

**U.S. HOUSE OF REPRESENTATIVES  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
SUBCOMMITTEE ON ENERGY**

**HEARING CHARTER**

*American Energy Outlook: Technology, Market and Policy Drivers*

Wednesday, February 13, 2013  
10:00 a.m. - 12:00 p.m.  
2318 Rayburn House Office Building

**PURPOSE**

On Wednesday, February 13, at 10:00 a.m. in Room 2318 of the Rayburn House Office Building, the Subcommittee on Energy will hold a hearing titled, *American Energy Outlook: Technology, Market and Policy Drivers*. The Subcommittee will receive testimony regarding the current state of the U.S. energy markets, projected trends, and the impact of technology development on the U.S energy sector. The hearing will examine the impact of technology and policy on energy markets.

**WITNESS LIST**

- **The Honorable Adam Sieminski**, Administrator, Energy Information Administration (EIA), U.S. Department of Energy
- **Mr. Robert McNally**, President, The Rapidan Group
- **Ms. Lisa Jacobson**, President, Business Council for Sustainable Energy

**BACKGROUND**

Over the last decade, the United States' energy profile has undergone a profound shift, partly attributable to both increased domestic energy production and more efficient energy use. Specifically, technological advances in oil and natural gas production methods have made recovery of previously inaccessible resources, such as those in shale formations, economically recoverable. The associated increased production resulted in what some have termed a "New Energy Reality"<sup>1</sup> as the U.S. energy paradigm has shifted from declining oil and gas production and dependence on imports to surging production and abundant American domestic resources. These changes impact energy markets broadly, and are reflected in current and projected domestic production and consumption trends in the electricity and transportation sectors.

America's resurgence as a leading global oil and gas producer can be credited in part to the development of specific enabling technologies, particularly the combination of horizontal drilling and hydraulic fracturing. The United States currently ranks second and third in global

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<sup>1</sup> Yergin, Daniel, The New York Times, *America's New Energy Reality*, June 9, 2012. Accessible at: <http://www.nytimes.com/2012/06/10/opinion/sunday/the-new-politics-of-energy.html>

natural gas and oil production, respectively.<sup>2</sup> The International Energy Agency (IEA) predicts the U.S. will overtake Saudi Arabia to become the world's largest oil producer by 2020 and Russia to become the world's largest natural gas producer by 2015.<sup>3</sup> Increased production, coupled with reduced domestic consumption, has led to a sharp decrease in energy imports. In 2012, imports accounted for 41 percent of total domestic oil consumption, down from 60 percent in 2005.<sup>4</sup> Domestic natural gas production is also projected to increase substantially, due largely to an anticipated increase in shale gas production of nearly 200 percent from 2011 to 2035. See Figure 1 below.

### *Electric Sector Trends*

In 2011, the United States consumed 3,856 billion Kilowatt-hours of electricity. Coal, natural gas and nuclear energy generate 86 percent of total electricity. See Figure 2 for how much each energy source contributes to the total electricity generated. Renewable sources of electricity account for 13 percent of total electricity generation, the majority of which is attributable to hydropower.

The impact of increased production from shale formations on America's energy outlook is striking. In the Annual Energy Outlook (AEO) for 2007, the EIA predicted that high natural gas prices would be responsible for declining use of natural gas for electricity generation by 2020, and thereafter be displaced by new coal-fired generating capacity.<sup>5</sup> The 2007 AEO also forecast that high natural gas prices would result in significant increases in liquefied natural gas (LNG) import capacity. By contrast, the 2013 AEO early release contemplates various LNG export scenarios, and projects U.S. natural gas prices will remain below \$4 per million British Thermal Units (BTUs) through 2018.<sup>6</sup>

The EIA recognizes that increased production of natural gas will shape electricity markets in the long-term. According to the 2013 AEO Early Release report, natural gas is projected to account for 30 percent of total generation in 2040, up from 24 percent in 2010. Though coal remains the largest source for electricity generation throughout the 2013 outlook projection period, its share of total generation is expected to decline from 42 percent in 2011 to 35 percent in 2040.

Electricity generation capacity from non-hydro renewable technologies has increased significantly in recent years, but remains a small fraction of total U.S. electric needs. The two largest non-hydro renewable technologies, wind and solar, experienced a 117 percent and 110 percent increase in net electric generation from 2008 to 2011, respectively.<sup>7</sup> However, in 2011 wind and solar accounted for just three percent and one-half percent of total electricity

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<sup>2</sup> CIA World Factbook. Accessible at: <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2249rank.html>

<sup>3</sup> International Energy Agency, World Energy Outlook 2012. Accessible at: <http://www.worldenergyoutlook.org/>

<sup>4</sup> Loder, Asjlynn, Bloomberg, *American Oil Growing Most Since First Well Signals Independence*, Dec. 18, 2012. Accessible at: <http://www.bloomberg.com/news/2012-12-19/american-oil-most-since-first-well-in-1859-signals-independence.html>

<sup>5</sup> Energy Information Administration, *Annual Energy Outlook 2007, With Projections to 2030*, February 2007.

