Testimony of Susan F. Tierney, Ph.D.
Before the U.S. House of Representatives
Committee on Energy and Commerce, Subcommittee on Energy and Power

Hearing on EPA's Proposed GHG Standards for New Power Plants and
H.R. ___, Whitfield-Manchin Legislation
November 14, 2013

Summary of Testimony

Good morning, Chairman Whitfield, Ranking Member Rush, and Members of the Subcommittee. My testimony focuses on the context for the Congressional consideration of the Whitfield-Manchin bill. If enacted, the bill would limit the ability of the U.S. EPA, under the Clean Air Act (Section 111), to adopt regulations addressing GHG emissions from new power plants and to issue guidance for regulating GHG from existing power plants.

I understand that the premise for the bill is a concern that the EPA's actions will have the effect of barring the ability to burn coal in new power plants and will have a negative impact on electricity consumers, the economy and the coal industry. In light of market realities affecting the nation's power system, I think that this concern is misplaced, for several reasons.

First, various abundant domestic energy resources are competing to supply affordable, reliable and clean electricity supply to consumers. This is beneficial for American consumers and for the economy. Second, EPA's taking action under Section 111 will help to clarify the 'rules of the road' under which coal and natural gas will compete with each other and with other fuels/technologies in the future. Having clear rules and regulatory stability will help support a positive investment environment at a time when new capacity and investor support for billions of financing will be needed to be added in many parts of the country. Third, putting the rules in place will allow EPA to address pollutants that have been found to threaten public health and the welfare of current and future generations of Americans, and to do so in a sector that produces one third of total GHG emissions in the U.S. The EPA's regulations will allow paths for the continued use of coal (and natural gas) as part of the nation's energy supply.

EPA action under Section 111 of the CAA is important for public health and is consistent with the goals for domestic energy resource development and use as part of a reliable, affordable, competitive and clean energy supply. My opinion is grounded in several facts and conditions in energy markets:

- Coal has been the dominant fuel used to generate electricity in the U.S., in no small part due to the nation's abundant supply of coal, and its historically low production costs.
- The level of coal use for power production has changed over the years, along with developments in new power generating technologies, changes in the cost to build different types of plants, and changes in the relative prices of fuels.
- Until recently those economics greatly favored use of coal. But the recent shale gas revolution has fundamentally changed that situation. This other abundant domestic fossil fuel is now economically accessible, can also supply over 100 years of demand at today's consumption rates, and can play an important role in helping the U.S. reduce GHG emissions from power supply. Abundant domestic supply of renewable energy (with zero fuel costs) also enable such outcomes.
- Currently low gas prices are putting economic pressure on coal facilities in most parts of the U.S. Gas-fired generation has increased, while coal-fired generation has decreased. Low prices in

forward natural gas markets has caused natural gas to become a better value, when compared to the cost of electricity generation at many coal-fired power plants.

- This in turn has led to lower wholesale electricity prices, which has in turn put significant market pressure on use of coal for power generation at many existing plants and new ones. It has contributed to announcements of retirements for some of the oldest, smallest and least-efficient coal plants. And the economics of over a hundred proposed new coal-fired power plants gradually became less attractive, leading to cancellations of projects.
- The "fuel of choice" for new power generation capacity planned and under construction by electric utilities and independent power producers has shifted to natural gas and renewable power plants, and away from coal.
- The bottom line of electricity market fundamentals is that coal and natural gas are in strong competition for market share. Such inter-fuel competition is not new in the power industry.
- These market dynamics have been important for helping the electric industry provide power to consumers (and to the U.S. economy) at relatively low prices in the past few years. These developments have also afforded the U.S. with the opportunity to simultaneously diversify its overall mix of power supplies using domestic energy resources.
- The industry's responses to the EPA regulations and market conditions – in the form of investments in environmental control technologies, new power plants, and other responses – will stimulate much-needed economic activity and modernization of the electric system. Investors in the nation's power sector need regulatory certainty, especially at a time when the industry is poised to spend an estimated billion dollars on power generation in upcoming years. The EPA GHG rules for power plants have been expected for many years.
- The recent changes in coal's use in power generation have taken place during a period in which U.S. domestic production of fossil fuels has remained relatively strong in part due to increased exports of coal in recent years.

The nation's various abundant domestic energy resources are competing to supply affordable, reliable and clean electricity supply to consumers. This is beneficial for American consumers and for the U.S. economy, and EPA's actions under Section 111 will not adversely undermine the ability of the nation to rely on domestic resources for power generation.

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Summary of Testimony

Good morning, Chairman Whitfield, Ranking Member Rush, and Members of the Subcommittee.

My name is Susan Tierney, and I am a Managing Principal at Analysis Group, Inc., a 650-person economic consulting firm headquartered in Boston, Massachusetts.[1]

I appreciate the opportunity to testify today and to provide information on the context for the Congressional consideration of the Whitfield-Manchin bill. If enacted, this bill would limit the ability of the U.S. Environmental Protection Agency ("EPA") under Section 111 of the Clean Air Act ("CAA") to adopt regulations addressing greenhouse gas ("GHG") emissions from new power plants and to issue guidance for state plans to reduce GHG emissions from existing power plants.

I understand that the premise for the bill is a concern that the EPA's actions under Section 111 will have the effect of barring the ability to burn coal in new power plants and will have a negative impact on electricity consumers, the economy and the coal industry. In light of market realities affecting the nation's power system, I think that this concern is misplaced, for several reasons.

[1] As indicated on my "Truth in Testimony" form, I am testifying on my own behalf, and neither on behalf of a governmental entity nor a non-governmental entity (other than myself). I have not received a federal grant (or subgrant) or contract (or subcontract) during the current fiscal year or either of the two preceding fiscal years.

- First, various abundant and domestic energy resources are competing to supply affordable, reliable and clean electricity supply to consumers. This is beneficial for American consumers and for the economy.

- Second, EPA's taking action under Section 111 will help to clarify the 'rules of the road' under which coal and natural gas will compete with each other and with other fuels and technologies in the future. Having clear rules and policy stability will help support a positive investment environment at a time when new generating capacity and investor support for billions in financing will be needed in many parts of the country

- Third, putting the rules in place will allow EPA to address pollutants that have been found to threaten public health and the welfare of current and future generations of Americans, and to do so in a sector that produces one third of total GHG emissions in the U.S. The EPA's regulations will allow paths for the continued use of coal (and natural gas) as part of the nation's electric energy supply.

My opinions are grounded in several facts and conditions in energy markets, which I explain further in my testimony below.

EPA action under Section 111 is important from a public health point of view, and is consistent with the goals for domestic energy resource development and use as part of a reliable, affordable, competitive and clean energy supply. Based on my nearly three decades of public and private-sector experience in electric system economics, policy and regulation, I think that Americans and the U.S. economy will benefit from EPA having the opportunity to take action as now directed under Section 111. My opinions stem from my knowledge of competitive power markets, fuel

markets (including natural gas and coal), the processes for permitting, developing and financing new energy facilities, and the diversity of ways that the electric industry provides reliable, efficient and clean electricity to consumers.[2] I respectfully urge you not to approve the Whitfield-Manchin bill.

[2] As indicated in my attached CV, I have been involved in issues related to public utilities, ratemaking and electric industry regulation, and energy and environmental economics and policy for over 25 years. During this period, I have worked on electric and gas industry issues as a utility regulator and energy/environmental policy maker, consultant, academic, and expert witness. I have been a consultant and advisor to private energy companies, grid operators, government agencies, large and small energy consumers, environmental organizations, foundations, Indian tribes, and other organizations on a variety of economic and policy issues in the energy sector. Before becoming a consultant, I held several senior governmental policy positions in state and federal government, having been appointed by elected executives from both political parties. I served as the Assistant Secretary for Policy at the U.S. Department of Energy from early 1993 through summer 1995. I held senior positions in the Massachusetts state government as Secretary of Environmental Affairs; Commissioner of the Department of Public Utilities; and Executive Director of the Energy Facilities Siting Council. My Ph.D. in regional planning is from Cornell University. I previously taught at the University of California at Irvine, and recently at the MIT. I currently sit on several non-profit boards and commissions, including as chair of the Advisory Council of the National Renewable Energy Laboratory; chair of ClimateWorks Foundation; a director of World Resources Institute, the Energy Foundation, and the Alliance to Save Energy; and a member of the Bipartisan Policy Center's energy project, of the National Petroleum Council, and of the NYISO's Environmental Advisory Council; and as co-lead convening author of the Energy Supply and Use chapter of the National Climate Assessment. I recently served on the Secretary of Energy's Advisory Board, where I was a member of its Shale Gas Production Subcommittee; and chaired the Policy Subgroup of the National Petroleum Council's study of the North American natural gas and oil resource base. Previously, I served as co-chair of the National Commission on Energy Policy; a representative to committees of the North American Electric Reliability Council; and a member of the National Academy of Sciences' Committee on Enhancing the Robustness and Resilience of Electrical Transmission and Distribution in the United States to Terrorist Attack. I have participated in countless studies, blue-ribbon commissions and other relevant analyses over my career. I have been invited to speak on U.S. electricity and energy markets at conferences sponsored by the National Association of Regulatory Utility Commissioners, the Bipartisan Policy Center, the Massachusetts Institute of Technology, the National Association of Clean Air Agencies, the National Governors Association, the Keystone Board, various universities (Harvard, Northwestern, MIT, Yale, University of Michigan, Boston University, University of Rochester, University of Colorado at Boulder, Wharton, Tufts, and others), and other organizations.

