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Methods to Standardize State Standard Utility Allowances

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Methods to Standardize State Standard Utility Allowances

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Introduction

This report documents research for the U.S. Department of Agriculture's (USDA) Food and Nutrition Service (FNS) to develop methods to standardize State standard utility allowances (SUAs) used to calculate Supplemental Nutrition Assistance Program (SNAP) eligibility and benefits. Although SNAP is a Federal program, States share responsibility for and the cost of administering the program by accepting applications, verifying eligibility, and calculating benefit amounts using parameters established by Federal law. Benefits are funded entirely by the Federal Government.

By design, most eligibility parameters are set at the Federal level with little variation or discretion at the State level or among households with similar income or household size. The main exception to this is in the area of shelter costs; program rules allow households to deduct shelter expenses that exceed 50 percent of net income, recognizing that households with high shelter expenses may have less income available to purchase food. One component of shelter expenses, and the component over which States have some discretion, is the SUA. States establish these utility allowances, which households may use in lieu of actual expenses when calculating total shelter costs.

States may establish multiple SUAs, including:

- A Heating and Cooling SUA (HCSUA) for households that pay heating/and/or cooling expenses.
- A Limited Utility Allowance (LUA) for households to do not pay heating and/or cooling expenses.
- Single Utility Standards (SUSs) for households with single utility expenses such as electricity.
- A Telephone Allowance for households that have no utility expenses other than telephone.

The purpose of this project is to develop standard methodologies that can be used to (1) construct SUAs that accurately reflect typical utility costs for low-income households and (2) make annual adjustments to the State SUAs.

Review of Relevant Data Sources

In order to gather information on potential data sources that could be used to develop and/or update SUAs, we examined a variety of sources that provide data on energy consumption and costs. We also looked more closely at three utility cost models used in other Federal programs, none of which were deemed to be a useful guide for developing an SUA methodology for FNS.

The main data sources that were evaluated include the following:[1]

- Residential Energy Consumption Survey (RECS)
- American Community Survey (ACS)

[1] The review of these sources, as well as other minor sources that were considered, are documented in Section II and Appendix A.

- American Housing Survey (AHS)
- State Energy Data System (SEDS)
- Consumer Expenditure Survey (CEX)
- Short-Term Energy Outlook (STEO)
- Consumer Price Index (CPI)

Our key criteria for assessing the usefulness of a data source included whether the data:

- Were representative at the State level.
- Were available at the household level.
- Included household demographic information, such as income and household size.
- Included specific information on types of utilities used by households, end-uses for these utilities, and how the utilities were paid for.

Modeling Alternatives

Based on our initial review of existing models and data sources, we developed a preliminary list of alternative approaches[2] that could be used to standardize the development or updating of SUAs. We conducted a number of analyses to evaluate these preliminary alternatives and then reduced them to a final set that was subjected to more detailed investigation. This final set included the following alternatives:

- Development of SUAs:
  1. Use data from the ACS adjusted using RECS.
  2. Use RECS.
- Update of SUAs:
  1. Use the STEO.
  2. Use the CPI.

Findings and Recommendations

Standardizing the development of SUAs is an extremely complex process primarily because no single data source provides all of the information and characteristics needed to compute standardized SUAs. Various data sources have to be merged in unique ways in order to obtain the desired estimates. In addition, small sample size issues have to be addressed, and extrapolation procedures are needed to address the substantial lags between the target year of the SUA and the most recent publication date of the data being used to develop the standardized SUAs. Finally, the States currently use a wide array of SUAs, which can vary in terms of customized sub-State geographic regions, household size categories, composition of utilities used to develop LUAs, and cost thresholds that are applied to ensure that a sizeable portion of SNAP recipients are covered by the SUA. This complexity is exacerbated by the desire to meet competing goals (administrative efficiency, equity, protection of the most vulnerable). Because of the complexity, any effort to standardize development of SUAs is likely to require some FNS involvement.

[2] See Appendix B for the full list of preliminary alternatives.

Development of SUAs

Neither the RECS nor the ACS can be used by itself to estimate all of the different SUAs. The main advantage of the ACS is that it is based on a very large sample and can provide representative estimates for every State. It is large enough to allow development of percentile estimates and to compute reasonable estimates for specific subcategories, such as the low-income group by household size. The main problem with the ACS is that it does not differentiate between heating/cooling end-use expenditures and other energy expenditures—information that is needed in order to develop SUAs that include heating and cooling expenditures (HCSUAs) and SUAs that exclude them because they are included in rent or condo fees (LUAs and SUSs).

RECS theoretically provides all of the data needed to estimate the energy components of the SUAs. It is also the most accurate source of those reviewed. However, RECS does have several limitations. State-level estimates are available for only 16 States, with estimates for the remaining States aggregated into 11 multi-State regions. Another issue with RECS is its timeliness: the survey is conducted only once every 4 years, and there is an additional 3- to 4-year lag before the data are published. Finally, the sample size is too small to be able to produce reliable estimates when the data are divided into numerous subcategories.

Because it is the only source that provides expenditure information on end-uses, RECS will be required in any approach that is used. If used by itself to develop the standardized SUAs, FNS will have to grapple with its limitations, notably the lack of State representation for every State and the lack of timeliness. The ACS will need to be incorporated in any approach that requires distribution information that will allow the SUAs to be set at a specified point above the mean/median. By using the ACS in conjunction with RECS, the limitations of each data source are somewhat offset by the advantages of the other. **Therefore, we recommend using the ACS-based approach, which relies upon both data sources**.

Updating SUAs

In regard to updating the base-year SUAs, a 3-year moving average of the CPI outperformed the STEO and demonstrated the best overall performance in terms of forecasting utility expenditures. Adding an adjustment for household growth was also found to produce a slight improvement in the performance of the CPI approach for updating the SUAs. T**herefore, we recommend using a 3-year moving average of the CPI, adjusted for household growth, when updating base-year SUAs**.

Implementation

Because of the complexity involved in developing base-year SUAs, any standardized approach is likely to require substantial FNS involvement. The effort required to develop the RECS adjustment parameters and extend the estimates to the target year could be substantial. For this reason, we recommend that FNS either construct the base-year SUAs and make them available to the States or develop and provide to the States any parameters applied to the underlying data set. FNS involvement will help reduce the duplication of startup time and effort that will occur if all of the States use the same approach to develop their SUAs but carry out those efforts separately.

It would not require a significant effort for the States to implement either of the alternative update methodologies; however, including an adjustment for household growth could increase the difficulty. FNS could ease this difficulty by making available household growth factors for each State.

I. INTRODUCTION

This report documents research for the U.S. Department of Agriculture's (USDA) Food and Nutrition Service (FNS) to develop methods to standardize State standard utility allowances (SUAs) used to calculate Supplemental Nutrition Assistance Program (SNAP) eligibility and benefits. Although SNAP is a Federal program, States share responsibility for and the cost of administering the program by accepting applications, verifying eligibility, and calculating benefit amounts using parameters established by Federal law. Benefits are funded entirely by the Federal Government.

By design, most eligibility parameters are set at the Federal level with little variation or discretion at the State level or among households with similar income or household size. The main exception to this is in the area of shelter costs; program rules allow households to deduct shelter expenses that exceed 50 percent of net income, recognizing that households with high shelter expenses may have less income available to purchase food. One component of shelter expenses, and the component over which States have some discretion, is the SUA. States establish these utility allowances, which households may use in lieu of actual expenses when calculating total shelter costs. The purpose of this project is to develop standard methodologies that can be used to (1) construct SUAs that accurately reflect typical utility costs for low-income households and (2) make annual adjustments to the State SUAs.

