GAO Highlights

Highlights of GAO-15-524, a report to congressional requesters

May 2015

ELECTRICITY

Generation Mix Has Shifted, and Growth in Consumption Has Slowed, Affecting System Operations and Prices

Why GAO Did This Study

Electricity in the United States has traditionally been generated largely from coal, natural gas, nuclear, and hydropower energy sources. More recently, various federal and state policies, tax incentives, and research and development efforts have supported the use of renewable energy sources such as wind, solar, and geothermal. In addition, consumption of electricity has been affected by federal efforts to improve energy efficiency, changes in the economy, and other factors.

GAO was asked to provide information on changes in the electricity industry. This report examines what is known about (1) how electricity generation and consumption have changed since 2001 and (2) the implications of these changes on efforts to maintain reliability, and on electricity prices.

GAO analyzed data on electricity generation, consumption, and prices and reviewed literature. GAO also interviewed 21 stakeholders, including government officials, and industry representatives, selected to represent different perspectives and experiences regarding changes in the industry.

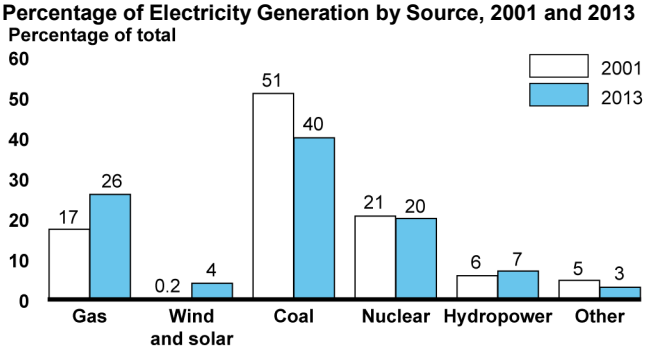
GAO is not making recommendations in this report. The Department of Energy and Federal Energy Regulatory Commission reviewed a draft of this report and provided technical comments that GAO incorporated as appropriate.

View GAO-15-524. For more information, contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov.

What GAO Found

The mix of energy sources for electricity generation has changed, and the growth in electricity consumption has slowed. As shown in the figure below, from 2001 through 2013, natural gas, wind, and solar became larger portions of the nation's electricity generation, and the share of coal has declined. These changes have varied by region. For example, the majority of wind and solar electricity generation is concentrated in a few states—in 2013, California and Arizona accounted for over half of electricity generated at solar power plants. Regarding consumption, national retail sales of electricity grew by over 1 percent per year from 2001 through 2007 and remained largely flat from that time through 2014.

Percentage of Electricity Generation by Source, 2001 and 2013



Source: GAO analysis of SNL Financial data. | GAO-15-524

Note: Other includes biomass, geothermal, oil, and other nonrenewable sources. Numbers may not sum to 100 because of rounding.

The literature GAO reviewed and stakeholders GAO interviewed identified the following implications of these changes:

- **Maintaining Reliability**: System operators, such as utility companies, have taken additional actions to reliably provide electricity to consumers. For example, some regions have experienced challenges in maintaining the delivery of natural gas supplies to power plants. In particular, severe cold weather in the central and eastern U.S. in 2014 led to higher than normal demand for gas for home heating and to generate electricity. Challenges delivering fuel to natural-gas-fueled power plants resulted in outages at some plants. System operators took various steps to limit the effect of this event, including relying on power plants that utilize other fuel sources that were more readily available at the time, such as coal and oil-fueled power plants, and implementing certain emergency procedures.
- **Prices**: Increased gas-fueled generation has influenced electricity prices, with wholesale electricity prices and gas prices generally fluctuating in tandem over the past decade. The effect of the increased use of wind and solar sources on consumer electricity prices depends on specific circumstances. Among other things, it depends on the relative cost of wind and solar compared with other sources, as well as the amount of federal and state financial support for wind and solar development that can offset some of the amount that consumers might otherwise pay. Taken together, the addition of wind and solar sources could have contributed to higher or lower consumer electricity prices at different times and in different regions.