

**“Coalface Cracks Under Pressure From Cheap Gas,” The Wall Street Journal, Liam Denning, February 7, 2012**

“Cheap natural gas creates winners and losers. Coal miners fall into the latter camp. Low-price [natural] gas encourages electricity generators to use gas-fired plants more and their coal-fired plants less.

In the 12 months through November [2012], 24.4% of U.S. electricity came from gas, against 42.8% from coal. In 2008, the figures were 21.4% and 48.2%. A decade ago, they were 17.9% and 49.8%.”

[Insight: And there is much more room for growth in gas vs. coal – nationwide, according to Morgan Stanley, 39% of U.S. generating capacity is gas-fired, versus 21% for coal.]

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**"Power Problems Threaten Growth in India," The Wall Street Journal, Eric Yep, January 3, 2012**

"India is the world's fifth-largest electricity producer after the U.S., China, Japan and Russia, but its per capita consumption is among the world's lowest. Almost 300 million people don't have access to electricity... More than half India's installed electricity-generating capacity of 182 gigawatts is coal-based, and a large chunk of future power projects also will run on coal. By way of comparison, China's installed capacity at the end of 2010 was 962 gigawatts, about 73% of it from coal."

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**"EPA Orders Deep Cuts in Emissions," The Wall Street Journal, Ryan Tracy, December 22, 2011**

"[Under a new rule, the EPA] would require deep cuts in emissions of mercury, acid gases and soot from coal-fired power plants and is likely to help reshape the industry as companies turn off old plants and decide whether to clean p existing ones or switch to cleaner-burning fuels such as natural gas. It will cost about \$9.6 billion annually... Some power companies and electric-grid operators said the rules will go too far, too quickly, and could put the reliability of the grid at risk... The Edison Electric Institute, which represents power firms, said it was 'the most expensive rule in the agency's history...'

EPA projects the rule announced Wednesday will require power plants to cut emissions of mercury, a neurotoxin, by about 75% by 2016 and reduce emissions of hydrogen chloride, an acid gas that irritates the respiratory system, by 88%. Those requirements add to earlier rules calling for plants in some states to cut back on gases that form smog and soot. Other pending rules would require plants to take in less water for cooling and impose new rules for handling of coal waste...