I.A. Overview of SNAP

The Food and Nutrition Act of 2008, as amended, establishes uniform national eligibility standards for SNAP and defines the parameters (e.g., countable income and assets, allowable deductions from gross income, and maximum benefit levels) used to calculate SNAP benefits. State agencies partner with FNS to administer SNAP. While FNS funds 100 percent of benefit costs, State agencies share with FNS the cost of administering the program. State eligibility workers accept SNAP applications, verify eligibility, and calculate benefit amounts (called the household's allotment) using parameters established by Federal law.

For a given household, benefits are calculated by subtracting 30 percent of the household's net income from the maximum allowable benefit for that household size. Net income is calculated by deducting certain allowable deductions from gross monthly income.[3] Allowable deductions include:

- A standard deduction that is available to all households.
- An earned income deduction for households with earnings.
- A dependent care deduction for certain out-of-pocket dependent care expenses.
- A medical deduction for households with elderly or disabled members.

[3] For further explanation of the SNAP eligibility and benefit determination, refer to *Characteristics of Supplemental Nutrition Assistance Program Households: Fiscal Year 2011,* available online at www.fns.usda.gov/fns/research.htm, or visit the SNAP Website, http://www.fns.usda.gov/snap/.

- A child support payment deduction for child support payments made to non-household members.
- An excess shelter expense deduction, available to households with shelter costs that exceed 50 percent of their income after other deductions. This deduction has a maximum limit, which is adjusted annually for inflation. The limit does not apply to households with an elderly or disabled member.

I.B. Standard Utility Allowances

Shelter expenses include the basic cost of housing, as well as utilities and other allowable expenses. In order to simplify program administration, States are permitted to establish SUAs that households may use in lieu of actual utility expenses. SUAs may include such expenses as fuel for heating and/or cooling, electricity and fuel for purposes other than heating or cooling, water, sewage, well and septic installation and maintenance, telephone, and trash collection.

While the use of SUAs simplifies the application process from the perspective of both the State agency and the applicant, program simplification needs to be balanced with other SNAP goals of ensuring benefit adequacy and program integrity. Simply stated, SUAs need to be set at a high enough level to ensure that households with high shelter costs receive adequate benefits, but not so high that benefit levels are inflated for households with relatively small utility costs.

States have the option of *requiring* that households use SUAs (rather than documenting actual utility costs), and most State agencies (47) do have mandatory SUAs.[4] However, if States require the use of SUAs, they must establish a minimum of two SUAs: one for households with heating and/or cooling expenses and another for households with no heating and cooling expenses.

States may establish multiple SUAs to reflect differences in households' circumstances. Households only need to provide evidence that they pay for the utility in order to receive the SUA. Types of SUAs include:

- A Heating and Cooling SUA (HCSUA), for households that pay heating and/or cooling expenses separate from their rent or mortgage. The HCSUA includes the costs of fuel for heating and/or cooling, electricity and fuel for purposes other than heating or cooling, water, sewage, well and septic installation and maintenance, telephone, and trash collection.
- A Limited Utility Allowance (LUA), for households that do not pay any heating or cooling expenses separate from their rent or mortgage. The LUA includes expenses for at least two allowable utility costs but does not include heating/cooling costs.
- A telephone-only allowance, for households that have no utility expenses other than telephone.
- Single Utility Standards (SUSs), for households with a single utility expense (other than heating/cooling or telephone) separate from rent or mortgage.

[4] When States require that households use SUAs rather than document actual utility costs, those households with actual costs below the standard get a higher benefit than they otherwise would, whereas those households with actual costs above the standard get a lower benefit than they otherwise would.

States may also set different SUA amounts based on geographic location within the State or household size.

I.C. Implementation of SUAs by States

FNS does not require that States use a particular methodology when developing SUAs. In general, their methodologies fall into two categories: (1) methodologies that rely on State-specific recent utility data and (2) methodologies that adjust a base number using an inflation measure such as the Consumer Price Index (CPI) of utility costs. Some States use a methodology that combines both approaches. Within these methodologies, there is considerable variation. For example, some States use only data for low-income households, while others gather data for all households. States incorporate a variety of fuel types, and some assign weights to the different fuel types while others do not. Over time, FNS has found some variation between established HCSUA values and average household utility expenses in many States.

States update their SUAs every year, usually on a Federal fiscal year calendar schedule. The 2013 SUAs are used to determine allotments during FY 2013 (October 1, 2012, through September 30, 2013). The ability to make annual adjustments to the SUAs is complicated by the lack of timely data sources on utility costs, especially for low-income households. There generally is a lag time of 1 or more years from the time survey data, which might contain information on SNAP participation or household income, are collected and when the data file is available for public use. Furthermore, many Federal data sources were not designed to be representative at the State level.

Nearly all States use HCSUAs and telephone allowances. Most have LUAs, and about half have at least one SUS. Most States do not define different SUAs according to household size or geographic region within the State. Only two States base their SUA levels on geographic region: Alaska and New York. Only a few States and territories base their SUA levels on household family size: Arizona, Guam, Hawaii, North Carolina, Tennessee, and Virginia.

Approximately 43 percent of the States use an updated base number for calculating SUAs, and about 57 percent of States recalculate the SUA using recent data. Table 1: lists the States that fall into each category.

Update a Base Number: Of the States that update a base number to calculate the current SUA, a vast majority use changes in the relevant price indexes (for electricity, natural gas, etc.). Only 42 percent of States know the source of their base number, and many States are uncertain of the year it was established.

Recalculate SUAs Yearly: Most States that recalculate their SUAs each year rely on utility usage information obtained from utility providers through their public service commission. Some States rely on utility consumption information available from other sources, such as the U.S. Department of Energy's (DOE's) Residential Energy Consumption Survey (RECS); Census Bureau's American Community Survey (ACS); Low Income Home Energy Assistance Program (LIHEAP); and Fisher, Sheehan & Colton's (FSC) Home Energy Affordability Gap model.

Table 1: SUA Methodology Used by State

Update a Base	Recalculate Yearly	Unknown
Alabama	Alaska	Arizona
Arkansas	Florida	District of Columbia
California	Georgia	Guam
Colorado	Illinois	Hawaii
Connecticut	Indiana	Idaho
Delaware	Kansas	Maine
Iowa	Kentucky	North Dakota
Maryland	Louisiana	Oregon
Massachusetts	Minnesota	Virgin Islands
Michigan	Mississippi	
Nebraska	Missouri	
New Jersey	Montana	
New York	Nevada	
Rhode Island	New Hampshire	
South Carolina	New Mexico	
South Dakota	North Carolina	
Tennessee	Ohio	
Vermont	Oklahoma	
Virginia	Pennsylvania	
	Texas	
	Utah	
	Washington	
	West Virginia	
	Wisconsin	
	Wyoming	

I.D. Study Objectives

The primary objectives of this study are to (1) conduct a review of available data on utility costs to determine which sources are most useful for standardizing SUAs, (2) develop two or more methods for standardizing the development of SUAs across all States, and (3) develop two or more methodologies for making annual adjustments to SUAs.

Objective 1: Review Data Sources

The purpose of this objective is to gather information on potential data sources that could be used to develop a standardized methodology for constructing and updating State SUAs. To meet this objective, we evaluated potential data sources in terms of completeness, accuracy, timeliness, and appropriateness for this study. The review took into consideration (1) the potential need to link multiple data sources to implement a proposed methodology, and (2) the likelihood that methodologies for updating SUAs may rely on different data than the methodologies for creating SUAs.

In particular, the data sources had to be assessed in terms of their ability to:

- Allow for State-level estimates and analyses.
- Provide information on utility costs paid by low-income households.
- Provide information on utility costs paid by other households.
- Provide information on the types of utility expenses paid by low-income households and the frequency with which low-income households incur these expenses.
- Provide information on the types of utility expenses paid by other households and the frequency with which these households incur these expenses.
- Allow for analysis of how these expenses vary geographically within States.
- Allow for analysis of average utility costs paid by low-income households, as well as costs at various cost percentiles.
- Provide information on all household demographic characteristics, most especially household size.

