BEFORE THE KANSAS SENATE STANDING COMMITTEE ON UTILITIES

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TESTIMONY OF TRAVIS S FISHER
INSTITUTE FOR ENERGY RESEARCH

Chairman Apple, Vice Chairman Knox, and Ranking Member Francisco: thank you for the opportunity to submit written testimony on the proposed repeal of Kansas's renewable energy standards act.

The Institute for Energy Research (IER) is a non-profit organization that conducts intensive research and analysis on the functions, operations, and government regulation of global energy markets. IER articulates free market positions that respect private property rights and promote efficient outcomes for energy consumers and producers. IER staff and scholars educate policymakers and the general public on the economic and environmental benefits of free market energy. The organization was founded in 1989 as a public foundation under Section 501(c)(3) of the Internal Revenue Code. Funding for the institute comes from tax-deductible contributions of individuals, foundations, and corporations.

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Introduction

Support for Renewable Portfolio Standards (RPSs), such as Kansas's, are based in large measure on misperceptions. Common misperceptions regarding these mandates include:

- RPSs will create jobs
- RPSs are needed because America is running out of coal, oil, and natural gas
- RPSs are needed because renewable energy is an infant industry in need of help
- RPSs will reduce the cost of electricity
- RPSs are an effective way to reduce carbon dioxide emissions

None of these are true, but *what is* true is that RPSs raise the cost of electricity, and the states that have RPSs tend to have the most expensive electricity. More expensive electricity hurts people and businesses, and it hurts the long-run competitiveness of local and state economies because it drives energy-intensive industries out of the state. RPSs hurt consumers by shielding producers of renewable energy from market forces that drive reductions in cost and real increases in efficiency through technological progress.

Mandates on renewable energy are left over from the days when it was widely thought the U.S. was running out of energy and shifting to renewables was the only answer. Those days are over. The energy situation in the United States has changed since 2009 when the Kansas RPS was passed. For example, in 2009 natural gas prices had just seen large spikes, natural gas production was uncertain, and it appeared that the United States may have to import natural gas. But that is not at all what happened. In contrast, estimates of technically recoverable shale gas resources more than doubled from 2010 to 2011, largely due to better technology.[1]

In fact, the energy situation everywhere is changing. Today, we have critical insights into how renewable energy programs have fared in other places around the world. Renewables everywhere, despite receiving heavy subsidies and mandates, are not developing as quickly as their advocates hoped. In short, predictions about their growth have proven to be wrong, and the same is true for estimates touting the economic benefits of renewable mandates.

Essentially, the times have changed. Renewables have turned out to be less promising than expected, and conventional sources of energy have turned out to be far more promising than expected.

Renewable mandates cause net job losses

One argument people use to promote renewable electricity mandates is that mandates create "green" jobs. But trying to create jobs through renewable subsidies and mandates has proved to be a failure, and the "green jobs" philosophy has been refuted both in theory and in practice.

In Spain, for example, it is estimated that for every "green" job created, 2.2 jobs were lost in the rest of the economy.[2] Unemployment there is now over 25 percent, even though the government spent huge amounts of money on green energy. In Germany, subsidies in the solar industry

[1] http://www.instituteforenergyresearch.org/2011/05/16/technically-recoverable-shale-gas-resources-jump-134-percent/

[2] Gabriel Calzada Álvarez*, Study of the Effects on Employment of Public Aid to Renewable Energy Sources*, Mar. 2009*,* http://www.juandemariana.org/pdf/090327-employment-public-aid-renewable.pdf.

reached as high as $240,000 per worker.[3] The situation in Denmark is similar. Danes have to pay the highest electricity prices in the European Union, and they pay subsidies of nearly $400 million a year to wind producers (in a country with less than 2 percent of the population of the United States).[4] Throughout Europe, countries are backing away as fast as possible from subsidies and mandates because the high electricity prices are driving businesses to other countries and they can't afford it.

While RPSs might "create" some identifiable jobs, they do not create jobs on net. The money to pay for the subsidies and mandates has to come from somewhere. In other words, if taxpayers had been able to spend or invest their money as they saw fit, instead of losing it to subsidies and higher electricity rates, the taxpayers would have spent the money and that spending would have created other jobs.

