Technical Assistance Program

Kentucky Electricity and Natural Gas Price and Consumption Forecasts to 2035

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Introduction

In support of energy planning in the Commonwealth of Kentucky, the Department for Energy Development and Independence (DEDI) has developed reference case projections for electricity and natural gas consumption and retail prices, which have been vetted by the American Council for an Energy Efficient Economy (ACEEE). These projections are based on the current economic outlook as well as state and regional factors, and represent an estimate of the shape of the future energy market in Kentucky. Readers should note that these projections are not intended to *precisely* project future energy consumption or prices in Kentucky for either the short or the long-term, nor are they intended as a projection of any particular utility. Rather, the purpose of this paper is to put forward a conservative forecast out of many possible futures. These projections will be integral for ACEEE in determining the potential long-term benefits that Kentucky could realize through focused and sustained investments in energy efficiency.

It does not appear that market demand and consumption will be the primary drivers of increasing energy prices in the future. Instead, the availability and cost of fuel inputs, such as coal and natural gas, as well as compliance with pending and proposed Environmental Protection Agency (EPA) air, water, and waste regulations will likely have a greater influence over prices. These costs are unfortunately difficult to predict because of uncertainty regarding emerging federal regulation and rulemaking. Ultimately, this is a possible price and demand scenario that could arise given certain factors influenced by federal rules and market forces and to a lesser extent by parties within Kentucky (utilities, Kentucky Public Service Commission, and the Kentucky Legislature).

Projections for Energy Consumption Growth in Kentucky

The first step in developing an energy efficiency potential assessment for Kentucky is to determine a business-as-usual (BAU) projection of energy consumption in the state, disaggregated by economic sector. By establishing market demand projections, ACEEE will be able to estimate the volume of consumption growth that energy efficiency will be able to meet and the subsequent economic benefits that will accrue, while highlighting the degree to which the state will have to rely on supply-side resources to meet the remaining consumption growth. Below, the methodology and projections for a BAU scenario for market demand for electricity and natural gas in the state are presented.

Electricity

For all forecasts in the electrical power sector, DEDI staff utilized the Kentucky Electricity Portfolio Model, a dynamic computer model developed by DEDI, which forecasts electricity prices, demand, price elasticity of demand, emissions, and fuel consumption based on various staff assumptions and changes to the generating portfolio. For the purposes of these BAU forecasts, DEDI staff modeled the following two electricity portfolios separately.

Scenario A assumes that Kentucky's electricity generation portfolio does not change, that no power plants are retired other than those that are required by legally binding agreements (175 MW Shawnee Unit 10), that environmental control systems—including desulfurization equipment—continue to be installed on the existing fleet of coal-fired electricity generators over the next five years, and that new Advanced Super Critical Pulverized (ASCP) coal power plants are constructed to meet growing electricity demand. The resulting 2035 electricity generating portfolio was 94% coal and only 2% natural gas. While DEDI staff recognize that electric utilities are evaluating the retirement of other coal units in Kentucky, no further retirements were included in this scenario, and thus represents an outcome most consistent with Kentucky's 2010 status quo.

Scenario B assumes that Natural Gas Combined Cycle (NGCC) power plants are constructed in Kentucky to meet growing electricity demand, while holding all other assumptions constant. The resulting 2035 electricity portfolio was 73% coal and 23% natural gas. DEDI staff selected this scenario after some public utilities announced plans to meet all of their forecasted growth in demand by building NGCC capacity.[1]

Increasing use of natural gas for electricity generation in Kentucky, and nationally, is driven by federal environmental regulations that, since the Clean Air Act Amendments of 1990, have increasingly penalized sulfur dioxide and nitrogen dioxide emissions. In addition, recent Federal environmental regulations that are scheduled to take effect in the coming years will also further increase the costs of coal-fired electricity generation versus natural gas. When combined with current low natural gas prices and the market uncertainty surrounding future green house gas regulation, some electric utilities view natural gas as an increasingly attractive alternative to coal-fired electricity generation.

Indeed, compared to Scenario A, Kentucky's 2035 forecasted green house gas emissions from electricity generation in Scenario B are effectively reduced by 23 million tons annually, or approximately 15%; and sulfur dioxide emissions are reduced by 29,059 tons annually, or approximately 18%. However, Scenario B simulation results indicate the Commonwealth's 2035 natural gas consumption for electrical power alone would be 150,000 MMCF, or 950%, versus 2010 levels, while total natural gas consumption would increase by 63%. Annual demand for coal until 2035 would remain fairly flat, rising by only 2 million tons, or approximately 5%. For both Scenarios A and B, a simple linear extrapolation of historical natural gas prices was assumed (discussed in further detail on pages 14-15, and illustrated in Figure 7 and Table 5). Neither the extreme volatility of historical natural gas prices nor the optimistic natural gas price projections in the EIA's Annual Energy Outlook 2011 were considered in either of these simulations.

Electricity Consumption

The BAU forecast for electricity consumption (illustrated on page 6 in Figure 1) projects that the growth of total and sector-specific electricity consumption will slow in Kentucky over the next 25 years. This forecast focuses on the annual *rate* of growth in historical consumption, which was then applied to electricity consumption data for 2010. Data for 2008 and prior are from the Energy Information Administration's (EIA) State Energy Data System, whereas data from 2009 and 2010 were derived from surveys of electric utilities (Form EIA-861, 2009 and Form EIA-826, 2010).

DEDI analyzed historical data for Kentucky's annual growth rate of electricity consumption by sector, which indicate that, while market demand (consumption) for electricity continues to rise, the constant annual growth rate (CAGR) of consumption in each sector is declining. In other words, electricity consumption is rising at a decreasing rate. Therefore, a linear extrapolation of consumption data is not appropriate as it would lead to a significant overestimation of future market demand.

Applying these declining trends in growth rates as initial inputs, DEDI staff developed a BAU electricity consumption forecast using the Kentucky Electricity Portfolio Model. The model considered the historical declining growth rates applied to the ten-year average CAGR, as well as consumer sensitivity in each economic sector to predicted increases in electricity prices.

Using the forecast provided by DEDI for the study period 2010-2035, the estimated average annual growth rates in consumption for the residential, commercial, and industrial sectors are 1.2%, 1.1% and 0.1% respectively, with 0.7% average annual growth rate for all sectors. Figure 2 on page 6 illustrates these declining historical growth rates across all sectors as the time frame is narrowed, as well as DEDI's BAU growth forecast. Most notable is the decline in the industrial sector's BAU growth forecast, which is

[1] The 2011 Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company. Kentucky Public Service Commission, Case No. 2011-00140, Volume 1, Section 8. Submitted on April 21, 2011. http://www.psc.ky.gov/PSCSCF/2011%20cases/2011-00140/20110421_LG%26E-KU_IRP_Volume%20I.pdf

attributable to the sector's response to increases in price. As the price of electricity increases, the quantity of electricity demanded by the industrial sector decreases, holding everything else constant. The residential and commercial sectors' responses to price are less dramatic. In both Scenarios A and B, forecasted electricity consumption in Kentucky was comparably suppressed by forecasted increases in electricity prices caused by impending federal environmental regulations. As a result, there is no significant difference in the electricity consumption forecasts generated from the two scenarios (illustrated as a single forecast on page 6 in figures 1 and 2).

