



Winter Fuels Explanatory Notes

Prices

The residential No. 2 heating oil and propane prices (excluding taxes) for a given state are based on the results of two independent telephone surveys of marketers and refiners, one for each of the two products. Data are collected by State Energy Offices under the U.S. Energy Information Administration (EIA) State Heating Oil and Propane Program (SHOPP).

Sampling methodology and estimation procedures for residential no. 2 heating oil

The No. 2 heating oil price data are reported by a statistical sample. According to the requirement of the SHOPP program, 21 States and the District of Columbia (DC) in the East Coast and Midwest regions participate in the No. 2 heating oil price survey. The sampling frame used was a list of all Company State Units (CSUs) in those 21 States and DC that reported residential No. 2 heating oil sales on the 2006 Form EIA-863, "Petroleum Product Sales Survey." CSUs that sold at least 5% of the residential No. 2 heating oil in a state, as reported in the frame survey EIA-863, were automatically included in the sample and are referred to as certainty units. The remaining CSUs, referred to as non-certainty units, were stratified into three groups by their residential No. 2 heating oil sales volumes in each state. Strata boundaries were determined using the Dalenius-Hodges procedure. The sample allocations were designed generally to yield average price coefficients of variation (CV) of 1%, but, due to budget constraints, individual state sample sizes were capped at 35 even if the target CV was not met. In addition, a minimum size of 15 was required for each of the 21 states. The sample of CSUs within each stratum was a simple random sample. The residential No. 2 heating oil sample size inclusive of certainty and non-certainty units is 527 CSUs.

To estimate the average residential No. 2 heating oil price data for a state, the sample and volume weights are applied to the reported price, summed and divided by the sum of the weighted volume:

$$\frac{\sum_{j=1}^s \sum_{i=1}^{n_j} w_{ij} v_{ij} p_{ij}}{\sum_{j=1}^s \sum_{i=1}^{n_j} w_{ij} v_{ij}}$$

where w_{ij} = sample weight, v_{ij} = volume weight, p_{ij} = price, i = respondent, n_j = sample size of stratum j , and s = number of strata. The sample weights w_{ij} were calculated as ratios of population number of CSUs to the sampled number of CSUs in each stratum. Volume weights v_{ij} were assigned using the data reported in the frame survey.

State level residential No. 2 heating oil average prices are then aggregated into regional and overall averages with state level total prime supplier volumes as weights.

These fixed volume weights v_{ij} indicate the relative importance of the individual companies according to the size of their sales at the time of the frame. Therefore, changes in the average price across time reflect only the change in the price being offered by the company, and not changes in the amounts sold. Price indexes constructed using fixed volumes, such as these annual sales, are known as Laspeyres Indexes. One alternative method of weighting, used in Paasche Indexes, uses current weights. This method would require each company to report the number of gallons sold at the reported price each pricing period and would be more burdensome on the companies. Both methods of weighting are correct but provide different averages particularly when volumes are changing. It has been argued in the literature that during periods of change, the Laspeyres method has a tendency to overestimate price changes, while the Paasche method tends to underestimate price changes.

In this survey, it is expected that the change in volumes weekly during the heating season is small. Residential sales are not bulk in nature and do not tend to reflect discounts on price for large volume purchases. Absolute changes in volume within a year's time would more likely reflect demand and be consistent across companies within a geographical area. Therefore, even though the volume weights used in the calculation of average prices in the SHOPP tend to lag behind the actual volumes sold in the reference period, fixed volumes are used to reduce company burden and enable timely release of average prices.

Sampling methodology and estimation procedures for residential propane

The propane price data are reported by a statistical sample. Prior to the 2014-15 heating season, according to the requirement of the SHOPP program, 24 States in the East Coast and Midwest regions participated in the propane price survey. The sampling frame used was a list of all Company State Units (CSUs) in those 24 States that reported residential propane sales on the 2006 Form EIA-863, "Petroleum Product Sales Survey." The population of the survey was first stratified by state which is the publication cell. Due to high residential propane price variation and budget constraints, sample sizes of all strata were limited to 30 even though the target CV of 1% was not met in many states. To select the sample, the CSUs in each state were ordered by zip code in order to control for the geographic location of the companies. A Probability Proportional to Size (PPS) Sequential Sample with Probability Minimum Replacement, using the propane volumes reported in the frame survey EIA-863 as a measure of sampling unit size, was then selected from this ordering. With the targeted maximum sample size of 30 CSUs in each state, any CSU that sold more than 3.3% (1/30) of the residential propane in a state was selected at least once. Within each sampled CSU, a simple random sample of residential propane outlets was drawn by using an outlet address listing EIA developed with information provided by the industry and State Energy Officials. The number of outlets selected from each CSU was the same as the number of times that CSU was selected in the PPS sample. The resulting total number of outlets selected to report on the propane sample was 720.

In cases where there were fewer outlets in a sampled CSU than the number of times that CSU was sampled in the PPS sample, all outlets for that CSU were selected and their weights were adjusted to n_i' / n_i , where n_i' is the number of times that CSU was sampled and n_i is the number of outlets sampled. (This was also the practice if a CSU preferred to report on the survey by providing the average of all its outlets in a given state.) Therefore, the actual number responding each month may deviate from the 720 outlets sampled.

To estimate the average residential propane price data for a state, a simple average of the prices from each sampled outlet yields a valid estimate as a result of the cancellation of sample weights of the PPS sample design and volume weights in the estimate:

$$\frac{1}{n} \sum_{i=1}^n \frac{n_i'}{n_i} p_i$$

where p_i = price, i = outlet respondent, n = sample size, and n_i' / n_i = weight adjustment as described in previous paragraph.

In the fall of 2014, residential propane price data collection was expanded from 24 states to 38 states. The same sample design and price calculations were used as described above. The sampling frame for the 14 additional states used was a list of all Company State Units (CSUs) that reported residential propane sales on the 2010 Form EIA-863, "Petroleum Product Sales Survey." An additional 420 outlets were added to the existing sample, bringing the total number of outlets sampled to approximately 1,140 from 720.

Regional and overall averages are calculated as averages of the state level residential propane prices with state level prime supplier volumes as weights with the exception of Kansas and Texas where the most recent state residential volumes (2008-10 three-year average) were used due to the influence of the Conway, KS and Mt. Belvieu, TX propane storage facilities on prime supplier volumes for those states.

Revision error

Numbers may be revised in the publication based on data received late or receipt of revised data. Numbers are published as preliminary and final. The difference between preliminary and final data is called the revision error.

Response rate

Response rates are generally 95 to 100 percent.

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