



**Congressional  
Research Service**

Informing the legislative debate since 1914

---

# Winter Fuels Outlook 2013-2014

**Robert Pirog**

Specialist in Energy Economics

December 18, 2013

**Congressional Research Service**

7-5700

[www.crs.gov](http://www.crs.gov)

R42090

## Summary

The Energy Information Administration (EIA), in its *Short-Term Energy and Winter Fuels Outlook* (STEWFO) for the 2013-2014 winter heating season, projects that American consumers should expect to see heating expenditures that on average will be somewhat higher than last winter. Average expenditures for those heating with natural gas are projected to increase by 13.4%, while those heating with electricity are projected to see an increase in expenditures of about 2.1%. These two fuels serve as the heating source for about 89% of all U.S. household heating. Propane and home heating oil consumers are also projected to see increased and decreased expenditures, respectively.

Within the U.S. average projections, differences exist with respect to region of the country and type of fuel.

Economic conditions of slow growth and relatively high unemployment suggest that lower consumption of all fuels may occur, especially in the context of the mixed winter weather conditions as forecast by the National Oceanic and Atmospheric Administration (NOAA). While the price of natural gas is expected to increase, the price of oil has been relatively high over the past year. If the price of oil spikes for an extended amount of time, or if the price of natural gas increases more than projected, heating costs might be expected to rise above projected levels for many consumers. Lower prices could reduce seasonal heating expenditures.

Uncertainty exists with respect to the status of funding for the Low Income Energy Assistance Program (LIEAP), the key federal program assisting low-income households with heating expenditures.

It has not been announced whether the CITGO program to assist some U.S. heating oil consumers will be continued.

## Contents

Introduction.....	1
Average Annual Heating Fuels Expenditures .....	1
Natural Gas .....	2
Heating Oil.....	4
Propane .....	5
Electricity.....	6
Wood, Wood Pellets, and Biomass .....	6
Risk Factors .....	7
Heating Expenditure Assistance .....	7
Conclusion .....	8

## Tables

Table 1. U.S. Average Winter Fuels Projections, Winter 2013-2014 .....	2
Table 2. Average Household Winter Natural Gas Consumption and Prices .....	3
Table 3. Average Household Heating Oil Consumption and Price .....	4
Table 4. Average Household Propane Consumption and Price.....	5
Table 5. Average Household Electricity Consumption and Price .....	6

## Contacts

Author Contact Information.....	8
---------------------------------	---

## Introduction

Each year, in October, the Energy Information Administration (EIA) publishes the *Short-Term Energy and Winter Fuels Outlook* (STEWFO).<sup>1</sup> The purpose of the STEWFO is to provide estimates of expected average annual heating fuel expenditures in comparison to previous years. While the STEWFO provides estimates of average annual heating expenses, individual expenses may vary regionally, by energy source utilized, by home size, energy efficiency, and individual temperature preference; by market size; and by local weather conditions.

Average annual heating fuels expenditures depend on the price of the fuel used, with natural gas, heating oil, propane, electricity, and wood products constituting the main heating fuels in the United States. Expenditures also depend on the quantity of fuel used, which is based on a variety of individual consumer decisions. Weather conditions, measured by heating degree-days, are the other key factor in determining expenditure levels.<sup>2</sup> The National Oceanic and Atmospheric Administration (NOAA) provides heating degree-day estimates to the EIA for the STEWFO.

The STEWFO is not a forecast in the statistical sense, but a projection based on assumed values of key variables. If, for example, the underlying fuel price estimates prove to be incorrect, or weather conditions vary from forecast trends, actual average heating expenditures will reflect those differences.

## Average Annual Heating Fuels Expenditures

NOAA forecasts a 0.3% reduction in heating degree-days for the 2013-2014 heating season compared to 2012-2013 for the United States as a whole. Regional differences in weather, along with regional fuel usage patterns, can cause regional expenditure projections to vary from the U.S. average.

In the Northeast, heating degree-days are expected to increase by 3.4%, while in the West they are expected to decrease by 3.1%. Estimated heating degree-days are expected to rise by 0.1% in the South, and decline by 1.3% in the Midwest.<sup>3</sup>

On average, the EIA projects that U.S. household expenditure on heating fuel for the 2013-2014 heating season will rise for households heating with natural gas, electricity, and propane while those using heating oil will see their expenditures decline. The increase in expenditures reflects higher fuel prices for all fuels except heating oil, and the quantity usage effects of generally similar weather patterns. **Table 1** provides a summary of the percentage changes in the key components of average annual heating fuel expenditures by fuel.