Figure 1. Kentucky Electricity Consumption by Sector, 1960-2035

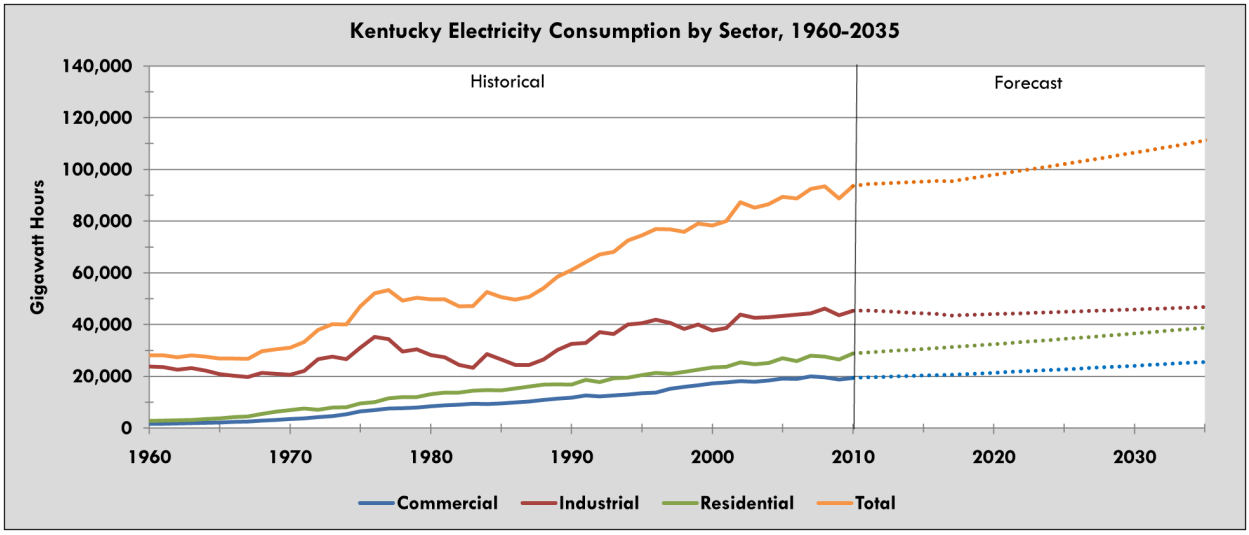
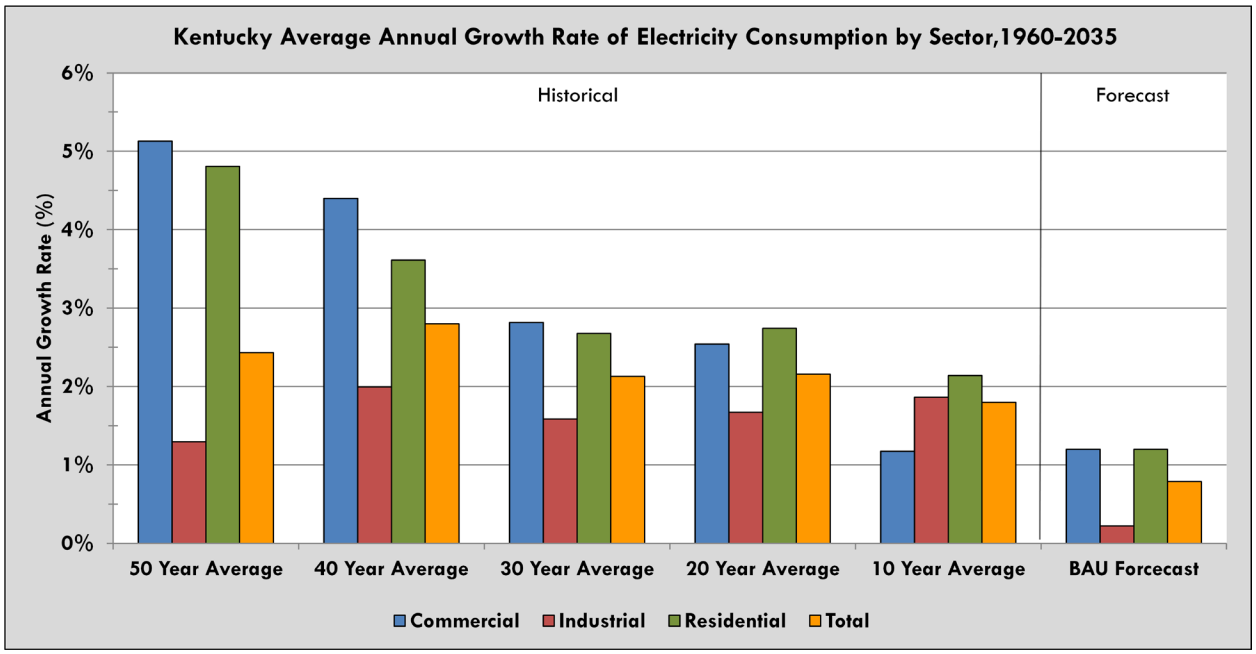


Table 1. Kentucky Average Annual Growth Rate of Electricity Consumption by Sector, 1960-2035

Sector	50-Year Average 1960-2010	40–Year Average 1970-2010	30-Year Average 1980-2010	20-Year Average 1990-2010	10-Year Average 2000-2010	BAU Forecast 2010-2035
Total	2.4%	2.8%	2.1%	2.2%	1.8%	0.7%
Commercial	5.1%	4.4%	2.8%	2.5%	1.2%	1.1%
Industrial	1.3%	2.0%	1.6%	1.7%	1.9%	0.1%
Residential	4.8%	3.6%	2.7%	2.7%	2.1%	1.2%

Figure 2. Kentucky Average Annual Growth Rate of Electricity Consumption by Sector, 1960-2035



Natural Gas

The BAU forecast for natural gas was also produced by DEDI staff. Since historical natural gas consumption trends are unique to each economic sector, a specific forecast was developed for each sector (illustrated on page 8 in Figures 3.a and 3.b.). For the electrical power sector in both scenarios, DEDI staff used the estimated fuel requirements from the Kentucky Electricity Portfolio Model, which were comparable to various forecasts developed by electric utilities in Kentucky. For all other economic sectors, DEDI staff used linear extrapolations of historical consumption trends, as well as qualitative input from natural gas experts at the Kentucky Geological Survey. While future natural gas consumption will ultimately be determined by the price competiveness of natural gas versus viable alternatives, these scenarios offer two possible consumption futures, as well as demonstrate the prodigious amount of natural gas required for Kentucky to meet future electricity demand growth with NGCC required under Scenario B.

For the residential and commercial sectors, DEDI staff extrapolated the 25-year effective constant annual growth rate, which for the commercial sector essentially led to an estimate of a flat-lining future growth. For the residential sector, DEDI staff assumes a declining trend in consumption growth, albeit at a slower rate over time, eventually resulting in flat-lining this sector. The EIA does not provide state level forecasts for residential and commercial sector natural gas consumption. National and regional forecasts are available but may not be the best resource for evaluating demand in a specific state.