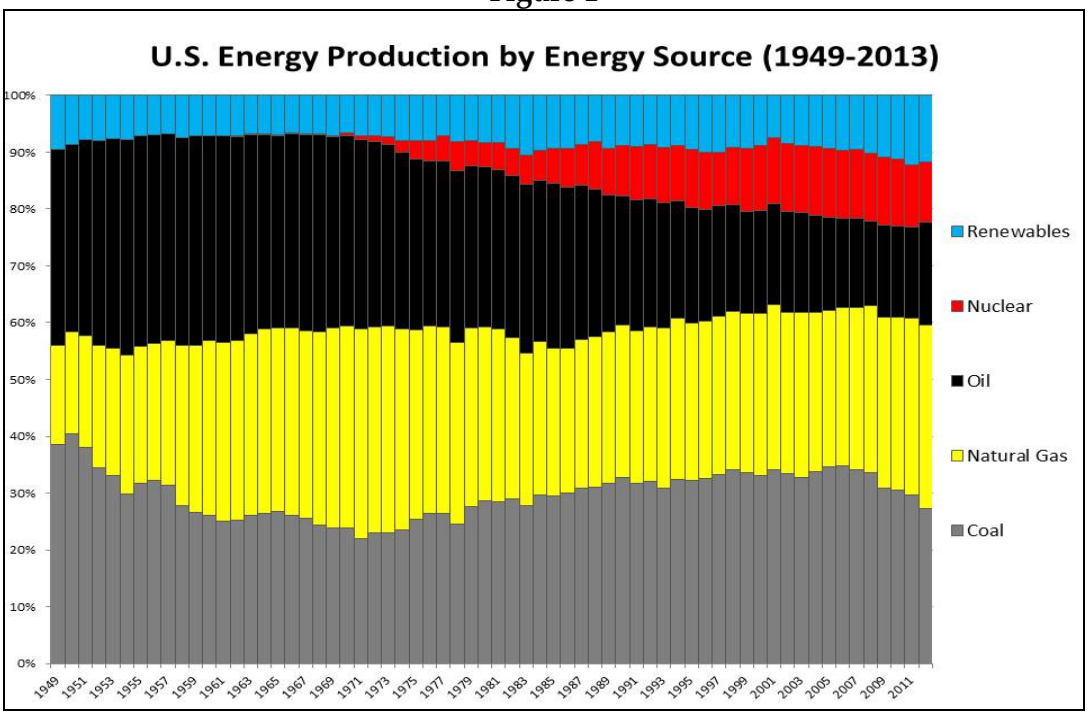
1. The U.S. has many abundant and diverse domestic energy resources that are competing actively to provide electric power generation

Today's electricity market is becoming more diverse as it also becomes more efficient, more affordable and cleaner. The backdrop for this positive outlook for the nation's electric resource mix is a history with much less diversity and with periodic concerns about energy security.

a. Coal has been the dominant fuel used to generate electricity in the U.S.

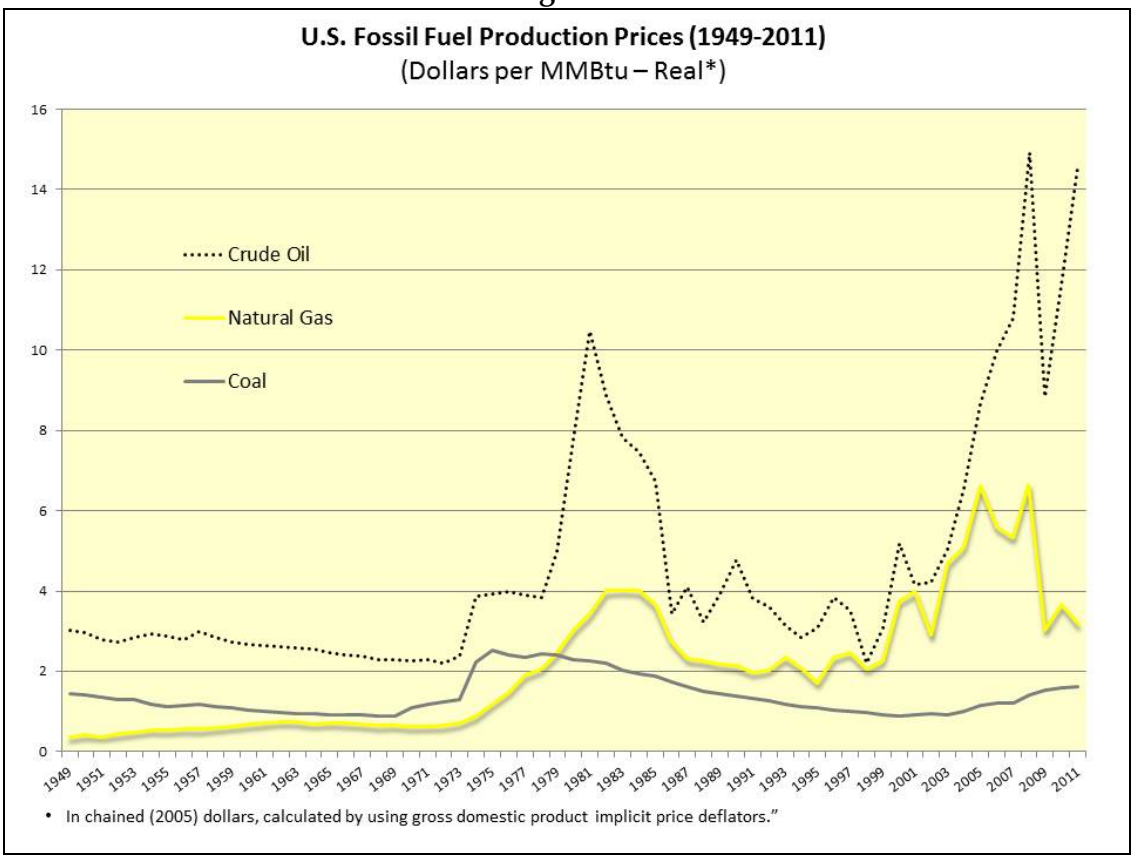
For my entire lifetime, coal has been the dominant fuel used to generate electricity in the U.S. Coal has also been a steady feature of overall U.S. energy supply, with coal production exceeding both natural gas and crude oil production in the U.S. for over half of the last sixty years (including the period from 1984 through 2010), as shown in Figure 1. This resulted in no small part from the nation's abundant coal resource base, as well as the relatively low domestic production prices compared to natural gas and crude oil, as shown in Figure 2.

Figure 1



Source: Energy Information Administration ("EIA"), "Annual Review of Energy"

Figure 2



Source: EIA, "Annual Review of Energy"

*b. **The level of coal use for power production has changed over the years***

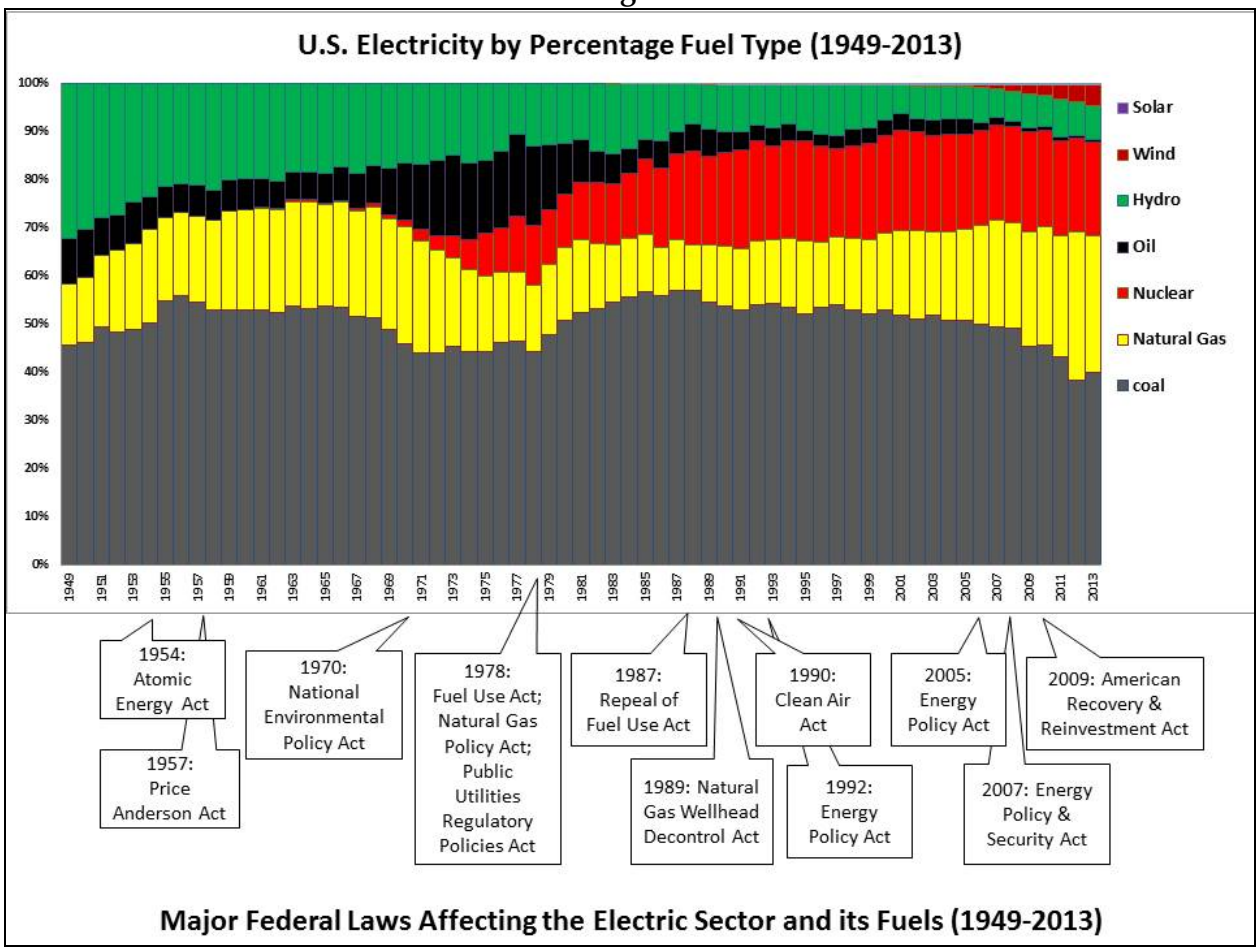
The overall level of coal used in the U.S. for power generation has varied over time, in large part with the advent of new power generation technologies (including nuclear energy, combined-cycle natural-gas technology, advanced coal generating technologies, wind, solar), and changes in cost to develop/construct/finance/operate different types of plants. Coal's relative attractiveness for power production has also been greatly affected by fuel prices and changes in cost to deliver fuel to power plants. In turn, major changes in federal energy, environmental and economic law and

policy (among others), and many other changes in state statures and regulation, have affected the relative roles that different fuels and technologies have played at different points in U.S. history.

Figure 3 shows the overall percentage of power generated by different fuels, from 1949-2013, along with significant changes in relevant federal laws. Development of federal hydroelectric projects during the New Deal's rural electrification period led to substantial reliance on water as the second largest source of energy for electricity (with coal as the first largest source). Nuclear power entered the market several decades after 1950s-era federal laws supported commercialization of the atom and investment in nuclear plants.[3] After price spikes following the OPEC oil embargo in 1973, Congress adopted laws limiting oil and natural gas for power generation, and coal regained market share for many years.[4] Natural gas began to rebuild its role after federal laws supporting deregulation improved supplies and lowered prices of gas, and its relatively clean-burning profile gave it certain advantages for new power plant permitting in many parts of the country, once the CAA was passed in 1990.[5] Gas got another boost after around 2000, as competition in the wholesale power markets[6] and electric industry restructuring in many states led to development of a significant amount of new gas-fired capacity. Nevertheless, the fact that existing-coal-fired power plants were grandfathered for many years under sections of the CAA also contributed to coal's ability to continue to play a significant role in producing electricity, even as natural gas and renewables have gained market shares.

