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Winter Fuels Markets

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Summary

The Energy Information Administration in its *Short-Term Energy and Winter Fuels Outlook* (STEWFO) for the 2008-2009 winter heating season warned consumers of the likelihood of higher heating costs. Average expenditures for those heating with natural gas might see their expenditures rise by more than 18%. Home heating oil expenditures were forecast to rise by 23%, propane expenditures by 11% and electric heating expenses by 10%. The forecasted increases in total expenditures result from higher prices for all energy sources, as well as the expectation of a colder winter than the past several years.

Oil markets have experienced downward volatility recently, with the price of crude oil falling almost 50% compared to the peak price reached in June 2008. If the downward trend in oil prices continues through the winter 2008-2009 heating season, or stabilizes at a lower level, the increased expenditure estimates of the STEWFO might not materialize. This is because the price of oil is a major factor in all the home heating prices surveyed in the STEWFO. The price of oil directly affects the prices of heating oil and propane, which are petroleum products. The price of oil indirectly affects the price of natural gas, and also, therefore, electricity through a historical price parity relationship.

The key risk factors for the STEWFO estimates are likely to be the extent to which the U.S. economy continues to experience an economic slowdown that results in further declines in the price of crude oil. Additionally, the variability of the weather could affect the expenditure estimates.

The Low Income Energy Assistance Program (LIHEAP), the primary federal program to assist with home heating costs, has been funded at higher levels than last year, and its eligibility requirements have been expanded. As a result, this program appears to be able to provide aid to consumers should heating costs escalate.

This report will be updated.

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The Energy Information Administration (EIA), in its October 2008 *Short-Term Energy and Winter Fuels Outlook* (STEWFO), warned consumers that not only might they expect the prices of natural gas, heating oil, propane, and electricity to be higher in the winter of 2008-2009 compared to those of 2007-2008, but that the National Oceanic Atmospheric Administration's (NOAA's) projections forecast a 2.4% colder winter compared to last year.[1] According to the STEWFO, the effect of these two factors will be that American consumers might expect to experience sharply higher home heating costs this winter. For the United States as a whole, STEWFO projections are that natural gas customers might expect to see their expenditures rise by 18.1%, heating oil consumers by 23.1%, propane consumers by 11.3%, and electricity consumers by 10.4%.[2]

Although these projected increases in themselves are likely to put pressure on consumer budgets, their effects could be even greater in an environment of deteriorating national economic conditions. A mixture of higher costs for home heating, combined with growing joblessness and declining economic growth, is likely to increase the importance of the Low Income Home Energy Assistance Program (LIHEAP).

Even though the STEWFO projections for winter energy costs indicate increasing costs, the projected increases are lower than they might have been had not the price of oil declined by about one third from the peak levels reached in the third quarter of 2008. Reduced oil consumption, related to relatively high prices, as well as slowing economic conditions, are expected to keep the price of oil below peak levels. However, the oil market remains in a potentially tight demand and supply balance with relatively low excess capacity available.

This report analyzes the key factors affecting the various winter fuels markets, including consumption, production, reserves, and storage volumes.

Background

Table 1 provides a summary profile of the winter heating picture for the winter of 2008-2009 based on U.S. averages. Within the U.S. averages, regional differences

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[1] The winter heating season is the period from October 1 through March 31.

[2] Energy Information Administration, *Short Term Energy and Winter Fuels Outlook*, Table WFO1, October 2008. Available at [http://www.eia.doe.gov].

can be important. In addition, the NOAA heating degree day projections differ by region.[3]

Table 1. U.S. Average Winter Fuels Expenditure Projections, Winter 2007-2008 to 2008-2009

(percentage growth)

	Natural Gas	Heating Oil	Propane	Electricity
Consumption	1.4	4.8	1.8	1.7
Price	16.5	17.4	9.3	8.5
Expenditure	18.1	23.1	11.3	10.4
Number of Households	0.9	-2.9	-1.1	2.0

Source: Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, 2008.

Note: Percentage growth reflects forecast changes for the winter of 2008-2009 compared to the winter of 2007-2008.

Regionally, EIA expects natural gas expenditures increase the most in the South, at 25.7%, and least in the West, at 12.8%. Expenditures in the Northeast and the Midwest are expected to increase by 18.8% and 16.8%, respectively. Heating oil expenditures are expected to be above average in the Northeast, where the largest proportion of heating oil consumers are, at 24.2%, and in the South where expenditures are expected to rise by 31.1%. Expenditure increases in the Midwest, at 11.8% and the West, at 9.8%, are well below average. Propane expenditures are projected to rise by 12.1% in the Northeast, and 15.5% in the South, while increasing by 9.8% in the Midwest, and 5.3% in the West. Electricity expenditures are projected to rise by 14.5% in the Northeast, 5.1% in the Midwest, 12.5% in the South, and 6.9% in the West.