For the industrial sector, the trend from 2004 to 2008 show a clear decline in industrial use, while the 10-, 20-, and 30-year CAGRs show positive growth. DEDI estimated a slowing growth rate, ultimately flat-lining future industrial consumption. This trend is generally consistent with various EIA forecasts for the industrial sector.

The growth rates in natural gas consumption for electric power generation over the past 20 years (illustrated in Figure 4 on page 9) historically are higher than in the other sectors, with an average growth rate of 22% between 1990 and 2010. Electric utilities have increased natural gas consumption not only in response to increased electricity consumption, but also due to the relative mitigation of pollutants from natural gas versus coal-fired electricity generation, as well as increased flexibility of natural gas generation which allows generators to more quickly respond to peak demands.

In Scenario A (illustrated on page 8 in Figure 3.a), total natural gas consumption remained relatively flat, a result of historically consistent increases in usage in the electrical power sector coupled with extrapolations of historical declines in residential and transportation consumption. All growth in baseload electricity generation was met by constructing new APSC power plants; thus, there was little impact on natural gas consumption. The resulting 2035 electricity generating portfolio was 94% coal and only 2% natural gas. In 2035, natural gas consumption in all sectors was estimated to be approximately 253,000 MMCF. Kentucky's 2035 annual coal consumption for electricity generation in Scenario A is forecast to be 62 million tons, an increase of 17 million tons annually from 2010 levels, or approximately 37%.

In Scenario B (illustrated on page 8 in Figure 3.b), total natural gas consumption increases significantly after 2015, as the model constructs NGCC power plants to meet future growth in electricity consumption. The resulting 2035 electricity generating portfolio was 73% coal and 23% natural gas. In 2035, Kentucky natural gas consumption in all sectors is estimated to be approximately 379,000 MMCF. Simulation results indicate the Commonwealth's 2035 natural gas consumption for electrical power alone would be 150,000 MMCF, or 950%, versus 2010 levels. Total Kentucky natural gas consumption in all sectors would increase by 63%. This volume of natural gas is equivalent to approximately 8% of the pipeline capacity moving through Kentucky and 230% of what Kentucky produced in 2008. Total 2035 annual demand for coal would remain fairly flat, rising by only 2 million tons, or approximately 5% versus 2010.

Figure 3.a. Kentucky Natural Gas Consumption by Sector, 1960-2035, Scenario A

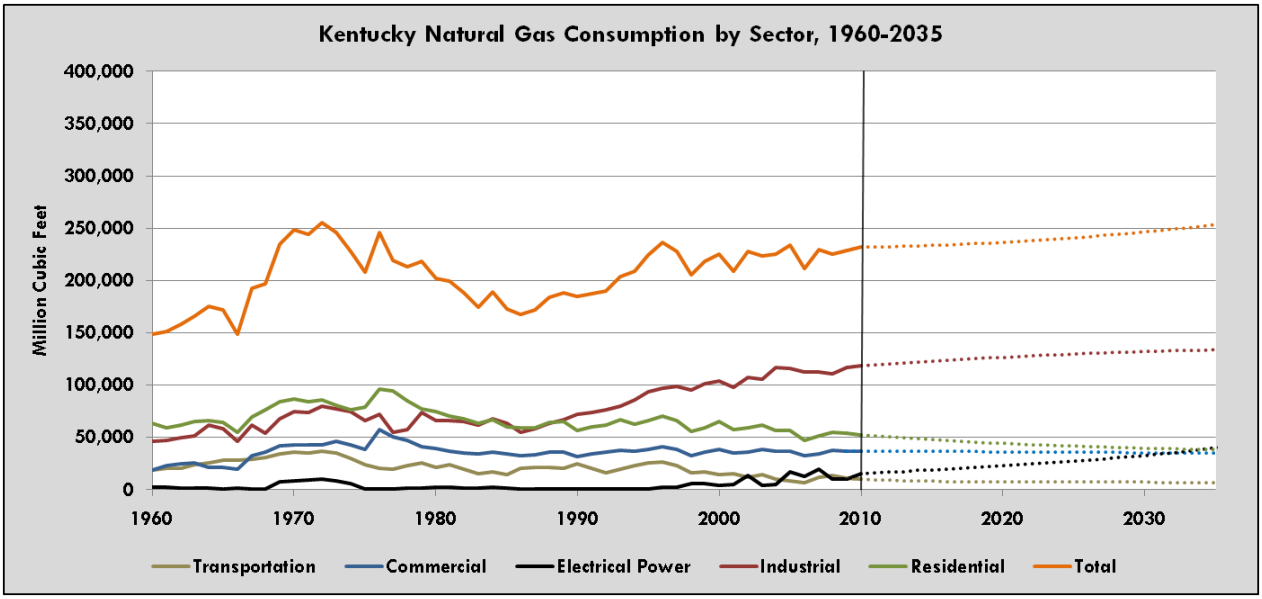
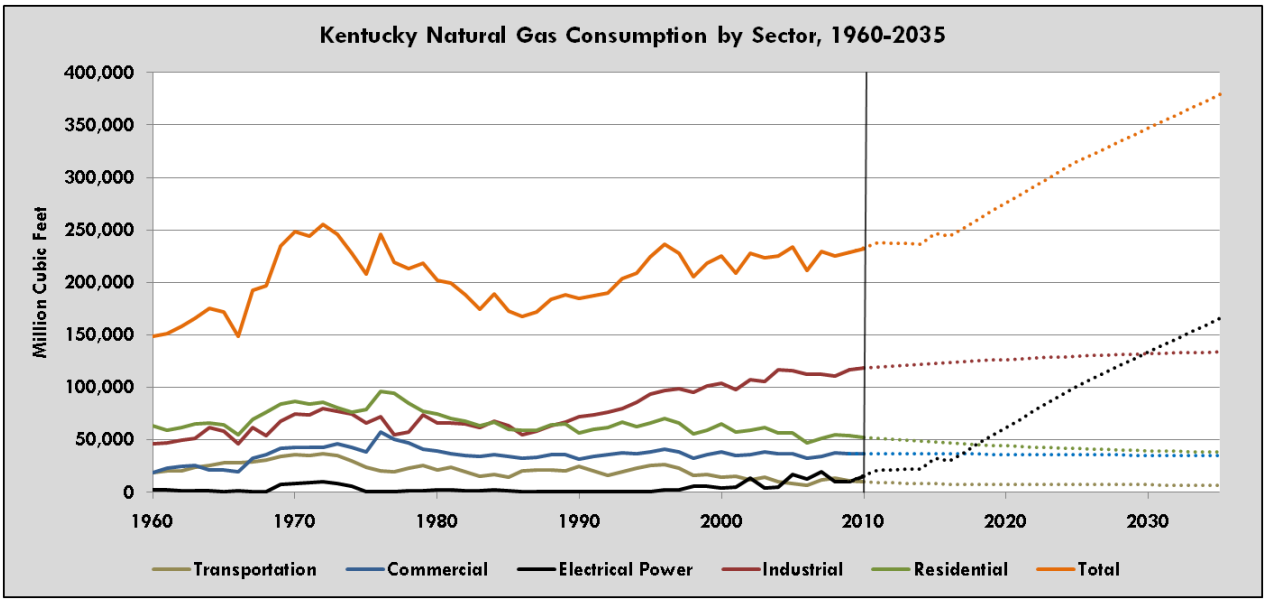


