learn more about three options to:

☑ ELIMINATE storage ponds

♻ CONSERVE water

◊ SAVE money

Allen-Sherman-Hoff is committed to developing products and services that are both environmentally responsible and economically feasible.

www.a-s-h.com | 1.888.ASH.PARTS

©2010 Diamond Power International, Inc. All rights reserved.
Power Density, Energy Density, Cost And Scale
Continued from page 27

Throughout the book, I was pleasantly surprised to find an author who is willing to take energy resources to task where they have real flaws, but who will also rationally assess risks and support their use when the benefits outweigh the costs. Many authors and policy wonks have fallen under the spell of the politically correct, ‘if it’s labeled green, it’s gotta be good’ mindset — they can’t muster the courage to openly admit that all energy resources, even renewables, have environmental, social, and economic costs associated with their use. That’s not Bryce; he lays bare the skeletons in the green energy closet, openly detailing the costs and environmental impacts of moving to a renewables-based energy supply. Amusingly, he even has the chutzpah to unseat the Danes as THE example the world should follow when it comes to the use of renewable energy. He exposes the well kept secret that, despite all their new wind-based electricity production, Danish coal consumption has not decreased over the past three decades.

Throughout the book, Bryce is an outspoken proponent of the continued use of hydrocarbon-based fuels, primarily because those fuels — unlike renewable options, and other so-called green fuels — meet his four-part test of power density, energy density, cost and scale.

Bryce demonstrates how renewable energy sources fail to meet both the power and energy density test. With regard to power density, renewables harness a limited amount of energy per given unit of volume, or mass. Translated into English, they require a lot of space or volume to produce the energy found in much smaller units of fossil fuels. That’s why wind farms and solar installations must be spread across large tracts of land, or why replacing just 10 percent of coal-fueled energy generation in America with wood would more than double overall U.S. wood consumption. With regard to energy density, renewables store far less energy per unit of volume than hydrocarbon-based fuels. His example is the available energy stored in a 5 gallon bucket of dried leaves is far less than that stored in the same bucket, full of gasoline. That comparison remains true if one switches out the leaves for corn ethanol, gasoline for anthracite, etc.

To his credit, Bryce also fails to swallow the other politically correct energy canard that gets regularly tossed around the planet; namely the notion that the United States is the environmental boogeyman of energy use. Rather than apologizing for high per capita rates of energy use in America, Bryce champions that use as the basis for our “incredible economic success.” He recognizes that our social, economic, and environmental well-being — something the vast majority of the world strives to emulate — is the outcome of our ability to produce high-quality, affordable and clean energy. He also presents little known facts like, “the United States produces about 74 percent of the primary energy it consumes.” Bryce also forcefully defends the fact that the U.S. has a world-leading track record of advancing energy efficiency, increasing power density, and reducing costs.

But Bryce isn’t focused only on renewables; he also considers primary energy sources, such as coal, natural gas, and nuclear. Given that he has proposed natural gas to nuclear as his preferred energy future, his critiques of gas and nuclear are somewhat less pointed and, therefore, a little less balanced. For example, in one questionable statement Bryce opines that “There’s no question that other sources of energy — particularly nuclear and natural gas — can provide large amounts of electric power without putting pollutants in the atmosphere.” We recognize that natural gas is a relatively clean burning fuel, but combustion of gas does still produce NOx and carbon monoxide. Additionally, this assertion ignores the reality of fugitive emissions from pipelines, equipment leaks, venting and flaring, and evaporative losses, as well as those emissions associated with exploration and mining.

In considering coal’s role in our energy supply, Bryce’s take is that coal is so massive a player and so inexpensive (compared to other options) that it cannot help but remain a key energy source well into the future. His focus on an N2N policy future, however, encourages him to engage coal in the same manner as he engaged renewables. Not surprisingly, he pulls no punches. Coal ash, GHG, heavy metals, and mountain top mining are addressed with the same biting intensity.
Perhaps the most valuable aspect of Power Hungry, however, is that it represents a new movement in policy circles and the energy industry to admit that there are environmental, social, and economic costs associated with renewable energy.

It was in the review of coal-based energy, however, that some key faults became evident in Power Hungry. Bryce did admit that few energy resources can approach coal’s low costs and that the provision of high-quality, low-cost electricity is a primary reason for our well-being and comfortable lifestyle. Unfortunately, he did not appear willing to ferret out other positive aspects to the use of coal, as he had done with both gas and nuclear. I waited in vain for his research to uncover information on the value of domestic energy production providing hundreds of thousands of high-paying jobs, or coal’s rapidly improving environmental record.

He did admit that, despite the bad press aimed at coal, we have continued to build more and more coal-fueled generation. In fact, he notes that since 1995, we have expanded coal-based generation by over 280 million megawatt-hours; almost six times more than wind and over 800 times more than solar in the same time period.

However, Bryce then used the sheer size of the coal industry to attack it, meticulously documenting the details of coal’s environmental challenges. He even allowed questionable sources such as Goodell’s Big Coal to inform his research on coal emissions. But he did not take time to recognize the multitude of clean coal technologies that are in use and reducing emissions and improving efficiencies today.

While he documented annual mercury emissions down to the pound, he did not report the fact that the coal industry has invested more than $90 billion over the past three decades in technologies and processes that reduce emissions and improve efficiency, and that these investments have paid off. He did not document the use of activated carbon injection to reduce mercury emissions. He did not note that while coal use has increased by almost 300 percent since 1970, EPA data shows that over the same period, emissions per unit of electricity generated fell by over 77 percent – SO₂ by 37 percent, NOₓ by 12.9 percent, and particulate matter (PM) by 88.5 percent.

When considering coal ash, Bryce gave into the headline-grabbing technique of claiming coal ash is “contaminated with heavy metals,” but ignored the research that shows coal ash is not toxic and is, in fact, made up of essentially the same levels and types of material found in normal backyard soil (see American Coal Issue 1, 2009).

It was also disappointing to see Bryce dip his toes into the “peak oil” and “peak coal” hysteria. While he worked in a following chapter to demonstrate how new technologies have helped to diminish concerns over waning domestic gas supplies, he was comfortable accepting the notion that coal production could peak by 2011. One is forced to wonder why the technical capabilities and innovative spirit that drove the advancement of unconventional and now booming shale gas production would be abandoned when it came to coal production and use.

While there are some clear deficiencies in Power Hungry when it considers coal-fueled energy, the work that the coal industry is doing to reduce emissions and improve efficiency, and clean coal technologies, the book is still a valuable addition to the discussion on energy. Overall, it has a great deal of good information for the student of energy generation and energy policy, and Bryce’s “take no prisoners” style of reporting makes for an engaging read. Perhaps the most valuable aspect of Power Hungry, however, is that it represents a new movement in policy circles and the energy industry to admit that there are environmental, social, and economic costs associated with renewable energy. That admission is a necessary move to help ensure fact- and science-based energy policy.

For too long policy makers have ignored costs, choosing to rely on feel good emotionalism and talking points when seeking to promote their ideas and plans on energy. It is long past time when we engage in an open and honest review of the potential of various energy options to affordably meet our growing energy needs. Bryce jumps into that discussion with both feet, and in that regard, Power Hungry is a worthwhile addition to anyone’s reading list.
Aiming higher?

Stock market listing. Private equity investment. Successful international trade. Achieving your company’s true potential isn’t easy. Ernst & Young can help. We bring together an experienced, globally integrated team who can provide the in-depth knowledge of assurance, tax, transaction and advisory services your business needs to get to the top.

What’s next for your business?

ey.com
Partnering With You To Deliver America’s Greatest Resource

From the very beginning, BNSF Railway has been a key link in the supply chain that delivers Powder River Basin coal to America. PRB coal and BNSF have grown together to help meet our nation’s energy needs.

