

## Pennsylvania: An Energy and Economic Analysis

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The Keystone State is experiencing record production for natural gas, largely due to a welcoming regulatory environment for hydraulic fracturing technologies that are unlocking vast reserves previously untouched in the Marcellus Shale. Meanwhile, however, the state's coal industry has been suffering and the refining sectors have felt the strain of Washington regulations that are designed to cripple fossil energy producers. The Institute for Energy Research monitors closely the developments in this critical energy state, where unemployment remains above 8 percent and gasoline prices continue to push \$4 per gallon.

### Pennsylvania Energy and Economic Facts

Real Gross Domestic Product per Capita	\$39,272	23 <sup>rd</sup> lowest
Unemployment Rate	8.1%	22 <sup>nd</sup> highest
Gasoline Price, per Gallon	\$3.897	16 <sup>th</sup> highest
Electricity Price, per Kwh	10.49 cents	15 <sup>th</sup> highest

Sources: Bureau of Economic Analysis, <http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1&isuri=1&acrdn=1> , Bureau of Labor Statistics,

<http://www.bls.gov/web/laus/laumstrk.htm/>, AAA Fuel Gauge Report, <http://fuelgagereport.aaa.com/> (September , 2012)

Energy Information Administration, *Electric Power Monthly, February 2012, Table 5.6B*, [http://www.eia.gov/electricity/monthly/current\\_year/february2012.pdf](http://www.eia.gov/electricity/monthly/current_year/february2012.pdf)

### Fossil Fuels: Coal, Oil and Natural Gas

Pennsylvania is rich in fossil fuels, particularly coal and natural gas. In 2010, its energy production totaled 3,051 trillion Btu, the 5<sup>th</sup> largest in the nation, behind Texas, Wyoming, West Virginia, and Louisiana. The Appalachian Basin, which covers most of the State, holds substantial reserves of coal and more moderate reserves of conventional natural gas. The Basin's Marcellus shale region contains reserves of unconventional shale gas produced using hydraulic fracturing.

**Coal.** Pennsylvania was the fourth largest coal-producing state in the nation in 2011, and the only state producing anthracite coal, which has the highest heat value among the coal types. Northeastern Pennsylvania has the nation's largest reserves of anthracite coal, a coal that burns cleanly with little soot, used primarily as a domestic fuel in either hand-fired stoves or automatic stoker furnaces. While Pennsylvania supplies virtually all of the nation's anthracite coal, most of the state's coal production consists of bituminous coal mined in the western part of the state, where several of the nation's largest underground coal mines are located. Pennsylvania's Enlow Fork Mine is the largest underground coal

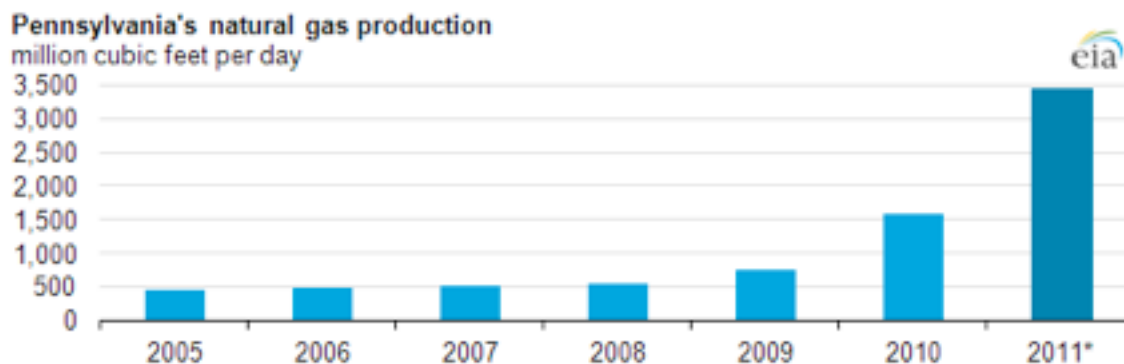
mine in the United States. In 2011, Pennsylvania produced [59.7 million short tons](#) of coal—a fuel that dominates Pennsylvania’s power generation market, accounting for about 45 percent of its net electricity production.

Pennsylvania’s coal industry employs [52,000 people](#), with a payroll of [\\$3.5 billion](#). Several independent studies have found that new regulations from the Environmental Protection Agency (EPA) would put thousands of jobs in jeopardy and increase Pennsylvania’s energy costs by as much as 8 percent. The new regulations due to the Obama Administration’s “war on coal” will result in coal-fired plant closings. GenOn Energy Inc., for example, plans to close five of its older coal-fired plants over the next 4 years. The company indicated that new environmental regulations from the EPA will make it unprofitable to operate the plants, which have a combined capacity of [3,140 megawatts](#). The 5 plants are located in Portland, Shawville, Titus, New Castle, and Elrama, Pennsylvania.