<sup>6</sup> Energy Information Administration, *Annual Energy Outlook 2013 Early Release Overview*, December 5, 2012.

<sup>7</sup> Energy Information Administration, *Annual Energy Outlook Total Electric Power Industry Summary Statistics, 2011 and 2010* and *Electricity Net Generation from Wind and Other Renewables, 2004-2008*.

generation, respectively. EIA projects that electricity generation from renewable energy technologies, including hydropower, wind, solar, geothermal, and other renewable sources, will grow from 13 percent in 2011 to 16 percent by 2040.

### *Transportation Sector Trends*

Petroleum is the primary transportation fuel in the U.S., accounting for 93 percent of total transportation fuels, with natural gas and renewable fuels accounting for the remaining seven percent. EIA estimates the United States will consume approximately 18.6 million barrels of oil per day (bb/d), while producing 6.4 million bb/d of crude oil daily.

U.S. consumption of petroleum and other liquid fuels peaked in 2005 at 20.8 bb/d but dropped to 18.9 bb/d in 2011, largely due to the ongoing economic downturn.<sup>8</sup> EIA projects energy consumption in the transportation sector to remain relatively constant out to 2020.<sup>9</sup>

### *Technology Development*

Technology impacts every component of the energy system: exploration, production, transportation, delivery and end-use consumption. Technology breakthroughs in any of the system components affect the entire system. One of the most readily apparent and consequential examples of the impact of technology is hydraulic fracturing. The combination of horizontal drilling technology combined with hydraulic fracturing has transformed oil and gas exploration and production activities by making previously inaccessible resources economically recoverable. Additionally, continued advances in drilling and exploration technologies have the potential to unlock other hydrocarbon resources, such as oil shale.

Recent technology developments in other portions of the energy supply and delivery system have impacted the current energy portfolio. For example, technological improvements in nuclear power plants have increased nuclear energy generation capacity by increasing the efficiency and output of existing plants. Additionally, increased application of grid technology enables more efficient transmission of electricity and results in greater reliability.

Furthermore, the U.S. has experienced dramatic gains in energy efficiency and energy intensity, driven by the application of new technologies. The 2013 AEO illustrates the impact technology is having on energy intensity. From 2011 to 2040, the U.S. population is expected to grow by 29 percent; over the same time period, energy use is expected to grow by only 10 percent while energy use per capita declines by 15 percent.

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<sup>8</sup> Energy Information Administration *U.S. Product Supplied of Crude Oil and Petroleum Products*, September 27, 2012. Accessible at: <http://www.eia.gov/petroleum/reports.cfm?t=164>