Figure 3.b. Kentucky Natural Gas Consumption by Sector, 1960-2035, Scenario B

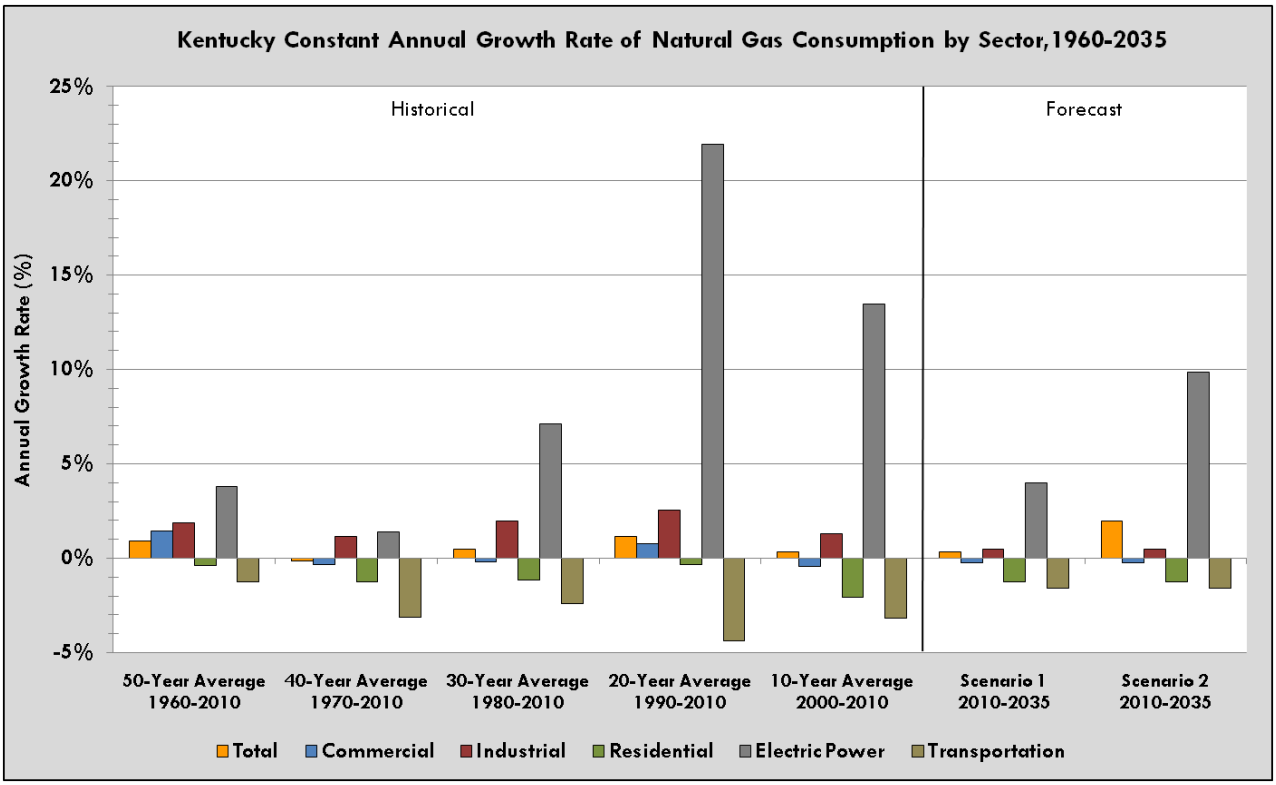


Using these forecasts provided by DEDI, for the study period 2010-2035, the estimated constant annual growth rate of total natural gas consumption is 0.34% and 1.96% for all sectors in Scenario A and B respectively (illustrated in Table 2 and Figure 4). For the electrical power sector, constant annual growth rates are estimated to be 4% under Scenario A, and 10% under Scenario B. The constant annual growth rates for the commercial, industrial, residential and transportation sectors are forecast to be -0.3%, 0.5%, -1.3%, and -1.6% in both scenarios respectively.

Table 2. Kentucky Growth Rate of Natural Gas Consumption by Sector, 1960-2035

Sector	50-Year Average 1960-2010	40-Year Average 1970-2010	30-Year Average 1980-2010	20-Year Average 1990-2010	10-Year Average 2000-2010	Scenario A Forecast 2010-2035	Scenario B Forecast 2010-2035
Total	0.90%	-0.16%	0.46%	1.17%	0.32%	0.34%	1.96%
Commercial	1.42%	-0.35%	-0.21%	0.75%	-0.45%	-0.25%	-0.25%
Industrial	1.90%	1.15%	1.96%	2.53%	1.30%	0.50%	0.50%
Residential	-0.36%	-1.24%	-1.15%	-0.33%	-2.06%	-1.26%	-1.26%
Electric Power	3.82%	1.40%	7.10%	21.92%	13.48%	4.01%	9.86%
Transportation	-1.26%	-3.12%	-2.41%	-4.38%	-3.18%	-1.57%	-1.57%

Figure 4. Kentucky Annual Growth Rate of Natural Gas Consumption by Sector, 1960-2035



Energy Price Projections for Kentucky

Electricity

In 2010, Kentucky maintained the fourth-lowest overall electricity price in the United States (Form EIA-826, 2010). Kentucky's abundant supply of coal has historically guaranteed the Commonwealth low and stable electricity prices. In fact, over 80% of the subtle variation in Kentucky's historical electricity prices can be attributed to fluctuation in coal prices. Nominal electricity prices in Kentucky have increased since 1970 for most sectors at about 2% annually, which is less than the rate of inflation. When adjusted for inflation, real electricity prices actually fell in Kentucky from 1980 to 2003, and have risen over the past decade with increases in the price of all fossil fuels.

Electricity prices in Kentucky are projected to increase over the long-term, as is the case elsewhere in the nation. However, many factors have the potential to change the rate of these impending price increases, including fossil fuel prices, new federal environmental regulations, economic growth, as well as changes in energy consumption resulting from energy efficiency.

The following electricity price forecasts were developed by DEDI staff using the Kentucky Electricity Portfolio Model.

In Scenario A, as already noted on page 3, DEDI staff have assumed that the prices of all fossil fuels remain low and stable, that Kentucky continues to depend upon coal for over 92% of electricity generation, that there are no major retirements in Kentucky's coal generation fleet beyond those required in legally binding agreements (175 MW Shawnee Unit 10), that new advanced coal-fired power plants are constructed to meet growing electricity demand, and that environmental control systems, to include desulfurization equipment, are installed on all coal units by 2017. Under Scenario A, DEDI expects total average real prices to reach $0.09 per kWh by 2035, with real residential prices approaching $0.12 per kWh (illustrated in Table 3.a on page 12 and Figure 5.a. on page 11). Given the age of the power generating facilities in Kentucky, as well as the impending federal environmental rules and their impact on coal-fired facilities, the forecasted constant annual growth rate in real prices until 2030 of 1.4% (illustrated in Table 4.a on page 12 and Figure 6.a on page 13) is notably conservative.