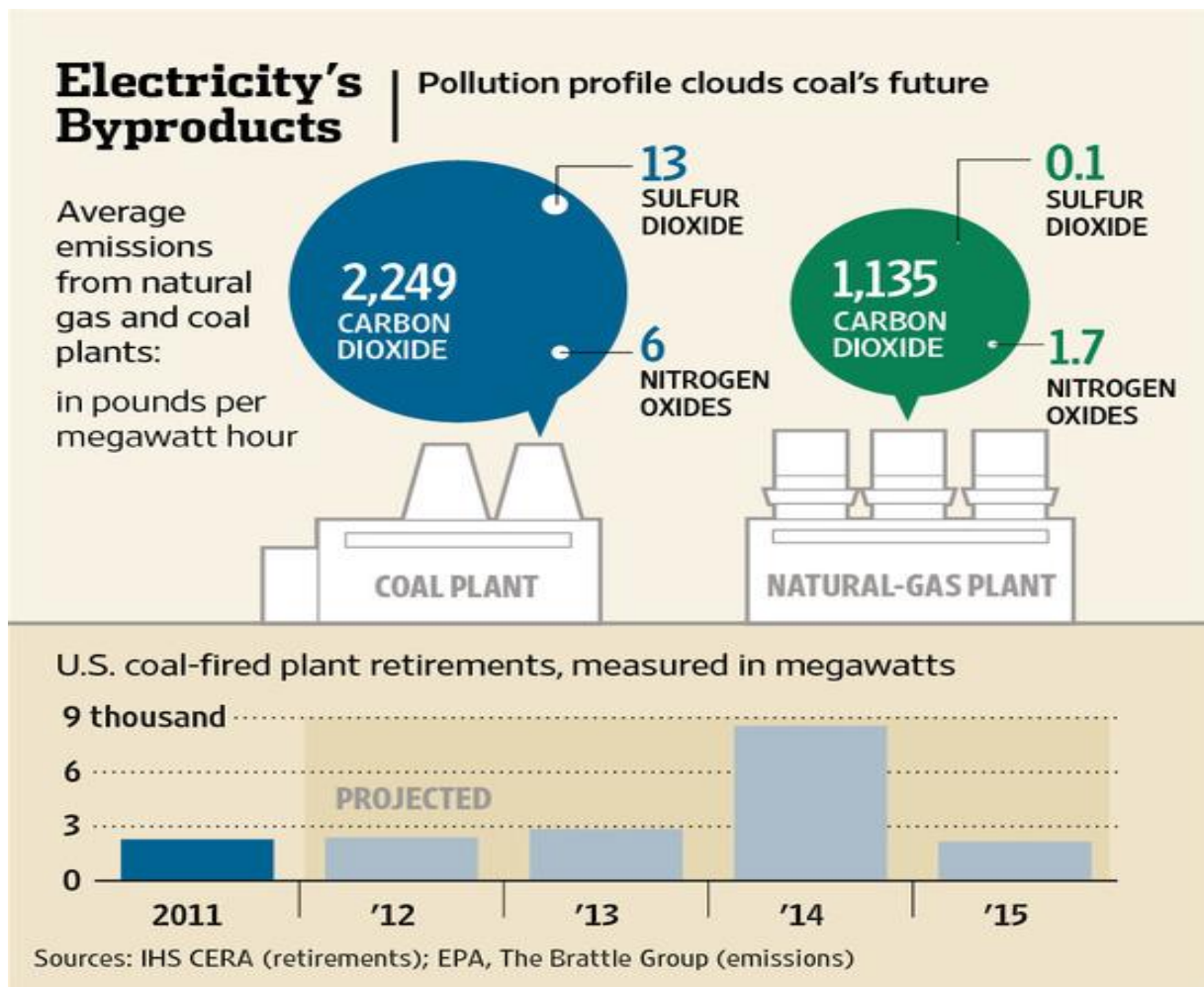
Not all grid operators believe the rules will impose a threat to reliability. The largest, PJM

Interconnection, which oversees the Mid-Atlantic power grid, said the process would allow it to maintain reliability."

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**"The Coal Age Nears Its End," The Wall Street Journal, Rebecca Smith, December 2, 2011**

"[Coal plant] owners cite a raft of new air-pollution regulations from the Environmental Protection Agency, including a rule that limits mercury and other emissions for the shut-downs. But energy experts say there is an even bigger reason coal plant are losing out: cheap and abundant natural gas, which is booming thanks to a surge in production from shale-rock formations in the U.S... Coal consumption by the power sector is expected to fall 2% this year and 4% next year; even small movements are important because utilities burned 92.4% of the 1,071 million tons of coal distributed last year. Experts think 10% to 20% of U.S. coal-fired generating capacity will get shut down by 2016."



**"Global Output of Carbon Dioxide just Keeps Rising," The Globe and Mail, Michael Kesterton, November 6, 2011**

"The global output of heat-trapping carbon dioxide jumped by the biggest amount on record, the U.S. Department of Energy calculated, a sign of how feeble the world's efforts are at slowing man-made global warming," says Associated Press. "The new figures for 2010 mean that levels of greenhouse gases are higher than the worst-case scenario outlined by climate experts just four years ago." The world pumped 512 million more metric tons of carbon into the air in 2010 than it did in 2009 – an increase of about 6 per cent."

[Ed. Note: 512 million metric tons of emissions is hard to understand unless you know that the Earth's atmosphere is comprised of about 500 million million tons.]

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**"Rising Use of Coal Prompts Warning," The Wall Street Journal, James Herron, October 20, 2011**

"The world is headed for a 'dire future' where high energy prices drag on economic growth and global temperatures rise dangerously, unless significant innovations are made to lower the cost of clean energy and carbon-capture technology, the International Energy Agency said..."