Differences in regional expenditure projections are due to regional fuel price differentials, varying intensities of consumption during the winter season, and regional variability in the NOAA forecast for heating degree days.

Due to market dynamics, the prices used in the STEWFO may overstate the forecasted increases in expenditures. For example, while the STEWFO uses $3.90 as the U.S. average price per gallon in the home heating oil market, the price reported by the EIA for the week of October 6, 2008 was $3.67, or 6% less. If oil prices continue to fall, or stabilize at lower levels, the STEWFO estimates could be high.

[3] Heating degree days are a measure of the number of degrees per day that the daily average temperature (the mean of the maximum and minimum recorded temperatures per day) is below a specified base temperature. Heating degree days are used to estimate the energy needed for heating.

Natural Gas

The U.S. natural gas market is a regional market, drawing supplies from domestic sources, 83% in 2007, as well as imports, largely via pipeline from Canada which accounted for about 16%. In addition, a small part of domestic supply is imported in the form of liquefied natural gas (LNG) which is part of a small world-wide market that is important to some countries, Japan, for example, and is expected to grow in importance in others, including the United States.

Consumers of natural gas include households and commercial customers that largely use natural gas for space heating. Electric power generators, especially those operating plants that satisfy peak demand loads, use natural gas to power generators. Industrial consumers use natural gas as a raw material, as for example in fertilizers, and as a heat source in industrial processes. Household, commercial, and electric power demand are those consumers that are likely to be affected by winter conditions.

Table 2. Average Household Natural Gas Consumption, Prices, Winter 2004-2005 to 2008-2009

(thousand cubic feet, mcf)

	04-05	05-06	06-07	07-08	08-09[a]
Consumption	66.8	64.7	66.0	67.2	68.1
Price ($/mcf)	$11.04	$14.58	$12.35	$12.72	$14.82

Source: Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, 2008.

a. Data for winter 08-09 are projected.

Table 2 presents average household natural gas consumption and price data for the winter heating seasons, 2004-2005 through 2008-2009. On a per household basis, natural gas consumption has been relatively stable. Prices spiked in winter 2005-2006, and are projected to exceed earlier peaks in 2008-2009. The price-consumption relationship suggests that natural gas demand is price inelastic, meaning that consumption does not vary sharply with variations in price. An inelastic relationship is likely because home heating and cooking are likely considered to be necessities by households, and, in general, existing metering does not provide consumers easy access to quantities used, and costs generated.

On the national level, natural gas consumption rose by 6.5% in 2007 compared to 2006. This increased consumption was led by the electric power sector with a 10.5% increase, and households with a 8.2% increase. The commercial sector increased consumption by 6.1% and industrial consumers increased consumption by 2.2%. The increase in household consumption is largely related to the increasing

proportion of households using natural gas. About 52% of U.S. households use natural gas as their primary heating source.[4]

U.S. natural gas production is projected to rise by 6.7% in 2008 and by 4.2% in 2009. These increases follow a 4.3% increase in production in 2007. Physical supply from production is expected to be adequate for the winter of 2008-2009. While some hurricane damage did result from the storms of 2008, resulting in a production shut-in of about 165 billion cubic feet of natural gas, total output is still expected to increase in 2008 and 2009.[5]

Because natural gas consumption, especially by households, is cyclic and weather related, peaking during the winter heating season, and to a lessor extent during the summer, accumulation of stored gas takes place at other times. Stored natural gas is then released into the supply system during peak periods to augment production. Although the amount in storage at the beginning of the 2008-2009 winter heating season, 3.110 billion cubic feet, was less than last year at the comparable time, it was still 50 billion cubic feet above the five-year average from 2003 through 2007.

Key factors in determining the accuracy of the STEWFO projections are likely to be the weather, the effect of what appears to be a deteriorating economic condition, and the level of oil prices.

A colder winter than anticipated will drive up household consumption and costs, especially in the normally colder climate areas. A warmer winter will drive consumption and costs down. The level of economic activity factor is open to several interpretations. Loss of jobs and income would tend to depress consumption, but natural gas used for heating and cooking is a necessity for most consumers. Also, it is unknown how deep the widely anticipated recession is likely to be. Oil prices are loosely linked to natural gas prices. Historically, the linkage was through fuel substitution; however, fuel oil is now only a minor competitor to natural gas in terms of fuel substitution. More recently, the price linkage is based on energy content. Oil prices have been volatile, reaching a high of over $147 per barrel in the summer of 2008, but falling into the $80 per barrel range at the beginning of the winter 2008-2009 heating season. The combination of high oil prices and slowing economic conditions reduced the demand for gasoline in the United States during 2008. If the price of oil does not spike to summer 2008 levels, or higher, during the 2008-2009 heating season it is likely that the STEWFO price projections, related to the oil price linkage, will remain valid.