America has an abundance of energy

One of the most popular misconceptions about RPSs is that they are necessary because we are running out of energy resources and should therefore use more renewable resources. The reality is far different. The United States is not just energy rich, but according to the Congressional Research Service, the United States has the largest combined resources of natural gas, coal, and oil in the world.[5]

For electricity production, coal and natural gas are the most important resources, and the United States has a large amount of both. In fact, the United States has 486.1 billion short tons of coal in its Demonstrated Reserve Base.[6] The U.S. consumes 1 billion short tons of coal a year,[7] which means we have over 480 years of coal at our current rate of consumption. This actually may be an understatement of America's coal resources because it does not include all of Alaska's coal resources—some estimates are that Alaska has more coal than the entire lower 48 combined.[8]

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[3] Manuel Frondel, Nolan Ritter, & Colin Vance, *Economic impacts from the promotion of renewable energies: The German experience*, Oct. 2009, http://www.instituteforenergyresearch.org/germany/Germany_Study_-_FINAL.pdf

[4] Hugh Sharman & Henrik Meyer, *Wind Energy: The Case of Denmark*, Sept. 2009, http://www.cepos.dk/fileadmin/user_upload/Arkiv/PDF/Wind_energy_-_the_case_of_Denmark.pdf.

[5] Gene Whitney et. al., *U.S. Fossil Fuel Resources: Terminology, Reporting, and Summary*, Congressional Research Service, Nov. 30, 2010, http://epw.senate.gov/public/index.cfm?FuseAction=Files.view&FileStore_id=04212e22-c1b3-41f2-b0ba-0da5eaead952.

[6] Energy Information Administration, *Annual Coal Report 2009, Table 15: Recoverable Coal Reserves at Producing Mines, Estimated Recoverable Reserves, and Demonstrated Reserve Base by Mining Method, 2009*, http://www.eia.gov/cneaf/coal/page/acr/table15.pdf.

[7] Energy Information Administration, *International Energy Statistics: Coal—Consumption,* http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=1&pid=1&aid=2.

[8] *See* U. S. Geological Survey, *Alaska Coal Geology, Resources, and Coalbed Methane Potential*, http://pubs.usgs.gov/dds/dds-077/. See also, Energy Information Administration, *Annual Coal Report*, http://www.eia.gov/cneaf/coal/page/acr/table15.pdf.

The United States also has large amounts of natural gas. We have about 2.744 quadrillion cubic feet of technically recoverable natural gas.[9] The U.S. uses 25 trillion cubic feet a year, so we have enough natural gas for more than a century at the current rate of use, and if you find more in Kansas, that number will grow significantly.[10]

Wind and solar may not be the technologies of the future

One argument for renewable electricity mandates is that renewables are the future, so we should mandate their use and have the energy of the future right now. This argument presupposes that technologies like wind and solar are infant technologies and only need a leg up to be cost competitive. It also presumes that advocates of renewables can see decades into the future of the energy industry.

However, wind and solar are far older technologies than most people realize. In fact, people have used wind power to generate electricity for more than 125 years since a Scottish academic named James Blyth made a wind turbine.[11] Solar is also not an infant technology. The first solar cells were made in 1883 by American inventor Charles Fritts.[12] The first photovoltaic cells powerful enough to run everyday electrical equipment were created in 1954.[13]

For decades, the promoters of wind and solar have been claiming that wind and solar will soon be cost competitive—if only they receive some subsidies (or mandates…or both!) to help out. For example, in 1983, Booz, Allen & Hamilton conducted a study for the Solar Energy Industries Association, American Wind Energy Association, and Renewable Energy Institute. The report stated that "The private sector can be expected to develop improved solar and wind technologies which will begin to become competitive and self-supporting on a national level by the end of the decade [i.e. by 1990] if assisted by tax credits and augmented by federally sponsored R&D."[14] In 1986, Amory Lovins of the Rocky Mountain Institute lamented the untimely scale-back of tax

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[9] Energy Information Administration, Assumptions to the Annual Energy Outlook 2011, April 2011, http://www.eia.gov/oiaf/aeo/assumption/oil_gas.html; Energy Information Administration, Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays, July 2011, http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf; USGS, USGS Releases New Assessment of Gas Resources in the Marcellus Shale, Appalachian Basin, Aug. 23, 2011, http://www.usgs.gov/newsroom/article.asp?ID=2893&from=rss_home.

[10] http://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm

[11] The Courier, *Renewable energy and role of Marykirk's James Blyth*, July, 16, 2010, http://web.archive.org/web/20120314025335/http://www.thecourier.co.uk/Community/Heritage-and-History/article/2332/renewable-energy-and-role-of-marykirk-s-james-blyth.html.

