

The 600 coal plants scattered throughout the nation are embedded in the socioeconomic fabric of their respective communities, providing good jobs, supporting businesses and generating tax revenues for local schools. Coal plants produce electricity when drought hits the hydroelectric dams, solar panels are clouded over and wind turbines are in the doldrums. They produce electricity when natural gas is too expensive to use and when nuclear power plants are closed. Coal power plants are there each day, every day, 24-7.

Far from being the "clunkers" described by Pearlstein, these coal plants are the tireless workhorses of our electric generation fleet and a core component of our continuing high quality of life.

References:

- [1] <http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.ByMonth>
- [2] Steven Pearlstein "Natural gas may help cut emissions", Wash. Post, 2/19/2010
- [3] See Gas Daily, July 2, 1998 and aga.org/statsStudies, 1998
- [4] Energy data based on files from EIA at <http://www.eia.doe.gov/>
- [5] <http://www.gasfoundation.org/>
- [6] Oil and Gas Journal, February 14, 2008
- [7] <http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.ByMonth>
- [8] <http://www.nerc.com/page.php?cid=4%7C53%7C59>
- [9] National Academy of Sciences, America's Energy Future, July 2009
- [10] "Natural Gas Price Volatility," California Energy Commission, November, 2009.
- [11] Adam Newcomer and Jay Apt Environ. Sci. Technol., 2009, 43 (11), pp 3995-4001
- [12] <http://opencrs.com/document/R40894/>
- [13] Delaware River Basin Commission, "Natural Gas Drilling" August ,2009
- [14] <http://www.eenews.net/public/Greenwire/2010/02/22/3>
- [15] <http://www.netl.doe.gov/energy-analyses/.../NatGasPowerIndWhitepaper.pdf>
- [16] <http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622>
- [17] <http://mobile.france24.com/en/20090908-star-studded-world-tour-chavez-seeks-create-gas-cartel-hugo-iran-belarus-venice>

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Natural Gas: Is A Train Wreck Looming?

"Increased supply from shale gas appears to have changed the production profile, we have seen similar scenarios occur after past spikes. The inherent lags between changes in drilling and production created natural gas spikes over the last ten years, and will continue to do so after this and every trough. All Americans paid a high price for over-reliance on natural gas in the last ten years. Our country cannot afford to repeat that mistake." -- Edward Stones, representing Dow Chemical Co. in testimony before the U.S. Senate, 2009 [1]

In his seminal essay, *Reason in Common Sense*, Santayana warned, "Those who cannot remember the past are condemned to repeat it." Apparently, Steven Pearlstein, business columnist for *The Washington Post*, is not a student of the history of energy.

In his February 19, 2010 column, he calls for the United States to use more natural gas to "Decommission about two thirds" of the coal plants that provide 50 percent of our electricity and replace them "with power generated from cheap and plentiful natural gas." [2]

Pearlstein argues "there is so much shale gas, and the cost of extracting it is so low" that it is competitive for baseload generation. Pearlstein claims that shale gas, whose eventual cost, sustainability, deliverability, reliability and environmental impact are virtually unknown, is a "silver bullet," offsetting steadily declining conventional production as well as drastically reduced Canadian imports.

Unfortunately, we have been down the natural gas "silver bullet" road before. Each trip has turned out to be a dud:

- In 1998, the American Gas Association predicted U.S. production would exceed 25 trillion cubic feet (Tcf) in 2010. The DOE now estimates that next year's production will only be 20 Tcf -- a difference of **three Oklahomas worth of natural gas production.** [3,4]

- In 2000, the U.S. Energy Information Agency (EIA) stated: "production from conventional sources is projected to grow rapidly through 2010." But production actually was **lower in seven of the next eight years.**
- In 2005, the American Gas Foundation declared: "6 Tcf per year ... of liquefied gas is pointed toward U.S. markets." **We have yet to receive even one Tcf.** [5]
- In 2008, Michael Stoppard, Director of Gas at Cambridge Energy Research Associates (CERA), claimed: "The LNG armada has already set sail." But Stoppard's fleet was more like the Spanish Armada of 1588 -- **only 352 Bcf of LNG made it to the United States in 2008, the lowest amount in the past six years.** [6]