We need PRB coal now more than ever.

- Low-cost PRB coal helps make electricity affordable.
- American PRB coal reduces dependence on energy imports.
- Low-sulfur PRB coal burns clean and can be even cleaner.

Economy. Energy security. Environment. PRB coal is an important fuel meeting all those needs, and BNSF is proud to be your partner in helping America strike that balance.
Natural Gas: “A long and expensive bridge”

By Mark Crisson, American Public Power Association

If natural gas is the bridge fuel that will take us to the promised land of carbon-free electricity generation, it’s going to be a pretty long and expensive bridge.

That’s one of the conclusions found in a new study commissioned for the American Public Power Association. The study was prepared to inform APPA members who are concerned about potential hurdles related to regulatory- and legislation-driven coal to natural gas conversions. Fossil fuel power plants and coal plants in particular face the prospect of a significant body of regulation over the next several years, even before the likely enactment of a climate change law. (The attached possible timeline for environmental regulations is sobering, to say the least.) Natural gas has been cast as the bridge fuel that will take us from relying on coal to generate more than half of our electricity, to a lower-carbon future of renewables, carbon capture and geological sequestration of CO₂, new nuclear plants, and perhaps plug-in hybrid electric cars.

Given the possibility of this coal-to-gas fuel-switching scenario, APPA commissioned the study, Implications of Greater Reliance on Natural Gas for Electricity Generation. The study was conducted by Catherine Elder, a natural gas expert at the Aspen Environmental Group. It is available for download at: http://www.appanet.org/files/PDFs/ImplicationsOfGreaterRelianceOnNGforElectricityGeneration.pdf

APPA commissioned this study because our members are concerned about just how utilities would extract, store, and move natural gas to where it is needed in a reliable, sustainable, affordable and environmentally sound way. It was never intended to be an advocacy tool, beyond advocating that policymakers – and utility planners – take a hard, fact-based look at energy policy options and their implications.

The implications of switching all coal-fueled electric generating plants to natural gas are daunting. The report found:

• Overall demand for natural gas would increase from 23 trillion cubic feet per year to 36 Tcf per year – a nearly 60 percent increase – with two-thirds of it serving electric power plants, up from just under one-third today.
• Certain areas of the country, such as the East Coast and Central Plains states, have significantly more pipeline capacity issues and gas storage problems than other areas. The pipeline capacity in 21 states would be inadequate to meet the extra demand from fuel switching. The estimated cost of the new pipeline capacity needed to meet this increased demand would be approximately $348 billion.
• There exists a common misconception that existing coal-fueled units can be retrofitted to burn natural gas, but virtually all conversions to date have been replacements, not retrofits. Combined-cycle gas-fired
generation costs roughly $1 million per megawatt (installed), so replacing the existing 335,000 MW of coal-fueled generation should cost in the range of $330 billion.

- Natural gas storage capacity will need to increase by 1.4 trillion cubic feet, at a cost of close to $12.5 billion. However, natural geology limits the opportunities to build new storage facilities where they are needed. The study points out that almost half the states have inadequate or no natural gas storage capacity.

The study estimates that the price tag to change all of the nation’s coal-fueled power plants to natural gas would be $750 billion. The magnitude of those costs suggests that natural gas must be more than a bridge fuel because utilities are not likely to invest that much and financial institutions are not likely to finance those investments other than on a long-term basis.

Fuel switching also poses operational challenges for electric utilities, such as the requirement to order or “nominate” natural gas in advance of its use, curtailments that must occur should supply or pipeline capacity run short, or unforeseen events such as hurricanes that could increase natural gas prices or restrict supply.

While the report examines a “bookend” scenario of 100 percent conversion of coal-fueled generation, that scenario is not inconceivable given the current list of existing and pending Environmental Protection Agency (EPA) regulations. However, the report takes a conservative approach on costs in some key areas.

For example, the $330 billion cost to build new gas-fired units does not include the cost of outstanding debt that utilities have incurred in building their existing fleet of coal-fueled power plants. That debt would still have to be paid if the plants are retired prematurely and those costs would be paid by customers, not shareholders.

More importantly, the report largely takes as a given the expansion of natural gas production arising from shale-based natural gas supply and the idea that the industry could provide enough natural gas supply. Additionally, the $750 billion price tag does not include higher commodity costs if gas prices rise above current prices. It is a sound assumption, regardless of the recent shale gas discoveries, that prices would rise if demand for the commodity goes up by 60 percent. However, potential EPA regulations governing techniques such as hydraulic fracturing could impact both the cost and potentially limit the supply of unconventional shale natural gas.

Other studies, such as the Energy Information Administration’s Annual Energy Outlook 2010, show relatively high natural gas prices at relatively modest demand levels. It seems unwise to expect to serve demand levels that are potentially very much higher than today without sending gas prices to much higher levels.

Policymakers need to take a fresh look at the regulations and incentives affecting electricity generation to make sure the problems identified in this study are addressed going forward.

Mark Crisson is President & CEO of The American Public Power Association (www.appanet.org)
Yeah... coal can do that.

St. Louis-based Peabody Energy is growing, global and green. We are the world’s largest private-sector coal company at a time when coal is the fastest growing fuel. We serve customers on six continents. And we are a world leader in clean coal solutions. Coal is a major source of America’s economic strength... the rock that reliably fuels half our energy at a fraction of the cost of competing sources. And technology now under development around the world will ensure that coal continues to power our 21st Century way of life.

Peabody is proud to fuel the future of energy. And we are pleased to support the American Coal Council.

CoalCanDoThat.com
Coal industry professionals recognize that unearthing the right information can be as difficult as extracting coal! That’s why Platts provides essential intelligence such as news, price assessments, analysis, and comprehensive market data to the coal industry. Count on Platts for timely information that will help you craft winning business strategies, whether you are a coal producer, consumer, distributor, analyst, trader, or otherwise involved in the industry. Platts resources include:

**Publications:**
- Coal Outlook/Coal Trader
- EU Energy
- Inside Energy
- International Coal Report/Coal Trader International

**Market Data:**
- Asia/Europe Forward Curve
- Global and regional coal fired generation data
- Historical Price Data
- Platts Global Steam Coal Assessments
- Platts Metallurgical Coal Assessments
- US and European GIS layers and map products
- US Market Fundamental Data

**Real-Time News and Data:**
- Electricity Alert
- European Power Alert

For more information or to take a free trial, visit [www.platts.com/freetrial](http://www.platts.com/freetrial) and use source code ACI2010
How Less Became More
Wind Generation: The Energy Option?

By John Lange, BENTEK Energy, LLC

Renewable portfolio standards (RPS) that rely on wind and criteria standards of the Environmental Protection Agency (EPA) are potentially on a collision course.

Using actual hourly generation data from every coal and gas boiler over 25 MW, BENTEK Energy investigated the efficiency losses at coal generation facilities attributable to renewable generation in the Public Service Company of Colorado (PSCO) and the Electric Reliability Council of Texas (ERCOT) operating areas. The results indicate that due to the provisions of RPS, wind energy is a must-take resource and causes utilities to cycle their coal and natural gas-fired power plants. Cycling coal power plants (and to a much lesser extent, gas plants) make their operation vastly less efficient and increases their emissions of CO₂, NOₓ and SO₂. Cycling also causes significantly greater wear and tear on the plants, thus adding to their maintenance costs and shortening their useful lives.

These findings have national policy implications. Integrating must-take, intermittent generation resources have caused severe system reliability and efficiency problems in ERCOT and Colorado at less than 10 percent renewable penetration levels even though flexible generation facilities comprise a significant component of the generation stacks in each area (25 percent in Colorado and 48 percent in Texas). If 20 percent to 30 percent RPS standards are mandated in areas where natural gas or other flexible generation is not adequate, coal plants will be cycled, and the potential emissions benefits from using wind will be dramatically reduced.