[12] Department of Energy, The History of Solar, http://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf.

[13] *Id.*

[14] *Renewable Energy Industry*, Joint Hearing before the Subcommittees of the Committee on Energy and Commerce et al., House of Representatives, 98th Cong., 1st sess. (Washington, D.C.: Government Printing Office, 1983), p. 52.

breaks for renewable energy, since the competitive viability of wind and solar technologies was "one to three years away."[15]

Despite years of subsidies for wind, solar, and other renewables, these technologies are still not competitive with coal, natural gas, and other affordable, reliable sources of electricity generation. Further, direct comparison between dispatchable, reliable sources of energy like natural gas, nuclear, and coal and non-dispatchable sources like wind and solar are an apples to oranges comparison because dispatchable power is so much more valuable in keeping the lights on. Also, if these renewables were truly cost-competitive and provided the same value as conventional resources, there would be no need for RPSs or subsidies like the wind Production Tax Credit (PTC).

Given the very poor record of analysts and renewables advocates in estimating if or when renewables will make economic sense, it is a risky proposition to mandate them in the future energy mix. As we have seen with the boom in production of shale gas, the energy future is nearly impossible to predict, and better technologies are hard to recognize before they have proven themselves in the market. The reality is that we do not know what the future will bring for electricity generation, and we should not presume to know what will be cost-competitive in the future. Instead of assuming it will be wind and solar, these technologies should prove themselves in the market. We will only know if renewables are cost-competitive by seeing if they can thrive without mandates and subsidies.

Renewables are expensive

There are several ways to look at the cost of producing electricity. One way is to look at the cost of building and operating new electricity-generation facilities. The Energy Information Administration (EIA) forecasts energy supply and demand, and their forecast includes estimates of:

- The cost of electricity that includes the capital cost.
- The cost of operating and maintaining the facilities (including fuel).
- The cost of the transmission to get the electricity to market.

EIA estimates these data for 2018, the most recent year that technologies can be compared due to the lead time for construction. The least expensive form of new electricity generation is expected

[15] Lovins, in K. Wells, "As a National Goal, Renewable Energy Has An Uncertain Future." *Wall Street Journal*, February 13, 1986, pp. 1, 19 at 19.

to be natural gas, followed by wind.[16] Solar is more than three times more expensive in EIA's calculation than natural gas.

Estimated Levelized Cost of New Dispatchable Generation Resources, 2018

Plant type Dispatchable Technologies	U.S. average levelized costs (2011 $/megawatthour) for plants entering service in 2018 Capacity factor (%)	Levelized capital cost	Fixed O&M	Variable O&M (including fuel)	Transmission investment	Total system levelized cost
Conventional Coal	85	65.7	4.1	29.2	1.2	100.1
Advanced Coal	85	84.4	6.8	30.7	1.2	123
Advanced Coal with CCS	85	88.4	8.8	37.2	1.2	135.5
Natural Gas-fired						
Conventional Combined Cycle	87	15.8	1.7	48.4	1.2	67.1
Advanced Combined Cycle	87	17.4	2	45	1.2	65.6
Advanced CC with CCS	87	34	4.1	54.1	1.2	93.4
Conventional Combustion Turbine	30	44.2	2.7	80	3.4	130.3
Advanced Combustion Turbine	30	30.4	2.6	68.2	3.4	104.6
Advanced Nuclear	90	83.4	11.6	12.3	1.1	108.4
Geothermal	92	76.2	12	0	1.4	89.6
Biomass	83	53.2	14.3	42.3	1.2	111

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Estimated Levelized Cost of New Non-Dispatchable Generation Resources, 2018

Plant type Non-Dispatchable Technologies	U.S. average levelized costs (2011 $/megawatthour) for plants entering service in 2018 Capacity factor (%)	Levelized capital cost	Fixed O&M	Variable O&M (including fuel)	Transmission investment	Total system levelized cost
Wind	34	70.3	13.1	0	3.2	86.6
Wind-Offshore	37	193.4	22.4	0	5.7	221.5
Solar PV[1]	25	130.4	9.9	0	4	144.3
Solar Thermal	20	214.2	41.4	0	5.9	261.5
Hydro[2]	52	78.1	4.1	6.1	2	90.3

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It appears that wind is, therefore, pretty inexpensive. The problem with this assumption is that it does not consider the requirements of the electrical grid. Wind, according to EIA, might be inexpensive, but it is only available when the wind is actually blowing. As we know, the wind does not blow all the time (and for that matter, the sun does not always shine).