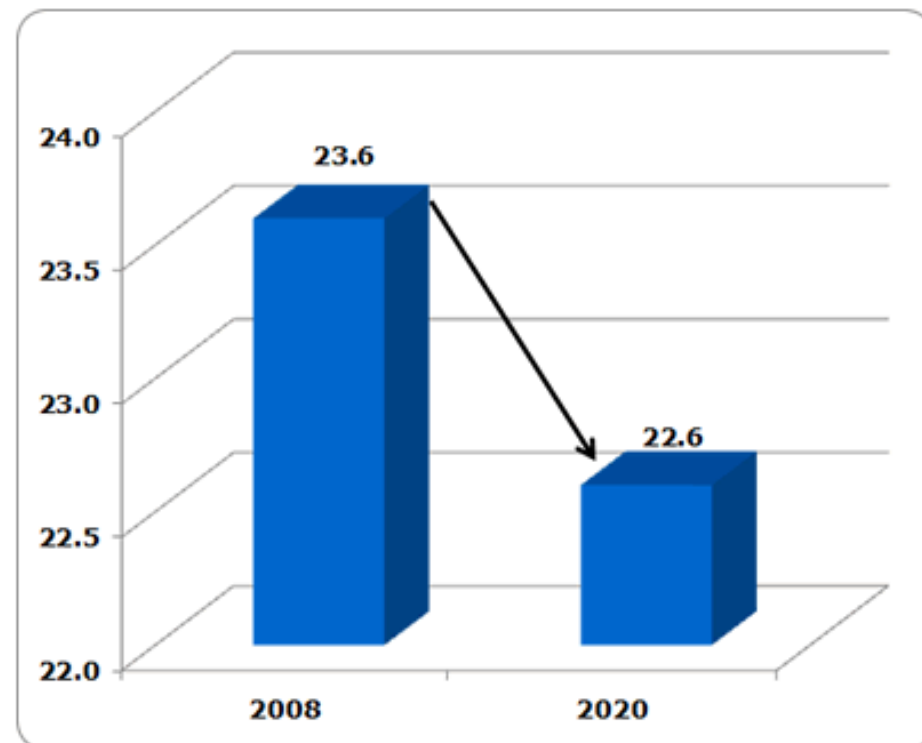
Can Natural Gas Even Meet Existing Demand?

But we do not have to look at history to raise concerns about the highly questionable panacea advanced by Pearlstein. In December, even the perpetually optimistic EIA projected that gas supply in the U.S.

will **decline 4 percent** by 2020. Far from meeting Pearlstein's answer to all of our electricity problems, the real question is this: **Can natural gas production even meet existing demand?**

We may be looking at a looming train wreck. Climate change legislation already virtually

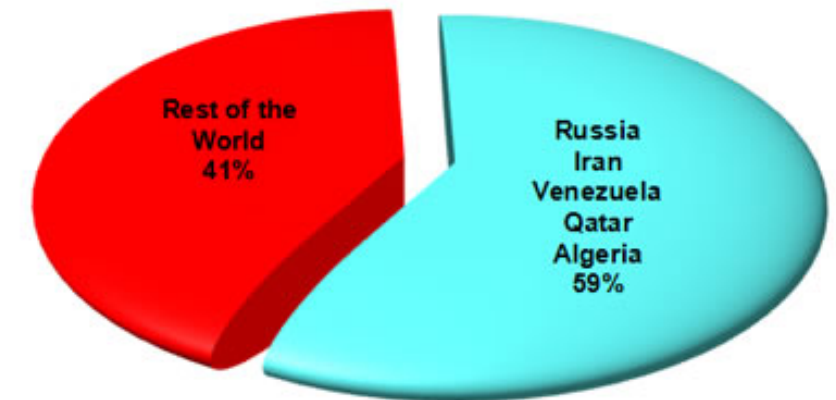
Gas Supply is Projected to Decline 4% by 2020