Heating Oil

Home heating oil is a middle distillate, derived from the same part of the oil refining process as diesel fuel. As a result, the price of home heating oil is closely

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[4] Energy Information Administration, *Natural Gas Monthly, and Short-Term Energy and Winter Fuels Outlook.*

[5] Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook,* October 2008, p.7.

related to the price of oil as well as the price of diesel fuel. Approximately 7% of U.S. households heat with oil, and most of these consumers are in the Northeast, where 31% of total consumers use heating oil as their primary heating fuel.

Table 3. Average Household Heating Oil Consumption, Prices, Winter 2004-2005 to 2008-2009

(gallons)

	04-05	05-06	06-07	07-08	08-09[a]
Consumption	610.2	574.9	580.9	585.7	614.0
Price	$1.93	$2.45	$2.49	$3.31	$3.89

Source: Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, 2008.

a. Data for winter 2008-2009 are projected.

EIA expects heating oil expenditures per household to rise by $449, or 23% during the winter 2008-2009. Projected increases in the Northeast and the South are larger, at 24.2% and 31.1% respectively.

Diesel fuel has been more expensive than gasoline recently, and at the beginning of the 2008-2009 winter heating season averaged about $0.40 per gallon more than gasoline. This price differential has resulted from U.S. refiners emphasis on gasoline production, and a high level of world demand for diesel fuel. The cost of gasoline, diesel fuel, and heating oil are all directly related to the price of crude oil. The Energy Information Administration (EIA) estimates that about 73% of the cost of gasoline is crude oil cost, and 64% of the cost of diesel fuel and heating oil is crude oil cost.

Inventories of home heating oil were affected by Hurricanes Gustav and Ike. At the start of the winter heating season, inventories were at approximately 122 million barrels. While this level is some 12 million barrels less than the available amount at the beginning of the 2007-2008 winter heating season, it is still near the five-year average. As a result, price spikes are not expected to arise from inventory problems.

The key risk factor for consumers of home heating oil is the price of oil. Oil prices have been volatile in 2008. The STEWFO uses a projected oil price of $112 per barrel for 2008 and 2009. If the price stays in the $80 per barrel range, observed at the beginning of the 2008-2009 winter heating season, heating oil expenditures could be less than projected. If the price of oil spikes to levels above $112 per barrel the STEWFO could underestimate expenditures. With a deteriorating economic condition, lower oil and petroleum product prices, and an unstable, tight world oil market the price level is uncertain.

Propane

Propane provides primary home heating for approximately 6,500 households in the United States, or 6% of the total households supplied with fuels covered in this report. Propane consumers are projected to experience an 11%, or $188 increase in expenditures this winter heating season.

Table 4. Average Household Propane Consumption, Prices, Winter 2004-2005 to 2008-2009

(gallons)

	04-05	05-06	06-07	07-08	08-09[a]
Consumption	668.3	655.4	669.0	682.1	694.3
Price	$1.65	$1.95	$2.01	$2.45	$2.68

Source: Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, 2008.

a. Data for winter 2008-2009 are projected.

EIA expects the number of propane consumers to decline by about 1.1% during 2008 and 2009. However, expenditure increases for this heat source are less than those expected for natural gas and home heating oil consumers. Consumption is expected to increase, but the price increases expected for propane, about 9%, are less than those expected for natural gas, 16.5%, and heating oil, 17.4%.

Propane supply is unique compared to the other fuels covered in this report, in the sense that it is a by-product, and not directly produced. The production of gasoline as well as natural gas give rise to propane supplies. As a result, when the availability of those fuels is high, so is the supply of propane. Propane production and inventories are expected to be adequate to meet demand during the winter 2008-2009 heating season.

Many of the same factors influence expected propane prices that affect natural gas and home heating oil prices. However, in this case, the relationship is somewhat indirect because of the by-product nature of propane. Propane prices are, unlike the other fuels covered in this report, affected by distance and dispersion of the consumer. This is because the distribution process usually requires deliveries of relatively small quantities, by truck, to individual consumers.

Electricity

Electricity output is related to natural gas pricing and availability because it uses natural gas as a production input.[6] Electricity also competes with natural gas as a final consumer heating source. Approximately 35% of U.S. households use

[6] Natural gas fueled approximately 20% of U.S. generating capacity in 2006. Coal supplied 49% of electricity, nuclear power, 19%, hydro, 11%, and other renewables 2% in 2006.

electricity as their primary heating source. Regionally, only 12% of households in the Northeast use electricity, while 59% use electricity in the South.