The American Tradition Institute recently produced a study that added the hidden costs of wind, which included the cost of fossil fuel power as back-up when the wind is dormant, the additional cost of transmission that frequently occurs with wind installations due to the inaccessibility of the best wind resources, the cost of wind's favorable tax benefits in "accelerated depreciation," and a shorter estimated life of a wind turbine of 20 years to the per-kilowatt-hour cost of generating electricity from wind power that includes capital costs and operating costs, as

[16] For more information, see this explanation of EIA's calculations, *see* Institute for Energy Research, *Levelized Cost of new Electricity Generating Technologies*, Feb. 1, 2011, http://www.instituteforenergyresearch.org/levelized-costs-of-new-electricity-generating-technologies/. For example, EIA's annualized cost figure for generating electricity from new coal includes a penalty of three percentage points on the cost of capital to represent the difficulty of obtaining financing for new coal units.

determined by EIA and the Department of Energy. They found the cost of wind power to be 15.1 cents per kilowatt hour if natural gas is used to back-up the wind energy or 19.2 cents per kilowatt hour if coal is used as the back-up fuel.[17] These costs are 1.5 to 2 times the 9.6 cents per kilowatt hour estimate the EIA is using for generating electricity from wind in its models.[18]

Another, perhaps more important way to look at the cost of sources of generation is to look at the states with the least expensive electricity rates and see how they generate their electricity. The following chart shows the 10 states with the least expensive electricity rates and their largest sources of electricity generation.[19] Note that coal produces the large share of electricity in seven out of 10 states and hydroelectric produces the largest share in the other three:

States with the Lowest Residential Electricity Prices, 2013			
	Retail Electricity Prices (¢/kWh)	Largest Source of Electricity Generation	Percentage of that Source
Washington	8.70	Hydro	58%
North Dakota	8.85	Coal	79%
Louisiana	9.15	Natural Gas	57%
West Virginia	9.36	Coal	97%
Idaho	9.54	Hydro	53%
Kentucky	9.60	Coal	96%
Oklahoma	9.61	Coal	42%
Arkansas	9.67	Coal	49%
Missouri	9.80	Coal	82%
Nebraska	9.93	Coal	73%
U.S. Average	**12.09**	**Coal**	**37%**

The takeaway from this chart is that according to EIA, although natural gas might be the least expensive source of electricity generation if you are building new plants, where coal plants are already built and where hydroelectric dams exist, coal and hydroelectric power are the cheapest. That also means that if older plants of any kind are being replaced, the cost of electricity from new plants will likely be more expensive. The following graph illustrates the incredibly low cost of installed coal capacity.[20]

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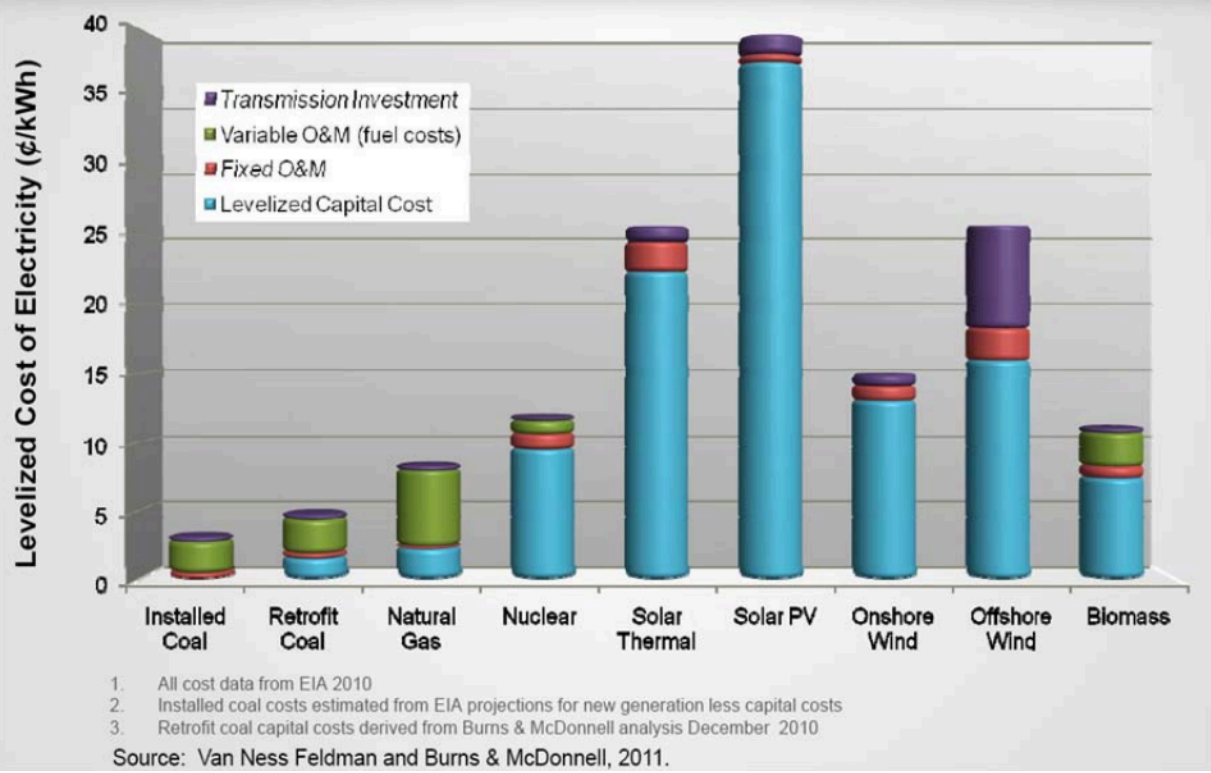
[17] George Taylor & Thomas Tanton, *The Hidden Costs of Wind Electricity Why the full cost of wind generation is unlikely to match the cost of natural gas, coal or nuclear generation*, http://www.atinstitute.org/wp-content/uploads/2012/12/Hidden-Cost.pdf.