[3] For example, through the Atomic Energy Act of 1954, with the Price Anderson Act in 1957.
[4] The Fuel Use Act was enacted in 1978, but was later repealed in 1987.
[5] See the 1978 Natural Gas Policy Act, the 1989 Natural Gas Wellhead Decontrol Act.
[6] See the Energy Policy Act of 1992 and the Energy Policy Act of 2005.

Figure 3

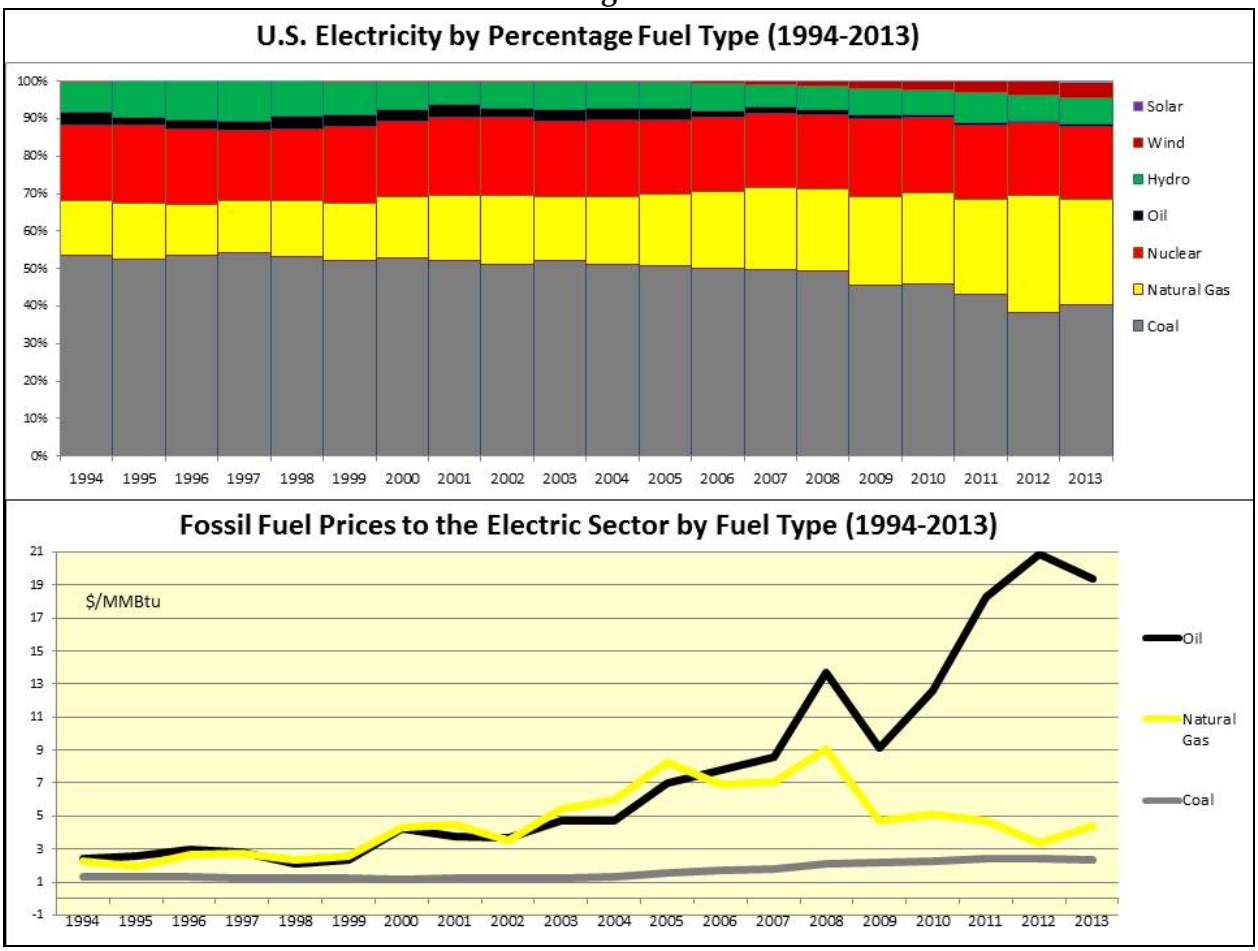


Source of data on electricity: EIA, "Annual Review of Energy"

Power generation shares (by fuel) also depend significantly on the cost of fuels as they have changed over time, in absolute terms and in relationship to each other. Figure 4 shows the same generation-by-fuel information as displayed in Figure 3 for the years 1994-2013, but also includes information about the changes in prices of coal, natural gas and oil fuels.[7]

[7] These are displayed on a comparable dollar-per-MMBtu of energy basis.

Figure 4



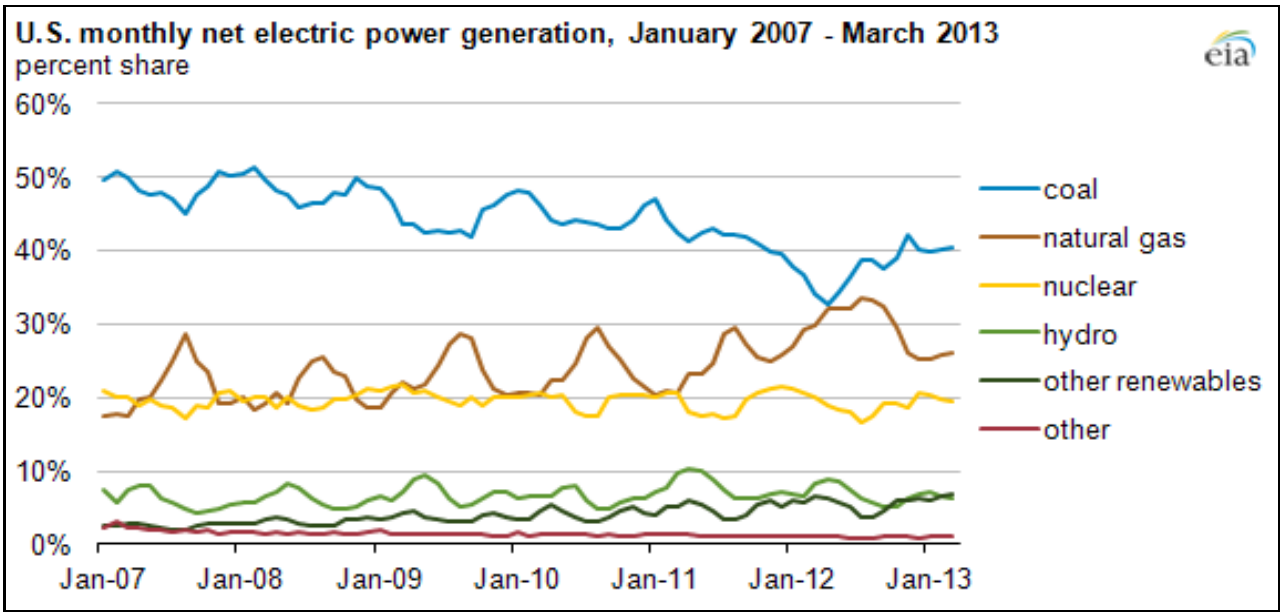
Source of data on electricity: U.S. EIA, "Annual Review of Energy"

c. ***Until recently those economics greatly favored use of coal, but the recent shale gas revolution has fundamentally changed that situation.***

Even as coal use has changed over the years, it has still played the dominant role in producing electricity for over six decades. It was not until recent developments in natural gas drilling and production technologies spurred the "revolution" in domestic supplies of natural gas, that coal experienced close to equal power-production market shares with another fuel (when that occurred

for a single month, in April 2012, as shown in Figure 5).[8] Indeed, even with such recent head-to-head competition with natural gas, coal has persisted as a large player in the U.S. power market.

Figure 5



Source: EIA, Today in Energy, May 23, 2013

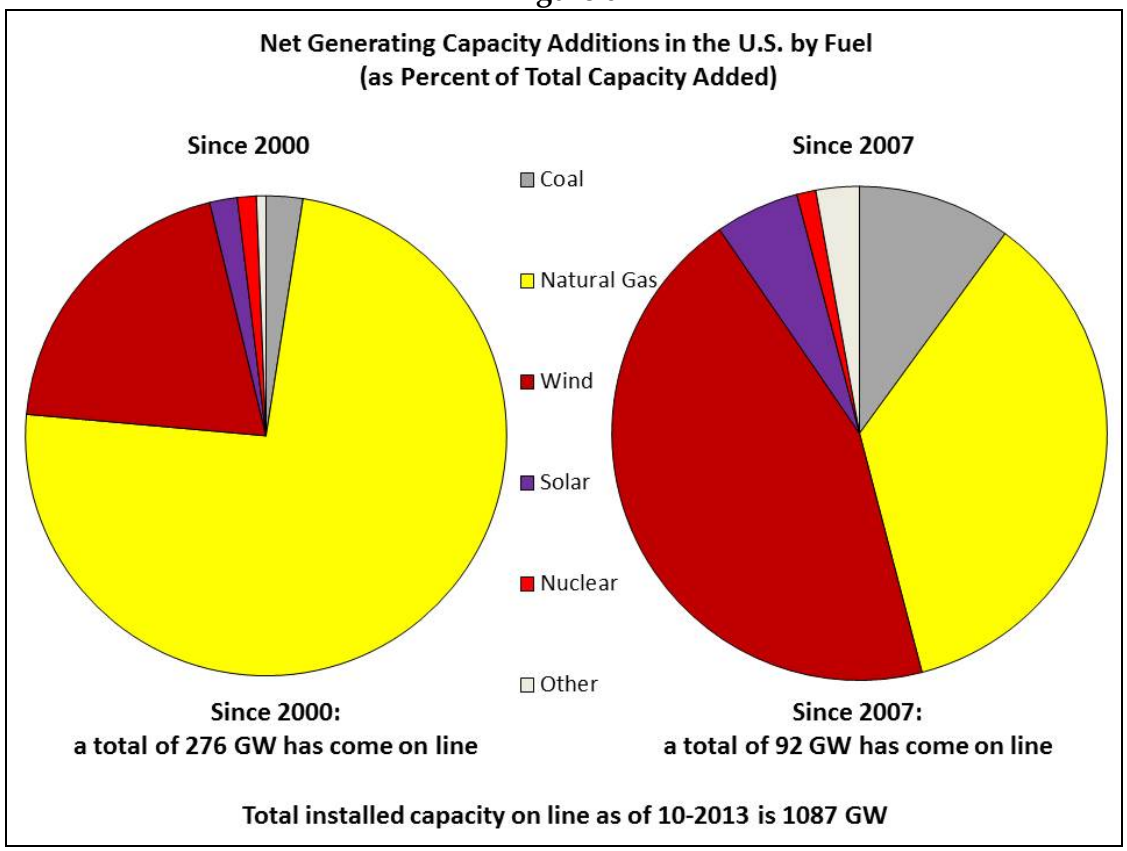
The currently low natural gas prices are putting economic pressure on coal facilities in most parts of the U.S. Even taking into account the effects of the economic downturn on power plant output (and electricity demand) that begin in 2008, lower gas natural gas prices and higher coal prices to utilities and independent power producers (as shown in Figure 6, below) have meant that gas-fired power plants increased their output (from 20 percent of all power production in the U.S. in 2007, to 28 percent to date in 2013), while coal-fired generation decreased (from 50 percent in 2007 to 39