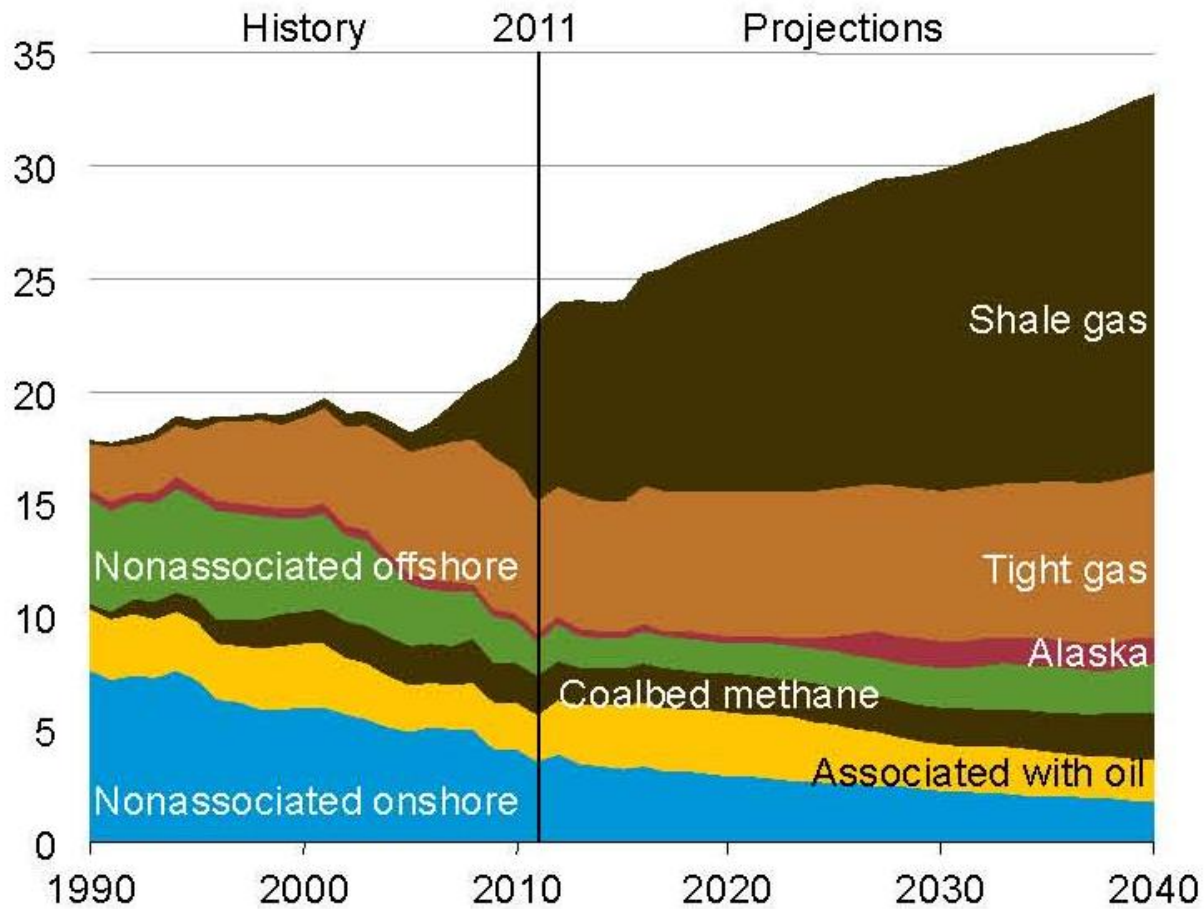
<sup>9</sup> Energy Information Administration *Transportation sector key indicators and delivered energy consumption*, accessible at: <http://www.eia.gov/forecasts/aeo/er/pdf/tbla7.pdf>

*Additional Reading*

For additional information and background on U.S. energy use and trends, see EIA Annual Energy Outlook located at <http://www.eia.gov/forecasts/aeo/er/index.cfm> and IEA reports located at <http://www.iea.org/countries/membercountries/unitedstates>.

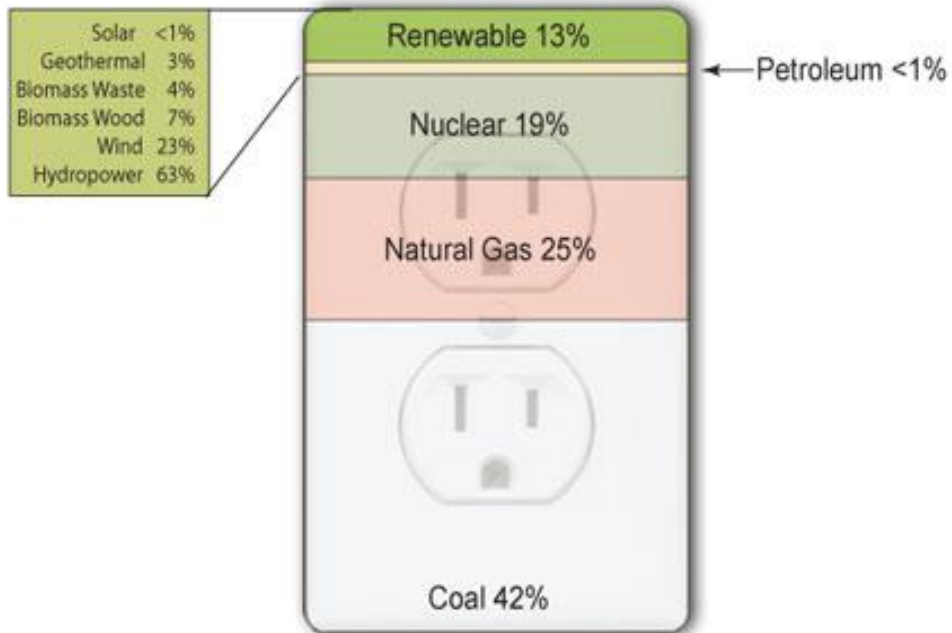
**Figure 1. U.S. dry natural gas production by source, 1990-2040 (trillion cubic feet)**