Source: EIA at <http://www.eia.doe.gov/oiaf/aeo/index.html>

of "frac water." [13] More and more questions are being raised as to why hydraulic fracturing is exempt from the Federal underground injections control requirements in the Safe Drinking Water Act. In fact, as Dr. Susan Riha, Cornell University Professor and Director of the New York State Water Resources Institute recently pointed out, in most states the industry is not even required to report the types of chemicals used in the process or specify where its wells are located. [14]

A Five Nation Cartel Would Control Almost 60% of the World's Natural Gas [16]



We are creating something similar to OPEC but with gas.
 -- Hugo Chavez on the formation of a gas cartel (2009) [17]

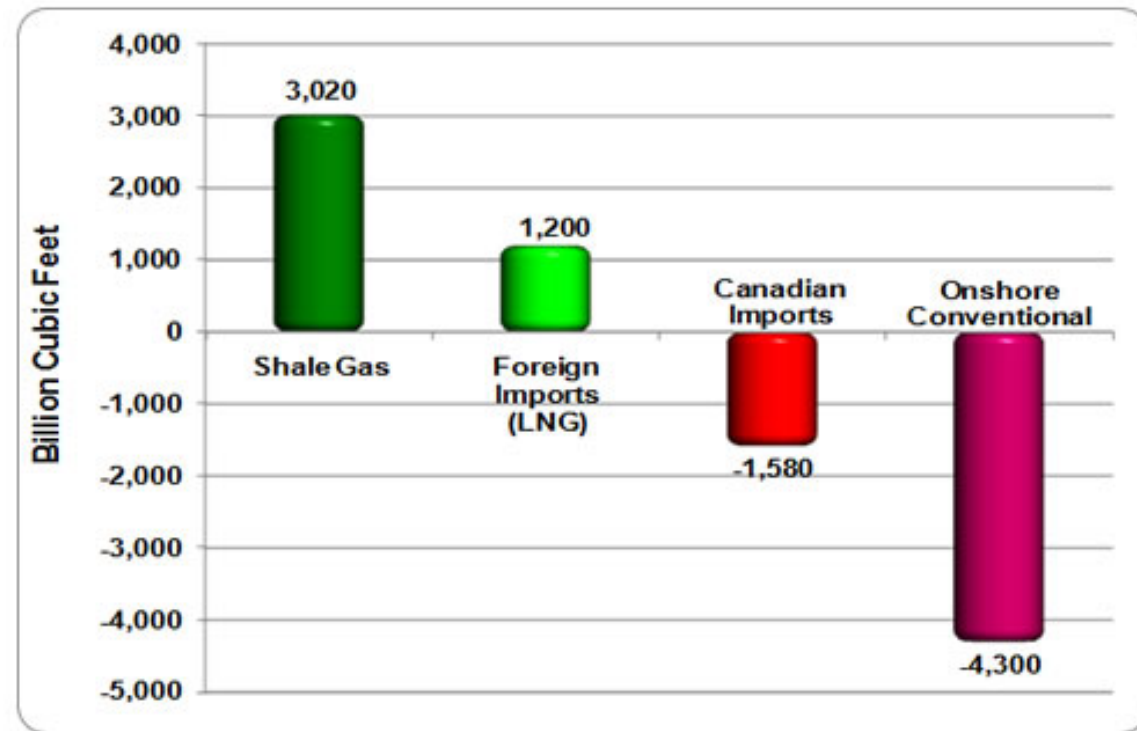
And, what if the shale gas about which Pearlstein is so optimistic does not arrive in a timely and affordable fashion in the quantities we need? Will he have us import liquefied natural gas (LNG) to run our power plants in a world where 45 percent of the global resources are controlled by Russia, Iran and Venezuela? The National Energy Technology Laboratory has identified the risks of that path: "...the need for more LNG will create closer links to the world oil price, setting the stage for the marginal price of electricity to be set by the whims of foreign oil/LNG suppliers, for the first time in U.S. history." [15]

What Pearlstein Missed

Yet, the most flagrant empirical flaw in the logic proposed by Pearlstein relates to his cavalier dismissal of coal-based electricity generation. The risk of the bet he is willing to place on an untested source of new supply is staggering indeed. The United States has the most reliable electric power supply system in the world. Coal is the foundation of that reliability. Coal produces 50 percent of our electricity and that means 2,000 billion kilowatt hours -- more than all the electricity used in Germany, France, Italy, Spain and the United Kingdom combined.