In Scenario B, which assumes that Natural Gas Combined Cycle (NGCC) power plants are constructed to meet growing electricity demand and holds all other staff assumptions constant as listed in Scenario A, DEDI expects total average real prices to reach $0.10 per kWh by 2035, with real residential prices approaching $0.13 per kWh (illustrated in Table 3.a on page 12 and Figure 5.b. on page 11). For both Scenarios A and B, a simple linear extrapolation of historical natural gas prices was assumed (illustrated on page 15 in Figure 7 and Table 5). The extreme volatility of historical natural gas prices was not considered in this scenario; therefore, electricity prices in a state dependent upon natural gas could be higher and more variable.

Figure 5.a. Kentucky Real Electricity Prices (2010 US$) by Sector, 1970-2035, Scenario A

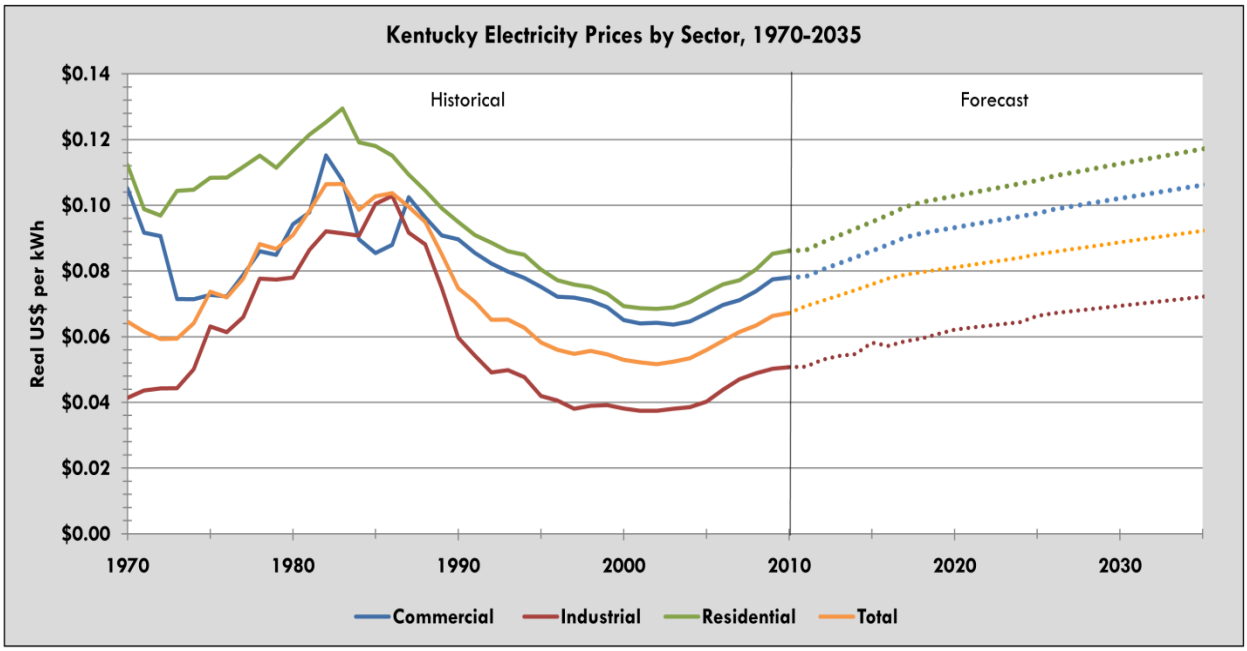


Figure 5.b. Kentucky Real Electricity Prices (2010 US$) by Sector, 1970-2035, Scenario B

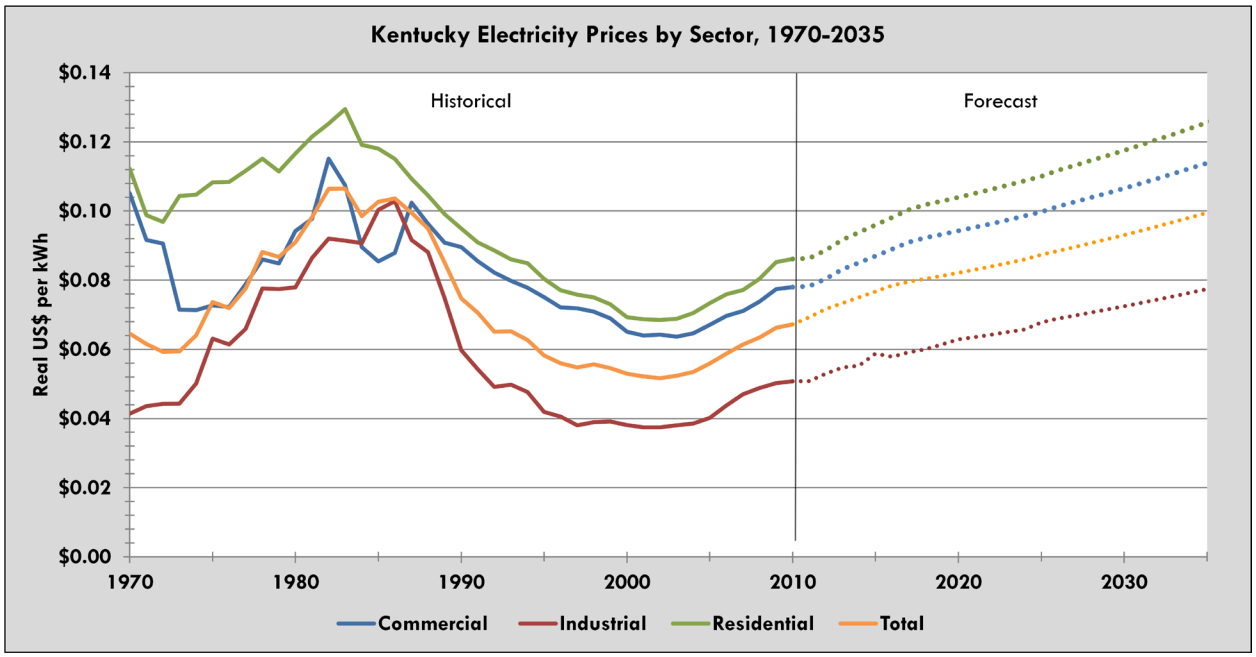


Table 3.a. Kentucky Real Electricity Prices by Sector (2010 US$ per kWh) 2010-2035, Scenario A

Sector	2010	2015	2020	2025	2030	2035
Total	$0.067	$0.076	$0.081	$0.085	$0.089	$0.092
Commercial	$0.078	$0.087	$0.095	$0.099	$0.104	$0.109
Industrial	$0.051	$0.059	$0.063	$0.067	$0.070	$0.072
Residential	$0.086	$0.095	$0.103	$0.108	$0.113	$0.117

Table 3.b. Kentucky Real Electricity Prices by Sector (2010 US$ per kWh) 2010-2035, Scenario B