Participants [in the IEA's two day meeting in Paris] concluded that growth in energy demand will be met largely with coal - and that the only hope of keeping global temperatures at safe levels would be in the creation of cheaper technologies to capture carbon dioxide."

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**Nearly one-half of America's electricity is produced from coal-fired generation. Our transmission system was built around and through those coal-fired plants. Arizona uses coal-fired electricity to supply the water Phoenix and Tucson rely on. So it's important in a profound way. The EPA is proposing significant changes to emissions standards that directly affect the coal-fired plants.**

**Here are two quotes from key people in the energy world, Lisa Jackson, EPA Administrator, and John Rowe, CEO of Exelon (which provides electricity in Illinois, Maryland, and Pennsylvania; and one reference to a position from an energy analyst in the financial sector, Travis Miller, associate director of utilities at Morningstar:**

LISA JACKSON: "Our estimate is that 1 percent of old, inefficient [coal-fired] units that have never controlled emissions would probably elect to close." [EnergyBiz, Sept-Oct 2011, "Positioning America for a New World Economy"]

JOHN ROWE: "We will see something like 10 to 15 percent of the coal plants disappear."  
[EnergyBiz, Sept-Oct 2011, "The Reign of Cheap Gas"]

TRAVIS MILLER expects that more stringent EPA emission rules will force 53 gigawatts of coal-fired plants, older than 30 years and smaller than 200 megawatts, to close in the next few years. [The U.S. has about 300 gigawatts of coal-fired plants in total, so his estimate is 17.6 percent - close to John Rowe's, but higher. [EnergyBiz, Sept-Oct 2011, "Winning over Wall Street"]

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**NOTE: Insight's view of the article below ("EPA to Ease Rule On Power Plants") is that it can only be interpreted one way - the economic and physics realities of coal are such that even the most anti-coal folks are coming to realize that coal is a conundrum shot through with compromises, you can hate it, but you also have to love it.**

**Nearly half this country's electricity comes from coal plants - most of those plants have already been paid for by ratepayers so they are providing cheap electricity. Furthermore, our country's electric transmission system is built around those plants - high-voltage transmission lines are routed through and around them and because of physics we can't shut them down.**

**Kirchhoff's Law of voltage explains how electricity moves around our electric grid, and here is the best explanation of Kirchhoff's Law that we have ever seen: "Voltages in an electrical power grid are tightly controlled, therefore, we can think of power as analogous to current. So requiring power to flow from point A to point B in an electrical grid means you must have the ability to control the direction of the flow at every node in the system." [Source: Robert J. Thomas, Cornell University, "Kirchhoff's Laws Cannot be Repealed, Legislated or Ignored", Feb. 1, 2002, Transmission & Distribution World]**

**So if you think we can shut down America's coal-fired baseload plants - you're wrong. We will lose control of the electric current and our transmission system will collapse. And, on economics - as we have said, nearly half our country's power is coming from those already paid-for coal plants - and that keeps electric rates affordable, which we desperately need if we are to pursue and maintain our manufacturing, IT, and computer-based industries.**

**"EPA to Ease Rule On Power Plants," The Wall Street Journal, October 5, 2011**

"The Environmental Protection Agency, under pressure from some states, industry and Congress, is expected to ease an air quality rule that would require power plants in 27 states to slash emissions... The EPA, which made the rule final in July, plans to propose as early as this week to allow certain states and companies to emit more pollutants than it previously permitted... The move comes amid a backlash over the rule... The Cross-State Air

Pollution Rule is intended to reduce smog-forming chemicals emitted from power plants that often drift into other states... This summer the White House, pressed by industry, forced the EPA to abandon an air-quality rule to curb ozone-forming smog. The agency also has delayed a rule on greenhouse-gas emissions."

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**"Coal's Glow Attracts Major Miners," The Wall Street Journal, September 10-11, 2011**

"For miners, the black stuff is now the right stuff. The sector's confidence in emerging-market demand for coal, especially the sort used in steelmaking, is keeping deal activity brisk.. Coal's popularity stems partly from rising Chinese imports."