Shale Gas Increases Will Not Even Offset Other Declining Supply

2008 to 2020



Source: EIA at <http://www.eia.doe.gov/oiaf/aeo/index.html>

Environmental Concerns Are Growing Over Shale Gas Development

Finally, the local environmental impact of shale gas is not even mentioned in Pearlstein's column. The water impact of the fracturing process is a matter of growing concern, particularly in New York and Pennsylvania in regard to the Marcellus Shale play. The Congressional Research Service (2009) for example, recently reported: "The hydraulic fracturing treatments used to stimulate gas production from shale have stirred environmental concerns over excessive water consumption, drinking water well contamination, and surface water contamination from both drilling activities and fracturing fluid disposal." [12]

In the Marcellus shale region, the Delaware River Basin Commission, responsible for a watershed that serves over 10 million people, has identified three major areas of concern: (1) reduction of stream flow; (2) pollution of ground and surface water, and; (3) proper disposal

guarantees more natural gas demand -- the mere threat has cancelled dozens of coal plants. Consider the EIA Senate testimony in October on the American Clean Energy and Security Act of 2009 (known as the "Waxman-Markey" climate bill): "Our results suggest that this legislation would likely increase the use of natural gas for generation over the next decade in all of the scenarios we analyzed..." [7]

Further, the North American Electric Reliability Corporation (NERC), the organization charged by the Federal Energy Regulatory Commission (FERC) to enforce electric grid reliability standards, warned: "Continued high levels of dependence on natural gas for electricity generation in Florida, Texas, the Northeast, and Southern California have increased the bulk power system's exposure to interruptions in fuel supply and delivery." [8]

In July, the National Academy of Sciences, our most prestigious scientific organization, stated in *America's Energy Future*: "... the committee along with most observers concluded that over the 30-year lifespan of an NGCC plant the price of natural gas would be likely to rise, the year-to-year variations could also be large." [9]

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North American Electric Reliability Corporation (NERC), 2009

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America's Energy Future, National Academy of Sciences, 2009

The California Energy Commission was even more blunt: "efforts to forecast natural gas prices have been highly inaccurate compared to actual prices ... future natural gas price forecasts likely will be more uncertain and less useful." [10]

Finally, in a peer-reviewed scientific paper in *Environmental Science and Technology*, Professor Jay Apt and Adam Newcomer at Carnegie Mellon University concluded that, with the cancellation of new coal generation, "the amount of time that natural gas generators set