---

<sup>1</sup> The winter heating season runs from October 1 through March 31.

<sup>2</sup> Heating degree-days are defined as the day's average temperature, calculated as the high plus the low temperatures divided by two. If the number is less than 65, subtract the average temperature from 65. The result is the number of heating degree-days on a particular calendar day.

<sup>3</sup> All percentage changes in the STEWFO and this report are calculated on a yearly heating season basis. The estimated 2013-2014 values are compared to 2012-2013 levels.

**Table 1. U.S. Average Winter Fuels Projections, Winter 2013-2014**  
(percentage change)

	Natural Gas	Heating Oil	Propane	Electricity
Consumption	-0.2	2.9	0.8	-0.2
Price	13.7	-4.9	10.0	2.3
Number of Households	0.6	-3.0	-2.1	3.0
Expenditure	13.4	-2.2	10.0	2.1

**Source:** Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, Table WFO1, October 2013.

**Note:** Percentage change compares projected changes for the 2013-2014 heating season to 2012-2013 data.

Regionally, the EIA expects expenditures on natural gas to increase the most in the Northeast, at 18.3%, and to increase by 12.8% in both the Midwest and the South, and 7.1% in the West. Expenditures on heating oil, used primarily in the Northeast, are expected to decline by 2.2%. Expenditures on propane are expected to increase by 10.6% in the Northeast and by 9% in the Midwest.<sup>4</sup> Electricity expenditures are expected to increase by 4% in the Northeast, 1.6% in the Midwest, 2.1% in the South, and by 1.5% in the West.

Due to changing market conditions for primary fuels, the prices assumed in the STEWFO can differ from actual prices. Price volatility in the world oil market can have direct effects on the cost of heating oil and propane. Variations in natural gas prices can directly affect those households heating with that fuel, while indirectly affecting electricity prices. Projected consumption levels are likely to be affected by variations in the weather. If the observed weather is colder, or warmer, than forecast by NOAA, or if consumers change their consumption habits at any given price level, or at any given number of heating degree-days, consumption levels would differ from those projected in the STEWFO.

## Natural Gas

The U.S. natural gas market is part of a North American regional market. The United States draws about 94% of its natural gas supplies from domestic sources. Over 90% of imports arrive by pipeline, from Canada, and small quantities of liquefied natural gas supplement supply, mostly from Trinidad, but also from many other countries.

Consumers of natural gas include households and commercial customers that largely use natural gas for space heating. Electric power generators, especially those that satisfy peak load demand, use natural gas as a fuel to power generators. Industrial consumers use natural gas as a raw material, for example in fertilizer production, and as a heat source in industrial processes. Household, commercial, and electric power generators are those consumers whose consumption is most likely to be affected by winter conditions.

<sup>4</sup> The 2013-2014 STEWFO does not include complete data broken down by region for heating oil and propane.

**Table 2** presents average household natural gas consumption and price data for the winter heating seasons 2009-2010 through projected values for winter 2013-2014.

**Table 2. Average Household Winter Natural Gas Consumption and Prices**

(thousands cubic feet, mcf)

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Consumption	63.7	64.2	55.1	61.8	61.7
Price (\$/mcf)	10.83	10.45	10.26	9.67	11.0

**Source:** Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, Table WFO1, October 2013.

**Note:** Data for Winter 2013-2014 are projected.

On a per-household basis, as presented in **Table 2**, winter consumption of natural gas has been relatively stable. Similarly, consumer prices have been relatively stable, but falling from 2009-2013, and increasing somewhat in the projection for 2013-2014. The price-consumption relationship suggests that natural gas demand may be price inelastic in the household sector, implying that consumption might not be expected to respond proportionally to changes in price.<sup>5</sup> An inelastic demand relationship is likely because home heating is typically considered to be a necessity by consumers. In addition, existing metering systems do not provide consumers with easy access to real-time quantity and price data. Lack of real-time information could result in consumers making ill-informed decisions with regard to heating expenditures. Income levels and the unemployment rate might also be important in determining natural gas consumption. Approximately 50% of all U.S. households heat with natural gas.