**Figure 3. U.S. dry natural gas production by source, 1990-2040 (trillion cubic feet)**



**Figure 2.**

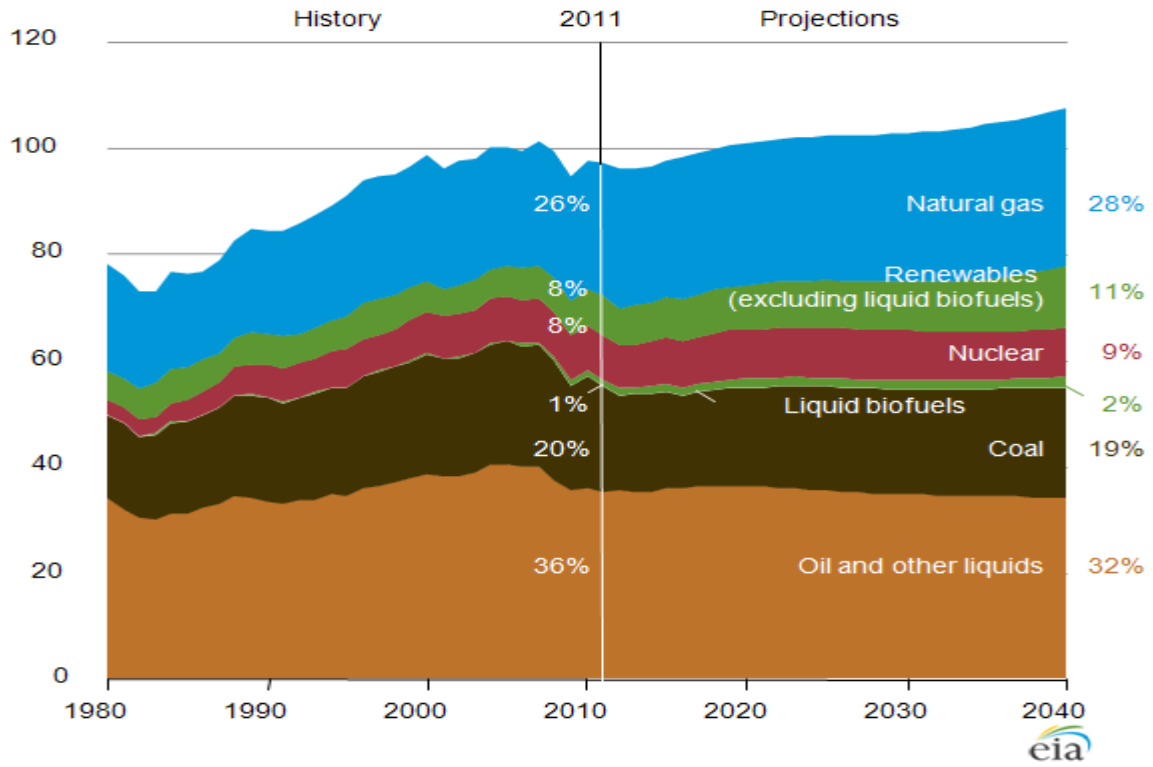
## Sources of Electricity Generation, 2011



Note: Includes utility-scale generation only. Excludes most customer-sited generation, for example, residential and commercial rooftop solar installations

Source: U.S. Energy Information Administration, *Electric Power Monthly* (March 2012). Percentages based on Table 1.1, preliminary 2011 data.