[18] Energy Information Administration, Levelized Cost of New Generation Resources in the Annual Energy Outlook 2012, July 12, 2012, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

[19] *See* Energy Information Administration, *Electric Power Monthly*, *Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector*, *http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_a.*

[20] http://www.americaspower.org/sites/default/files/Social_Cost_of_Carbon.pdf



Renewable Electricity Mandates Are an Expensive Way to Reduce Carbon Dioxide Emissions

Some argue that renewable electricity mandates are a good way to reduce carbon dioxide emissions,[21] but renewable electricity mandates are a very expensive way to reduce carbon dioxide emissions. According to the California Air Resources Board, it costs $133 per ton to reduce carbon dioxide emissions through a renewable electricity mandate.[22] An internal Obama administration memorandum on subsidies for renewables recently noted that carbon dioxide emissions "would have to be valued at nearly $130 per ton for CO_2 for the climate benefits to equal the subsidies."[23] To put these numbers in perspective, it currently costs about $3.60 a ton to purchase a certified carbon dioxide allowance traded on the European Climate Exchange.[24]

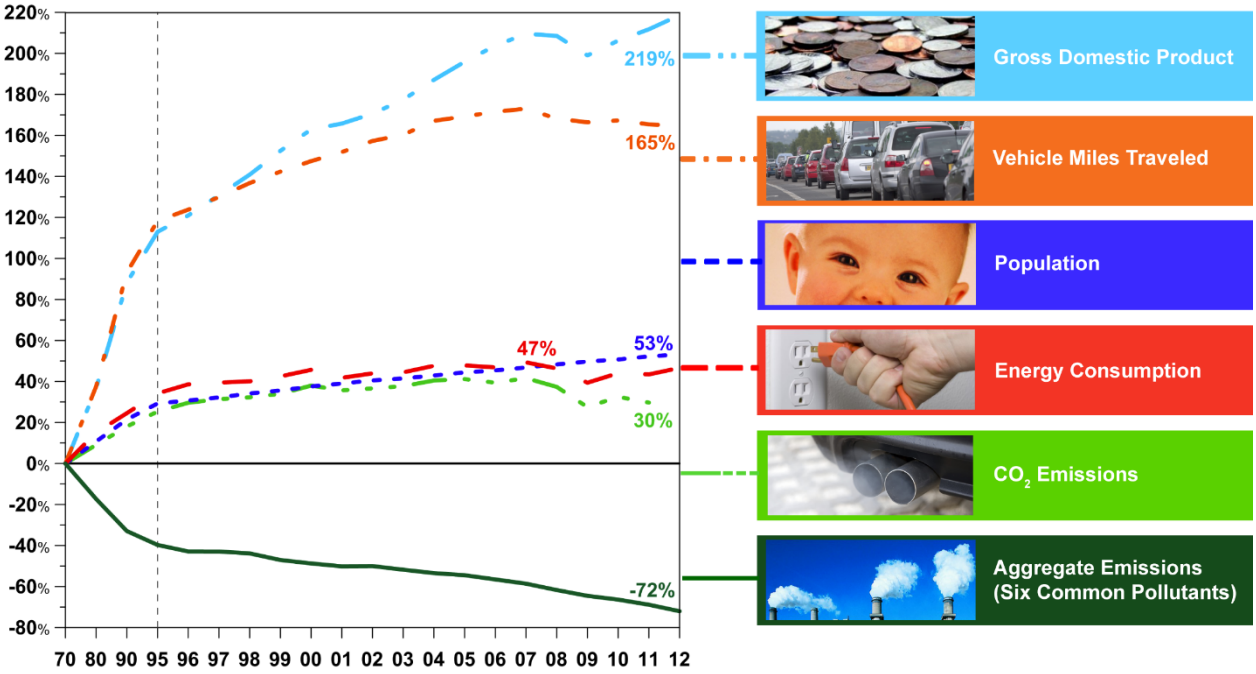
[21] *See, e.g.* Kara Rowland, *Chilly wind blows against global climate pact*, WASHINGTON TIMES, Nov. 7, 2010, http://www.washingtontimes.com/news/2010/nov/7/after-vote-obama-faces-chilly-road-on-climate (see Robert Gibbs comment).
[22] California Air Resources Board, *Climate Change Scoping Plan,* p. 84, http://climatechange.ca.gov/eaac/documents/state_reports/Adopted_Scoping_Plan.pdf.
[23] Stephen Power, *U.S. Weighs Funding for Renewable Energy Projects*, WALL STREET JOURNAL, Nov. 3, 2010, http://online.wsj.com/article/SB10001424052748703506904575592843603174132.html.
[24] Point Carbon, *EU CO2 prices to hit 2-3 euros without support: analyst*, http://www.pointcarbon.com/news/1.2211004.

Air Pollution and Coal

America is very rich in coal. However, one reason some support RPSs is because they are concerned about air pollution from coal. But there is good news—our air quality is improving and new coal plants are cleaner than ever before.

Today's coal-fired power plants produce more power, with less emission of pollutants, than ever before. The reason is because of pollution control technologies such as flue gas desulfurization, selective catalytic reducers, fabric filters, and dry sorbent injection, all of which have greatly reduced coal plant emissions. [25]