Good Intentions
Renewable policies have been implemented with the best of intentions. Reducing emissions, lowering electricity costs and creating a sustainable source of domestic energy have been priorities for at least the last three administrations. Of the many options for renewable energy, wind generation has been touted as the most feasible and cost-effective means of lowering emissions. As such, the generation capacity of wind projects has increased exponentially over the past decade.

In addition to emissions reduction, wind generation was thought to lower electricity costs because there is no variable power cost associated with wind blowing. Offering
lower electricity rates to American voters is appealing to politicians who have pushed for renewable energy mandates.

Wind generation was also thought to provide a sustainable, renewable and domestic energy source that does not tax the environment, in contrast to hydrocarbon-based natural resources. Last but not least, reducing America’s dependence on foreign resources has been a priority of nearly every administration over the past five decades.

**The Unintended Consequences**

Unfortunately for ratepayers, the impacts of integrating must-take, variable renewable generation resources were poorly understood and will result in higher-than-expected rate increases and lower-than-expected emission reductions.

A reality of wind generation across the U.S. is that it does not generate electricity at high utilization rates during peak hours. Most electricity is generated at night when wind blows the hardest, but demand is usually lowest. In addition, low demand means that natural gas generation is usually ramped down to the lowest allowable operating levels, and coal and nuclear generation become the dominant generation sources.

The must-take nature of wind power, coupled with the coal-dominated power generation stack that occurs during nighttime and early morning hours means that increased maintenance costs, new transmission lines and higher turbine component costs are only a few of the costs that integration planners failed to anticipate.
wind forces coal plants to be cycled much more extensively than they would be absent the wind. Incidence of coal plant cycling in Colorado and Texas increased 51 percent and 127 percent between 2007 and 2009 as wind was introduced on a large scale to these systems. The increased coal plant cycling and resulting increase in emissions and loss of efficiency are the unintended consequences of wind generation.

Coal facilities are not meant to be consistently cycled at high ramp rates. They are designed to offer steady levels of cheap, reliable generation to America. When the units are cycled, efficiency is severely degraded due both to heat rate increases and loss of emissions equipment control. Even though coal generation may be offset for a few hours at night, the total increase in emission levels due to the loss in efficiency offsets any savings from decreased generation.

This directly conflicts with EPA’s renewed interest in lowering ozone standards. The EPA is in the process of mandating vastly stricter SO₂ and NOₓ reductions across the U.S. Cycling coal units to accommodate wind will make it significantly harder to meet the tougher criteria standards.

In addition to the loss of short-term efficiency, continuous rapid cycling of coal facilities dramatically increases maintenance costs. Xcel Energy is currently in the process of petitioning the Colorado Public Utility Commission (PUC) for these increased maintenance costs to be included in the wind integration costs, and utilities in many other parts of the country are pursuing rate cases to offset incremental costs that in part derive from implementing RPS.

**Realities**

One megawatt-hour of wind generation does not reduce emissions equivalent to one megawatt-hour of generation by a fossil fuel. The decrease in efficiency occurs both at natural gas plants (although to a lesser extent because these facilities are designed to cycle) and at coal facilities. BENTEK’s research indicates that emissions levels from the PSCO and ERCOT systems are actually higher than they would have been had wind generation not been introduced to the systems.

In order for wind generation to attain the emission and cost savings goals it is designed for, more flexible baseload generation sources are necessary. While flexible coal units do exist (primarily in the Southeast), very few of these units are installed in the West where wind generation is dominant. Without the build-out of flexible coal-fired generation in areas where wind is increasingly utilized, more natural gas combined-cycle generation will be required as a flexible baseload resource.

The unexpected costs of wind generation continue to show themselves in the form of rising electricity rates. Increased maintenance costs, new transmission lines and higher turbine component costs are only a few of the costs that integration planners failed to anticipate. Considering the track record thus far, further costs will likely hit ratepayers for years to come.

Maintaining the current generation mix and furthering the penetration of wind generation will only amplify the costs and lessen the overall emissions savings rate. A national RPS will further widen the gap between the intended goal of adding wind generation to the mix and the actual, unintended consequences of achieving it.

---

John Lange is Director, Marketing at BENTEK Energy, LLC (www.bentekenergy.com)

© 2010 Wells Fargo Equipment Finance, Inc. All rights reserved.
CCP Management & Power Plant Support Services

- Landfill Design, Construction, Operations, Management & Closure
- Fly Ash, Bottom Ash, Gypsum & FGD Byproduct Disposal
- CCP Sales & Marketing
- Power Plant Support Services including Limestone Supply & Gypsum Operations
- Ash Pond Conversion & Closure using PondX™
- IGCC Slag Beneficiation & Other Innovative Solutions

Conserving our natural resources through the beneficial use of CCPs

Call Us for More Information: 502-245-1353
www.charah.com
A “special” euphemism threatens coal ash recycling

By Melissa Hendricks, American Coal Ash Association

“Science and the scientific process must inform and guide decisions of my Administration…”

– Order on Scientific Integrity, March 9, 2009, President Barack Obama

A n hour past midnight, on the shortest day of 2008, decades of disposed coal fly ash slurry escaped its containment and spilled across 300 acres of land and into tributaries of the Tennessee River. Sunrise on December 22 illuminated berg-like clumps of ash punctuating a grey, eerie landscape. Three homes were rendered uninhabitable, 23 were damaged, and one was pushed off its foundation. Roads, rail lines, and utilities were also damaged. Fortunately nobody was injured.

The largest U.S. electric power producer, owned by the federal government, faced an unprecedented crisis. The Tennessee Valley Authority fielded hundreds of calls from reporters as staff attempted to accurately determine the scope and impact of the spill, establish logistics for clean-up, and inform all stakeholders, regulators and jurisdictional agencies. The American Coal Ash Association was engaged to assist with community outreach, providing expertise on the material and answering citizens’ and reporters’ questions.

Interest groups led by environmental attorneys spoon-fed media outlets with exaggerated comparisons to the Exxon Valdez spill and labeled coal ash “toxic” and “hazardous.” Soon after, Erin Brockovich and other notables descended upon the small, nearby town of Harriman, 40 miles west of Knoxville, fueling national media attention with hearsay claims of toxic exposures. A fear campaign heretofore limited to alternative weeklies and blogs was officially launched nationwide.

On March 3, 2009, a ready-to-wear network of 100-plus interest groups signed on to a letter urging EPA Administrator Lisa Jackson to regulate coal ash as a hazardous waste. The day after, Barbara Boxer (D-Calif.), chair of the Senate Committee on Environment and Public Works, and Thomas Carper (D-Del.), chair of the Subcommittee on Clean Air and Nuclear Safety, introduced a resolution calling for immediate reviews and inspections of all coal ash impoundments in the U.S. and to propose and issue as quickly as possible rules to regulate coal combustion residues under the Resource Conservation and Recovery Act (RCRA).

Over the next several months, the voices of coal ash experts and stakeholders were relegated to second stage as dramatic headlines originating from media savvy, well-funded interest groups appeared to subjugate the spotlight. The legal term “high hazard,” a designation for dam safety, was misappropriated to describe coal ash as a hazardous waste. The legal term “damage case” was applied liberally to studies with data and variables taken out of context, as documents filled with erroneous details were publicized with the intent to exaggerate and inspire haste. A litany of hearsay ailments related to “toxic coal ash” exposure was promoted as fact by the media without confirming final medical reports or checking the motives of sources.