Sector	2010	2015	2020	2025	2030	2035
Total	$0.067	$0.077	$0.082	$0.087	$0.093	$0.010
Commercial	$0.078	$0.087	$0.094	$0.010	$0.107	$0.114
Industrial	$0.051	$0.059	$0.063	$0.068	$0.073	$0.078
Residential	$0.086	$0.096	$0.104	$0.110	$0.118	$0.126

Table 4.a. Kentucky Annual Growth Rate of Real Electricity Prices, 1970-2030, Scenario A

Sector	40-Year Average 1970-2010	30-Year Average 1980-2010	20-Year Average 1990-2010	10-Year Average 2000-2010	Scenario A Forecast 2010-2020	Scenario A Forecast 2010-2030
Total	0.10%	-1.01%	-0.53%	2.42%	1.89%	1.38%
Commercial	-0.74%	-0.63%	-0.69%	1.83%	1.79%	1.34%
Industrial	0.51%	-1.43%	-0.81%	2.90%	2.05%	1.57%
Residential	-0.66%	-1.01%	-0.49%	2.20%	1.79%	1.34%

Table 4.b. Kentucky Annual Growth Rate of Real Electricity Prices, 1970-2030, Scenario B

Sector	40-Year Average 1970-2010	30-Year Average 1980-2010	20-Year Average 1990-2010	10-Year Average 2000-2010	Scenario B Forecast 2010-2020	Scenario B Forecast 2010-2030
Total	0.10%	-1.01%	-0.53%	2.42%	2.02%	1.64%
Commercial	-0.74%	-0.63%	-0.69%	1.83%	1.91%	1.57%
Industrial	0.51%	-1.43%	-0.81%	2.90%	2.17%	1.80%
Residential	-0.66%	-1.01%	-0.49%	2.20%	1.90%	1.57%

Figure 6.a. Kentucky Growth Rate of Real Electricity Prices (2010 US$), 1970-2030, Scenario A

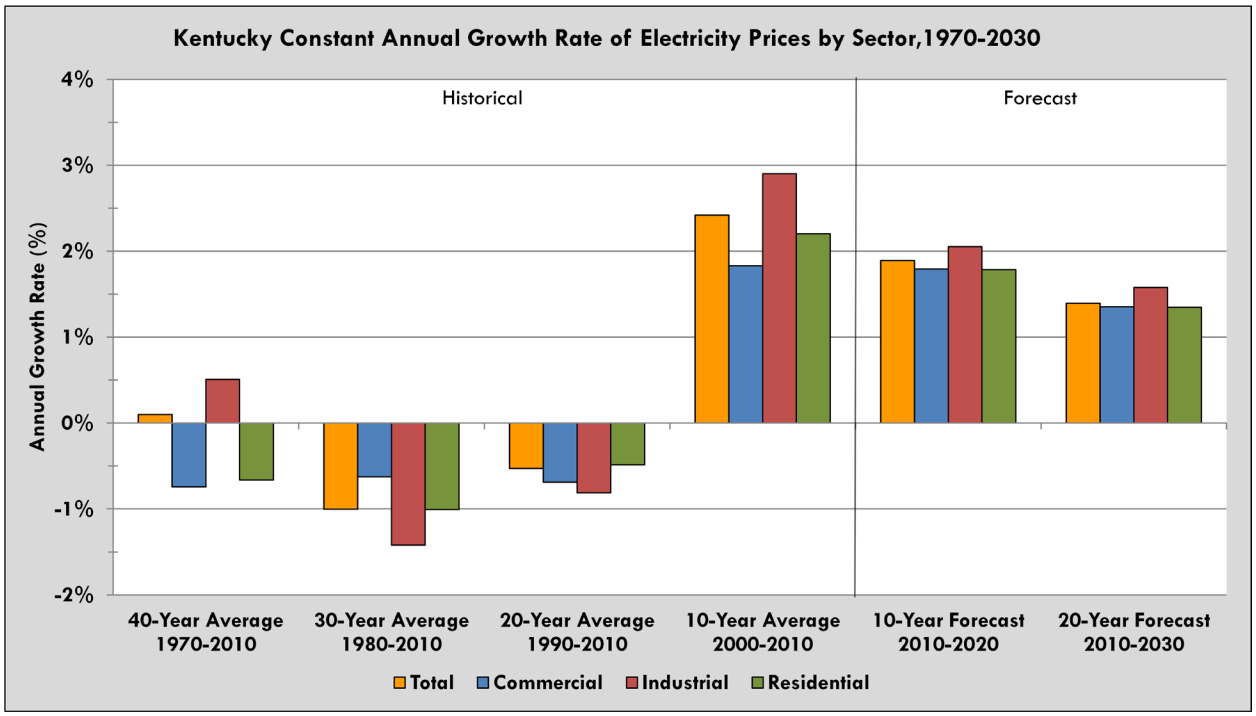
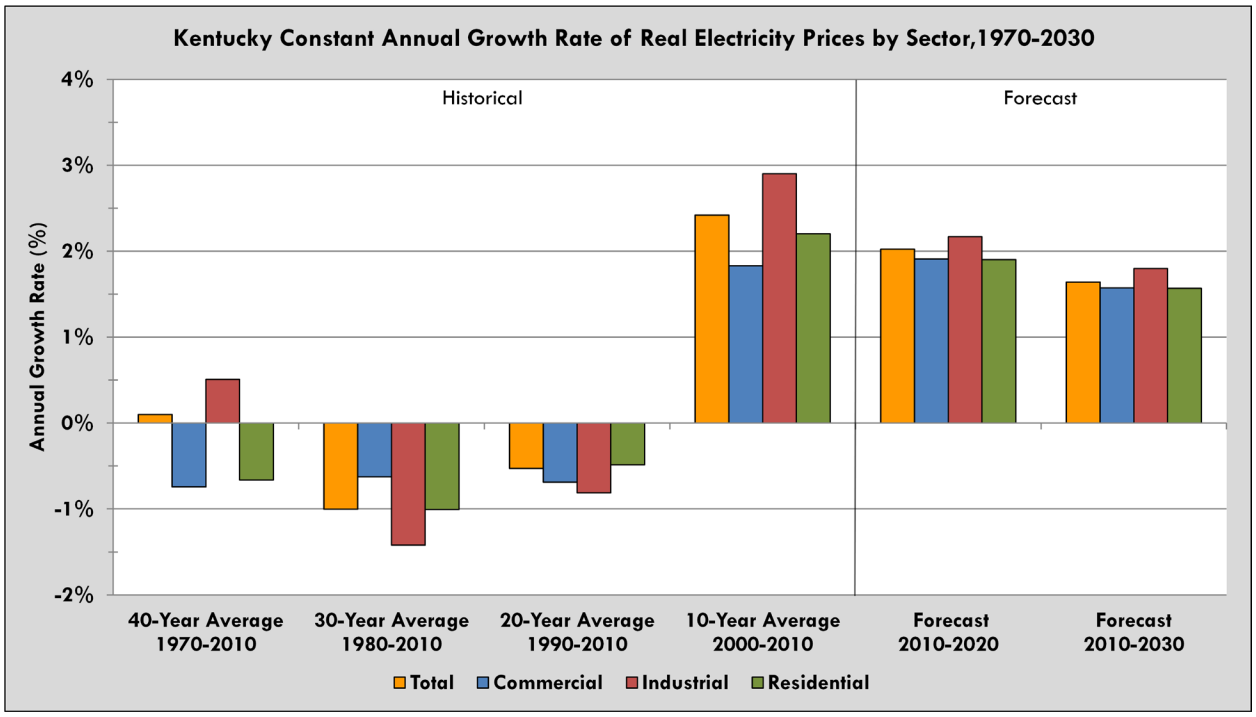


Figure 6.b. Kentucky Growth Rate of Real Electricity Prices (2010 US$), 1970-2030, Scenario B



Natural Gas

According to the EIA's *Natural Gas Annual*, in 2008, Kentucky's natural gas prices were average relative to the rest of the U.S., with the exception of its natural gas price for the industrial sector, which was the thirteenth (13th) lowest in the country (EIA 2010).