Objective 2: Develop Methodologies for Standardizing Development of SUAs

The purpose of this objective is to use the results of the data source review to develop two or more methodologies that could possibly be used by States to develop SUAs. Development of the methodologies took into consideration:

- How easily they could be adapted for use by States.
- Whether they would allow States to make adjustments based on variations among States in average utility costs or types of expenses paid.
- The extent to which they could be used to develop multiple SUAs (HCSUA, LUA, etc.).
- Which utility costs should be included when building a SUA and weighting factors for those costs.
- How to make within-State geographic adjustments.
- How to make adjustments for household size and other factors.
- The need to balance the goals of ensuring benefit adequacy, simplifying program administration, and ensuring program integrity.

Objective 3: Develop Methodologies for Making Annual Adjustments to SUAs

This objective is to use information gathered during the data sources review to develop two or more methodologies for making annual adjustments to SUAs. Development of these methodologies took into consideration:

- How easily they could be adapted by States.
- Whether they allow for variations among States in average utility costs or types of expenses paid.

- The extent to which they could be easily adapted for updating different types of SUAs (e.g., HCSUA or LUA).
- The extent to which they would account for the volatility of utility and fuel costs.
- The time lag between data collection, data availability, and annual SUA updates.
- The timing of annual adjustments to SUAs.
- The extent to which they allow for variations in utility cost changes between States.

II. REVIEW OF RELEVANT DATA SOURCES

As part of our review of relevant data sources, we examined a variety of sources that provide data on energy consumption and costs. We also looked more closely at three utility cost models used in other Federal programs. This section summarizes those data sources and models, evaluates their strengths and weakness, and makes recommendations regarding which sources are most useful for developing and updating SUAs.[5]

In order to be useful for this study, the data sources considered would ideally:

- *Be representative at the State level.* Although SNAP is a Federal program, States establish their own SUAs. In addition, utility expenditures vary across States due to differences in taxes and tariffs, weather, access to fuel supplies, etc.
- *Provide information on a household level basis*. Because the SUAs are developed at the household level, the ability of the data source to provide household-level expenditure estimates is a key consideration.
- *Have information on household income*. Because utility expenditures vary according to household income, it is important to isolate utility expenditures for low-income households.
- *Have information on household size*. Because utility expenditures vary according to household size, some States implement specific SUAs for different household size categories.
- *Provide detail on the different types of utilities used by households*. Since some States have separate SUSs for electricity and natural gas/other fuels, it is important to be able to differentiate expenditures on the different types of utilities.
- *Have expenditure information on different utility end-uses (heating and cooling or other)*. In order to estimate SUAs that closely match utility expenditures for households with and without heating and/or cooling expenses, it is necessary to distinguish between heating and cooling expenses and expenditures for other types of end-uses (such as lighting or water heating).
- *Provide information on how the different end-uses are paid for (included in rent or paid for directly by the occupant)*. In order to calculate the different types of SUAs, it is necessary to distinguish between expenses, by end-use, that are included in rent and those that are paid for directly by the occupant.
- *Consist of Timely Data*. Due to fluctuations in fuel supplies and prices, recent data will provide estimates of current utility expenses that are more accurate than those developed using relatively older data.
- *Be updated at least once a year*, to support the States' annual revisions to their SUAs.
- *Allow for analysis of how utility expenses vary geographically within States.* Due to factors that can give rise to substantial differences in utility expenditures across different sub-State regions, some States develop specific SUAs for different sub-State areas.
- *Allow for the estimation of confidence intervals or development of costs for different cost percentiles.* It may be necessary to establish an SUA that is above the mean utility expenditure to ensure that a sufficient number of low-income households are addressed.

[5] Appendix A identifies minor sources that were reviewed, but not considered for use in developing the SUAs.

II.A. Residential Energy Consumption Survey

DOE's Residential Energy Consumption Survey is the source of the most accurate and detailed information on U.S. residential energy consumption. The data characterize residential energy use and expenditures by a number of different factors such as:

- Type of Fuel.
- Appliances Used.
- Location (Census Region, urban vs. rural, metropolitan or micropolitan statistical area).
- Climate Region.
- Type of Housing (single family attached/detached, multifamily small/large, mobile home).
- Owned vs. Rented.
- Age.
- Square Footage.
- Household Size.
- Household Income.
- Income Relative to Poverty Line.
- Payment Method (all paid by household, some in rent, all in rent).

The survey was first conducted in 1978 and has been repeated every 4 years since 1993. The survey is based on a nationally representative sample; in 2009, it collected data from 12,083 households designed to represent 113.6 million primary residences in the Nation. The data produce reliable estimates for the 4 Census regions, 9 Census divisions, and 16 States that vary in terms of geography, climate, and population size. The sample is believed to provide sufficient data to construct statistical models that can estimate utility consumption for different structure types and climate conditions.

In administering the survey, DOE uses different survey instruments designed to collect both different types of data as well as overlapping data that can be validated against each other. These instruments include:

- Household Survey (HS) consisting of in-person interviews with householders of sampled housing units.
- Survey/interview of rental agents for sampled rental units where some or all of the energy costs are included in the rent.
- Energy Supplier Survey (ESS) in which energy suppliers are asked to provide 12 months of consumption and expenditure data for the sampled housing units.

DOE uses the HS and ESS data in a nonlinear statistical model that disaggregates total energy consumption into energy consumption by end-use categories (heating, cooling, cooking, refrigeration, lighting, etc.). ***RECS is the only source that provides information on how occupants pay for these different end-uses, a critical factor needed to be able to develop the SUAs.***

In addition to the level of detail it provides, one of the biggest strengths of RECS is that it does not rely upon respondent recall to estimate consumption and expenditures for different fuel types and uses. This is important, as past Census research has shown that utility cost estimates based on respondent recall are usually higher than actual costs.[6] In the HS, the interviewers review actual billing statements, and in the 2009 RECS, interviewers used portable devices to scan the sampled household utility bills. A statistical procedure then matches and compares the ESS and HS consumption and expenditure figures for the sampled households.[7]

RECS does have several limitations, notably:

- State-level estimates are available for only 16 States; estimates for the remaining States are aggregated into 11 multi-State regions.
- The survey is administered once every 4 years, and the data are released in multiple phases as they are collected.[8] Household characteristics data are released a little over a year after the end of the reference period. For example, household characteristics data for RECS 2009 were released in early 2011. Data based on the ESS are not released until approximately 2.5 years after the end of the reference year, with end-use estimates released approximately 3 years later. For example, the 2009 ESS data were released in mid-2012, and the RECS 2009 end-use estimates were released in early 2013. This could mean that other data sources would be needed to update RECS-based SUAs in the intervening years between data releases.
- The sample size is too small to be able to produce reliable estimates if the data are divided into numerous subcategories. For example, in order to develop LUAs and SUSs, it is necessary to categorize the data by State, income group, type of fuel, end-use, and who paid for the expenditure; in some instances, this amount of categorization leads to very few or no observations in the subcategories.

II.B. American Community Survey (ACS)

The American Community Survey is a continuous survey of the American populace administered by U.S. Census Bureau. It collects information from approximately 3 million households per year on a wide range of topics, information that was previously gathered on the long form of the decennial census. Other than the decennial census, it is the largest survey administered by the Census. The estimates are published fairly quickly after the reference period: for example, the Census released estimates for 2012 in December of 2013.

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6 Riley & Associates and Alan Fox Consulting, 2009, page 14.

7 For example, see Energy Information Administration, U.S. Department of Energy, *Assessment of consumption and expenditure data collected from energy suppliers against bill data obtained from interviewed households: Case study with 2009 RECS*, February 2013.

8 For a more precise schedule, see http://www.eia.gov/consumption/residential/methodology/2009/pdf/techdoc-summary010413.pdf.