Hundreds of letters flowed into the EPA from industry stakeholders…a 31-page...
letter from ACAA; letters from members of congress; letters from state governors, environmental regulatory associations, departments of transportation, public utility commissions; municipal governments, chambers of commerce, labor unions, state legislatures; more than 100 affiliated organizations; and many more.

When the EPA submitted the first draft of its regulation on October 2009 to the U.S. Office of Management and Budget, the proposed rule was hazardous, “Subtitle C,” under RCRA. For the first time, the coal ash recycling industry, led by ACAA, was given an opportunity for face-to-face meetings with regulatory officials. Though this review is part of the regulatory process, it was characterized by interest groups as sinister and “back door.” Each meeting was posted on OMB’s website along with documents submitted by all stakeholders, including interest groups. Hardly backdoor.

The draft regulation returned to the EPA from OMB, with a co-proposal for Subtitle D, a solid waste rule preferred by industry. One high-ranking EPA official speaking to the Environmental Council of the States a month before the draft was submitted to OMB said this rule was “sufficient” for regulating coal combustion residuals.

On June 20, 2010, the EPA released its final draft proposal with two options or “co-proposals.” A hazardous waste rule (Subtitle C) and a non-hazardous, solid waste rule (Subtitle D). The hazardous rule labels coal ash or coal combustion residuals (CCR) “special waste,” which according to the EPA, would limit the stigma and promote recycling. The EPA’s rule would limit recycling to such “encapsulated” products as concrete or building materials, but did not define the term’s meaning to those stakeholders who would consider many other uses, such as soil stabilization, an encapsulated use according to the nature of the ash.

“The Subtitle C option would regulate CCRs more stringently than any other hazardous waste by applying the hazardous waste rules to certain inactive and previously closed CCR units,” said Lisa Bradley, a senior toxicologist at engineering giant AECOM, which determined the cause of the spill in Tennessee. “The EPA has never before interpreted RCRA in this manner in its 30 years of administering the federal hazardous waste rules.”

The rule proposal applies to all CCRs generated by electric utilities and independent power producers, but would not apply to CCRs from non-utility boilers burning coal, although EPA will consider actions for the latter after the current rulemaking is completed.

The Subtitle C option requires state or federal permit programs, would allow for direct federal enforcement, and would include related storage, manifest, transport, and disposal requirements and mechanisms for corrective action and financial responsibility. Before the Subtitle C rule would become effective, authorized states would need to adopt the rule, a process that could take several years.

The Subtitle D option would go into effect sooner than a Subtitle C rule, with implementation required approximately six months after promulgation. However, the Subtitle D option would not require permit programs to be established, although states can establish such permit programs under their own authorities. Also, the federal Subtitle D proposal would not be federally enforceable, although citizen’s suits could be filed, and would not establish the same...
extensive management requirements for CCRs destined for disposal. “The EPA can always take action if a situation presents an imminent and substantial endangerment to human health or the environment,” said Bradley.

On July 22, 2010, Rep. Heath Shuler (D-N.C.), held a hearing in D.C. to examine what impacts the proposals would have on small businesses. “If a consumer has the option of choosing between a product that’s non-hazardous and a product that contains a material labeled hazardous, it’s logical that they would choose non-hazardous product,” testified Thomas H. Adams, ACAAs executive director.

Following the hearing, Shuler released a statement to the media: “I agree that we need strong and enforceable regulations at the federal level for coal ash storage and disposal. I want to work with EPA on a solution to provide better environmental protection without the economic damages of regulating coal ash like a hazardous waste – when it really isn’t.”

The EPA first considered regulating coal ash as a hazardous waste in late 1978. Five years later, following an exhaustive investigation determining the material is not hazardous, the agency issued its first federal procurement guideline for the use of fly ash in cement and concrete. In 1988, EPA issued a Report to Congress, in which the agency encouraged “the utilization of coal combustion byproducts could provide numerous environmental and economic benefits to the United States. Positive environmental effects include (1) reduced solid waste, (2) reduced use of natural resources, and (3) reduced energy consumption and CO₂ emissions from the reduced use of natural resources and the production of cement.”

In 1993, the agency again determined that coal ash did not warrant regulation as a hazardous waste. In a 1994 Report to Congress, the U.S. Department of Energy concluded: “The increased utilization of coal combustion byproducts could provide numerous environmental and economic benefits to the United States. Positive environmental effects include (1) reduced solid waste, (2) reduced use of natural resources, and (3) reduced energy consumption and CO₂ emissions from the reduced use of natural resources and the production of cement.”

In the EPA’s “Regulatory Determination on Wastes from Fossil Fuels: Final Rule,” published on May 22, 2000, the agency again concluded that CCRs “do not warrant regulation under Subtitle C of RCRA and is retaining the hazardous waste exemption under RCRA section 3001(b)(3)(C).” In the determination the EPA also stated: “We do not wish to place any unnecessary barriers on the beneficial uses of these wastes, because they conserve natural resources, reduce disposal costs and reduce the total amount of waste destined for disposal.”

In 2003, the EPA formed the Coal Combustion Products Partnership, or C²P². The stated purpose was to: “… help promote the beneficial use of Coal Combustion Products and the environmental benefits that result from their use.” The C²P² website featured case studies, touting performance and economic benefits, while listing specific environmental benefits such as reducing greenhouse gases, energy use, landfill space, and mining for virgin materials.

On July 7, 2010, the program’s pages were taken off the EPA’s website without notice to C²P² members.

Despite assurances by the EPA that Subtitle C will have no negative impact on the beneficial reuse market, the mere discussion of regulating CCRs under RCRA’s hazardous waste program has already produced a downturn in the market for these materials. “We believe that those who argue beneficial use of CCRs will increase under the Subtitle C option do not appreciate the realities of the potential legal liabilities under today’s tort system,” said Adams. “The reality is that the marketplace is already reacting negatively to these concerns, and we are losing important green jobs, along with the greenhouse gas emission reduction benefits that flow from the use of CCRs in numerous products, particularly in transportation infrastructure projects.”

Hearings are now underway across the U.S. to “encourage a robust dialogue on the most effective means to address the human health concerns and structural integrity issues associated with coal ash impoundments and landfills.” The EPA stated in a news release that the ultimate decision will be based on the best available data with the fullest possible extent of public input. The comment period concludes November 19, 2010.

Melissa Hendricks is communications director for the American Coal Ash Association
With a company history stretching back over 150 years, Inspectorate continues to develop its global services for the inspection and analysis of coal and coke. Inspectorate’s independent weighing, sampling and analytical services make it possible to reduce and eliminate risks associated with the movement of these commodities.

**Coal & Pet Coke Services**

Inspectorate’s inspectors and surveyors are experienced in the full range of sampling situations. Whether your product is being handled through a small port or a large-scale modern terminal, our expert staff ensure that correct sampling methods are used to produce representative samples for laboratory testing. With modern, professional laboratories at key locations world-wide, Inspectorate is perfectly positioned to help you protect your interests.

To meet the increasing demands for its ISO-accredited Coal & Coke Services, Inspectorate continues to expand its capabilities and existing global network of laboratories. With offices already in strategic commercial hubs in countries like The Netherlands, Belgium, Germany, Russia, Ukraine, Greece, South Africa, Indonesia, India, China, Colombia and Brazil, Inspectorate has now added the United States to its growing portfolio. Our full-service coal and coke laboratory, operating in Houston, Texas, is equipped with state of the art analytical instruments and staffed with industry-experienced personnel. Our goal is to provide you with a superior service experience that will have you coming back for more!