On the national level, overall consumer groups, total natural gas consumption rose by about 9.6% from 2008 through 2012. Over the period, the electric power generating sector's consumption rose by about 36.6%. Residential and commercial usage showed small consumption losses, while industrial demand increased by about 8.3%.<sup>6</sup> The STEWFO projects an increase in total natural gas consumption of less than 1% from 2013 to 2014. Most of the increased consumption is expected to occur in the industrial sector.

The STEWFO projects an increase in U.S. natural gas production of about 0.06% for 2014 compared to 2013, and a 1.1% increase from 2013 to 2012. The relative weakness of wellhead natural gas prices from 2010 to 2013 reflects the increased production resulting from shale gas and other non-conventional sources. However, these lower prices, and the growing price spread between petroleum liquids and natural gas, has shifted exploration and drilling activity in the direction of liquid deposits, slowing growth in natural gas.

Imports of natural gas are expected to decline by about 3% from 2012 to 2013, mostly on pipeline imports from Canada. Lower natural gas prices in North America than in Asia and Europe will continue to make liquefied natural gas imports a small component of the U.S. gas picture as the United States prepares to become an exporter of liquefied natural gas.

<sup>5</sup> Price elasticity of demand is calculated as the percentage change in quantity demanded divided by a percentage change in price. Demand is considered to be inelastic if the price elasticity computation yields a value less than one.

<sup>6</sup> Data available at <http://www.eia.doe.gov>.

Natural gas demand from households and commercial customers peaks in the winter, and to a lesser extent in the summer. This leads to accumulation of natural gas in storage facilities in the off-peak seasons. At the beginning of the winter heating season, October 1, 2013, natural gas in storage was approximately 3.5 trillion cubic feet, above the five-year average storage quantity.<sup>7</sup>

## Heating Oil

Home heating oil is a middle distillate, derived from the same part of the refining process as diesel fuel. As a result, the price of home heating oil is closely related to the price of crude oil as well as the price of diesel fuel. Approximately 5.8% of U.S. households heat with oil, and most of these consumers are in the Northeast, where about 80% of U.S. heating oil consumption takes place.<sup>8</sup>

**Table 3. Average Household Heating Oil Consumption and Price**

(gallons)

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Consumption	538.2	574.1	465.3	539.9	555.3
Price (\$/gallon)	2.85	3.38	3.73	3.87	3.68

**Source:** Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, Table WFO1, October 2011.

**Note:** Data for 2013-2014 are projected.

The EIA expects average home heating oil expenditures per household to decline by \$46, or 2%, for the winter 2013-2014. This dollar, and percentage, decline is relatively small compared to the total cost of heating with other fuels identified in the STEWFO. Oil represents the highest total expenditure for any winter fuel, \$2,046 per household. The projected amount for winter 2013-2014 is over three times as high as the total for a household heating with natural gas, which is projected to spend \$679 on average for the season.

Diesel fuel, a product almost identical to home heating oil, has been more expensive than gasoline in 2013, averaging about \$0.30 per gallon higher. A \$0.10 per gallon premium has been observed in 2013 when comparing the price of home heating oil to the price of gasoline. These price differentials result from U.S. refiners' emphasis on gasoline production for the U.S. market and the relatively high level of world demand for diesel fuel. The cost of gasoline, diesel fuel, and home heating oil are all directly related to the price of crude oil on the world market. The EIA projects the refiner's acquisition cost of crude oil to fall to \$101.70 per barrel during 2014, compared to their 2013 value of \$103.95.<sup>9</sup> The spot price of West Texas Intermediate, a reference crude oil, averaged over \$98 per barrel for the first three quarters of 2013, and was trading at about that level during the first months of the winter heating season.

<sup>7</sup> Data available at <http://www.eia.doe.gov>.

<sup>8</sup> Ibid.

<sup>9</sup> The refiners acquisition cost of crude oil is an average value that reflects the actual mix of crude oil by quality and domestic or imported source used in U.S. refineries.

The key risk factor for home heating oil consumers is the price of crude oil. Oil prices can be volatile. The economic recession, beginning in December 2007, and accompanied by record high crude oil prices in 2008, served to decrease demand. Overall liquid fuels consumption in the United States is projected by the EIA to remain about constant in 2014 compared to 2013, and to have risen by 0.08% compared to 2012. Within these overall increases, gasoline consumption is expected to remain relatively constant from 2013 to 2014, declining by about 0.4%, while distillate consumption is expected to increase by 2.4%. The relative increase in distillate consumption is likely to maintain, or increase, the price premium of these fuels over gasoline, and could create possible upside price risk over the STEWFO projection for heating oil consumers.