Table 5. Average Household Electricity Consumption, Prices, Winter 2004-2005 to 2008-2009
(kilowatt hours)

	04-05	05-06	06-07	07-08	08-09[a]
Consumption	8,246	8,156	8,215	8,231	8,373
Price	$0.088	$0.096	$0.101	$0.104	$0.113

Source: Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, 2008.

a. Data for winter 2008-2009 are projected.

On average, electricity consumers can expect to pay 10% more for winter heating in 2008-2009 than in 2007-2008. This increase is as a result of 8.5% higher prices for electricity as well as higher usage rates due to the expected colder temperatures.

EIA expects overall electricity demand growth in 2008 to be about 1% and flat during 2009. As a result, little in the way of new demand will stress the generation and distribution system. Electricity prices are directly affected by the cost of raw materials, notably natural gas prices which are expected to increase by 36%, and coal prices which are expected to increase by 12% compared to last year.[7]

Risk Factors

The primary risk factors concerning the STEWFO are the weather and economic conditions. Total household expenditures on heating are equal to the price that must be paid times the quantity of fuel used. The weather, measured by the number of heating degree days, largely determines quantity of fuel used. Conservation, in the form of reducing the temperature inside the house can also reduce the quantity of fuel consumed, but for a given desired temperature, heating degree days is the key factor. The 2008-2009 winter heating season is expected to be colder than recent winter seasons. If the NOAA forecast estimates turn out to over or under state the number of heating degree days, the quantities demanded of heating fuels will fall, or rise.

The other component of total expenditures, price of fuel, is determined by a complex web of related prices and other economic variables. In a period of deteriorating economic conditions, the key relationship may be that between the level of economic activity, measured by the gross domestic product growth rate, and the price of crude oil on world markets. At the beginning of the 2008-2009 winter heating season the price of crude oil has been observed to be below $70 per barrel, a decline of almost 50% compared to the recent peak prices.

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[7] Energy Information Administration, *Short-Term Energy and Winter Fuels Outlook*, October 2008, p.8.

A lower price of crude oil directly reduces the price of home heating oil and propane. Natural gas prices that are linked to crude oil prices, historically and by energy content, also could be lower as a result of lower oil prices. This result is especially likely in a market environment of adequate storage, domestic supply growth, and reduced need for LNG imports. Because natural gas is a primary fuel in electricity generation, a link also exists between oil, natural gas, and electricity prices.

Heating Expenditure Assistance

The Low Income Home Energy Assistance Program (LIHEAP) is the primary federal government program to supplement home heating expenditures.[8] This program is composed of two parts: funding for block grants to states, and emergency contingency funds. For FY2008, the block grant portion of the program was funded at $1.98 billion and the emergency contingency funds at $590.3 million. Initial budget proposals for FY2009 had LIHEAP funding falling by over 20%.

The FY2009 funding level for LIHEAP, as set in P.L.110-329, signed on September 30, 2008 more than doubles the FY2008 amounts. The block grant portion of the program will receive $4.509 billion, with the emergency contingency component of the program receiving $590 million. Normally, the emergency contingency funds are released at the discretion of the President, however this year, the law required all LIHEAP funds to be released within thirty days of enactment. In addition, the legislation provides for the expansion of eligibility in the program to 150% of poverty, or 75% of the state median income. Previously, the standards had been 150% of poverty, or 60% of state median income.

CITGO, the United States based subsidiary of the Venezuelan national oil company PDVSA, has a separate, and non-U.S. governmental, Low Cost Heating Oil Program. This program is operated in conjunction with Citizens Energy Corporation, a non-profit organization. During the winter heating season 2007-2008 the program provided an estimated 112 million gallons of home heating oil to about 224,000 households in 23 states. The fuel is discounted by 40% of the delivered price. Household can receive a maximum allocation of 100 gallons through the program, about one sixth of the estimated quantity needed for the 2008-2009 season.[9]

Conclusion

The STEWFO forecasts that Americans will face increased need for home heating fuels during the winter 2008-2009 heating season due to colder temperatures as well higher prices for fuel. If accurate, the result is likely to be increased expenditures for what most households view as a necessity.

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[8] CRS Report RL31865, *The Low Income Home Energy Assistance Program(LIHEAP): Program and Funding,* by Libby Perl.

[9] Citgo data, available at [http://www.citgo.com].

While increased heating expenses are generally a burden to consumers, the winter 2008-2009 heating season might provide even greater challenges due to deteriorating economic conditions, possibly resulting in increasing unemployment, slow income growth, and higher prices for food and other goods. On the other hand, the economic slowdown is likely to moderate the cost increases projected in the STEWFO.

A positive factor is the expanded funding available to LIHEAP which may be able to help those least able to pay the increased costs.