The ACS publishes three types of estimates:

- 5-year estimates: These estimates are based on 60 months of collected data for areas of all population sizes. Of the three types of estimates published, these rely upon the largest samples (and are therefore the most reliable and most accurate) and also allow for the analysis of small populations. However, the estimates are not very current.
- 3-year estimates: These estimates are based on 36 months of collected data for areas with populations exceeding 20,000 people. These estimates are more current than the 5-year estimates but are not as reliable or precise and cannot be used to analyze areas with very small populations.
- 1-year estimates: These estimates are based on 12 months of data for areas with populations exceeding 65,000 people. These estimates are the most current and can be used to analyze relatively large populations, but they are not as precise or reliable as the 3-year or 5-year estimates.

The ACS is representative at the State level, includes most utility expenses (the exceptions being trash and telephone), includes SNAP participation and poverty status variables, and uses a sufficiently large sample size to be able to produce reliable estimates by various demographic categories (e.g., household size, income group, structure type) and for sub-State regions. It should also be possible to compute estimates for quartiles or percentage ranges. Finally, there would be no need to convert quantity estimates to costs (since the ACS captures expenditures) or to make location adjustments to account for different climate conditions.

One problem with the ACS is that the cost estimates are based on customer recall rather than on actual utility bills or supplier data. As noted earlier, there is some evidence that Census-based utility cost estimates are higher than they should be because individual respondents tend to remember the highest monthly expenditures rather than average expenditures.[9] According to 2006 ACS technical documentation:

> Research has shown that respondents tended to overstate their expenses for electricity and gas when compared to utility company records. There is some evidence that this overstatement is reduced when yearly costs are asked rather than monthly costs. Caution should be exercised in using these data for direct analysis because costs are not reported for certain kinds of units such as renter-occupied units with all utilities included in the rent and owner-occupied condominium units with utilities included in the condominium fee.[10]

This is supported by an analysis in the Department of Housing and Urban Development (HUD) *Comparative Study* (cited previously), which found that electric and natural gas heating cost estimates based on the ACS were 12–19 percent higher than comparable costs derived from RECS.[11]

[9] HUD and the Census have also confronted and have attempted to deal with this issue in the American Housing Survey (AHS). According to a 2009 study on AHS survey design, "Respondents frequently do not have good recall about utility expenses and even when recall is good, it can be affected by seasonal fluctuations in utility bills. The few studies that have been conducted regarding respondent error suggest that residents overestimate their utility costs." See U.S. Department of Housing and Urban Development, *Streamlining the American Housing Survey*, report prepared by Frederick J. Eggers of Econometrica, June 2009.
[10] U.S. Census Bureau, *American Community Survey Definitions, 2006*, page 22.
[11] Riley & Associates and Alan Fox Consulting, 2009.

Nevertheless, HUD uses ACS and Census data to periodically re-benchmark its Fair Market Rents, so there is both a precedent for a Government-wide program to use the ACS, as well as a rationale supporting consistency and comparability across agencies.

II.C. State Energy Data System (SEDS)

Using a number of different data sources and estimation procedures, DOE's Energy Information Administration (EIA) has created historical time-series estimates of annual State-level energy production, consumption, prices, and expenditures. These series, known as the State Energy Data System (SEDS), are defined as consistently as possible over time and across sectors. To maintain this level of consistency, the data are published on an annual basis and for very broad categories such as primary energy source (e.g., electricity, natural gas, distillate fuel oil) and major end-use (e.g., residential, commercial, industrial). All prices are expressed in current dollars per Btu (British thermal unit) to facilitate comparison across energy sources.

We initially anticipated that these data could serve several functions if used in the development of standardized State-level SUAs for FNS. First, we thought they would be able to serve as control totals for State-level residential energy consumption and expenditures (total and by fuel source) within a disaggregation approach to estimate average energy expenditures for low-income households. Second, the time-series data would make it possible to use trend analysis (or other forecasting approaches) to estimate consumption and expenditures for the specific reference year pertaining to the utility allowance being revised.

EIA publishes the data in phases, releasing the final estimates approximately 18 months after the end of the reference year. For example, final estimates for 2012 are scheduled to be released mid-year 2014.

EIA taps a number of different surveys and data sources to develop the SEDS consumption estimates. These sources include, but are not limited to, the following EIA publications:

- *Annual Coal Report.*
- *Natural Gas Annual.*
- *Petroleum Supply Annual.*
- *Electric Power Annual.*

As seen with RECS, the data collection instruments include surveys of both suppliers and end-use consumers, with the data obtained from these surveys often published in EIA reports such as the *Monthly Energy Review*. EIA cautions users against comparing survey consumption estimates and SEDS consumption estimates, noting that consumption surveys do not account for all energy-using sectors and cannot be summed together to estimate total energy use.

Although SEDS provides very good information on State-level energy expenditures, the data are highly aggregated and numerous processes are needed to allocate those data, which together introduce considerable error. The SEDS data represent total expenditures in the State and are not defined on a household basis; therefore, they have to be allocated to households based upon assumptions of household usage by different income groups. Furthermore, the data reflect total expenditures, including those paid directly by occupants and those included in occupant rental fees; as a result, an additional allocation procedure is needed to isolate those expenditures paid for directly. The data do not provide information on households that use multiple utilities (e.g., electricity for cooling and natural gas for heating) and have to be adjusted for those instances. Finally, adjustments have to be applied to isolate heating and cooling expenses from other types of end-uses (required to develop the LUAs and SUSs).

II.D. American Housing Survey (AHS)

The American Housing Survey (AHS) is a survey conducted by the Census Bureau for HUD. National-level data are collected every 2 years, while data for selected metropolitan areas are collected approximately every 6 years. The two main advantages of the AHS are:

1. The amount of detailed information on utilities that is collected.
2. The data collection and validation protocols that are utilized.

In regard to the first point, the AHS poses significantly more questions about utilities than are asked by the ACS.[12] Detailed questions are asked about the different types of utilities used, how they are paid for (e.g., included in rent or combined with other payments), and payment amounts.

In regard to the data collection and validation protocols, several points are worth mentioning. First, unlike most surveys, the AHS uses a longitudinal sample (i.e., uses the same housing units in subsequent surveys) that facilitates different and unique types of temporal analyses. Second, the questionnaire and interview process have been developed over time and incorporate a number of cross checks designed to reduce erroneous responses. The HUD *Comparative Study* references a 1989 study that compares actual electricity and natural gas expenditures with reported costs (no citation given); the study apparently found that residents overestimate their utility costs by 15–20 percent. An earlier unpublished study by AHS in the 1970s apparently found even larger overestimates. The AHS questionnaire and interview process has been modified over time to specifically address this issue. The current protocol attempts to solicit responses based on actual electric and natural gas utility bills for the months of January, April, August, and December, as those months have been shown to be the best predictors for developing annual cost estimates. If the respondent cannot provide or refuses to provide that information, a subset of questions is asked about his/her utility costs. The responses undergo an extensive data editing routine that includes a variety of consistency audits (e.g., between type of equipment used and type of utility paid for). Finally, the data are calibrated using RECS data as control totals (e.g., annual costs are benchmarked to current RECS averages for each Census Division).

The main disadvantage of the AHS is that it is not representative at the State level. However, the 2015 AHS is currently in the planning stages, and there has been some discussion about redesigning it to produce State-level estimates for most if not all States.[13] HUD and the Census

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[12] For a comparison, see Frederick J. Eggers, Econometrica, *Comparison of Housing Information from the American Housing Survey and the American Community Survey*, report prepared for HUD under Contract No. C-CHI-00839, Task D, Order No. CHI-T0002, Project No. 017-002, September 2007, http://www.huduser.org/portal/publications/pdf/comparison_hsg.pdf.