Situational Assessment

In contrast to electricity, the natural gas wholesale marketplace is a fully deregulated national market with significant short-term variations in price occurring due to changes in market conditions. As a result, great uncertainty exists in any projection of natural gas prices. The past 15 years have been subject to increasing price volatility, driven by a relatively tight balance between supply and demand as well as changes in annual consumption patterns due to greater use of natural gas for power generation. While the emergence of new, "non-conventional" natural gas resources, particularly shale gas, offer some promise of higher supply and lower volatility in the future, significant uncertainty remains in this market. These uncertainties are made evident, in part, by the fact that the most recent EIA forecasts for the region are very optimistic and depart from past price trends in the natural gas market. Among the factors that might affect gas production, volumes and prices are:

- *Actual long-run cost of production of shale gas*. Recent assessments suggest that the percentage of reserves that are recoverable may continue to rise as directional drilling and hydro-fracturing ("fracking") mature. This may decrease the cost of production and, therefore, decrease natural gas prices.
- *Regulations of non-conventional gas production*. Concerns are emerging about the environmental impacts of non-conventional production with respect to drilling, the hydraulic fracking process, the management of the large volumes of potentially hazardous fracking fluids on production sites and possible contamination of groundwater resources. These concerns may lead to more stringent regulation of the exploration and production activities that may result in restrictions of production and higher cost of compliance, putting upward pressure on well head prices.
- *Increased market demand for natural gas*. In an environment of high oil prices and relatively high coal prices, Kentucky could experience significant increases in market demand for natural gas for new applications such as electric power generation and transportation fuels. A dramatic increase in gas consumption would likely create upward pressures on natural gas prices, as has been seen in the past.
- *Globalization of North American natural gas markets*. Currently, the North American gas marketplace is largely decoupled from global gas markets due to infrastructure and policy reasons. This has created a situation where North American prices are far below world prices. Some market players are now exploring the creation of an export capacity in the form of liquefied natural gas (LNG) to exploit this price difference. The emergence of significant capacity would create upward pressures on gas prices, as has been seen with globalization of other fuel markets, as has been the case with coal over the past five years.

The factors described above could result in actual prices that are significantly higher or lower than the projections. The history of accurately projecting natural gas price has not been positive.

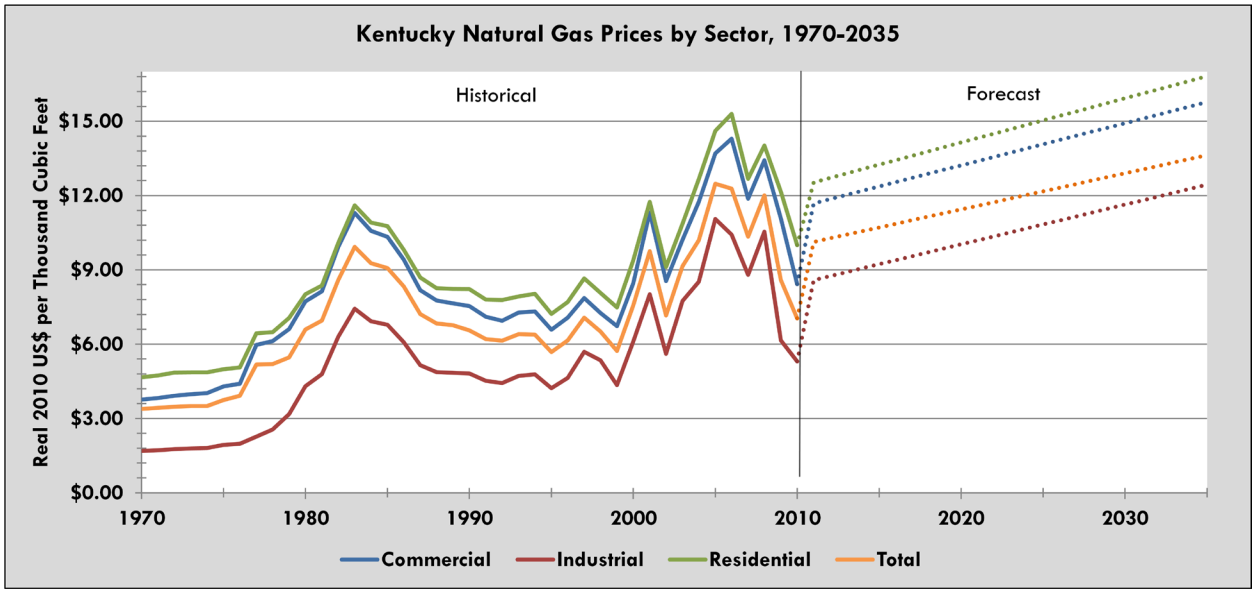
Methodology & Projections

This baseline natural gas price forecast was developed by DEDI staff and compared with various external forecasts. In an effort to produce conservative and historically consistent price estimates, DEDI staff have used a simple linear extrapolation of historical natural gas prices in Kentucky by economic sector. DEDI has elected to deviate from Federal natural gas price forecasts, namely the EIA's *Annual Energy Outlook 2011* for the ECARC, because such historically inconsistent estimates could lead to underestimation of the vulnerability of the Commonwealth to natural gas price volatility. Staff have also not attempted to account for the probability of natural gas price increases due to increased demand for natural gas for the generation of electrical power. Table 5 and Figure 7 on page 15 present the DEDI reference price projections.

Table 5. Retail Natural Gas Price Forecast for Kentucky (Real 2010 US$ per MMBtu)

Sector	2010	2015	2020	2025	2030	2035
Total	$7.05	$10.71	$11.44	$12.17	$12.90	$13.63
Commercial	$8.42	$12.37	$13.22	$14.07	$14.92	$15.77
Industrial	$5.30	$9.23	$10.03	$10.83	$11.64	$12.44
Residential	$10.00	$13.25	$14.14	$15.04	$15.93	$16.82

Figure 7. Real Retail Natural Gas Price Forecast for Kentucky, 1970-2035



Discussion

Our projections represent one of many possible scenarios that Kentucky could face with regard to future energy consumption and retail prices. DEDI and ACEEE project that energy prices will continue to rise regardless of demand- and supply-side investments, but the magnitude of the rate of increase is predicated by a number of factors, such as federal air, land, and water quality regulations and their impact on the energy industry.