PBS Coals Inc. and its affiliate company, RoxCoal Inc., laid off about [225 workers](#) as part of an immediate idling of some deep and surface mines in Somerset County, Pennsylvania, that now employ some 795 workers. “[T]he escalating costs and uncertainty generated by recently advanced EPA regulations and interpretations have created a challenging business climate for the entire coal industry,” said PBS Coals Inc. President and CEO D. Lynn Shank. Another coal company, Alpha Natural Resources Inc., is cutting [1,200 jobs, roughly 9 percent of its workforce](#) as it temporarily closes eight mines in Virginia, West Virginia and Pennsylvania.

**Natural gas.** Between 2009 and 2011, Pennsylvania's natural gas production more than quadrupled due to expanded horizontal drilling combined with hydraulic fracturing in the Marcellus shale gas formation. Hydraulic fracturing, which has been used for over 60 years with no confirmed case of groundwater contamination in one million applications, along with horizontal drilling has made Marcellus Shale extraction both economical and environmentally safe.

Historically, natural gas exploration and development in Pennsylvania was relatively steady, with operators drilling a few thousand conventional wells annually. Prior to 2009, the wells produced about 400 to 500 million cubic feet per day of natural gas. With the increase in horizontal wells, Pennsylvania's natural gas production more than quadrupled since 2009, [averaging nearly 3.5 billion cubic feet per day in 2011](#). A Penn State study indicated that the industry will generate over [111,000 jobs](#) and \$987 million in state and local tax revenue by 2011. By mid-2010, the state had already received \$425 million in leasing fees and over \$250,000 in royalty payments for drilling on state lands.



**Source:** U.S. Energy Information Administration (2005-2010); Pennsylvania Department of Environmental Protection (2011).

**Note:** \*EIA production data are used for 2005-2010 due to reporting issues with 2010 data provided by the [Pennsylvania Department of Environmental Protection \(DEP\)](#). DEP data are used for 2011 as EIA data are not yet available; EIA volumes are expected to be similar.

Pennsylvania state officials oversee its natural gas production. Natural gas drillers must comply with **eight** federal and **eleven** state acts and laws, and are subject to frequent inspections by the state Department of Environmental Protection (DEP). Pennsylvania employs [193 drill site inspectors](#). Hydraulic fracturing and natural gas drilling [are overseen by two regional and four state agencies](#) including the DEP, the Fish and Boat Commission, and the Department of Conservation and Natural Resources, and regional watershed commissions.

In 2010, Pennsylvania ranked 8<sup>th</sup> in the nation in natural gas production, producing [572.9 billion cubic feet](#). Because of hydraulic fracturing and directional drilling, Pennsylvania's natural gas production more than doubled from 2010 to 2011.

Pennsylvania's natural gas storage capacity is among the highest in the nation, allowing the state to store fuel during the summer when demand is typically lower, and ramp up delivery during the winter months when natural gas markets increase consumption for home heating needs.

Natural gas is used in Pennsylvania for electricity generation, supplying over 18 percent of its state's net generation, and also for residential, industrial, and commercial use.

**Oil.** Although the first commercial oil well was drilled in Pennsylvania in 1859, the state's current production of oil is small. In June 2012, Pennsylvania ranked 19<sup>th</sup> among the states in oil production, having produced [316,000 barrels](#) with most of the production coming from stripper wells.

Pennsylvania, however, is the leading petroleum-refining state in the Northeast with large-scale refineries located along the Delaware River near Philadelphia that process primarily foreign crude oil shipped from overseas. Due in large part to new EPA regulations, earlier this year several of these refineries were threatened with closure causing concern regarding the availability of petroleum products on the east coast.

Among the new EPA regulations are Tier III and emission standards for refineries and U.S. smog and particulate matter air-quality standards. Since 2004, when EPA's Tier II standards were implemented, refiners cut sulfur levels in gasoline by 90 percent, from an average of 300 parts per million (ppm) in 2004 to an average of 30 parts per million today, at a cost of \$10 billion. EPA's new Tier III rules would cut the sulfur content of gasoline from 30 down to 10 parts per million. A [report](#) conducted by Baker and O'Brien for the American Petroleum Institute (API) found that the rule adds [\\$2.4 billion in annual compliance costs](#), resulting in an increase of 6 to 9 cents per gallon of gasoline. Achieving the incremental sulfur reduction requires large capital investments in equipment and could lead to refinery closures. Last December, in fact, [a large refinery](#) in Pennsylvania was shuttered.