[8] "After an equal share of electric power was generated from coal and natural gas in April 2012, EIA's most recent preliminary data through March 2013 show coal has generated 40% or more of the nation's electricity each month since November 2012, with natural gas fueling about 25% of generation during the same period." Source: EIA, Today in Energy May 23, 2013: "Coal regains some electric generation market share from natural gas," http://www.eia.gov/todayinenergy/detail.cfm?id=11391

percent 2013 (through September)(.[9] Gas-fired generation increased in absolute terms, while coal-fired generation decreased in absolute levels over that period.[10]

These changes in power generation were able to occur relatively rapidly in light of the significant amount of gas-fired generating capacity that had been added in the U.S. since 2000 (as shown in Figure 6). That boom in construction ended up with capacity surplus in many regions for many years, and with under-utilized gas-fired capacity when natural gas prices rose.

Figure 6



Source: EIA

[9] Source: EIA, Monthly Energy Review, and Short-Term Energy Outlook.

[10] Coal-fired generation dropped from 2016.5 GWh in 2007 to 1517.2 GWh in 2012, while generation at plants burning natural gas increased from 896.6 GWh in 2007 to 1230.7 GWh in 2012. Source: EIA, Monthly Energy Review, October 2013, Table 7.2a.

The trend towards increased natural gas use (and displacement of some coal-fired generation) was greatly influenced by the structural changes in U.S. natural gas development.[11] Starting in mid-2007, many observers of natural gas markets began to expect more stable and lower natural gas prices in the future. This came from a growing expectation that unconventional gas wells in the U.S. – including shale gas in particular – could be reached more economically through new applications of technologies, including directional (horizontal) drilling and hydraulic fracturing. Consistent with this view and after a period of relatively flat assessments, the estimates of technically recoverable gas reserves increased, as various experts began to calculate the resources in underground areas that could now be reached with known technologies.[12] The National Petroleum Council's 2011 report characterized this "shale gas revolution" this way:

> **Natural gas is a very abundant resource.** America's natural gas resource base is enormous. It offers significant, potentially transformative benefits for the U.S. economy, energy security, and the environment. Thanks to the advances in the application of technology pioneered in the United States and Canada, North America has a large, economically accessible natural gas resource base that includes significant sources of unconventional gas such as shale gas. This resource base could supply over 100 years of demand at today's consumption rates. Natural gas, properly produced and delivered, can play an important role in helping the United States reduce its carbon and other emissions.[13]

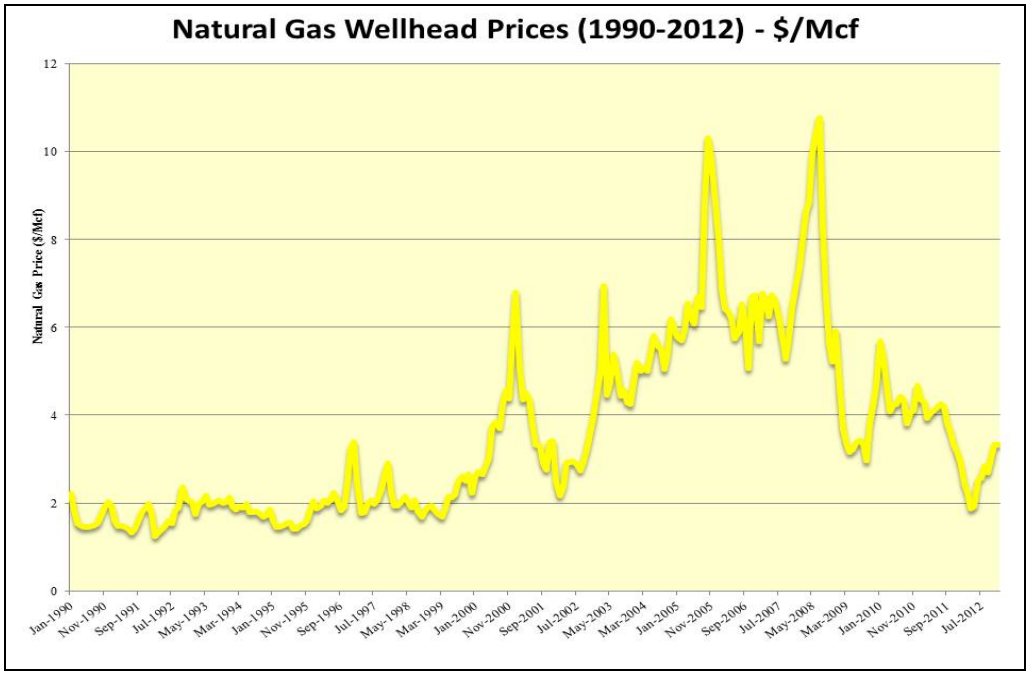
[11] See, for example, National Petroleum Council, "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources" ("NPC Report"), September 2011.

[12] Revised estimates and outlooks for natural gas have come from the Potential Gas Committee, the U.S. Geological Service, the U.S. Department of Energy, the EIA, and the National Petroleum Council, among many others.

[13] NPC Report"), page Executive Summary 8.

These changes, in combination with the lower demand for energy (from the U.S. economic downturn starting in the second half of 2008 and other factors[14]), resulted in more stable and lower natural gas prices in U.S. energy markets, as shown in Figure 7 for wellhead prices of natural gas.[15]

Figure 7



Source: EIA

Prices in forward natural gas markets (i.e., future prices for natural gas commodities that could be locked in prior of delivery dates for the underlying natural gas) also began to drop during this period, illustrating the market's expectations that prices would continue to reflect the larger (and increasing) supplies of natural gas. Figure 8 shows forward prices for natural gas.[16] Lower prices

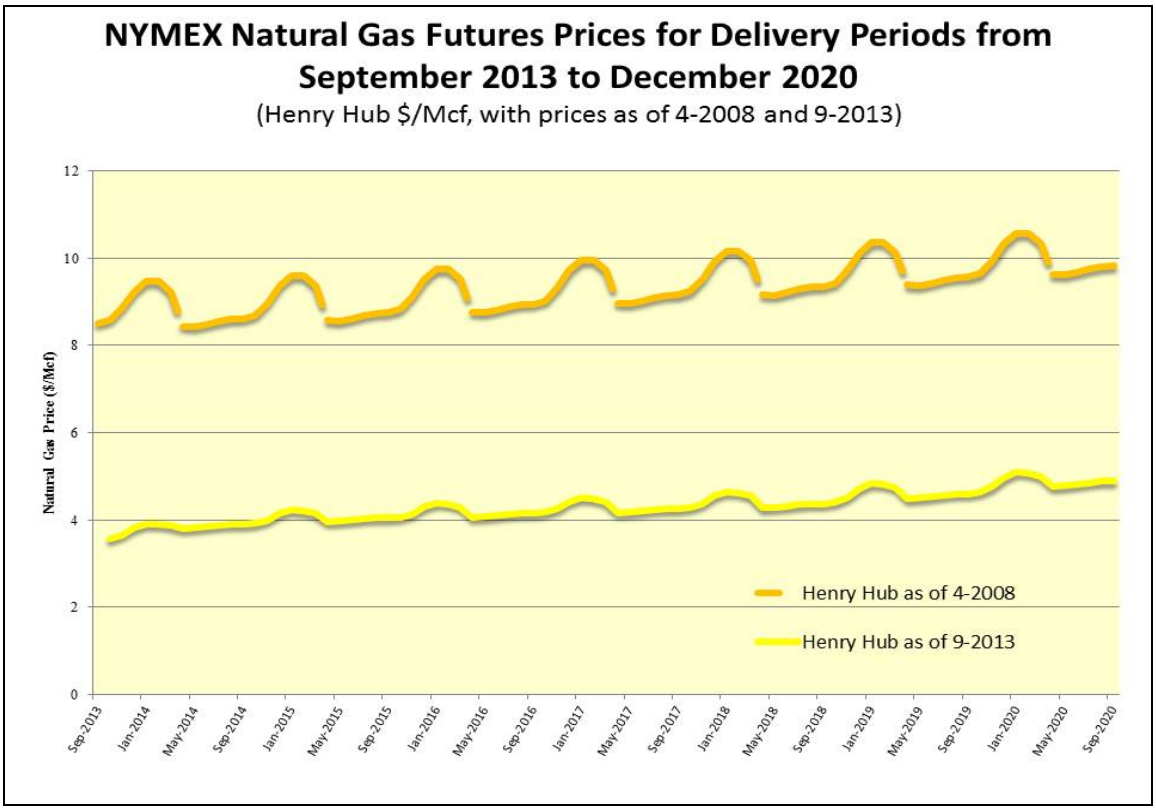
[14] Including states' promotion of increased funding for energy efficiency programs, and stronger appliance energy efficiency standards.

[15] Wellhead prices do not include the cost to process and deliver gas to areas of use, such as in Colorado markets, but nonetheless show the changes in average production costs for natural gas over the time period shown.