This section briefly discusses these upcoming federal regulations, which will contribute to rising electricity rates throughout the country. In states like Kentucky, where over 92% of electricity is generated by coal-fired facilities, regulatory impacts will be exacerbated relative to the rest of the country. Unfortunately, there is much uncertainty regarding the degree to which rates will increase due to regulatory impacts. This uncertainty arises because it is difficult to estimate the compliance costs associated with meeting the recent and upcoming regulations, especially due to the intermittent introduction of new regulations and rulemaking over the next 5 years and the variety of compliance deadlines.

U.S. Environmental Protection Agency Air and Water Quality Regulations

A number of new or pending environmental federal regulations could potentially impact the economic viability of existing and future electric power generation facilities in the state, briefly discussed below.

National Ambient Air Quality Standards (NAAQS): The Clean Air Act, last amended in 1990, requires the U.S Environmental Protection Agency (EPA) to set NAAQS for several pollutants from diverse sources considered to be harmful to public health and the environment. The EPA has set NAAQS for six principal pollutants: carbon monoxide (CO); lead (Pb); nitrogen dioxide (NO_2); ozone (O_3); particulate matter (PM); and sulfur dioxide (SO_2). Revised standards for all but carbon monoxide could push some cities in Kentucky past the maximum limit and into "non-attainment." Compliance with the new standards began in 2010 with sulfur dioxide and will be phased-in through 2016.

Cross-State Air Pollution Rule (CSAPR) On July 6, 2011, the US Environmental Protection Agency (EPA) finalized the CSAPR that requires 27 states to significantly improve air quality by reducing power plant emissions that contribute to ozone and/or fine particle pollution in other states. This rule replaces EPA's 2005 Clean Air Interstate Rule (CAIR). A December 2008 court decision kept the requirements of CAIR in place temporarily but directed EPA to issue a new rule to implement Clean Air Act requirements concerning the transport of air pollution across state boundaries. Kentucky is controlled for both fine particles (annual SO2 and NOx) and ozone (ozone season NOx). The Kentucky state allowable emissions requires a 398,056 ton reduction in annual SO2, a 91,013 ton reduction in annual NOx, and a 5,257 ton reduction in ozone season NOx emissions from 2005 levels by 2014. On a percentage basis these 2014 allocations will reduce Kentucky's annual SO2 by 80 percent, annual NOx by 55%, and ozone season NOx emissions by 14 percent from 2005 levels.[2]

Maximum Achievable Control Technology (MACT): In July 2010, the EPA published new rules regarding maximum achievable control technology for boilers and incinerators, though it mainly affects coal-fired plants. The target of the new rules is to limit a wide range of toxic emissions and mercury. Not all sources are subject to the same set of MACTs. For example, coal-fired boilers face limits on mercury, particulate matter, and carbon monoxide, while incinerators would face stricter emissions limits for mercury, lead, particulate matter, and several other harmful emissions. The projected final MACT rule is due November 2011, with compliance beginning January 2015.

Best Available Control Technology (BACT): BACT is an emission limitation that is based on the maximum degree of control that can be achieved for a particular process or facility, based upon case-by-case cost-benefits analyses of individual projects/upgrades. BACT can be add-on control equipment or modification of the production process or method. BACT may be a design, piece of equipment, work practice, or operational standard if the implementation of an emissions standard is not feasible. The rules for BACT were amended to include carbon dioxide (CO_2) in May 2010, with compliance beginning January 2011.

Water Quality: The EPA is also revising cooling water withdrawal and water discharge guidelines and standards for cooling systems of certain thermal power plants that use "once-through" cooling systems. The new rule for water withdrawal was issued in December 2010, while the new rule for water discharge will be issued sometime in 2012. The effective date for compliance with these rules is uncertain.

Solid Waste Disposal: In June 2010, the EPA proposed a new rule targeting coal combustion residuals (CCR), also known as coal ash, that are considered exempt wastes under an amendment to the Resource Conservation and Recovery Act. The proposed rule would regulate coal ash for the first time in order to address the risks from the disposal of wastes generated by electric utilities and independent power producers. A final rule is expected sometime in 2011.

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[2] United States Environmental Protection Agency, Cross-State Air Pollution Rule. Retrieved, July 11, 2011. http://www.epa.gov/airtransport/whereyoulive.html

Potential Impact

The impact of these federal environmental rules on Kentucky is difficult to estimate. However, recent environmental cost recovery plans and certificates of public convenience and necessity filings with the Kentucky Public Service Commission by Louisville Gas and Electric Co. (LG&E) and Kentucky Utilities Co. (KU) offer some perspective on the impact. According to their filings and press releases, the total price impact from these EPA air regulations on LG&E customers could be as much as 24 percent, while the impact on KU customers could be as much as 14 percent.[3] Other utilities have stated similar expectations. The full impact of these emerging EPA regulations has not been factored into the forecasts presented in this analysis, indicating that our estimates truly represent a very conservative assessment of future electricity prices for the state.

Conclusion

Energy consumption in Kentucky is forecast to grow at a fairly modest rate over the next few decades. In both of the scenarios modeled by DEDI, it does not appear market demand and consumption will be the primary drivers of increasing energy prices in the future. Instead, the availability and cost of fuel inputs, such as coal and natural gas, and compliance with pending EPA air, water, and waste regulations will likely have a greater influence over prices. Unfortunately, these costs are uncertain and difficult to predict—a challenge that is exacerbated by emerging federal regulation and rulemaking and Kentucky's vulnerability to them because of heavy reliance on coal to generate electricity. These are two possible price scenarios that could emerge given certain factors influenced by federal rules and market forces and, to a lesser extent, by parties within Kentucky (utilities, Kentucky Public Service Commission, and Kentucky State Legislature). While Scenario A and Scenario B have similar impacts on electricity consumption and prices, the Commonwealth's generating portfolio and fuel consumption change significantly from the status quo under Scenario B, changing from a 94% coal portfolio to only 73%, and 2% natural gas to 23%.

What is certain is that investment in energy efficiency can mitigate the impact of rising electricity prices. Electricity expenditure in Kentucky is a function of both the price of electricity and the amount that is consumed. Consumers facing rising electricity prices can improve the efficiency of their homes and businesses, thereby maintaining or reducing their electricity costs despite increasing prices. Further, if utilities retire coal-fired electric generating units in response to stricter environmental rules, as they have indicated they may, efficiency can be used to replace some of the lost capacity in place of building new generation.

Energy efficiency is the least expensive, fastest, cleanest, and most reliable energy resource that can be deployed to meet future energy needs, achieve regulatory compliance, and curtail impending price growth. Considering the vast uncertainty faced by Kentucky's energy industry in the coming years, it behooves the state to explore this underutilized resource as a means of providing greater energy security and economic opportunity.

[3] Louisville Gas & Electric and Kentucky Utilities Press Release, May, 25, 2011. http://www.lge-ku.com/newsroom/archive2011/news_052511.asp