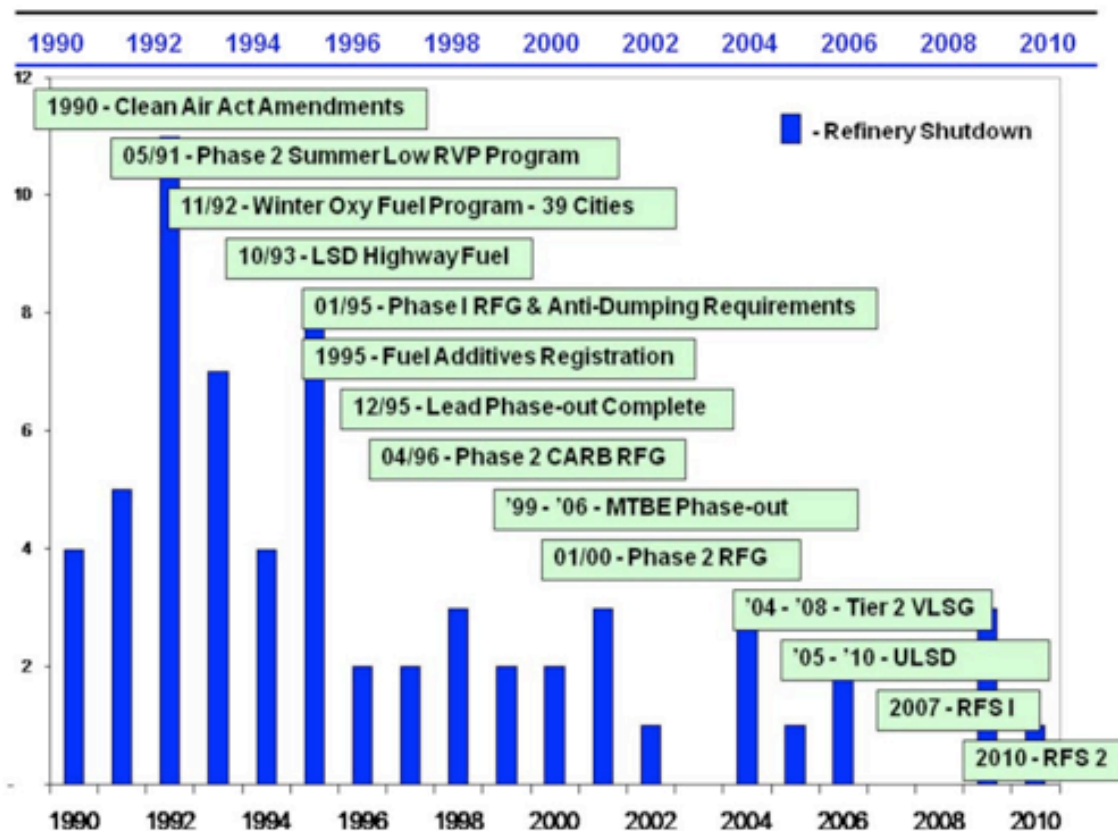
Further, two refineries in Pennsylvania with a joint capacity of 363,000 barrels per day owned by Sunoco and Conoco Phillips were idled earlier this year due to losses resulting from increased regulatory requirements and lower demand for petroleum products. Sunoco estimates that environmental regulatory costs represent about 15 percent of its operating budget. The two idled Pennsylvania refineries along with a third Sunoco refinery operating in the Philadelphia area had employed [1,200 workers](#) and almost as many salaried and contract workers, manufacturing 50 percent of the petroleum fuels produced on the east coast of the United States.

Sunoco has entered into a merger agreement with Energy Transfer Partners where Energy Transfer Partners will acquire Sunoco for [\\$5.3 billion](#), creating one of the largest and most diversified energy partnerships in the country. According to Sunoco, its Marcus Hook plant, which it idled in December, will remain closed under the merger. Its Philadelphia refinery, which is the largest on the east coast, is operating and employs about 850 workers. The Philadelphia refinery was aided by the Obama Administration, who turned to the Carlyle Group, a private equity firm, to [bail it out](#), renegotiating state and federal regulations and transferring the pollution credits from a nearby closed refinery to the Philadelphia refinery. Because Pennsylvania is a battleground state in this year's election, the White House likely felt action was needed to ensure adequate petroleum products to the east coast. The merger decision with Energy transfer Partners will be determined by Sunoco's shareholders, scheduled for [October 4](#).