[16] Note that these forward gas market prices indicate seasonal variation in prices, with prices in winter months rising as demand for gas increases with uses of gas for heating purposes. The overall year-to-year trends indicate an expectation of gradually rising prices for natural gas.

in forward natural gas markets caused natural gas to become a relatively better value, when compared to the cost of coal for use in electricity generation.[17]

Figure 8



Source: SNL Financial

Note that my focus on the size and implications of the large resource bases for natural gas (and coal) are not meant to divert attention to the contributions of other domestic energy resources which are also substantial and rich. Some of these (such as crude oil) are not expected to play a large role in the power sector going forward. Others, however, including the nation's vast wind and solar resources, are expected to continue to increase the market share that they have begun to gain in the past decade, in part due to their support in states with renewable portfolio standards, in

[17] National Petroleum Council, "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources," September 2011.

part due to their having virtually free fuel, and in part due to their virtually carbon-free generating profile.

d. ***Currently low gas prices are putting economic pressure on coal facilities and coal project proposals in most parts of the U.S.***

Lower natural gas prices have reduced fuel costs for power plant operators, which in turn has led to lower electricity prices in recent years and significant market pressure on use of coal for power generation at existing plants and new ones, as well. There are several ways that has played out.

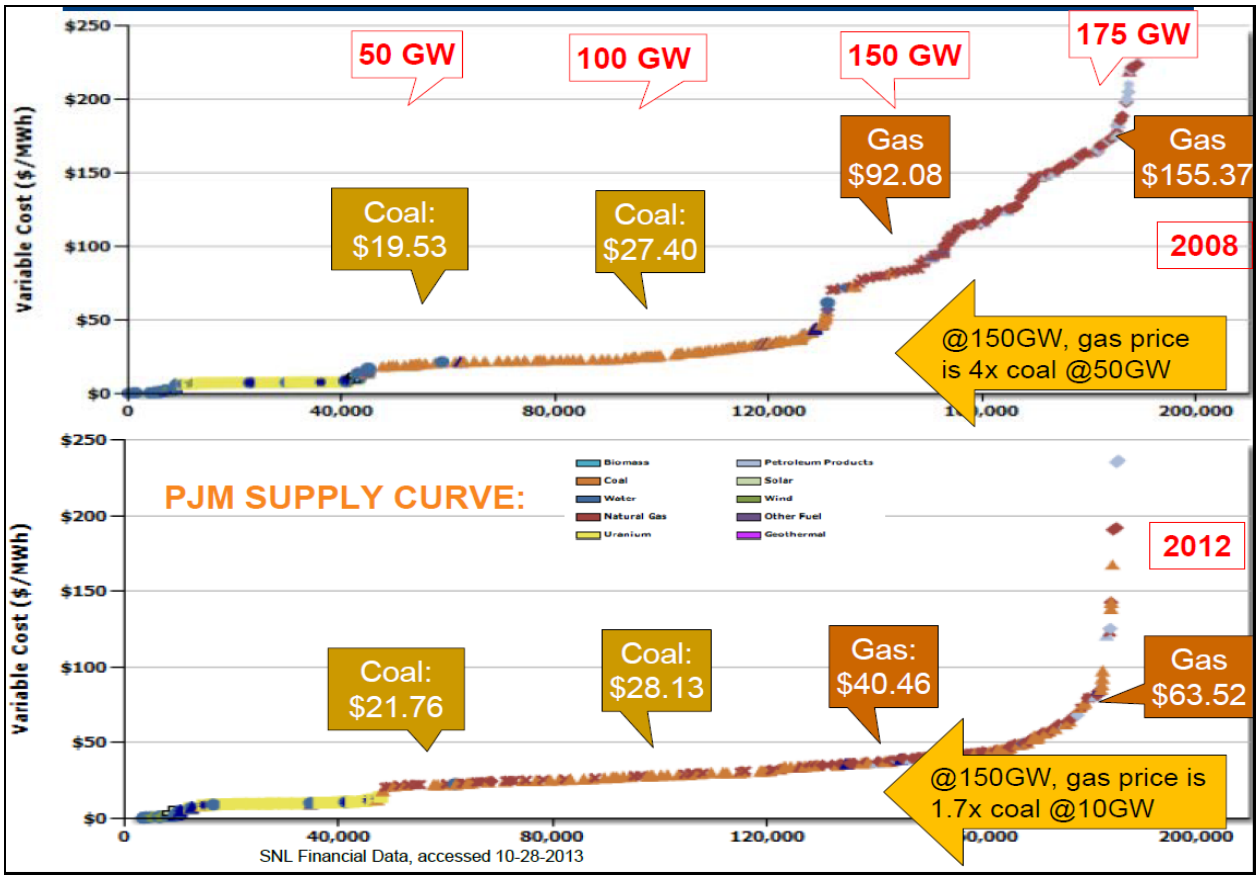
First, to see the effect of such low-natural-gas prices on spot prices for electricity and on price pressure on existing coal plants, Figure 9 shows the power production supply curves for the PJM power region of the U.S. PJM serves portions of states in the Mid-Atlantic and Midwest areas and is the largest centralized regional wholesale power market in the U.S.

Given PJM's wholesale market design, a good proxy for the market clearing price in any hour is the variable operating costs of the marginal generator in that hour. I've shown the variable costs (including fuel) of the marginal generator at different load levels (e.g., 50 GW, 100 GW, 150 GW, and 175 GW) as they were on average in 2008 versus in 2012.

As shown in 2008, the clearing price at a 150-GW load was $92.08/MWh, based on the variable costs of the marginal generator (a gas plant). The proxy clearing price at a 175-GW load was $155.37/MWh, again based on a gas-fired power plant. Thus, at the 150-GW point on the supply curve, the average energy clearing price was four times the clearing price at a 50-GW load level, where the marginal supply was a coal plant operating with $19.53/MWh.

By 2012, things had dramatically changed. The marginal generator at a 150-GW load level was still a gas-fired power plant, but its average variable costs had dropped to $40.46/MWh; at the 175-GW load level, the proxy clearing price was $63.52, or a 60-percent reduction in wholesale clearing prices. By contrast, the coal-fired power plants' operating costs had increased in 2012 relative to 2008 (as shown by comparing the marginal plant operating at 50-GW and 100-GW load levels in each year). Most of this change reflected higher coal supply costs in 2012 relative to 2008 – the opposite from what had happened to the fuel costs of natural-gas-fired power plants in PJM.

Figure 9



Source: SNL Financial data on supply curves for PJM.

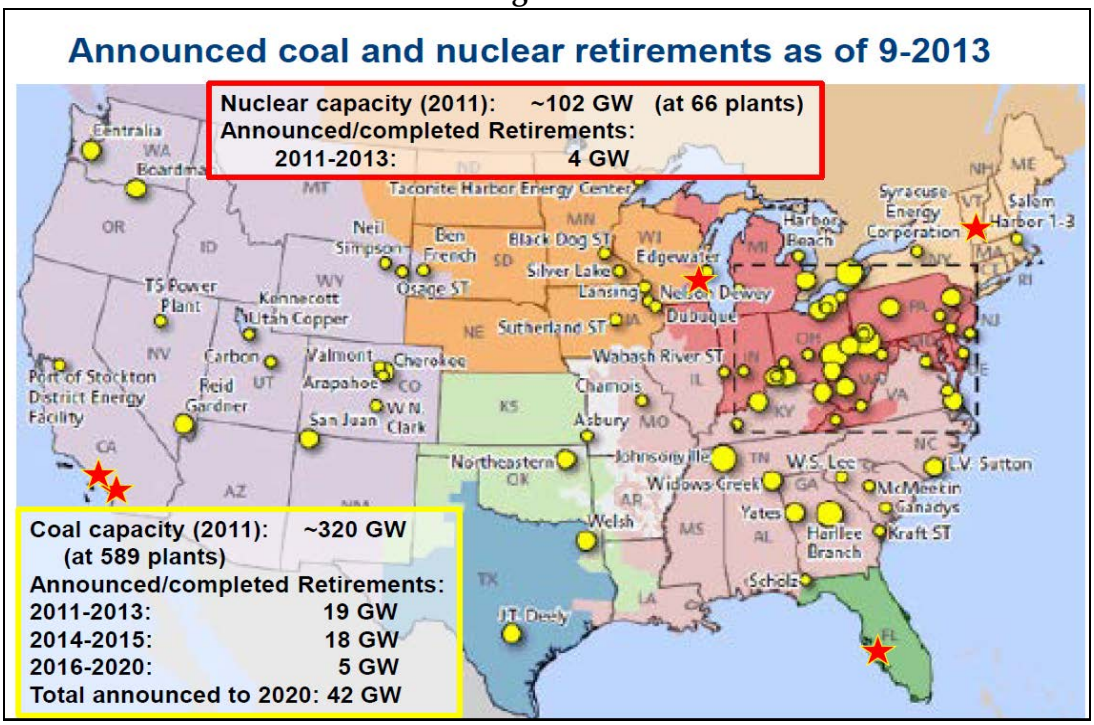
Because in PJM, clearing prices in hourly energy markets are the basis for compensating power plants for providing electricity in that hour, a typical coal plant's costs rose while its payments from the electric energy market decreased. This has created real price pressure on owners of older and less-efficient power plants, not only because of lower revenues but also because they operated (and got paid) less often (while some natural gas plants were dispatched more often, instead of such coal plants).

Second, this market pressure resulting from low natural gas prices led to announcements of retirements of some of the oldest, smallest and least-efficient coal plants. Figure 10 shows the locations and amounts of announcements of coal plants (along with nuclear plants). As of September 2013, the total amount of announced coal-plant retirements was 42 GW (out of a total of 320 GW of coal-fired capacity in 2011). (My longer explanation of such market changes is in my February 2012 paper called "Why Coal Plants Retire: Power Market Fundamentals as of 2012.")

Some, but certainly not all, of the announcement retirements of existing power plants has also been prompted by problems in market rules in some regional markets[18] as well as the upcoming air-pollution-control requirements associated with compliance with EPA's Mercury and Air Toxics Standard ("MATS").

[18] See: my testimony ("Considerations for the Future of Centralized Capacity Markets") before the Federal Energy Regulatory Commission's Technical Conference on Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators, Docket No. AD13-7-000, September 25, 2013; my presentation to the Keystone Energy Board, "The World of Abundant Natural Gas in the U.S.: Looking Ahead for Power-Sector Implications," October 30, 2013; and my presentation to the Independent Power Producers Association of New York, "Capacity Markets in the Northeast," September 10, 2013.