[13] We have received conflicting information on this issue. An AHS Planning Conference was held in May 2013, and one of the attendees told us that the AHS was being redesigned to produce State-level estimates. In addition, HUD's Website mentions this change (http://www.huduser.org/portal/datasets/ahs/ahs_2015.html). A white paper produced

Bureau are preparing a series of 13 papers in preparation for the 2015 redesign. One paper—entitled "Best Methods for Collecting Utility Cost Data: Evidence from the ACS, AHS, and RECS"—is intended to answer a number of questions, including:

- Which surveys collect utility data?
- Do the different surveys produce similar estimates?
- Is the AHS an appropriate instrument for collecting utility data?
- How should utility data be imputed, if at all?

In addressing the utility questions, the redesign is looking for ways to reduce the burden on respondents. A number of options are under consideration, including the following:

- Using RECS exclusively instead of asking respondents about their utility costs.
- Removing the requests for utility bill information and relying more upon RECS.
- Developing better imputation procedures.
- Reworking the questions.

It is hard to predict the outcome of the 2015 AHS redesign, but it could potentially be a good source that would allow for the easy calculation of standardized State-level SUAs for FNS. A key question will be the extent to which the survey provides end-use information that can be used to develop FNS' SUAs. For these reasons, FNS may want to become involved in the AHS planning process or at least stay abreast of its progress.

II.E. National Economic Accounts

The U.S. Bureau of Economic Analysis (BEA) produces detailed annual estimates of personal consumption expenditures in the United States as part of its National Income and Product Accounts (NIPA).[14] The data reflect total annual expenditures and are not reported on a household-level basis. The current data set provides these annual expenditure estimates for 1959–2012.

For this effort, notable line items include:

- Landline telephone expenditures, local charges.
- Water supply and sewage maintenance expenditures.
- Garbage and trash collection expenditures.

Both RECS and the ACS provide limited information on these utilities, so these BEA data are helpful in filling in some of the gaps when utilizing one of these other sources to estimate household energy expenditures.

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by Census Bureau staff (and provided on HUD's Website) also notes that certain changes to the AHS will be implemented (one being the ability to produce estimates at the State level) irrespective of other options being considered for redesign (http://www.huduser.org/datasets/ahs/AHSRedesignWhitepaper.pdf). However, in a telephone conversation with a HUD staff member working on the AHS, we were told that the 2015 AHS would only be representative at the Census Division level.

[14] Reported in Table 2.4.5U as part of BEA's Detailed NIPA Data.

II.F. Telephone Data Sources

In 2008, the Federal Communications Commission (FCC) published an analysis of household telephone expenditures.[15] This report utilized two sources of telephone expenditure data: the Bureau of Labor Statistics' (BLS) Consumer Expenditure Survey (CEX), discussed below, and data donated to the FCC from TNS Telecoms, a telecommunications market information firm that gathers information on actual household telecommunication bills. Given the availability of the CEX data, we are using it in conjunction with the BEA landline expenditure data and the ACS to estimate the telephone SUAs.

II.G. Consumer Expenditure Survey

The CEX is a data collection program administered by BLS, although the data are actually collected by the Census Bureau. The data allow for detailed analysis of different expenditure patterns by income level and other demographic characteristics (notably, SNAP participation and household size for purposes of this study). The main problem with the CEX is that the data are not representative at the State level and cannot be used to produce accurate State-level estimates. It is also not clear whether the method currently used to collect the information on utility expenditures (through the Quarterly Interview Survey) incorporates the use of respondent billing statements to validate responses from memory, which would help reduce errors due to inaccurate recall. BLS has been exploring this issue but does not seem to have implemented such provisions.

On the other hand, the data do contain consistent expenditure information for all types of utility expenses, and these data can be categorized by household size, income level, and SNAP participation status. For purposes of developing SUAs, the CEX is the only readily available source of information on landline telephone expenditures by household and by income group. These data are therefore used within a disaggregation routine to estimate telephone SUAs by State. We also used the CEX national-level utility expenditure estimate per household as benchmarks for evaluating different disaggregation routines that were tested.

II.H. Short Term Energy Outlook (STEO)

EIA's Short Term Energy Outlook (STEO) includes quarterly forecasts of energy consumption data (quantity, price, and expenditures) for the Nation and Census Regions. The forecasts cover residential consumption of electricity, natural gas, and renewable fuels and extend approximately 6 quarters into the future. STEO also provides forecasts for corresponding macroeconomic indicators and climate (Heating Degree Days (HDDs) and Cooling Degree Days (CDDs)).[16] Our initial efforts used STEO forecasts to help develop the base-year SUAs; however, validation of the results indicated that an alternative extrapolation method based upon the CPI produced more accurate results and would be easier to implement.

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[15] Federal Communications Commission, Industry Analysis & Technology Division, Wireline Competition Bureau, *Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service*, 2008.

[16] HDDs and CDDs are metrics that reflect the quantity of energy needed to heat or cool a building, respectively. The metrics compare average temperatures over a specific period of time with base temperatures in which heating or cooling is not required.

II.I. Consumer Price Index (CPI)

BLS publishes monthly data on various CPIs, which can be easily accessed on the BLS Website. The CPIs vary in terms of the type of consumer being reflected, aggregation level of the product, geographic regions, how the indexes are constructed, time interval, etc.

A notable feature of the monthly CPI data is that BLS releases it soon after the end of the month, so it is the most current historical data available for updating the SUAs. The States can take advantage of this by calculating custom-defined annual averages (as opposed to the calendar-year averages presented by BLS) to capture the most recent non-seasonal price changes. For example, States that define their SUAs on an October–September year basis could look at growth rates in average annual prices calculated between September and August.[17]

BLS publishes five different indexes, which vary in terms of market baskets and the type of consumer reflected:

- All Urban Consumers (Current Series).
- Urban Wage Earners and Clerical Workers (Current Series).
- All Urban Consumers (Chained CPI).
- Average Price Data.
- Department Store Inventory Price Index.

BLS reports calendar-year averages, as well as seasonally adjusted and not-seasonally adjusted monthly averages.

The CPI data do have several limitations. Geographic detail is available for 27 metropolitan areas and 4 regions (Northeast, Midwest, South, and West) but is not provided for individual States. For these 31 subnational geographies, there is no specific coverage for fuel oil, although it is included in the CPI for household energy. Data for water/sewage/trash are not provided for subnational levels (although these services are included in the CPI for total "Fuels and Utilities"); data for landline telephone services are provided only at the national level.

[17] Monthly data for September are not available before the beginning of the October–September Fiscal Year; therefore, the most recent annual period that can be used to calculate average prices before October 1 is September through August.

II.J. Data Review Summary

Table 2 summarizes the major data sources in terms of their ability to provide key types of information needed to develop the SUAs.

Table 2: Summary of Data Sources

Ability to Provide the	Data Source				
	RECS	ACS	SEDS	AHS	CEX
Ability to Provide State Level Estimates	√*	√	√		
Provide information at the Household Level	√	√		√	√
Information on Household Income	√	√		√	√
Information on Household Size	√	√		√	√
Information on Different Types of Utilities	√	√	√**	√	√
Information on Utility End-Uses	√				
Information on How Utilities are Paid For	√				
Allows for Sub-State Analyses		√			
Allows for Development of Cost Percentiles		√***			

*RECS can provide estimates for sixteen States and eleven multi-State groups.

**SEDS provides total expenditures for different types of utilities, but does not provide detail for households that use multiple utilities simultaneously.

***With the exception of SEDS, all of the data sources can provide "some" information on the underlying distributions, depending on the level of aggregation. However, the ACS is the only source with a large enough sample to be able to provide distribution information for fairly disaggregate estimates (e.g., by income group, household size, and type of utility).