**Services include:**
- Modern Laboratory with Full Analytical Capability
- Experienced Field Inspectors in the Gulf, East Coast and Western US
- Surveying Services
  - Detailed Stockpile Survey Inventory and Report
  - Barge Surveys
  - Vessel Draft Surveys
  - Hydrographic Surveys
  - Site Planning
  - Topographical and GIS Mapping
  - Remote Sensing
- Design and Operations of Sampling Systems
- Operation of Contract Laboratories

Inspectorate America Corporation
Metals & Minerals Division
12622 Hwy 3
Webster, TX 77598
Office: 713-944-2000
Email: Solidfuels@inspectorate.com
www.inspectorate.com
Coal Sector – Business Opportunities in the Carbon Market

By Kasia Ouda, Carbon Credit Capital

Editor's note: This article takes for granted that some form of federally mandated restrictions on carbon dioxide will be passed and implemented in the near future. While this view is widely held by many in the policy and energy industries, it is also widely contested. With changing political winds and increasing public resistance to the potential costs and economic disruptions associated with cap-and-trade, or legislating the reduction of GHG emissions, there is a growing belief that federal GHG, or climate, legislation may not be forthcoming. Working from that assumption, it could be equally likely that future legislation would focus on a direct energy tax, energy efficiency, and/or on restricting EPAs ability to regulate in the area of GHG reductions.

Greenhouse gas reduction in the 21st century introduces challenges, risks and complexity for coal-powered energy producers worldwide. Government, investors, and customers have demanded cuts in greenhouse gas (GHG) emissions that could have enormous implications for the power sector – the largest emitters of GHG. To respond to these demands, the utility industry will need to be ready for a major transformation. A new report from Carbon Credit Capital, LLC (CCC) stresses that this impending liability for coal-fired utilities can also be an important opportunity. The report outlines a plan to help develop a low cost strategy for GHG mitigation.

The U.S. Congress is debating the design of a plan for the reduction of GHG emissions. While the latest attempt to introduce cap-and-trade, as presented by Senators Kerry and Lieberman in the American Power Act (APA), has been postponed until after the November elections, it is almost certain that GHG will be regulated in the U.S. Cap-and-trade has been given the greatest attention in the debate. CCC has taken the position that the establishment of cap-and-trade in the U.S. will provide the right incentives for U.S.-covered industries to reduce emissions in the most cost-effective way and that this is a better option than top-down regulation by the EPA or the Dept. of Energy.

Coal-fired power plants will have three options for compliance with emissions reduction requirements: 1) internal
The prices for discussed compliance options are as follows:

Source: The EPA

The plant has to internally abate or use offsets to cover the 111,164 tons of CO₂ it will not be able to cover using auctioned allowances (difference between emissions and allowances). CCC assumes that in Ibbid. According to McKinsey & Company: China's Green Revolution According to McKinsey & Company: Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost? Allowances and offsets up till 2028, after that internal abatement solutions will have to be implemented. The American Power Act (Kerry-Lieberman), shows that the compliance costs fall 71 percent when major findings of the analysis is concerned with the impact of carbon offsets on cost containment. The inclusion of carbon offsets in a power company's plan can reduce the cost of compliance. Carbon offsets have the potential to lower the total cost of GHG emission reduction by substituting less expensive emission reductions from entities not subject to emissions caps for more expensive reductions by companies that will be subject to caps. EPA has conducted an analysis of the climate and energy bills proposed in Congress, and focused on the economic effects of the cap-and-trade program, energy efficiency and competitiveness provisions. One of the major findings of the analysis is concerned with the impact of carbon offsets on cost containment. The analysis of both pending bills, the American Clean Energy and Security Act (Waxman-Markey) and the American Power Act (Kerry-Lieberman), shows that the compliance costs fall 71 percent when international and domestic carbon offsets are allowed to be used for compliance.

500 MW Coal-fueled Power Plant – A Case Study on the Economics of Using Carbon Offsets

This case study examines how the operator of a 500 MW coal-fueled power plant may reduce the cost of compliance through the use of carbon offsets. The table on the left of this page illustrates the plant's emissions, the estimated allowances available for the plant in early stages of the regulated period (e.g. 2017) and the estimated offset limit (overall and international). Please refer to the chart to the left.

---

1 For the purpose of this analysis we included emissions from the electric power industry, industrial sources, and transportation industry which account for 80 percent of the total U.S. GHG emissions and are the sectors most likely to be regulated under the APA bill.

2 Based on the American Power Act
The prices for discussed compliance options are as follows:

Internal abatement (here we present two of the several options available):

- Improve the heat rate of the base-load. Average cost: $15 per ton of CO₂. That is, the power plant would have a profit of $15 per ton of CO₂ reduced.

- Carbon capture and storage (CCS). Average cost: $44 per ton of CO₂.  

Allowance price (government): $12 (estimated auction reserve price in the APA bill).

Allowance price (secondary market): $12 (the price in the secondary market is going to be higher than the government auction price, but in this example, for simplicity, we assume the price is the same).

Carbon offset available: investment in a coal mine methane management project in China. Estimated cost: $2 per ton of CO₂e. (This cost takes into account possible revenues from the investment, such as selling the electricity generated). Estimated carbon offsets generated: 209,000 per year for 10 years (average yield of carbon credits for this kind of project developed under the Kyoto Protocol).

The plant must internally abate or use offsets to account for the 111,164 tons of CO₂ it will not be able to cover using auctioned allowances (difference between emissions and allowances). CCC assumes that the power plant from this case study chooses to improve its heat rate. Assuming a 2 percent increase in heat rate, the approximate CO₂ reduction achieved is 35,000 tons of CO₂/Yr.

After the improvement, the company is still responsible for 3,705,480 tons of CO₂ (emissions minus the reduction), of which 76,164 cannot be covered using auctioned allowances. Three possible scenarios are:

1. Use offsets: investment in the China methane project could generate 209,000 offsets and buy allowances from the government to cover the remaining difference (3,670,480 – 209,000).

2. No offsets used: buy allowances up to the government limit and buy allowances in the secondary market to cover the remaining 76,164 tons of CO₂.

3. No offsets used: invest in a CCS system that has the capacity to abate 76,164 tons of CO₂ by 2017. This will eventually allow the power plant to abate a significant percentage of its emissions. However, the system will take several years to operate at its maximum capacity, requiring the purchase of allowances up to the government limit.

The comparative costs of the three scenarios are shown in the chart above.

The example above illustrates how a coal-fueled power plant may save up to 10 percent by investing in an offset project.

Under all of the previous proposals in Congress, the power sector is scheduled to be the first one to comply (as early as 2013). This is one of the reasons why companies that become involved in the carbon market at an early stage will have gained experience and a position in the market which will provide them with a strong competitive advantage when legislation passes.

Companies that become involved in the carbon market at an early stage will have gained a high quality carbon offset portfolio. Early action allows for careful planning and the opportunity to amass a high quality carbon offset portfolio.


According to McKinsey & Company: China’s Green Revolution

According to The Electric Power Research Institute

Source: Carbon Credit Capital, LLC
4. Companies that become involved in the carbon market at an early stage will have gained experience and a position in the market which will provide them with a strong competitive advantage when legislation passes.

5. A company can demonstrate corporate social responsibility and enhance its public image by investing in renewable energy or energy-efficiency carbon offset projects. This is compounded if the company does it before government mandates.