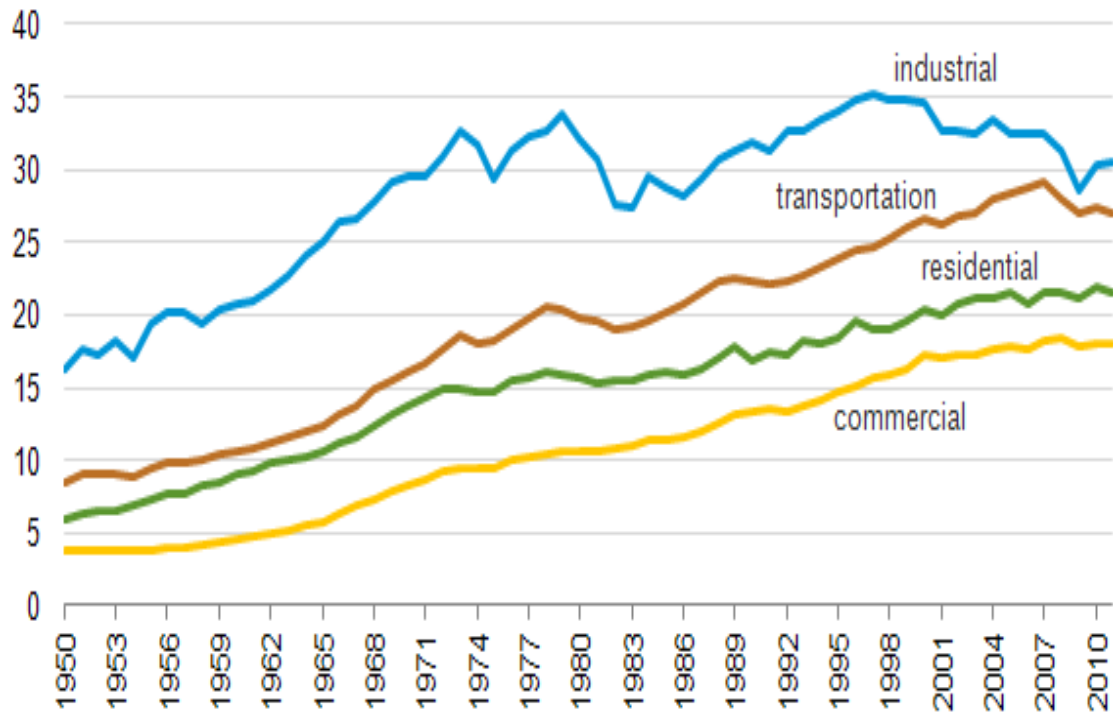
**Figure 3. U.S. Primary Energy Consumption by fuel, 1980-2040 (quadrillion Btu per year)**



**Figure 4.**

**U.S. total energy consumption estimates by end-use sector, 1950-2011**

quadrillion Btu

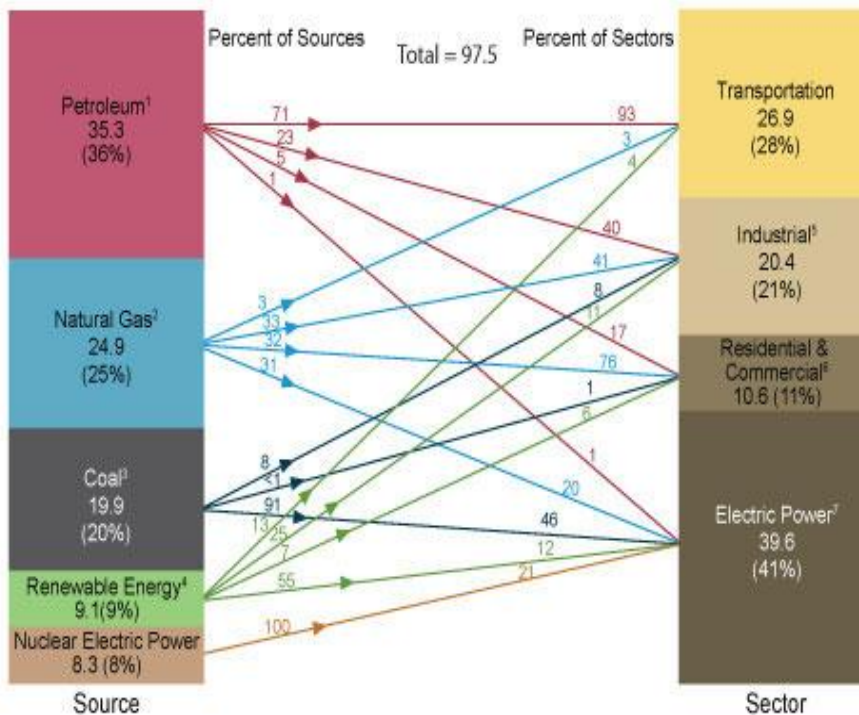




**Figure 5.**

# Primary Energy Consumption By Source and Sector, 2011

quadrillion Btu



**Endnotes:**

- 1 Does not include biofuels that have been blended with petroleum—biofuels are included in "Renewable Energy."
- 2 Excludes supplemental gaseous fuels.
- 3 Includes less than 0.1 quadrillion Btu of coal coke net exports.
- 4 Conventional hydroelectric power, geothermal, solar/PV, wind, and biomass.
- 5 Includes industrial combined-heat-and-power (CHP) and industrial electricity-only plants.
- 6 Includes commercial combined-heat-and-power (CHP) and commercial electricity-only plants.
- 7 Electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. Includes 0.1 quadrillion Btu of electricity net imports not shown under "Source."

Note: Primary energy in the form that it is first accounted for in a statistical energy balance, before any transformation to secondary or tertiary forms of energy (for example, coal is used to generate electricity).

• Sum of components may not equal total due to independent rounding.

Sources: U.S. Energy Information Administration, Monthly Energy Review (March 2012), Tables 1.3, 2.1-2.5, preliminary 2011 data.