II.K. Review of Federal Methodologies

We reviewed several models that were developed by other Federal agencies and are used to compute utility allowances or estimate energy consumption.[18] These models were evaluated to see whether they could be adapted to meet FNS' objectives. These models include (1) HUD's Office of Public and Indian Housing (PIH) Utility Schedule Method, (2) the HUD Utility Schedule Model (HUSM), and (3) DOE's DOE-2 model. The first two models are used to calculate utility allowances applied under HUD's Section 8 Housing Choice Voucher Program, and the DOE-2 is used in building design and energy conservation studies.

HUD PIH Utility Schedule Method

This consumption-based method originated in the 1970s and is designed to help Housing Authorities (HAs) fill out HUD's Form HUD-52667, which is the form HAs are required to complete to establish their utility allowances for households receiving housing assistance. A few private vendors have developed spreadsheet models that assist HAs in filling out Form 52667. Such models are relatively simple and only require the numbers of HDDs and CDDs and utility rate information as data inputs from the user.

HUD Utility Schedule Model (HUSM)

This downloadable spreadsheet model[19]—employed by the Internal Revenue Service (IRS) to determine utilities for its Low Income Housing Tax Credit (LIHTC) program and by an

[18] See Appendix A for more detailed information on these models.

[19] Available at http://www.huduser.org/resources/utilmodel.html.

indeterminate number of HAs for HUD's Section 8 program—uses utility rate and location information to calculate consumption estimates. The model incorporates parameters statistically estimated using data from the DOE's RECS. As with the PIH Utility Schedule Method previously described, the model is designed to help HAs complete HUD Form 52667 and therefore includes a lot of detail that would not be needed by FNS. Required inputs to the model include the number of HDDs and CDDs by month (which can be retrieved via a ZIP Code lookup utility), as well as detailed information on utility tariffs.

The model produces a number of different allowances by structure type and utility end-use. Allowances for heating, cooking, and water heating are further itemized by type of fuel (natural gas, bottled gas, electric, and other). Most of the allowances are also itemized by the number of bedrooms in the structure.

Department of Energy's DOE-2 Utility Estimation Model (DOE-2)

The DOE-2 model uses a very complicated engineering approach to estimate utility consumption.[20] The model is based on engineering calculations and to some extent on RECS, and uses data on detailed structural characteristics as well as climate data. In practice, the model is seldom used because of the time and costs involved.[21]

Conclusion

Based on our analysis of these models, we do not think any of them would serve as a useful guide for developing an SUA methodology. These models were developed to estimate utility expenditures at much lower levels (e.g., by type of housing construction) than is required for SUAs. In most cases, these models would require much more detailed information than is currently used by States to develop their SUAs. In addition to this problem, some of our analyses indicate a weak relationship between the number of CDDs/HDDS and utility consumption—the main input drivers of these models.

[20] See http://www.doe2.com.
[21] Riley & Associates and Alan Fox Consulting, 2009, page 14.

III. SELECTION OF FINAL MODELING ALTERNATIVES

Based on our initial review of existing models and data sources, we developed a preliminary list of alternative approaches[22] that could be used to develop, obtain, or calculate standardized SUAs. We then conducted a number of analyses to help us evaluate these alternatives. Based on these analyses, we developed the following approaches for developing base-year SUAs. These approaches include two alternatives that address the energy components of the SUAs, a specific approach for estimating telephone allowances and a specific approach for estimating water, sewage, and trash allowances.

Energy-Related Allowances

The following two approaches, based on different data sources, could be used to develop the energy components of the HCSUAs, LUA, and SUSs.

1. **Use data from the ACS, adjusted using RECS**. The approach has two advantages: (1) it provides some utility expenditure data for every State and (2) the sample is very large so that the averages for subcategories—such as the low-income group—are based on a considerable number of observations. The ACS has two main problems. First, it does not differentiate between heating/cooling end-use expenditures and other energy expenditures—information that is needed in order to develop SUAs that include heating and cooling expenditures (HCSUAs) and SUAs that exclude them because they are included in rent or condominium fees (LUAs and SUSs). Second, as mentioned previously, there is some evidence that respondents tend to overestimate self-reported utility expenditures, making it is necessary to use RECS to develop adjustment parameters to (1) ensure that heating and cooling expenses are either included in the development of the HCSUAs or excluded from the other SUAs and (2) account for upward bias in the ACS self-reported utility expenditure estimates.
2. **Use RECS directly to develop the energy components of all of the different types of SUAs**. RECS provides all of the data needed to estimate these components and would require the fewest linkages to other sources to carry out the approach. An issue with RECS, however, is its timeliness: the survey is conducted only once every 4 years, and there is an additional 3- to 4-year lag before the data are published. To put this issue in practical terms, data from the 2013 RECS probably will not be published until 2016 or 2017; this implies that development of the year 2017 SUAs could have to rely upon the 2009 RECS data, which at that time would be 8 years old. Furthermore, RECS is not representative for all States.

When using RECS to adjust the ACS, several issues are encountered that are likely to introduce error into the resulting estimates. First, there is not a direct linkage between RECS and the ACS for every State in the country. RECS provides representative State-level estimates for only 16 States; estimates for the remaining States are aggregated into 11 multi-State regions. Therefore, 34 States in the ACS have to rely on RECS estimates for 1 of these 11 multi-State regions rather than an estimate for a specific corresponding State. Second, the energy expenditure data in the ACS are not entirely compatible with those in RECS. For example, the ACS assumes that **all** expenditures for a specific energy source (e.g., electricity) are either included in the occupant's rent/condo fee or not;

[22] See Appendix B for the full list of preliminary alternatives, and the rationales used to drop some from further consideration.

RECS, on the other hand, takes into account circumstances where some end-uses are included in rent/condo fees but others are not and have to be paid for out of pocket.

Given the amount of error that can be introduced via the adjustment processes that try to address these issues, it is possible that just using RECS directly to estimate the SUAs will produce results as accurate as the ACS-based approach. In this case, the error will accrue primarily to the 34 States that are not specifically represented in RECS and that would have to use estimates based on the multi-State regions in which they are included. As a result of not having to establish data linkages with other data sets, the RECS-based approach may be easier to implement than the ACS approach.

Neither the RECS nor the ACS can be used by itself to estimate all of the different SUAs. Neither source collects information on telephone expenditures, which means these sources cannot be used by themselves to estimate the telephone SUAs or the HCSUAs or LUAs (since telephone expenditures are part of them). The sources also do not provide complete or detailed information on water/sewage/trash expenditures, so other sources are required to develop estimates for those utilities, which then must be added to the HCSUAs or LUAs. The specific approaches used to develop the telephone and water/sewage/trash allowances are described below.

Telephone Allowances

The methodology for estimating landline telephone expenditures uses a disaggregation procedure to allocate national-level control totals (from BEA's National Economic Accounts) to each State. Prior to the State allocation, however, the BEA's national-level figures are distributed to low-income groups using national-level landline expenditure data from BLS' CEX. The resulting estimates are then allocated to the State level using total personal income from the ACS.[23]

Water/Sewage/Trash Allowances

The methodology for estimating water/sewage/trash expenditures relies on the ACS as the main data source to develop estimates of low-income household expenditures for water and sewage services combined.[24] To address the lack of data on trash expenditures, a simple scaling factor derived from BLS' national level CEX data was used to escalate the ACS State-level estimates for water and sewage services.[25]

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[23] See Section IV.C for detail on the methodology used to estimate the telephone allowances.

[24] The ACS combines water and sewage into a single category and does not provide expenditure detail for each one separately.

[25] See Section IV.B for detail on the methodology used to estimate the water/sewage/trash allowances.