As the global carbon market reached a total value of $144 billion in mid-2010, the carbon market continues to be the fastest growing global commodities market worldwide. Once legislation is in place, the U.S. carbon offset market is forecasted to triple in size, and early participants will benefit the most. U.S. carbon offset players who act sooner rather than later will gain substantial advantage and strategic market position. ◆

Kasia Duda is an associate with Carbon Credit Capital, LLC (www.carboncreditcapital.com)
Improvements In Fuel Flexibility And Operating Cost Reduction

At CSU Drake Station With Targeted In-Furnace Injection™ Technology

Excerpt from technical paper presented at ASME Power 2010 – Chicago, IL
James Towell, Tom Martinez, David Hightower, Richard Maxey – Colorado Springs Utilities
Gerry Snow, PE; Hector Gonzalez; Robert Rians – Fuel Tech, Inc. Warrenville, IL

Power generating stations are under continuous pressure to achieve maximum availability, high efficiency, and minimum environmental emissions at the lowest possible cost. In recent years, increased fuel flexibility has become more critical, financially and operationally, than ever before. Colorado Springs Utilities (CSU) has been very progressive in adopting and implementing benchmark technologies and operating strategies to help achieve these goals across their diversified generation portfolio, and in particular at four operating coal units representing 462 megawatts in the system. One key strategy employed at CSU’s Martin Drake Station has been to continuously evaluate and test alternative coal feedstocks which have potential to reduce cost while maintaining capacity, fuel supply security, availability, and efficiency. These tests were made possible by the use of Fuel Tech’s Targeted In-Furnace Injection™ (TIFI®) technology to control slagging1 and fouling, reduce forced outages and load drops, and enhance unit efficiency. The TIFI process uses Computational Fluid Dynamic (CFD) modeling to predict the precise trajectory of an injected chemical, helping to ensure as close to 100% coverage of the targeted zones as possible.

With TIFI installed on Units 6 and 7 at Martin Drake Station, the operators were able to blend Powder River Basin coal with design fuel up to double the percentages previously achievable. Using TIFI, the plant was able to maintain full load generation, better control slagging deposits, show improvements in heat absorption, and reduce attemperator spray flows over previous blend trials. Including the cost of the TIFI program, the station has demonstrated a potential annual operating cost reduction approaching $4.9 million. Effective return on TIFI program investment is 4:1.

The Martin Drake Power Plant comprises Units 5, 6, and 7. Units 5 and 6 are wall-fired boilers rated at 46 MW and 77 MW, respectively. Drake Unit 7 is a 1,336 MMBtu/hr (nameplate) Babcock & Wilcox wall-fired, dry bottom, coal-fired boiler rated at 131 MW (net). Unit 7 entered commercial operation on June 14, 1974 and a reverse-air fabric filter baghouse was placed in service on Drake Unit 7 in November 1993. Low NOx burners were installed in October 1999.

Fuel Blends

Design fuels fired at Drake Station are bituminous coals sourced from mines located in western and northwestern Colorado. All three units are able to burn 100% of either of these fuels. From early 2005 through 2007, various blends of PRB were tested in Unit 7. The unit was able to maintain full load up to a 30% PRB blend; however slag deposits quickly formed on the waterwalls causing increased furnace exit gas temperatures. Related to increased furnace exit gas temperatures (FEGT) and due to ash fusion characteristics of the PRB coal, the secondary superheat and pendant reheater surfaces also became heavily slagged and fouled. These deposits have been a key contributor to increased tube leaks through tube metal corrosion, requiring increased soot blowing and aggressive cleaning measures, and flow channeling and increased gas flow velocities leading to tube erosion and wastage.

Comparing analysis details between the two coal types, we concluded that slagging and fouling with even modest blends of PRB would be expected in this unit. During the 2005 – 2007 PRB blending test burns, large clinkers were observed growing on the upper waterwall surfaces and pendant superheat surfaces, even with PRB blends of less than 30%. Falling slag occasionally bridged the bottom of the boiler. All of these issues required load sheds and forced outages to remove and clean slag accumulations. In order to consistently fire PRB blends higher than approximately 10% or 20% in Drake Unit 7, CSU worked with Fuel Tech to design a Targeted In-Furnace Injection™ (TIFI®) program to reduce or eliminate slagging and fouling and eliminate forced load drops and outages so that the Martin Drake Power Plant could take full advantage of cost savings associated with utilizing the maximum blend of PRB coal.

---

1 Slag is molten ash deposits that are formed during the combustion of coal.
Fuel Tech has been applying and optimizing the TIFI® or Targeted In-Furnace Injection™ program since the early 1990s. TIFI systems are currently installed on over 100 combustion units burning a wide variety of fuels including coal, heavy oil, biomass and municipal waste.

Identified benefits of TIFI programs fall into five broad categories:
1. Availability and reliability gains
2. Efficiency gains
3. Maintenance benefits
4. Fuel flexibility
5. Environmental improvements

The TIFI slag and fouling control program involves targeting areas of the radiant and convection sections of a boiler with chemicals designed to control these problems. By targeting the problem areas of the furnace instead of simply putting additives in the fuel, performance and cost effectiveness are significantly improved. Chemicals are mixed with air and water and then injected into the flue gas stream. The areas targeted are based on Computational Fluid Dynamics (CFD) models to ensure maximum coverage where the problem areas are known to exist.

Following the completion of the CFD model and operating case studies, an injection design model is then developed to simulate and optimize the TIFI injector array. The model allows the design team to test various combinations of injector locations along with variable droplet size, distribution, and velocity. Best candidate solutions are then modeled with CFD, coupled with injector placement and flows. Concentration contours showing chemical distribution are used to evaluate the effectiveness of possible injector arrays. Isosurface temperature models are also used to predict where ash softening temperatures are expected to occur.

Financial Analysis
In testing the effectiveness of the TIFI program, three operating cases were established:
• Case I: Baseline Operation, Colorado Coal – 92% capacity
• Case II: 30% PRB / 70% Colorado, w/o TIFI – 87% capacity
• Case III: 50% PRB / 50% Colorado, with TIFI – 92% capacity with 4:1 ROI
Based on five months of operating experience under Case III, there were no forced outages, slag related derates, off-line explosive cleaning requirements, or pressure part failures beyond normal baseline, design coal operation. Under the Case III scenario as compared to the baseline Case I – capacity was held constant, while a fuel cost savings of over $6 million contributed to a total overall savings (as compared to baseline) of $4.9 million with an effective return on TIFI program investment (ROI) of 4.2 to 1. With close monitoring of key unit performance indicators and fuel properties, we expect to increase this ROI value even further.

Current Status And Future Plans
Following five months of operation with increased PRB blends and the TIFI program, Unit 7 was returned to Colorado design coal with minimal PRB blends. This decision was based on changes in coal market pricing that have temporarily eliminated the financial advantage for Drake Station to blend higher PRB percentages. As a result, the TIFI system is currently off-line and remains in standby. These market driven changes are expected to reverse in early 2011, and will once again provide Drake a significant financial advantage in resuming the TIFI system. These circumstances illustrate a key feature of TIFI technology – as market and operational circumstances shift; the flexibility of the TIFI system allows utilities to use as needed and quickly leverage the benefits and financial advantages accordingly.

Read the full case study at – www.ftek.com/pdfs/TPP-590.pdf
The ACC would also like to thank Fuel Tech for their participation in the Annual Sponsorship Program. Fuel Tech is our newest Champion Sponsor. See www.americancoadcouncil.org for more information on sponsorship opportunities.
Experience the difference.

Voted Overall Energy Broker of the Year five years running by the readers of Energy Risk magazine.

Go beyond. www.icapenergy.com

Coal:
Norwalk
+1 203 663 9425
Louisville
+1 502 327 1417

Structured Coal Products:
Daniel Vaughn
+1 417 336 5582

Emissions:
Houston
+1 281 340 8300

Find out more.

© ICAP plc 2010. ICAP® and other service marks and logos are service marks of ICAP plc and/or one of its groups of companies. All rights reserved. Entities within the ICAP group are registered as applicable.
Valuation of Pre-Combustion Coal Cleaning Facilities for Power Plants

By Bethany Snoby & Stephen Smith

Executive Summary

The quality of feed coal is known to influence the combustion efficiency as well as financial performance of coal-fueled power plants. Pre-combustion coal cleaning produces a fuel with lower ash, thereby reducing emissions of sulfur dioxide, mercury, nitrogen oxides, and carbon dioxide. Utility executives may overlook coal cleaning due to higher priority responsibilities or a lack of understanding of the financial value derived by cleaning coal. Using a recently developed model, this paper examines the benefits and costs associated with obtaining and operating coal preparation plants and considers the financial valuations for a utility on a project-specific basis.