Figure 10



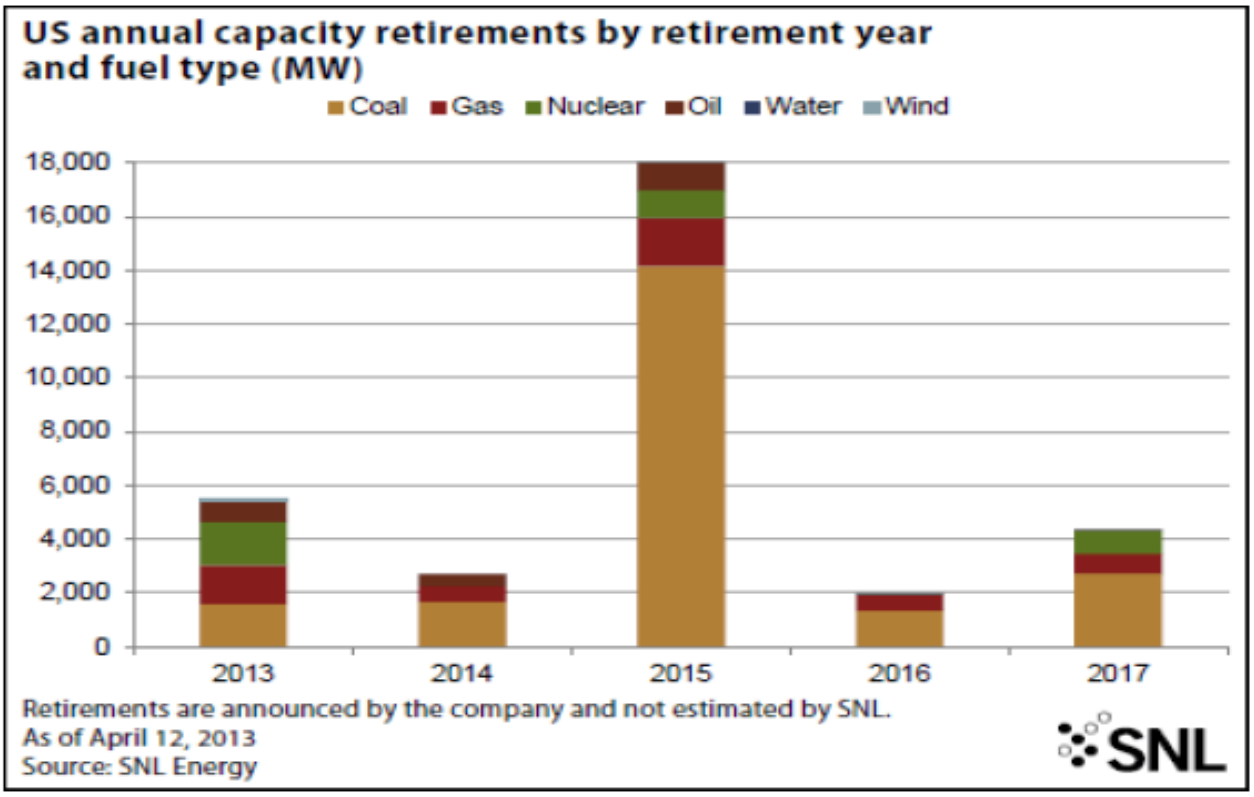
Source: SNL Financial for announced coal plant retirements, with SNL map annotated to include annouced retirements of 5 existing nuclear generating units.

The majority of coal-fired generating capacity already complies with such air regulations,[19] and therefore such regulations raise new compliance costs mainly for the coal-fired and oil-fired power plants not yet in compliance. Because owners of plants affected by the MATS rule have until March 2015 at the earliest (and in some cases will have more time) to comply with the rule's requirements, the retirements anticipated to occur before then can be viewed as heavily affected by current power market pressures. In a world of low gas prices, some of the least-efficient coal plants do not have an economic justification to add on equipment or otherwise make expenditures to comply with the MATS rule, and are therefore likely to retire as of the date needed to comply with these health-based environmental standards. Figure 11 indicates announcement power plant

[19] See Michael Bradley, Susan Tierney, Chris Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability," Summer 2011 Update, June 2011.

retirements by fuel type (including natural gas, nuclear and oil-fired power plants, as well as coal plants) and by year of expected retirement.

Figure 11



Third, the economics of some proposed, new coal-fired power plants gradually became less attractive in recent years, as the outlook for low natural gas prices became more broadly shared by investors. Over 150 planned new coal-fired power plant projects were cancelled from the mid-2000s through early 2013.[20,21]

[20] "Coal Plants Are Victims of Their Own Economics," *Science*, February 18, 2013, accessed on November 3, 2013 at: http://news.sciencemag.org/2013/02/coal-plants-are-victims-their-own-economics, reporting on the presentations at a panel held at the annual meeting of the American Association for the Advancement of Science.

[21] In early 2012, there had been 24.7 GW of specific announced coal plant retirements; by a year and a half later (Q3 2013), that number had increased to 40.8 GW nationally (including plants in Canada that are part of US NERC regions). See National Energy Technology Laboratory ("NETL"), "Tracking New Coal-Fired Power Plants (data update 1/13/2012), January 13, 2012 SNL coal plant retirement data as of October 2013.

e. ***The "fuel of choice" for new power generation capacity planned and under construction by electric utilities and independent power producers has shifted to natural gas and renewable power plants, and away from coal***

Over this period, the "fuel of choice" for new power generation capacity planned and under construction by electric utilities and independent power producers shifted to natural gas and renewable power plants, and away from coal.[22] This reflects the changing price outlook for fuels, as well as changes in the capital costs associated with financing and constructing new power plants,[23] state policy support for generating more power from domestic renewable energy resources,[24] and other factors (such as investment size and risk).

Figure 12 and Table 1 show the amount of planned generating capacity in the U.S., by fuel type

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[22] I note, for example, the decision of the Kentucky Public Service Commission to approve a proposal by investor-owned utilities (Kentucky Utilities Co. and Louisville Gas & Electric Co.) to construct a 640-MW combined cycle natural gas-fired generating facility and to purchase an existing 495-MW natural gas-fired peaking plant. The new gas plant is designed to replace coal-fired units that will be retired by 2015 and to meet projected increases in demand for electricity by 2016. "In an order issued today, the PSC agreed…that the companies had proven the need for the replacement generating capacity and demonstrated that the proposed gas-fired plants were the least-cost, reasonable option for providing the needed power." Kentucky Public Service Commission press release, "PSC Approves LG&E and KU Plan for Gas-fired Power Plants," May 2, 2012.

[23] See, for example, the estimates of levelized cost of energy prepared by Lazard in different years, with costs of different technologies (e.g., advanced coal, natural-gas combined cycle capacity, on-shore wind, nuclear, solar) shifting from 2009 to 2013. Using an approach it describes as determining the "levelized cost of energy, on a $/MWh basis, that would provide an after-tax [internal rate of return] to equity holders equal to an assumed cost of equity capital," Lazard estimated that the levelized cost of energy for most types of power generation technologies dropped from 2009 to 2013. The range of costs of the most-common technologies added in the period since 2007 (i.e., natural gas peaking plants, natural gas combined cycle units, and wind turbines) all declined during this period:

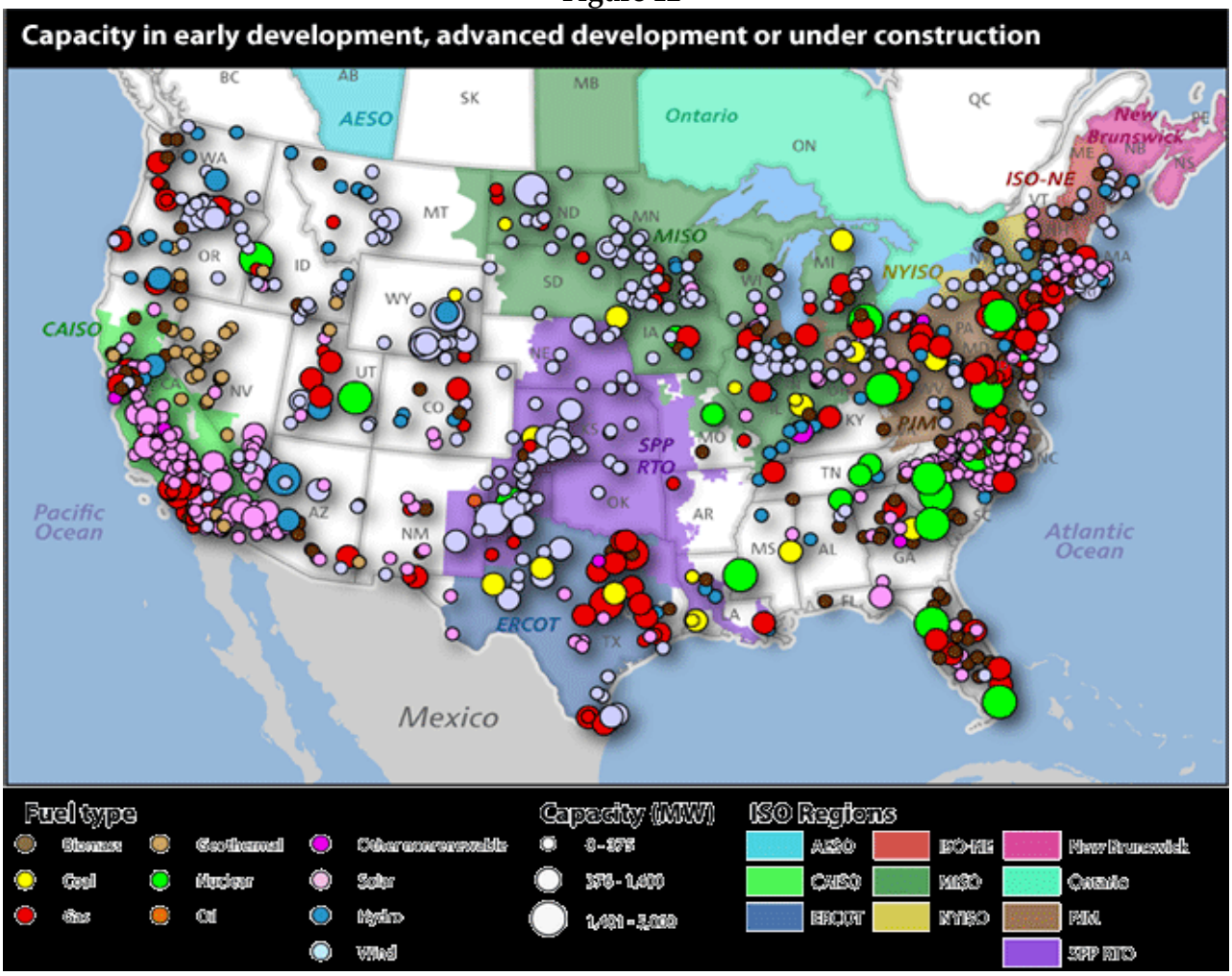
	2009 estimate ($/MWh)	2013 estimate ($/MWh)
Natural gas combined cycle	$74-$102	$61-$87
Conventional coal	$78-$144	$65-$145
On-shore wind	$57-$133	$45-$95

"Certain assumptions (e.g., required debt and equity returns, capital structure, and economic life) were identical for all technologies, in order to isolate the effects of key differentiated inputs such as investment costs, capacity factors, operating costs, fuel costs (where relevant) and U.S. federal tax incentives on the levelized cost of energy." Lazard, "Levelized Cost of Energy, 2013," version 7.0,, and Lazard, "Levelized Cost of Energy, 2009," version 3.0 .