IV. METHODOLOGIES FOR DEVELOPING SUAS

This section provides an overview of the final methodologies we developed to standardize State SUAs. The methodologies were used to develop HCSUAs, LUAs, SUSs, and telephone utility allowances.[26]

Growth in average household utility expenditures consists of three elements: change in the price of the utility, change in the quantity consumed (e.g., cubic feet or kilowatt hours), and change in the number of households. The relationship between these components is summarized in the following formula (Appendix C contains a more detailed description of this relationship):

Equation 1: Household Utility Expenditures and Component Growth Rates

$$
\begin{aligned}
UtilityExpenditures\_per\_Household_{t+1} = \; & UtilityExpenditures\_per\_Household_{t} \\
\times \; & Average\ Annual\ Growth\ Rate\ in\ Prices \\
\times \; & Average\ Annual\ Growth\ Rate\ in\ Quantity\ Consumed \\
\div \; & Average\ Annual\ Growth\ Rate\ in\ Number\ of\ Households
\end{aligned}
$$

This formula shows that average household utility expenditures change as a result of changing prices, consumer response to price changes and other factors (e.g., weather) in terms of how much of the utility is purchased, and growth in the number of households.[27] These components and their relationship to each other play an important part in the development of the alternatives presented below.

In general, both alternatives utilize similar methodological approaches to develop the SUAs.

1. Each approach starts by developing an estimate that is equivalent to a SUA for the latest year in the data set being used (2011 for ACS and 2009 for RECS). For the RECS-based approach, we tabulate these figures directly from RECS. For the ACS-based approach and the approaches for the non-energy utilities, we apply either a disaggregation routine[28] or an adjustment parameter to the relevant base-year expenditure figures.
2. Next, we extrapolate these estimates to the target year. The extrapolations take into account the three growth factors shown in Equation 1 and are necessary due to lags between the target year and the year of the data being used.

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[26] The data sources that can be used to support the development of a standardized methodology for estimating State SUAs do not provide information for Guam or the U.S. Virgin Islands. It may be possible to use other sources to develop SUAs for these areas; however, we are not aware of any Government sources that can be used for that purpose. Another option would be to use 1 of the 50 States as a proxy for each territory, perhaps with some customized adaptation. Examples that come to mind are using Hawaii for Guam and Florida for the U.S. Virgin Islands. Either approach would not necessarily be consistent with a standardized approach developed using the ACS or RECS.

[27] Since the average expenditure per household is essentially total expenditures divided by the number of households, we have to take into account the extrapolated number of households in order to compute the extrapolated expenditure per household.

[28] A disaggregation routine allocates a total value for a category to subcomponents or subcategories. For example, total employment in the United States could be allocated to occupational categories and/or to geographic regions or States.

IV.A. Computation of Electricity and Natural Gas/Other Fuels SUSs

This section presents a step-by-step description of how the proposed methodologies would be used to develop electricity and natural gas/other fuels SUSs for each State.

IV.A.1. American Community Survey

As noted previously, the ACS collects expenditure data for total energy usage (electricity, natural gas, and other fuels) but does not provide detail by end-use. Therefore, it is not possible to use the ACS directly to estimate energy expenditures for non-heating and non-cooling end-uses, the relevant energy end-uses for computing SUSs and LUAs. In order to develop these types of SUAs using the ACS, it is necessary to apply an adjustment mechanism that will essentially remove heating and cooling expenditures from the ACS expenditure estimates.

The method used to develop the single energy SUAs for electricity and natural gas/other fuels[29] consists of four steps:

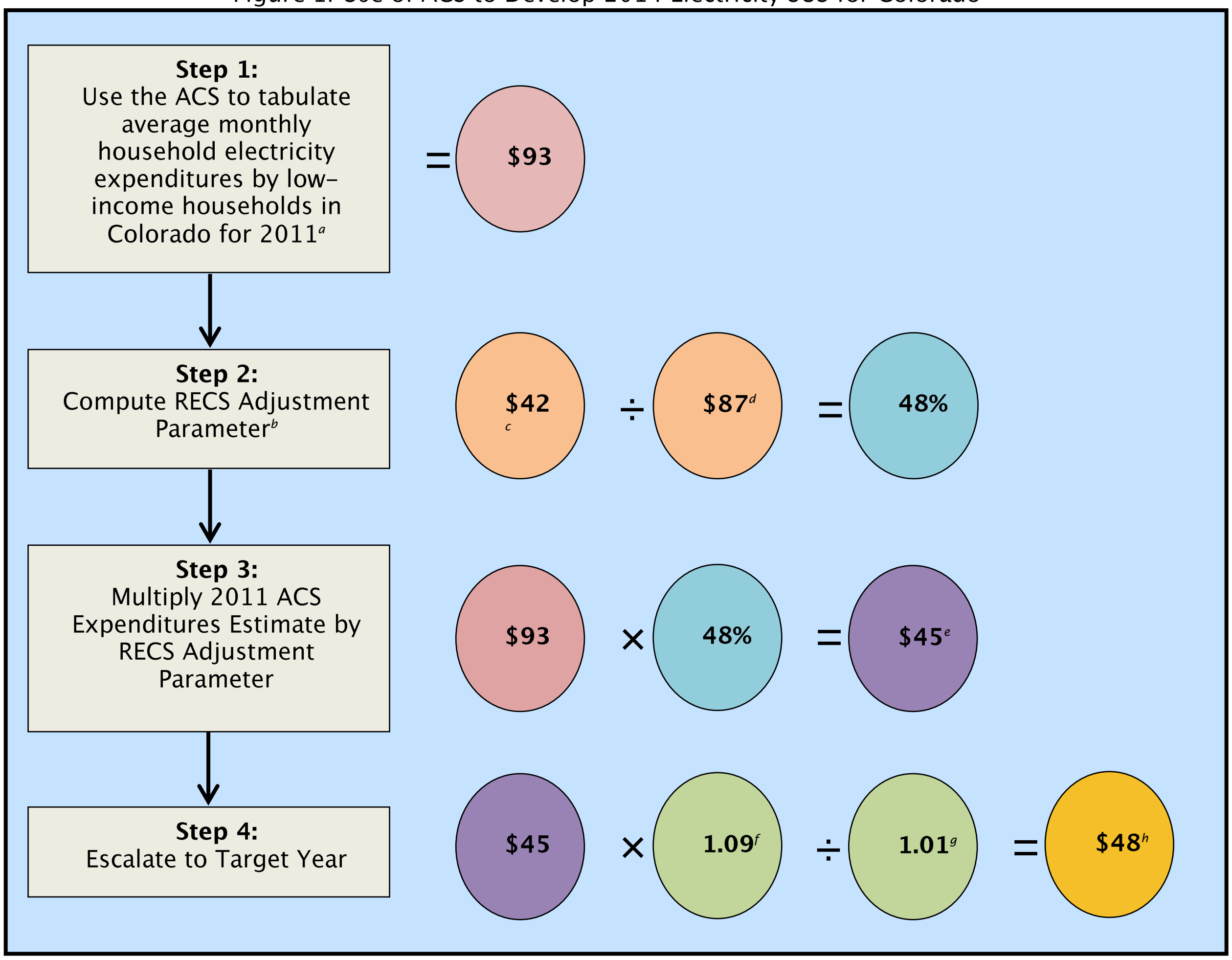
1. For each fuel type, we used the ACS to tabulate by State the average household energy expenditure for low-income households (shown in Appendix G).
2. We developed an adjustment parameter that removes heating and cooling expenses from the ACS estimates. Because RECS is the only reliable source that provides energy expenditure information by end-use, we used it to develop the adjustment parameter (shown in Appendix H). For each fuel type, the parameter is defined as the ratio between non-heating/non-cooling energy expenditures estimated using 2009 RECS data and the corresponding total energy expenditures estimated using 2009 ACS data. The parameter essentially converts the ACS data into RECS equivalents, addressing at the same time any potential upward bias in the ACS estimates because they are based on household recall. A separate adjustment parameter was calculated for each of the 16 States and 11 multi-State regions included in RECS.
3. We multiplied the 2011 ACS expenditure estimates (shown in Appendix G) by the adjustment parameters to develop base year (2011) estimates of low-income household energy expenditures on end-uses other than heating and cooling.
4. We escalated these figures to the target year[30] by multiplying them by the applicable expenditure growth rates presented in Appendix F[31] and dividing by the low-income household formation growth rates presented in Appendix E. The results for all States are presented in Appendix I.