A 650 ton per hour wet preparation plant yields a $3,720,000 net present value and a 20 percent internal rate of return. This financial valuation of pre-combustion cleaning is not dependent on the type of coal preparation plant or the coal cleaning circuitry, except to the extent that the prep plant and circuitry affect the consistent quality of the cleaned coal. The quality of the coal has a direct effect on the valuation.1

Upgraded Coal as Fuel

Coal is processed to provide a cleaner, more consistent fuel for power plants. Pre-combustion coal cleaning removes mineral matter; therefore, coal cleaning results in a higher energy per pound of fuel and a reduction of spikes in mineral content entering the power plant. Burning coal of consistent quality reduces operating and maintenance costs, improves efficiency, increases capacity, reduces emission levels from the power plant, and hence can lead to a more cost efficient power station operation.

Cleaning coal is often perceived as being costly, because the expenses are apparent and the savings are difficult to quantify. Utilizing recently developed, simplified modeling, this paper presents valuations that demonstrate how significantly pre-combustion cleaning can enhance the financial bottom line of both older and newer power plants.

Pre-combustion cleaning reduces the amount of pollutants to capture. For older power plants, installing a coal cleaning facility could save a significant amount of capital as compared to new pollution-control equipment, such as scrubbers or carbon capture systems. Because the expense of a preparation plant is usually far less than the cost of post-combustion capture, a combination of the two can be a cost effective solution. Power plants in the initial stage of development may reduce costs by designing the post-combustion capture in conjunction with a pre-combustion cleaning plant.

Modeling the Benefits of Pre-Combustion Coal Cleaning

Allmineral LLC has created a model, the Allmineral Coal Preparation Valuation Model (the ACPV Model), to forecast a power plant’s financial advantage when utilizing a coal cleaning plant. The Allmineral Coal Preparation Valuation Model provides an inexpensive, preliminary evaluation of the financial gain from coal cleaning. Based on the results, more extensive analyses may be sought if the preparation plant seems justifiable.

The ACPV Model appraises several financial areas of the coal-based electric generating process, including sulfur credits/penalties, sulfur in the stack gas, mercury credits/penalties, BTU improvement, ash improvement, high quality coal purchases, equipment expenditures, life of mine reserve (additional years of mining beyond the expected date of the mine closure due to increased coal recovery), and efficiency of the power plant. The model results are based on customized inputs related to the individual power plant. The summation of these benefits is the yearly value of the cleaning facility to the power plant.

The costs of obtaining and operating the preparation plant are included in the ACPV Model.

These costs are compared by the model to the financial benefits, using a standard financial analysis to obtain net present values and internal rates of return.
**Alljig Case**

This case uses an Allmineral Baum (wet) jig (the “Alljig”) to clean western bituminous coal prior to fueling a typical but hypothetical Midwestern coal-fueled electric power plant. This power plant is assumed to have a cost-plus contract with the mine.

An Allmineral Alljig can improve the coal quality of this western bituminous coal as shown in the following table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Raw</th>
<th>Cleaned</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield %</td>
<td>100%</td>
<td>80%</td>
<td>-20%</td>
</tr>
<tr>
<td>Ash %</td>
<td>15%</td>
<td>10%</td>
<td>-33%</td>
</tr>
<tr>
<td>Sulfur %</td>
<td>1.5%</td>
<td>1.0%</td>
<td>-33%</td>
</tr>
<tr>
<td>Mercury %</td>
<td>15 PPM</td>
<td>9 PPM</td>
<td>-40%</td>
</tr>
<tr>
<td>BTU/lb</td>
<td>10,000</td>
<td>12,000</td>
<td>+20%</td>
</tr>
</tbody>
</table>

The 1000 Megawatt (MW) system in this case consumes 3.7 million tons of raw coal annually to produce energy. Due to the enhanced heating value of the cleaned coal, less than 3.2 million tons of cleaned coal is needed to produce the same energy content. When reducing the throughput tonnage of the power plant and maintaining the same energy output, savings associated with operating and maintenance costs are realized.

With the preparation plant yield of 80 percent clean product, almost 3.9 million tons must be mined. This cost is accounted for in the ACPV Model by the variable mining costs.

Included in the ACPV Model is the cost per megawatt-hour associated with owning and operating the preparation plant. The following conservative assumptions were used to estimate the cost for the Alljig plant:
The clean coal facility’s Operating Cash Flow calculations include a first year cost of $0.31/megawatt-hour (MWH). This figure represents the minimum savings necessary to break-even. The thirty-one cents per MWH cost includes the property, plant and equipment (PP&E) depreciation expense (7-year straight-line model) to prorate the cost of the cleaning plant over a period of time. Lastly, the discounted cash flow statement includes the reduction in taxes due to the increase in expenses incurred by implementing the prep plant.

With the expenditures established, for this coal cleaning project to be viable, the financial returns from the reduction in ash, mercury and sulfur and the elevated heating value of the cleaned fuel must exceed these expenses. The power plant’s overall financial gain using the Alljig preparation plant is $0.74 per MWH. The $0.74/MWH far exceeds the capital outlay of the Alljig plant, $0.31/MWH.

The benefits available from coal cleaning are summarized in Table 3.

A discounted cash flow for the Alljig facility can be performed including the operational savings and all preparation plant expenses. This discounted cash flow generates the total value of the preparation plant. Using a 10 percent weighted average cost of capital (WACC), the net present value (NPV) for the Alljig facility is $3.7 million and the internal rate of return (IRR) is 20 percent.

<table>
<thead>
<tr>
<th>Item</th>
<th>Raw</th>
<th>Cleaned</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield %</td>
<td>100%</td>
<td>82%</td>
<td>-12%</td>
</tr>
<tr>
<td>Ash %</td>
<td>18%</td>
<td>11%</td>
<td>-39%</td>
</tr>
<tr>
<td>Sulfur %</td>
<td>1.2%</td>
<td>0.9%</td>
<td>-25%</td>
</tr>
<tr>
<td>Mercury %</td>
<td>10 PPM</td>
<td>7 PPM</td>
<td>-30%</td>
</tr>
<tr>
<td>BTU/lb</td>
<td>5,500</td>
<td>6,500</td>
<td>+18%</td>
</tr>
</tbody>
</table>

Let Golder push your project forward.

Over the past 50 years, Golder has developed unique expertise with complex underground and open pit projects. We deliver technical solutions that maximize value while meeting your obligations to communities, regulators and the environment.

Let Golder push your project forward.

<table>
<thead>
<tr>
<th>Capital cost of Alljig plant</th>
<th>$6,500,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable mining cost</td>
<td>$3.00/ton</td>
</tr>
<tr>
<td>Alljig plant operating expense</td>
<td>$0.70/feed ton</td>
</tr>
<tr>
<td>Alljig spare parts</td>
<td>10% capital cost/yr</td>
</tr>
<tr>
<td>Refuse disposal expense</td>
<td>$1/ton</td>
</tr>
</tbody>
</table>
STORM TECHNOLOGIES, INC.

STORM™ is a full service and results-oriented organization providing boiler consulting services, technical direction, general and comprehensive inspections, and performance testing services. STORM™ also provides pulverizer and burner performance replacement parts, short courses and in-house programs, which can help your team work towards total boiler optimization.