[24] 29 states and the District of Columbia have adopted requirements related to the percentage of retail electricity sales that need to be from renewable energy sources (e.g., renewable portfolio standards or renewable energy standards). Source: North Carolina State University's N.S. Solar Center, Database of State Incentives for Renewables and Energy Efficiency, funded by the U.S. Department of Energy. ("DSIRE Database), http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf

and by stage of development, as of April 2013. Half of the power plant capacity under construction was at gas-fired power plants, and another 21 percent was at renewable projects. For other projects in advanced development (e.g., well along in permitting but not yet under construction), approximately one-third of the capacity was at gas-fired power plants, and another 42 percent was at renewable projects. In essence, three-quarters of the capacity under construction or in advance development was using these two domestic fuels, with a relatively small share (8 percent under construction, 14 percent in advanced development) to be fueled by coal.

Figure 12



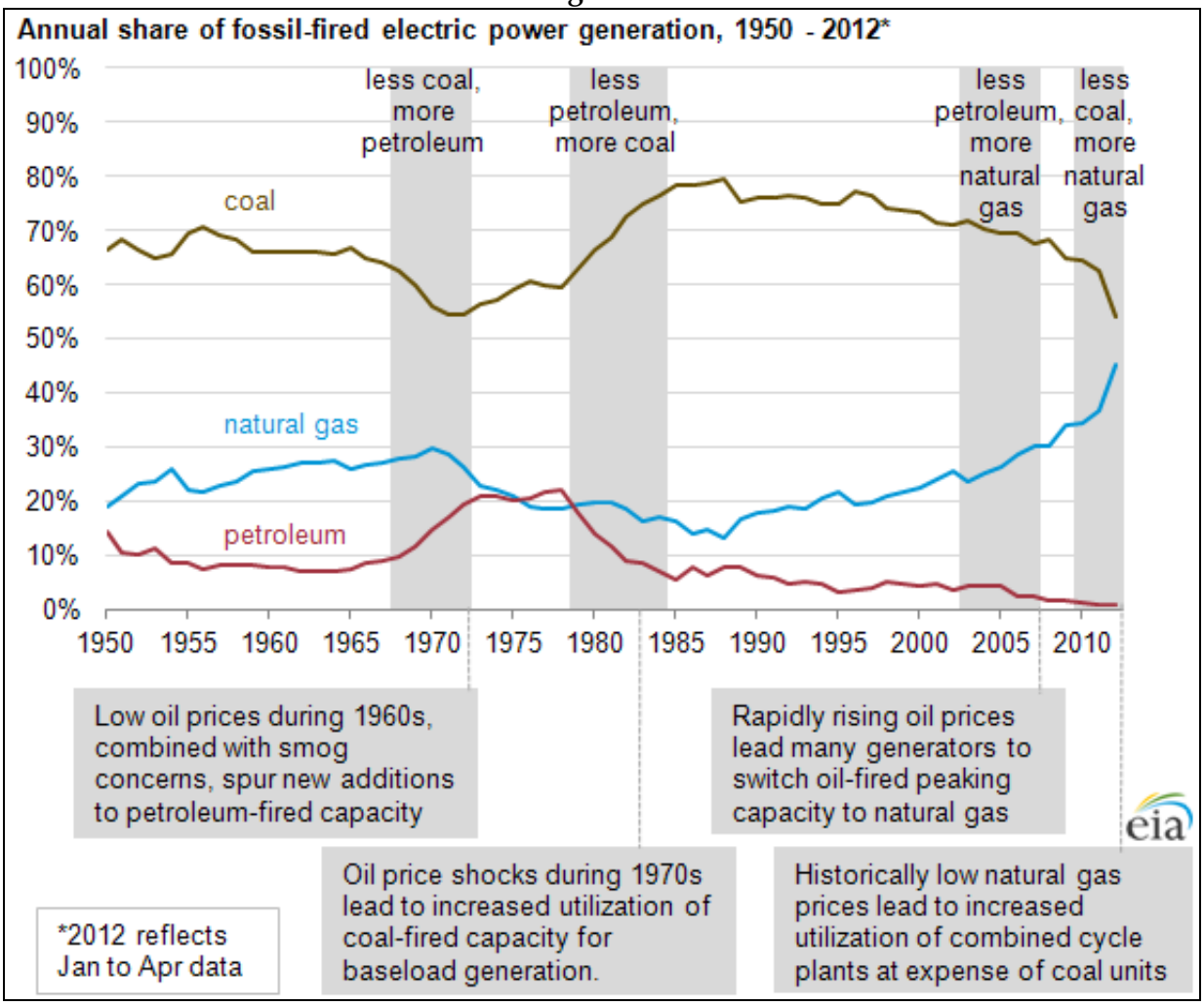
Source: SNL Data Dispatch, "**Wind beats out gas, making up 30% of generation capacity in development**," April 25, 2013.

Table 1

U.S. Planned Generating Capacity (MW) by Fuel Type and Development Status						
	Under Construction	Advanced Development	Early Development	Other Announced	Postponed	Total
Natural Gas	16,176	10,523	44,747	25,694	8,653	105,793
Wind	492	6,730	52,882	48,306	11,316	119,726
Solar	4,486	6,068	20,025	7,479	1,640	39,698
Water	583	134	8,295	43,702	5,283	57,997
Nuclear	5,614	3,494	27,098	8,150	5,900	50,256
Coal	2,489	4,731	2,000	516	3,350	13,086
Biomass	749	1,207	1,399	669	1,313	5,367
Geothermal	57	176	2,094	2,098	400	4,825
Other	45	855	180	772	0	1,851
Total	30,690	33,920	158,720	137,417	37,854	398,600
As of April 12, 2013. Source: SNL Energy						

The bottom line of current electricity market fundamentals is that coal and natural gas are in strong compeition for market share based on their comparative economics. Such inter-fuel competition has long been a feature of the electricity industry. This fact is hardly new, as seen in the recent analysis depicting the shifting electric production patterns over the years (see Figure 13, from an EIA analysis from July 2012):

Figure 13



Source: EIA, "Today in Energy: **Competition among fuels for power generation driven by changes in fuel prices," July 13, 2012.**

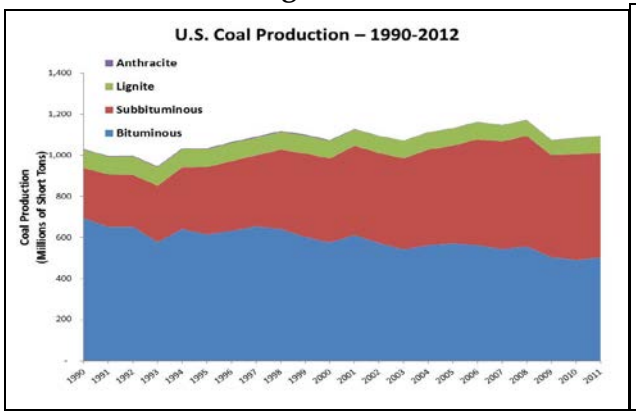
f. U.S. domestic production of fossil fuels has remained relatively strong in part due to increased exports of coal in recent years

The recent changes in coal's use in power generation has taken place during a period in which U.S. domestic production of fossil fuels has remained relatively strong. The EIA estimates that the U.S. will become the world's largest producer of natural gas (and oil) in 2013.[25] And domestic

[25] EIA, "Today in Energy: U.S. expected to be largest producer of petroleum and natural gas hydrocarbons in 2013," October 4, 2013. http://www.eia.gov/todayinenergy/detail.cfm?id=13251

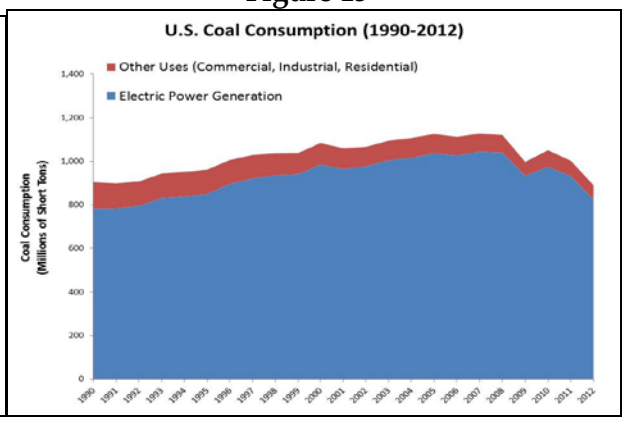
production of coal has remained relatively stable (see Figure 14), even as coal has lost some market share for power generation (see Figure 3) and it had declined in terms of absolute levels of consumption (see Figure 15). Production levels have been supported in part due to increased exports of coal in recent years (see Figure 16),[26] and also due to the continued role of coal as having the largest source of electricity supply in the U.S.