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**"Killing Coal," Public Utilities Fortnightly, Michael T. Burr, August 2011**

"[C]oal-burning utilities are caught in a quandary: they 'need to develop carbon-capture technology to meet any future greenhouse-gas emissions rules, but cannot afford the projects without federal standards that will persuade the states to allow reimbursement."

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**"What's Killing Carbon Capture?" Bloomberg BusinessWeek, Ken Wells and Ben Elgin, July 25 - July 31, 2011**

"Coal generates 40 percent of the world's electricity - a number that could grow to 60 percent by 2030... (Developing countries are expected to account for 97 percent of that growth because they have almost no alternatives).. Coal is also the world's most intensive CO2 intensive fossil fuel... [Carbon Capture and Sequestration] CCS, say climate scientists, has emerged as the lead technology in the race to reduce global greenhouse gases...

Yet only two years in, the future of CCS is in jeopardy... "Two years ago was the height of optimism," says Howard J. Herzog, senior research engineer for the Massachusetts Institute of Technology Energy Initiative who has tracked CCS technologies and research from the outset... It's easy to see why [CCS] once seemed so appealing. It could significantly reduce carbon emissions while keeping coal, still the nation's chief source of electric power, central to the energy mix...

Yet since the beginning of the fourth quarter of 2010, at least five large-scale CCS projects have been canceled or postponed, while the fate of several others remains doubtful... For all its hype and promise, the challenges of extracting carbon dioxide from smokestacks, compressing it, transporting it, and pumping it underground, where it is supposed to stay for eons, remain daunting. Costs are a core obstacle, notably those related to what's called the parasitic load.

[Parasitic load is] defined as the amount of energy consumed in the process of removing

CO2 from power plant exhaust. Estimated to be \$60 to \$95 per metric ton of CO2 captured, these costs could add 81 percent or more to consumer power bills, according to a November 2010 Energy Dept. report...

Why is CCS so expensive? Based on results so far, storage capacity isn't the driving cost factor. A 2010 DOE report estimated that between underground saline formations, oil and gas fields, and un-mineable coal areas, the U.S. and Canada alone have up to 5,700 years of carbon sequestration capacity. But capturing carbon is another matter...

When the AEP project [Mountaineer] went on line in 2009, the goal was modest: to capture and bury up to 1.5 percent of Mountaineer's carbon dioxide. When the project shut down, the New Haven plant had captured only 37,000 metric tons of CO2, a fraction of its target... separating out the carbon using complex chemistry proved challenging."

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**"EPA to Require New Pollution Cuts", Ryan Tracy and Tennille Tracy, The Wall Street Journal, July 8, 2011**

"The Environmental Protection Agency said Thursday it would require power plants in the eastern half of the U.S. to make major reductions in soot and smog, the latest in a series of moves aimed at reducing pollution associated with coal and other fossil fuels. The EPA's Cross-State Air Pollution Rule is one of roughly half dozen measures targeting pollution associated with fossil fuels that the agency is expected to adopt or propose over the next two years...

The cross-state air pollution rule will affect about 1,000 power plants in more than two dozen states. It will require them to cut emissions of sulfur dioxide by 73% and nitrogen oxide by 54% from 2005 levels by 2014... The regulation is expected to force power companies to install new pollution controls or switch from coal to cleaner-burning fuels, such as natural gas... Environmental and public-health group largely cheered the EPA's announcement.

So did power companies that rely heavily on nuclear power, natural gas, and solar and wind."

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**"Tapping Into America's Newfound Energy", Liam Denning, The Wall Street Journal, July 6, 2011**

"For all the talk of Uncle Sam being past his prime, he is surprisingly sprightly when it comes to one thing: energy production... U.S. demand for coal has fallen this past decade and remains under pressure as emissions standards for plants tighten. Demand elsewhere, however, is expected to keep growing strongly... With regard to [natural] gas, the current controversy about hydraulic fracturing of shale gas will prompt tougher regulation. But gas' cleaner emissions relative to coal, homegrown provenance, and low cost makes a

broad [fracking] ban highly unlikely. Last week, New York state's top environmental official recommended allowing hydraulic fracturing to go ahead, albeit with some restrictions.