- Fuels Flexibility Testing Services
- Comprehensive Boiler Inspections
- Technical Direction of Outage Repairs
- Specialized Testing Equipment
- Airflow Measurement and Control Devices (Design Fabrication and Calibration)
- Flyash Carbon Reduction Programs
- NOx Emissions Tuning and Control
- Combustion Improvement Programs for:
  - Pulverizers
  - Burners
- Fans
- Boiler Surface Area Evaluations
- Air In-Leakage
- Testing and Corrective Plans of Action
- Pulverizer Capacity and Fineness Improvements
- Secondary Air Balancing
- Air Heater Leakage and Performance
- Heat Rate Improvements Through Boiler Optimization Programs
- Failure Analysis
- Consulting
- Short Courses
- Immediate Technical Responses
- Full Service Fabrication and Machining
- Fast Equipment, Parts or Service Turn-Around Time
- Outstanding Fabrication Quality
- Complete Annual Service Contracts

Phone: (704) 983-2040  www.stormeng.com
If a cap and trade system on carbon dioxide emissions is implemented, a coal preparation plant will have a positive cash flow from trading CO₂ because “… coals with low ratios of carbon concentration to energy content will give off less CO₂ than fuels with a higher ratio of carbon concentration to energy” (Wolf). To estimate the amount of CO₂ emitted during combustion, quantifications of CO₂ for the raw coal and cleaned products is used in conjunction with a $30/ton cost of CO₂ credits. Additional yearly savings attributed to the preparation plant is roughly $1,000,000.

Conclusion
In the hypothetical case presented, the power plant benefits from a coal preparation facility. The cost to reduce the dilution material in the feed coal, thereby enhancing the heating value, is justified by the expected financial benefits. The project has a positive NPV and an IRR greater than the hurdle rate (WACC), which are essential qualities of a good investment project. Of course, every power plant and project is different; due diligence for each specific project is critical. For this, the Allmineral Coal Preparation Valuation Model can be an illuminating first step in evaluating a coal cleaning plant project.

Works Cited


## Index to Advertisers

<table>
<thead>
<tr>
<th>Company</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEP River Operations</td>
<td>26</td>
</tr>
<tr>
<td>Allen-Sherman-Hoff</td>
<td>30</td>
</tr>
<tr>
<td>Arch Coal, Inc.</td>
<td></td>
</tr>
<tr>
<td>Benetech, Inc.</td>
<td>31</td>
</tr>
<tr>
<td>BNSF Railway Company</td>
<td>34</td>
</tr>
<tr>
<td>Charah, Inc.</td>
<td>42</td>
</tr>
<tr>
<td>Cloud Peak Energy</td>
<td>14</td>
</tr>
<tr>
<td>Coalfield Services, Inc.</td>
<td>44</td>
</tr>
<tr>
<td>Constellation Energy</td>
<td>56</td>
</tr>
<tr>
<td>CSX Transportation</td>
<td>56</td>
</tr>
<tr>
<td>E S &amp; S Company</td>
<td>60</td>
</tr>
<tr>
<td>Energy Publishing, Inc.</td>
<td>57</td>
</tr>
<tr>
<td>Ernst &amp; Young</td>
<td>33</td>
</tr>
<tr>
<td>First Union Rail</td>
<td>41</td>
</tr>
<tr>
<td>Freight Car America</td>
<td></td>
</tr>
<tr>
<td>Fuel Tech, Inc.</td>
<td>24</td>
</tr>
<tr>
<td>Golder Associates Inc.</td>
<td>57</td>
</tr>
<tr>
<td>HardSteel</td>
<td>45</td>
</tr>
<tr>
<td>Helm Financial Corporation</td>
<td>60</td>
</tr>
<tr>
<td>ICAP United</td>
<td>54</td>
</tr>
<tr>
<td>Ingram Barge Company</td>
<td></td>
</tr>
<tr>
<td>Inspectorate America Corporation</td>
<td>46</td>
</tr>
<tr>
<td>Interlake Steamship</td>
<td>59</td>
</tr>
<tr>
<td>Jennmar Corporation</td>
<td>2</td>
</tr>
<tr>
<td>Kiewit Mining Group</td>
<td>40</td>
</tr>
<tr>
<td>Marshall Miller and Associates, Inc.</td>
<td>50</td>
</tr>
<tr>
<td>Martin Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Material Control, Inc.</td>
<td>50</td>
</tr>
<tr>
<td>Microbeam Technologies Inc.</td>
<td>53</td>
</tr>
<tr>
<td>Midwest Generation EME, LLC</td>
<td>10</td>
</tr>
<tr>
<td>Mole-Master Services Corporation</td>
<td>20</td>
</tr>
<tr>
<td>Murray Energy Corporation</td>
<td>4</td>
</tr>
<tr>
<td>Peabody Energy</td>
<td>37</td>
</tr>
<tr>
<td>Platts</td>
<td>38</td>
</tr>
<tr>
<td>Richwood</td>
<td>53</td>
</tr>
<tr>
<td>Roberts &amp; Schaefer Company</td>
<td>6</td>
</tr>
<tr>
<td>SCH Terminal Co.</td>
<td>50</td>
</tr>
<tr>
<td>Storm Technologies</td>
<td>58</td>
</tr>
<tr>
<td>Strata Products Worldwide</td>
<td>58</td>
</tr>
<tr>
<td>Taggart Global, LLC</td>
<td></td>
</tr>
<tr>
<td>Tank Connection</td>
<td>32</td>
</tr>
<tr>
<td>TECO Coal Corporation</td>
<td>50</td>
</tr>
<tr>
<td>TEMA Systems, Inc.</td>
<td>18</td>
</tr>
<tr>
<td>The Raring Corporation</td>
<td></td>
</tr>
<tr>
<td>Union Pacific Railroad</td>
<td>8</td>
</tr>
<tr>
<td>Weir International, Inc.</td>
<td>17</td>
</tr>
</tbody>
</table>

---

### CONVEX MIRROR SYSTEMS FOR LARGE OFF-ROAD TRUCKS

**DECREASE**
- DOWNTIME
- INJURIES
- EQUIPMENT DAMAGE

**Let E.S. & S. equip your trucks with the best mirrors available!**

**Convex Mirror**
- IMPACT RESISTANT
- EXTREMELY DURABLE
- PROTECTED from ATMOSPHERIC CORROSION
- NEOPRENE MOUNTED in a PROTECTIVE HOUSING
- PROVIDES VIEW WITHOUT DISTORTION

**Visibility Aids... Because sometimes what you can't see, can hurt you!**

P.O. Box 742 • Pleasanton, CA 94566-0074
(925) 462-4393 • Fax (925) 484-5173

---

### Locomotives

**Railcars**

**Sales**

**Leasing**

**Parts**

505 Sansome, Suite 1800
San Francisco, CA 94111
Phone: 415-388-4510
Fax: 415-388-4816
www.nlm.com
INGRAM BARGE COMPANY

has been a quality marine transporter on America's inland waterways since 1946, and has grown to become the leading carrier on America's inland waterways. Ingram has superior customer service, state-of-the-art information systems, and training and safety practices that are second to none.

A commitment to continuous improvement involving every associate sets Ingram apart from the competition and provides the best possible service and value for the transportation dollar.
Leading the World in Material Handling and Coal Preparation design, construction, commissioning and operations.

Taggart Global designs, builds and operates state-of-the-art coal preparation plants and material handling systems for clients worldwide in the coal production, power generation, steel making and material handling sectors.

We offer flexible contract services to meet the unique needs of your project, and our construction, electrical and international procurement divisions bring specialized expertise to deliver a project that’s on time, within budget and beyond your expectations.

Whether you’re adding a new facility or system, modifying an existing plant or seeking to outsource operations, take advantage of Taggart’s innovative and proven solutions to improve performance, increase efficiencies and accelerate return on investment.