## Propane

Propane provides primary home heating for approximately 5.5 million households in the United States, about 4.7% of the total households. Propane consumers are projected to experience a \$120, or 9%, increase in heating expenses during the 2013-2014 winter heating season. These cost increases make propane the second most expensive fuel among those covered in the STEWFO. The number of households heating with propane has declined every year for the past five years, suggesting that propane is not a preferred fuel choice. The EIA expects a further decline of 2.1% in the number of households using propane for 2013-2014.

**Table 4. Average Household Propane Consumption and Price**  
(gallons)

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Consumption	794	821	841	N/A	N/A
Price (\$/gallon)	2.45	2.38	2.18	N/A	N/A

**Source:** Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, Table WFOI, October 2011.

**Note:** Data for 2012-2013 through 2013-2014 on U.S. average consumption and price were not provided.

The EIA sees propane expenditures rising by 9% in the Midwest, and 10.6% in the Northeast.<sup>10</sup> Propane price can vary; for the Northeast in 2013-2014 the STEWFO projects a price of \$3.23 per gallon, while the Midwest is projected to see a propane price of \$1.92 per gallon. While consumption in the two regions is expected to be, on average, within 90 gallons of each other, the difference in price leads to heating season expenditures of \$1,453 in the Midwest compared to \$2,146 in the Northeast.

Propane is unique compared to other fuels covered in this report in the sense that it is a by-product, and not directly produced itself. The production of gasoline and natural gas both contribute to the supply of propane. As a result, when the supply of those fuels is high, so is the supply of propane.

Many of the same factors that affect natural gas and home heating oil prices influence expected propane prices. However, in the case of propane, the relationship is indirect because propane is a

<sup>10</sup> The EIA did not provide data on propane for the South and the West in the October 2013 STEWFO.



by-product. Propane prices, unlike the other fuels covered in this report, are affected by distance and dispersion of consumers. The reason is that because the distribution process usually requires the delivery, by truck, of relatively small quantities, it tends to be high-cost.

## Electricity

Electricity prices are related to natural gas and coal prices as well as the availability of nuclear and alternative fuel generating capacity.<sup>11</sup> In addition to electricity being generated using natural gas, direct combustion of natural gas is also a competitor to electricity as a home heating source. Approximately 40% of U.S. households use electricity as their primary heating source. In the Northeast, electricity use is lowest, at about 14.2%, while in the South it is highest, at 64%. Overall growth in the number of households using electricity for space heating is expected to be 3% year on year, driven by further expansion of market share in the South. In comparison, the number of propane and heating oil customers is declining, by an expected 2.1% and 3%, respectively. Natural gas is also a heating source with an expanding customer base, expected to rise by 0.6% in 2014.

**Table 5. Average Household Electricity Consumption and Price**  
(kilowatt hours)

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Consumption	7,900	7,810	7,234	7,638	7,621
Price (\$/kwh)	0.110	0.113	0.116	0.117	0.119

**Source:** Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, Table WFO1, October 2011.

**Note:** Data for 2013-2014 are projected.

The EIA projects increasing heating expenditures for areas heating with electricity. In the Northeast the increase in expenditures is expected to be 1.3%, in the South 2.1%, and in the Midwest 1.6%. Expenditures in the West are expected to rise by 1.5%. In general, electricity prices have shown less volatility than many other heating source prices.

## Wood, Wood Pellets, and Biomass

Wood and wood pellets are projected to provide primary home heating for approximately 2.6 million U.S. households in 2014. The EIA estimated wood provided a secondary heating source for about 8.8 million households, over 8% of total households in 2009.<sup>12</sup> EIA data show the number of households heating with wood has increased steadily over the past five years.<sup>13</sup> U.S. Census data show the number of occupied housing units using wood growing by about 1.6% to

<sup>11</sup> In 2012, coal fueled about 37.4% of U.S. electricity generating capacity, natural gas 30.2%, nuclear about 19%, hydro about 6.8%, and all other sources about 6.6%.

<sup>12</sup> Energy Information Administration, Residential Energy Consumption Survey, Table HC1.1, Fuels Used and End Uses in U.S. Homes, by House Unit Type, 2009.