Huge new shale-gas reserves, causing excess supply, have kept U.S. prices stuck at less than half the level being paid in Europe and Asia. Owners of largely idle gas import terminals such as Cheniere Energy want to build export facilities alongside them to let excess supply escape the U.S... Cheaper gas-fired electricity, meanwhile, should displace more carbon-intensive coal-fired plants. It should also present a significant challenge to more expensive, less reliable low-carbon technologies such as solar power."

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### **"Coal Takes a Back Seat", EnergyBiz, January/February 2011**

"The decision in September by Old Dominion Electric Cooperative to delay its ambitious \$6 billion Cypress Creek project threw the future of coal-fired electricity generation in the U.S. further into doubt... An April 2009 report on the Cypress Creek project by Synapse Energy Economics noted that more than 30 proposed coal-fired plants had been cancelled in the previous three years, and more than 40 others had been delayed...

[R]eport author [David] Schlissel, who now operates as an independent consultant, said the delay in the Cypress Creek project follows a pattern of many coal-fired projects that have been cancelled in recent years. "First they delay for a year or two, then they extend the delay and then finally they die," he said. Schlissel is currently working on an update of the Cypress Creek report for local environmental groups. "I don't think anybody will build new coal-fired plants for a long time," he said. "The economic risks are too great and there are cheaper alternatives." These include natural gas, combined cycle, and renewable energy plants, Schlissel said.

Houston-based Wood Mackenzie analyst Hind Farag predicted that as much as 60 gigawatts of coal-fired capacity will be forced into retirement in the next 10 years, compared with 30 gigawatts of capacity closed in the past decade, representing mostly old steam and oil-fired plants. A number of leading utilities, including Duke Energy, American Electric Power, Xcel Energy and several others, have announced plans to retire thousands of megawatts of coal capacity over the next five or six years.

Even aside from any comprehensive cap-and-trade legislation... anticipated U.S. Environmental Protection Agency rules for further regulating non-carbon emissions would require installing expensive emissions controls on generators not yet retrofitted, Farag wrote, or incurring extremely high sulfur dioxide and nitrogen oxide emission allowance costs. Other non-carbon regulations that will have significant impact on the coal-fired fleet are the Clean Air Transport Rule, Mercury Maximum Achievable Control Technology standard, Hazardous Air Pollutants standards, and a new rule under the Clean Water Act.

"It's hard to justify investment in a new coal-fired plant when construction is three to four times what it costs for a natural gas combined cycle plant," [Ms. Farag] said in an interview. Cheap shale gas is also approaching coal in price and even in quantity with much lower

emissions, she noted.

Neither of the two countries most likely to implement Carbon Capture and Sequestration [CCS] - the United States and China - have proper incentives in place, [according to Richard Morse, director of research on coal and carbon markets at Stanford University's program on Energy and Sustainable Development.] The economic stimulus program and the House bill for cap and trade were the only sources for the government subsidies that would make CCS development possible. Stimulus money is mostly gone, and cap-and-trade legislation will die in a Republican-dominated Congress.

In China, Morse said, research and development on CCS will continue but it will not be implemented there because power costs are already too high. CCS would double the cost of building power plants and require 30 percent more coal to operate - neither of which is in China's interests.

In the meantime, unused capacity in existing natural gas plants remains high, Schlissel said, with a weighted average of 41.2 percent in 2009. Tapping into this capacity and building more wind and solar capacity is the way the power market will pick up the slack on coal-fired generation, he said."

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**"Positioning Coal" - an interview with Steven Leer, CEO of Arch Coal, EnergyBiz magazine, Nov/Dec 2010**

"ENERGYBIZ: Congress doesn't seem likely to address the carbon issue in the near future. Would you like to see that issue addressed by Congress?