Conoco Phillips operated a refinery in Trainer, Pennsylvania that produced [185,000 barrels a day](#) of petroleum products. Over the last 10 years Conoco Phillips invested 100 percent or more of its profit into its Trainer refinery to meet regulatory requirements, but lost money in each of the previous three years. [Delta Airlines](#) has purchased the Conoco Phillips facility as a hedge against increasing jet fuel prices for [\\$150 million](#). Delta plans to invest [\\$100 million](#) in maximizing the refinery's jet fuel output, cutting the airline's fuel bill by [\\$300 million a year](#).

According to a March 2011 Department of Energy report, in the past 20 years, federal regulations were a significant factor in the closing of 66 U.S. refineries. (See chart below.) Refinery closures and the recession have led to a loss of over 3,000 direct jobs and 506,000 barrels per day decrease in refining capacity.

**Figure 9. U.S. Refined Product Environmental Regulations 1990-2010**



Source: SAIC, 2010, EIA Table 15 - Refineries Permanently Shut Down, 2010.

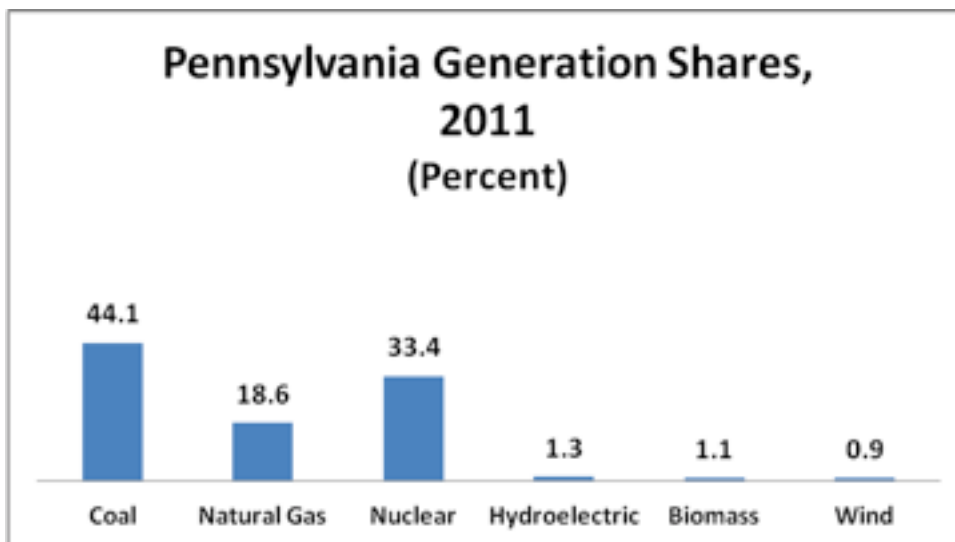
Source: U.S. Department of Energy, Office of Policy and International Affairs, *Small Refinery Exemption Study – An Investigation Into Disproportionate Economic Hardship*, p. 28-30, found at: <http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/small-refinery-exempt-study.pdf>

## Electricity and Renewable Energy

Pennsylvania ranks [third in electricity production](#) in the nation and it exports electricity to adjoining states. Its electricity markets rely primarily on coal, nuclear and natural gas for electricity generation. While coal supplies over 44 percent of its generation, natural gas-fired generation is a growing source, supplying over 18 percent of net generation in 2011.

Pennsylvania's five operating nuclear plants supply about one-third of the state's electricity production. Pennsylvania ranks second in the nation after Illinois in nuclear generating capacity. Pennsylvania was home to the nation's first commercial U.S. nuclear power plant in Shippingport, which came online in 1957 and was decommissioned in 1982 after 25 years of service. In 1979, a partial meltdown at Pennsylvania's Three Mile Island nuclear plant resulted in the cancellation of new nuclear power plants in the country.

Pennsylvania generated 3.3 percent of its electricity from renewable resources in 2011. The Susquehanna River and several smaller river basins provide hydroelectric power, and the Appalachian and Allegheny mountain ranges and the shoreline along Pennsylvania's border with Lake Erie have wind power potential. Pennsylvania is among the largest users of municipal solid waste and landfill gas for electricity generation in the United States.