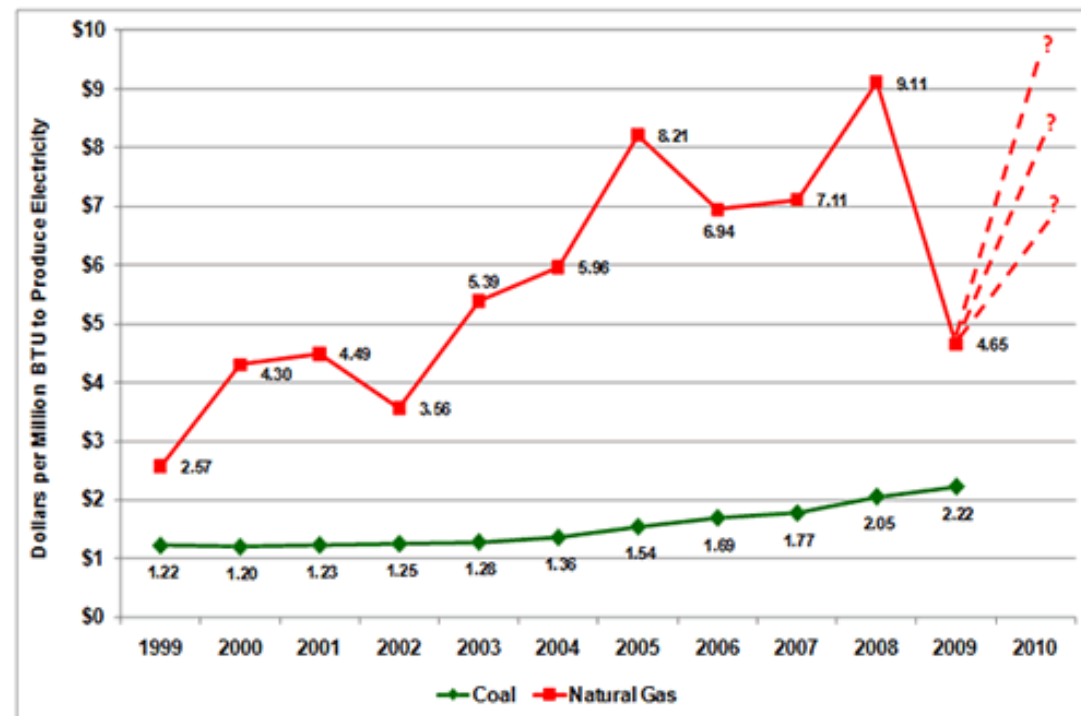
the market price of electricity would increase substantially, and other industries that use natural gas, may be priced out of the market." [11]

Gas Power Plants Compete With Families and Businesses for Fuel

Over 90 percent of the new power plants built since 2000 depend on natural gas. Almost 50,000 additional MW of gas capacity will be added by 2013. The consequences of this mad rush to build out the natural gas infrastructure have been expensive indeed. Gas consumption for power generation has increased significantly and this new demand has created an internecine conflict between families and businesses for fuel -- elevating and destabilizing prices for all consumer groups.

In 2000, for example, the residential price of gas was \$7.76/Mcf. By June of 2008, it had increased over 160 percent to \$20.24/Mcf and, in 2009, averaged over \$12.75/Mcf. Just as important, increased natural gas generation has led to higher electric rates across the

Coal Prices to Produce Electricity are Lower and Far More Stable than Gas Prices



Source: EIA data

nation: from 6.81 cents/kWh in 2000 to 10.02 cents/kWh in 2009.

But increased gas-based generation does not merely raise the cost of electricity. It also raises the price of gas for other consumers. During the past decade **gas prices have not only averaged four times higher than coal prices but were far more volatile.**

Pearlstein cavalierly dismisses these facts by stating: "Until recently ... not only was natural gas a lot more expensive than coal, but its price was also very volatile." Well, guess what? **It still is.**

In 2008-09 alone, the price of gas to businesses ranged from \$3.81 to \$13.05 per mcf. This continuing price volatility puts some manufacturers out of business and forces others to move abroad. And, of course, planning a family budget becomes nearly impossible at the lower income levels, and the Low-Income Home Energy Assistance Program (LIHEAP) is chronically overwhelmed with requests for support in paying utility bills.

Finally, this price volatility, despite Pearlstein's assertions, is not going to disappear. Once again, the California Energy Commission analysis is instructive: "Future natural gas price forecasts will be even less accurate as natural gas prices continue to experience price volatility."

Despite his disregard of these realities, warnings and adverse projections, the real problem with Pearlstein's argument is not what he says but what he doesn't say. For example, nowhere does he indicate the impact increased dependence on natural gas will have on electricity prices. He laments that gas-fired power plants are used only about 25 percent of the time. But he does not ask why this is the case. The answer is clear: the cost of natural gas to produce electricity in 2008 was \$9.11/million Btu. The cost of coal was only \$2.07/million Btu.

Electric rates would significantly increase for families and businesses.

Similarly, Pearlstein does not even raise the question of deliverability. In other words, can shale gas be produced at scale? Even the relatively optimistic projections of the EIA indicate increases in shale gas production will offset only about half of supply declines in other key sources (e.g., Canada). Decline rates in shale gas wells can exceed 70 percent in the first year, creating a constant treadmill to find additional resources and drill new wells.

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