LEER: We need to resolve the uncertainty. We've always had the position that if you look at CO2 it is a global question... The only technology that might be achievable on a global basis in the next 40 year looks like it's carbon capture and sequestration. Keep in mind that the developing world's emissions are far exceeding the developed world's... [So] you must look at emissions on a global scale... [B]ut it really comes down to Congress. Somewhere between \$10 billion to \$20 billion a year needs to be invested globally in world-scale carbon capture and sequestration projects now.

[W]e are still seeing the second-largest coal plant building boom that I've seen in my career in 30 years... We have approximately 1,050 coal-fired power plants in the United States...

In the last decade, coal has been the fastest-growing energy source in the world in terms of total British thermal units delivered. Solar, perhaps, has grown at a higher percentage rate, but from a small base of a few tenths of one percent. The magnitude of the growth in coal capacity was larger than all other fuels, and it's led by demand from China and India."

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**"Dealing with Coal Ash", EnergyBiz, July/August 2010**

"Utility companies that have coal-fired plants and the industry that recycles coal ash say the U.S. Environmental Protection Agency's proposal of two options for regulating the material did little to clear up uncertainty but did make doing business more difficult.

The EPA issued its long-awaited proposal in early May [2010] but the only real decision so far is that agency, for the first time, will regulate coal ash as a waste material. The EPA will take public comment on two approaches - handling coal ash as hazardous waste under Subtitle C of the federal Resource Conservation and Recovery Act or treating it as household garbage, leaving adoption of federal guidelines up to individual states... [E]ither new regulatory framework will have widespread consequences.

Recycling the material for concrete, metal alloys, plastic composites, wallboard and other uses is a \$7 billion annual enterprise... About 44% of coal ash is recycled.

By 2015, coal-fired power plants in the United States are expected to generate 175 million tons of coal ash each year. They already generate some 130 million tons, and the volume increases as plants install scrubbers to keep particulates out of the air.

Under the EPA's hazardous waste proposal, storage ponds, also called surface impoundments, would be phased out over five years. That approach would cost the industry \$1.5 billion a year; the other [treating it as household garbage] would cost \$600 million a year, the EPA estimated.

Industry leaders say the EPA vastly underestimated the costs. Treating the material as hazardous would cost the industry \$20 billion a year, said Jim Roewer, executive director of the Utility and Solid Waste Activities Group. Even without Subtitle C regulation, phasing out wet ponds... would cost \$40 billion over 10 years."

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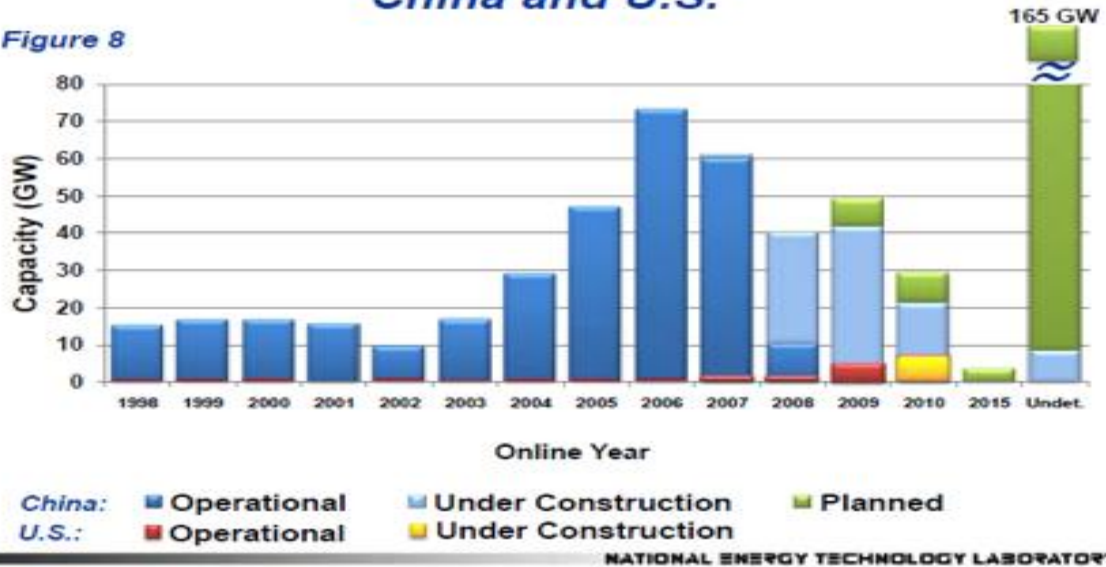
### **"China's Dubious Accolade," The Wall Street Journal, July 20, 2010**