These advances in technology have enabled large improvements in air quality. Since 1970, the total emissions of the six criteria pollutants have declined by 72 percent, even though energy consumption has increased by 47 percent, vehicle miles traveled have increased by 165 percent, and the economy has grown by 219 percent.[26] (The "criteria pollutants" are carbon monoxide, lead, sulfur dioxide, nitrogen oxides, ground-level ozone, and particulate matter.) The following chart from EPA shows the increase in economic measures compared to the decrease in pollution emissions.[27]



[25] *See* Institute for Energy Research, *The Facts About Air Quality and Coal-Fired Power Plants*, http://www.instituteforenergyresearch.org/2009/06/01/the-facts-about-air-quality-and-coal-fired-power-plants/.
[26] Environmental Protection Agency, *Air Quality Trends*, Jan. 5, 2012, http://www.epa.gov/airtrends/aqtrends.html.
[27] Environmental Protection Agency, *Air Quality Trends*, http://www.epa.gov/airtrends/aqtrends.html. The specific graphic is available here: http://www.epa.gov/airtrends/images/comparison70.jpg

As technology continues to advance, pollution from coal-fired power plants and other sources will continue to improve and air quality will improve as well.

Conclusion

Much of the support for renewable portfolio standards is based on misperceptions about America's energy resources and the nature of electricity generation. America is an energy rich country—we are rich in natural gas, coal, and even nuclear resources. We have enough natural gas to last for a century at our current rate of use and hundreds of years of coal. Some have raised concerns about air quality, but history shows that even as we have used more energy, our air quality has improved.

Mandating renewable production is mandating the use of inefficient, unreliable sources of electricity generation. This increases electricity rates and it increases taxes to pay for subsidies such as the production tax credit.

Someday generation and storage technologies may improve and wind and solar technologies may be cost-competitive with affordable, reliable sources like nuclear, coal, or natural gas. But wind and solar are not cost-competitive yet, and we should let the technologies improve instead of mandating their use and paying the price with higher electricity rates and fewer jobs.