Source: Energy Information Administration, *Electric Power Monthly*, February 2012, [http://www.eia.gov/electricity/monthly/current\\_year/february2012.pdf](http://www.eia.gov/electricity/monthly/current_year/february2012.pdf)

### **Pennsylvania State Regulatory Environment**

Pennsylvania is one of the [30 states that have a renewable portfolio standard](#) (RPS) that mandates that a specified share of electricity be produced by renewable fuels in the future. [Pennsylvania's Alternative Energy Portfolio Standards](#) require 18 percent of electricity sold by compliance year 2020 (June 1, 2020 to May 31, 2021) to come from renewable or approved alternative sources, including at least 0.5 percent solar photovoltaic power. The 18 percent includes 8 percent from Tier I resources (photovoltaic energy, solar-thermal energy, wind, low-impact hydro, geothermal, biomass, biologically-derived methane gas, coal-mine methane and fuel cells) and 10 percent from Tier II resources (waste coal, distributed generation systems, demand-side management, large-scale hydro, municipal solid waste, wood pulping and manufacturing products, and integrated gasification combined cycle coal technology). States that have an RPS tend to have higher electricity prices because renewable sources of energy are [more expensive](#) than their fossil fuel counterparts. Pennsylvania has the 15<sup>th</sup> highest electricity prices in the nation.

Pennsylvania also requires that utilities meet a portion of their electricity demand with energy efficiency. Act 129, adopted in October, 2008, requires utilities to implement programs to reduce consumer electricity demand. By May 31, 2013, consumption must decrease by [3 percent](#) from levels projected by the Commission for the June 2009-May 2010 period, and peak demand must decrease by 4.5 percent from measured June 2007-May 2008 peak demand levels.

In Pennsylvania, investor-owned utilities must offer [net metering](#) to residential customers that generate electricity with systems up to 50 kilowatts in capacity; nonresidential customers with systems up to three megawatts (MW) in capacity; and customers with systems greater than 3 MW but no more than 5 MW who make their systems available to the grid during emergencies. Systems eligible for net metering include those that generate electricity using photovoltaics , solar-thermal energy, wind energy, hydropower, geothermal energy, biomass energy, fuel cells, combined heat and power , municipal solid waste, waste coal, coal-mine methane, other forms of distributed generation and certain demand-side management technologies.

Pennsylvania requires that all diesel fuel be mixed with [at least two percent biodiesel](#) one year after the in-state production volume of 40,000,000 gallons of biodiesel has been reached and sustained for three months on an annualized basis. Also, to reduce emissions of smog-forming pollutants, the state requires the motorists of the Philadelphia metropolitan areas to use [reformulated motor gasoline blended with ethanol](#) and the Pittsburgh area to also use specially formulated gasoline, 7.8 RVP, a fuel blended to reduce emissions that contribute to ozone formation.

Pennsylvania imposes automobile fuel economy standards similar to California's to regulate greenhouse gas emissions from new vehicles. In 2006, the state's Environmental Quality Board approved the [Clean Vehicles Program](#) to adopt certain of California's vehicle emissions standards.

Pennsylvania requires new [residential and commercial buildings to meet energy efficiency standards](#). Residential and commercial buildings statewide are required to meet the 2009 International Energy Conservation Code; and commercial buildings must also comply with ASHRAE 90.1-2007. These are codes that mandate certain energy efficiency standards.

[Pennsylvania's Executive order 2004-12](#) requires State agencies to purchase energy star appliances when economical and consistent with life-cycle costs.

Pennsylvania does not provide a cap on greenhouse gas emissions as do several states that are members of a regional agreement to limit greenhouse gas emissions. However, Pennsylvania is an [observer of the Regional Greenhouse Gas Initiative](#), an agreement among ten Northeast states to limit greenhouse gas emissions, by 10 percent by 2018 through a cap and trade program. As an observer, Pennsylvania has no obligation to reduce its greenhouse gas emissions. Because there is no commercially available technology to control the release of carbon dioxide emissions, the most prevalent greenhouse gas emission, the cost of containment is particularly high resulting from either limiting the use of fossil fuels or increasing their prices. Carbon dioxide is a natural byproduct of the combustion of carbon-containing fuels, such as coal, natural gas, petroleum, wood, and other organic materials.

## **Conclusion**

Pennsylvania is rich in energy resources, but threats from the federal government to further regulate the coal and refinery industries and to regulate hydraulic fracturing which has helped to more than quadruple Pennsylvania's natural gas production since 2009 threaten the state's economy and unemployment rate, which is currently equal to the national unemployment rate. Coal plants and

mines are being closed in Pennsylvania because of the Obama Administration's "war on coal" and refineries that supply the east coast with petroleum products are being threatened by new environmental rules to the point that the White House had to intervene so that a refinery could continue to operate. For just this refinery, exceptions were made regarding pollution control credits and compliance with federal and state regulations. But, in general, Obama administration regulations and actions regarding fossil fuels are clearly negatively affecting employment and energy output in the state.