"News that China consumed more energy than the U.S. last year will be taken by many as another sign that a new epoch is upon us. Indeed, that is how the International Energy Agency, source of the data, described its findings Monday. But the headline numbers only tell half the story. The underlying data say a lot more about the challenges facing both economies.

China consumed half as much energy as the U.S. in 2000. Last year, it burned through slightly more. Yet the energy mix for each country couldn't be more different. Coal accounts for 22% of U.S. energy consumption, but a full two-thirds of China's, up from 57% in 2000."

## Coal-Fired Build Rate China and U.S.

Figure 8



Source: Plants - UCI Database - December 2008  
Ventyr - Velocity Suite 1/8/2010

NATIONAL ENERGY TECHNOLOGY LABORATORY

### "Clearing the Air", Forbes, July 19, 2010

"Never mind cap and trade. Small coal plants are doomed anyway. By December two coal-powered plants 30 miles southeast of Chicago that have been pumping out electricity for 55 years will be shut down. The plants work fine, but their owner, Edison International, agreed to close them as part of a broad agreement with Illinois designed to comply with tightening federal emissions standards.

These plants are among dozens of small and midsize coal plant nationwide that will likely be shut down over the next several years... [C]lean air regulations already in place, affecting pollutants like sulfur dioxide and nitrogen oxides [SO<sub>x</sub> and NO<sub>x</sub>] are becoming strict enough to beat carbon taxes to the punch.

Hugh Wynne, an analyst at Bernstein Research, estimates the tougher regulations could, over the next several years, cut the nation's annual coal-fired power production by 14% or 290 billion kilowatt hours. That's \$15 billion worth of electricity. Natural gas, which emits 45% less carbon dioxide than coal, would take up most of the slack. Because coal power is cheaper than natural gas power, the switch will jack up your utility bills.

Investors have rendered their verdict. Edison's generating subsidiary, which has 10 gigawatts of capacity among its 44 unregulated plants and wind projects has zero valuation: The parent company's \$11 billion market value is the same at what its regulated utility operation would be worth on its own, says Wynne.

Edison conceivably could add scrubbers to the plants, but at a puny 155 megawatts each they are too small to support the cost. Wynne says coal plants 200 megawatts and smaller, which account for 22% of the nation's coal capacity, will likely not be able to afford upgrades. He estimates that a sulfur dioxide scrubber costs 36 cents a watt, or \$360 million, for a 1-gigawatt plant, but \$1.14 a watt for a 50-megawatt plant. For \$1.14 a watt you can buy a spanking new gas-fired plant."

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**"The Bucyrus Travesty" - Op Ed, The Wall Street Journal, June 30, 2010**

"Last Thursday, the U.S. Export-Import Bank denied loan guarantees to Reliance Power Ltd., and Indian utility building a coal-fired power plant near Sasan, India. Bucyrus International Inc., a South Milwaukee-based manufacturer, was ready to export some \$310 million in mining equipment - and about \$600 million over three years - but Reliance's order was contingent on the favorable financing rates provided by the Ex-Im guarantee...

[The denial won't stop the plant because] the Sasan plant is already under construction and is scheduled to open in 2012. The coal to feed it will still be mined, and demon carbon will still be emitted. The only difference is that an American business, and the 1,000 or so people who work there or for the companies in its 13-state Midwest supply chain and were depending on the project, will no longer benefit."