Figure 14



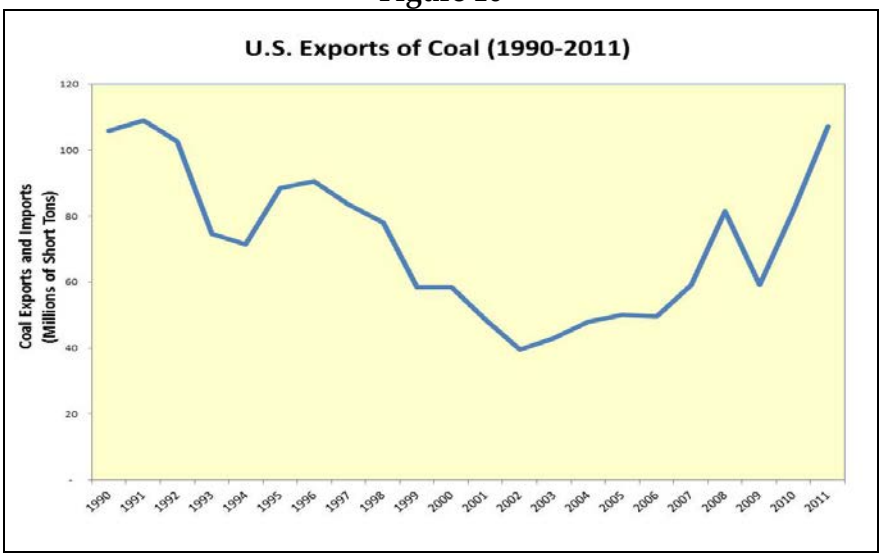
Source: EIA

Figure 15



Source: EIA

Figure 16

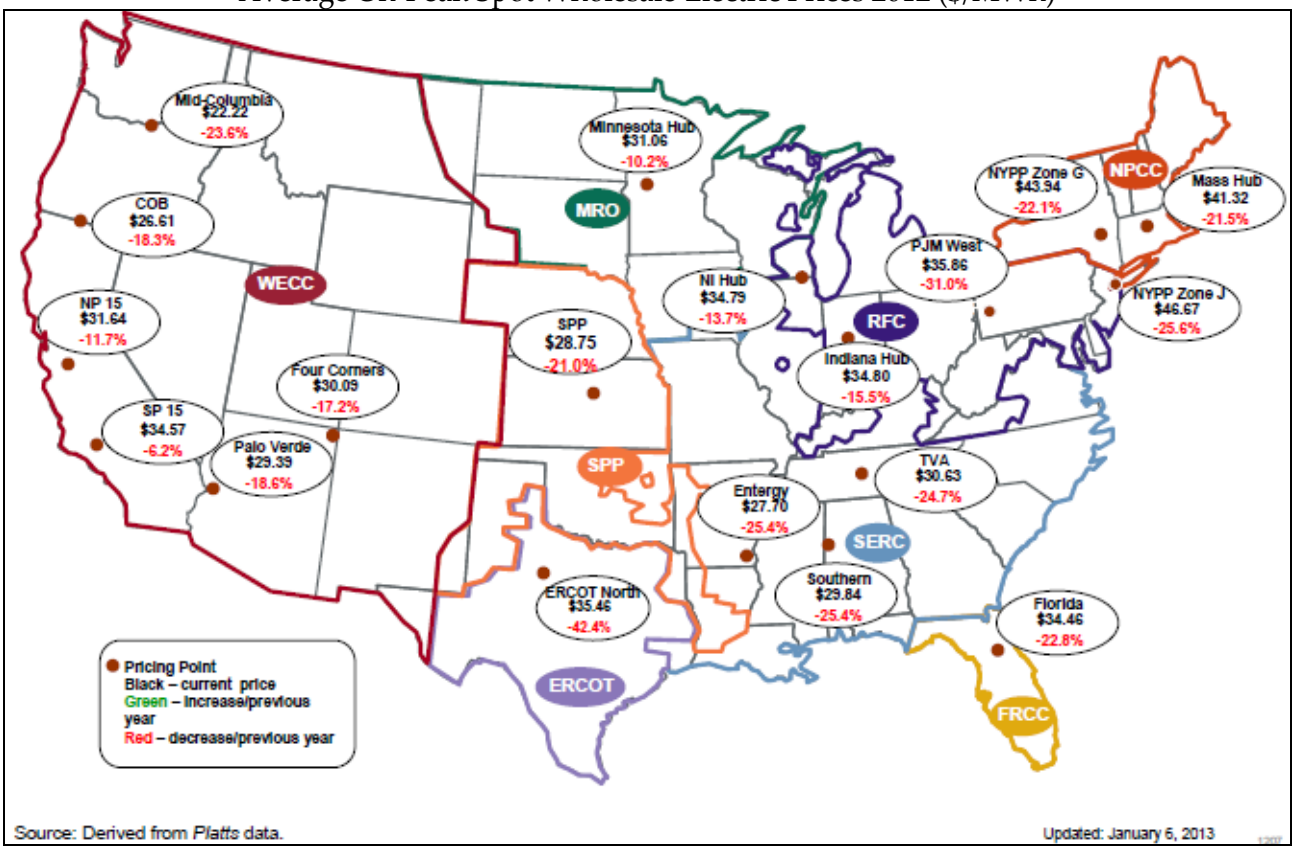


Source: EIA

[26] EIA, "Today in Energy: EIA: U.S. coal exports set monthly record," June 19, 2013.

Such market dynamics have been important for helping the electric industry provide power to consumers (and to the U.S. economy) at relatively low prices over the past few decades.[27] Figure 17 shows the downward movement in average wholesale power prices in 2012, relative to the prices in the prior year. Average prices dropped in all regions of the U.S.

Figure 17
Average On-Peak Spot Wholesale Electric Prices 2012 ($/MWh)



Source: FERC, http://www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-on-pk-elec-pr.pdf

Happily, recent developments have afforded the U.S. with the opportunity to simultaneously diversify its overall mix of power supplies using domestic energy resources and leading to long-term trends in lower emissions of most – although not all – key air pollutants from power plants.

[27] Electricity and natural gas expenditures have decreased as a percent of disposal income for most of the past three decades. Source: Bureau of Labor Statistics, cited by Dan Eggers, Credit Suisse.

(The recent drop in GHG emissions from the energy use is largely viewed to be the results of still-low demand for power combined with coal-fired generation being displaced by natural gas.[28])

The nation's various abundant and domestic fuels and energy resources are competing to supply affordable, reliable and clean electricity supply to consumers. This is beneficial for American consumers and for the economy, and EPA's actions under Section 111 will not adversely undermine the ability of the U.S. to rely on domestic resources for power generation.

2. EPA action under Section 111 of the CAA will help support competition among two key domestic fossil energy resources (coal and natural gas) for power generation

Allowing EPA to proceed with its planned action under Section 111 will help to clarify the 'rules of the road' under which coal and natural gas will continue to compete with each other and other fuels and technologies for assuring reliable, clean and efficient power supply for the nation's economy. Having clear rules and regulatory stability will help support a positive environment for investment at a time when new capacity is needed to be added in many parts of the country.

The U.S. electric industry is poised to invest significant new capital into the electric sector. In 2008, the Brattle Group estimated that the industry will make significant investments in power generation capacity, in the range of $500 billion to nearly $700 billion.[29] This investment will take

[28] "Energy-related carbon dioxide (CO2) emissions in 2012 were the lowest in the United States since 1994, at 5.3 billion metric tons of CO2 (see figure above). With the exception of 2010, emissions have declined every year since 2007. The largest drop in emissions in 2012 came from coal, which is used almost exclusively for electricity generation (see figure below). During 2012, particularly in the spring and early summer, low natural gas prices led to competition between natural gas- and coal-fired electric power generators. Lower natural gas prices resulted in reduced levels of coal generation, and increased natural gas generation—a less carbon-intensive fuel for power generation, which shifted power generation from the most carbon-intensive fossil fuel (coal) to the least carbon intensive fossil fuel (natural gas)." EIA, "Today in Energy: Energy-related carbon dioxide emissions declined in 2012," April 5, 2013.

[29] Mark Chupka, Robert Earle, Peter Fox-Penner, and Ryan Hledik, "Transforming America's Power Industry: The Investment Challenge 2010-2030," 2008.

place largely through private capital markets, which are well known to raise the cost of investment when they see risks of one sort or another.

Based on my interactions with electric industry executives and investors over many years, I observe that there is now a broad expectation among them that some form of regulation of GHG emissions from the U.S. power sector is inevitable. This has been the case especially since the U.S. Supreme Court made its finding in *Massachusetts v. EPA* – that the CAA gives the EPA the authority to certain GHG emissions from sources in the U.S.[30] This perspective assumes that there is intrinsic cost-related risks in the future associated with using fuels that emit GHG emissions.

The EPA is now proceeding under its well-noticed plan to propose and adopt regulations to set requirements for new fossil-fuel power plants under Section 111(b) (which is now in a proposed rule phase), and to issue guidelines under Section 111(d) that will require states to adopt state implementation plans to reduce GHG emissions from existing fossil-fuel power plants in the future. As of the end of 2013, EPA's proposed regulations and upcoming guidance have been anticipated for many years, Consideration of the bill that could inhibit EPA to take actions under Section 111 will complicate the industry's planning to respond to EPA policy, will raise the risk of investment at a time the nation needs to rely heavily on private capital markets to finance new investment, and will increase the cost of electricity to consumers. Given the state of markets for natural gas and coal for power generation, and the investment that will come about in the next few

[30] Such expectations have been in place at many investor-owned utility company owners of coal-fired power plants, in part as a result of shareholder requests to disclose carbon-related risks.

years to modernize the electric grid, it would be disruptive to investors to introduce further uncertainty about the 'rules of the road' at this point in time.

3. EPA action under Section 111 of the CAA will address significant air pollutants that threaten public health and the welfare of current and future generations of Americans

Given the electric sector's contribution of one third of the nation's GHG emissions, it is timely and responsible for EPA to proceed on its plan to set forth the terms under which natural gas and coal may have a role in power generation in the future. By now, there is a strong body of scientific knowledge,[31] including the EPA's own record of decision on its endangerment finding, that points to the need to take action to reduce GHG emissions around the world, including in the U.S.

In my experience as a state utility regulator and a state cabinet officer responsible for implementing environmental regulations and as a consultant to businesses and other electric industry clients, I am aware of the tensions that often exist on the eve of implementing new regulations that will impose costs of an industry (and sometimes on the consumers of its products), and the fears that such regulations will lead to jobs losses. Often, though, the very capital investments and expenditures that will be made by the industry to respond to regulatory requirement can – and do - produce positive economic activities in the local and regional communities affected. There is no reasonable basis for believing any other outcome will occur as a result of allowing EPA action to proceed under Section 111 of the CAA.

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[31] From the recent report of the Intergovernmental Panel on Climate Change, "Climate Change 2013: They Physical Science Basis – Summary for Policymakers," October 2013: "Human influence on the climate system is clear." (page 13) It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century." (page 15) "Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions." (page 17)

Conclusion

For these reasons, I strongly believe that it would be ill advised for Congress to enact the Whitfield-Manchin bill. Coal will no doubt continue to play a large role in the nation's power supply, and the EPA's proposals open up such a pathway for coal as part of a long-term diverse, domestic and clean source of electricity for the nation. They will support fair and efficient competition among domestic supplies of energy. They will clarify the rules of the road under which new fossil-fuel power plants will compete in the future. And they will begin to address the pollution from GHG emissions from the power sector, for the benefit of current and future Americans.