<sup>13</sup> Ibid., Table HC4.2, Space Heating Characteristics by Type of Housing Unit, 2005.

2.1% per year between 2000 and 2010, resulting in a cumulative growth of about 22%.<sup>14</sup> The STEWFO projected that residential wood biomass would increase somewhat between 2013 and 2014, from 0.185 to 0.211 quadrillion Btu.<sup>15</sup> The EIA has not started tracking price data for wood and wood pellets as of the October 2013 release date of the STEWFO. As a result, no seasonal heating expenditure projections for this fuel source are included in the STEWFO.

## Risk Factors

The primary risk factors concerning the STEWFO are weather and economic conditions. Total household expenditures on home heating are equal to the price of the fuel times the quantity of the fuel consumed. The weather, measured by the number of heating degree-days, largely determines the quantity of fuel used. Conservation, in the form of reduced temperatures inside the home, also reduces the quantity of fuel consumed, but for a given desired temperature inside the home, heating degree-days are the key factor. The 2013-2014 winter heating season is expected to be colder in the Northeast and South and milder in the Midwest and West. While the 2013-2014 NOAA heating degree-day estimates may prove to be accurate, data from November 2013 suggest that the central part of the nation and the Northeast experienced below normal temperatures.<sup>16</sup>

The other component of total heating expenditures, the prices of the various fuels, is determined by a complex web of related prices, market conditions, expectations, and other economic variables. In a period of relatively weak economic growth, with persistent high unemployment, the key relationship may be that between the level of economic activity, measured by the real growth rate of gross domestic product, and the prices of natural gas and crude oil.

A higher price for crude oil directly increases the price of home heating oil and propane. Natural gas supplies tend to be reduced as a larger spread develops between oil and natural gas prices. Electricity prices are directly affected by natural gas and coal prices. Even in the face of a growing reserve base and increased production, U.S. natural gas prices are expected to increase by about 11% for consumers, on average, this heating season.

## Heating Expenditure Assistance

The Low Income Energy Assistance Program (LIHEAP) is the primary federal government program to supplement home heating expenditures.<sup>17</sup> LIHEAP is composed of two parts: funding for block grants to states and emergency contingency funds. For FY2014, the Administration has proposed \$2.8 billion for LIHEAP regular funds and \$150 million for emergency contingency funds. The FY2013 total was \$3.255 billion in regular funds.

---

<sup>14</sup> See [http://factfinder.census.gov/servlet/ACSSAFFHousing?\\_sse=on&\\_submenuId=housing\\_1](http://factfinder.census.gov/servlet/ACSSAFFHousing?_sse=on&_submenuId=housing_1).

<sup>15</sup> Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, Table 8, October 2013.

<sup>16</sup> Temperature data available at <http://www.ncdc.noaa.gov>, National Temperature and Precipitation Maps.

<sup>17</sup> See CRS Report RL31865, *LIHEAP: Program and Funding*, by Libby Perl, for more detail on this program.

CITGO, the U.S. subsidiary of the Venezuelan national oil company PDVSA, has operated a Low Cost Heating Oil Program, without any connection to the U.S. government.<sup>18</sup> The program, operated in conjunction with a nonprofit, the Citizens Energy Corporation, began in 2005. During the 2010-2011 heating season, 25 states and the District of Columbia participated in the program, which discounts the delivered cost of home heating oil by almost 40%. CITGO estimates that 1.7 million households and hundreds of homeless shelters have benefited from the program since 2005.<sup>19</sup> It has not been announced whether the program will continue in the 2013-2014 winter heating season.

## Conclusion

The STEWFO projects that Americans will generally face increased heating costs during the winter of 2013-2014. Fuel prices are generally expected to be higher, which will support the effects of colder temperatures for key regions. Any change in the level of economic activity, or changes in the price of fuels, coupled with variability in the actual weather experienced during the winter heating season, could change the expenditure projection.

Uncertainty concerning the funding level of LIHEAP, and concern as to whether the CITGO program will continue in 2013-2014, contribute to the potential burden of high heating costs for lower-income Americans.

## Author Contact Information

Robert Pirog  
Specialist in Energy Economics  
rpirog@crs.loc.gov, 7-6847

---

<sup>18</sup> For more details, see <http://www.citgoheatinoil.com>.

<sup>19</sup> Ibid.