As an example, consider the development of a 2014 electricity SUA for Colorado, shown in Appendix Table I-1 and illustrated in the following graphic. Column 5 in Appendix Table I-1 shows that, in 2011, Colorado low-income households had an average electricity expenditure of $93 per month—based on the 2011 ACS (this figure is also reported in Appendix Table G-1).

[29] Other fuels include coal, distillate fuel oil, kerosene, liquefied petroleum gas, and wood.
[30] We have presented estimates for several different target years, including calendar years 2013–2015 and fiscal years 2014–2015.
[31] Our initial efforts used STEO forecasts for this purpose; however, validation of the results indicated that an alternative extrapolation method based upon the CPI produced more accurate results and would be easier to implement.

Column 6 shows that approximately 48 percent of low-income household electricity expenditures in Colorado are for non-heating and non-cooling end-uses, such as lighting and refrigeration (this figure comes from Appendix Table H-1). Multiplying the values in Columns 5 and 6 produces the values in Column 7: the estimated 2011 electricity expenditures for non-heating and non-cooling end-uses by low-income households. For Colorado, the product is shown to be \$45 (which is 48 percent of \$93). This figure is then escalated to year 2014 by multiplying it by the expenditure growth rate reported in Column 8 and dividing by the household formation growth rate reported in Column 9. The resulting the 2014 Colorado SUA for electricity—\$48—is shown in Column 10. The expenditure growth rate comes from the STEO electricity forecasts for the Mountain Census Division, shown previously in Appendix Table F-1.[32] The household formation growth rate comes from Appendix E. This example is demonstrated graphically in the following illustration.

Figure 1: Use of ACS to Develop 2014 Electricity SUS for Colorado



[a] Shown in column 5, Appendix Table I-1.
[b] Shown in column 6 of Appendix Table I-1, and in column 9 of Appendix Table H-1.
[c] 2009 RECS estimate of average monthly electricity expenses for non-heating/non-cooling end-uses paid for directly by low-income households (shown in Appendix Table H-1, column 6).
[d] 2009 ACS estimate of average monthly electricity expenditures (all end-uses) by low-income households (shown in Appendix Table H-1, column 3).
[e] Shown in column 7, Appendix Table I-1.
[f] Expenditure growth rate, shown in column 8, Appendix Table I-1.
[g] Household formation growth rate, shown in column 9, Appendix Table I-1.

[32] Ibid.

[h] Shown in column 10, Appendix Table I-1.

IV.A.2. Residential Energy Consumption Survey

RECS has several disadvantages when compared to the ACS:

- RECS is based on a sample that is much smaller than the one used for the ACS.
- RECS provides representative estimates for only 16 States, with the other 34 States being grouped into 11 multi-State categories. This means that States within the same group will have the same SUAs and LUAs.
- RECS is only updated once every 4 years instead of every year, and the data are released on a slower timeframe than ACS, resulting in a greater lag between data collection and data release. To put this issue in practical terms, data from the 2013 RECS probably will not be published until 2016 or 2017; this implies that development of the year 2017 SUAs could have to rely upon the 2009 RECS data, which at that time would be 8 years old. Significant changes in energy prices could take place over this period.

Despite these shortcomings, RECS does have several notable advantages. In particular, the information it provides is more accurate than that provided by the other sources because it is validated against data on customer billings from utility company records rather than being based exclusively on respondent recall. In addition, RECS provides data by end-use and by the method by which payments are provided (e.g., directly or through rent). Using RECS as the primary source for developing the SUAs also means the methodology is relatively simpler to implement and is less prone to the introduction of errors that accumulate as a result of data linkages.

The RECS-based method used to develop SUSs consists of two steps.

1. The first step involves using RECS to tabulate the following:
   - the average low-income household expenditure, by fuel type,
   - paid directly by the occupant,
   - on end-uses other than heating/cooling.[33]

2. The second step entails escalating these tabulations to the target year by multiplying them by the expenditure growth rates presented in Appendix F[34] and dividing by the low-income household formation growth rates presented in Appendix E. The results for all States are presented in Appendix J.

The following illustration provides a graphic example of using RECS to develop a 2014 electricity SUS for Colorado, shown in Appendix Table J-1.

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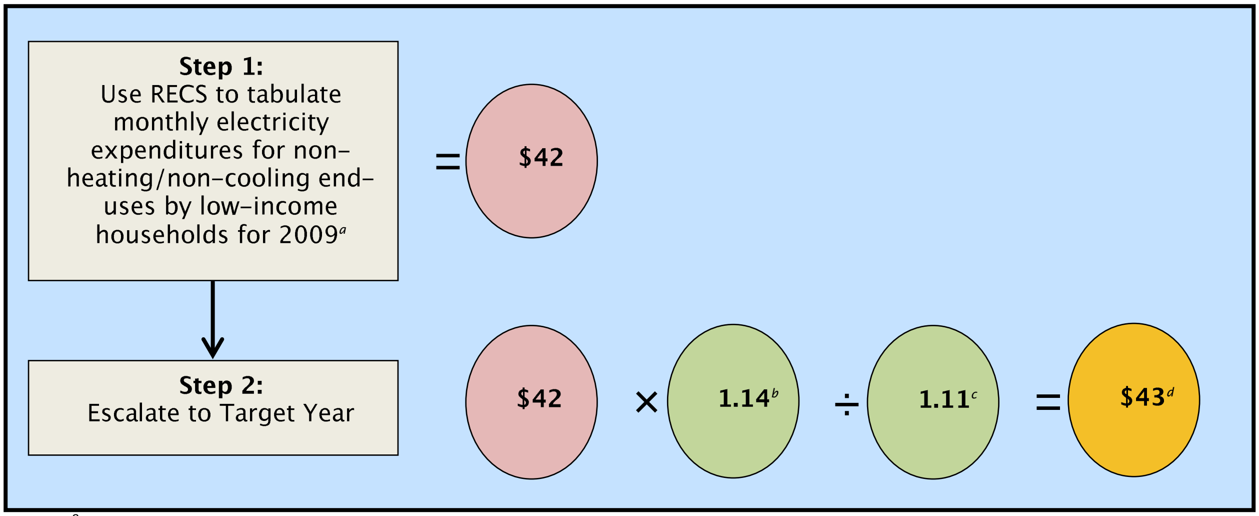
[33] We initially tried to restrict the selection procedure in RECS to only those who do not have heating/cooling expenses or whose heating/cooling expenses are included in their rent. However, the resulting numbers of observations were very small, or even zero, for some States, meaning that the estimates for those States would not be reliable.

[34] Our initial efforts used STEO forecasts for this purpose; however, validation of the results indicated that an alternative extrapolation method based upon the CPI produced more accurate results and would be easier to implement.

Figure 2: Use of RECS to Develop 2014 Electricity SUS for Colorado



[a] Shown in column 5, Appendix Table J-1, and in column 6 of Appendix Table H-1.
[b] Expenditure growth rate, shown in column 6, Appendix Table J-1.
[c] Household formation growth rate, shown in column 7, Appendix Table J-1.
[d] Shown in column 8, Appendix Table J-1.

IV.B. Water, Sewage, and Trash

This section reports on the method proposed to standardize the development of utility allowances for water, sewage, and trash. A single methodology was used to develop estimates for these services. The estimates are provided in aggregate for water/sewage/trash combined. It would be possible to develop some rough estimates of expenditures on trash services separate from water and sewage services combined; however, developing estimates for water supply separate from sewage would require the introduction and merging of additional data sources that are not believed to be complete and would add a layer of significant complexity to the implementation process.

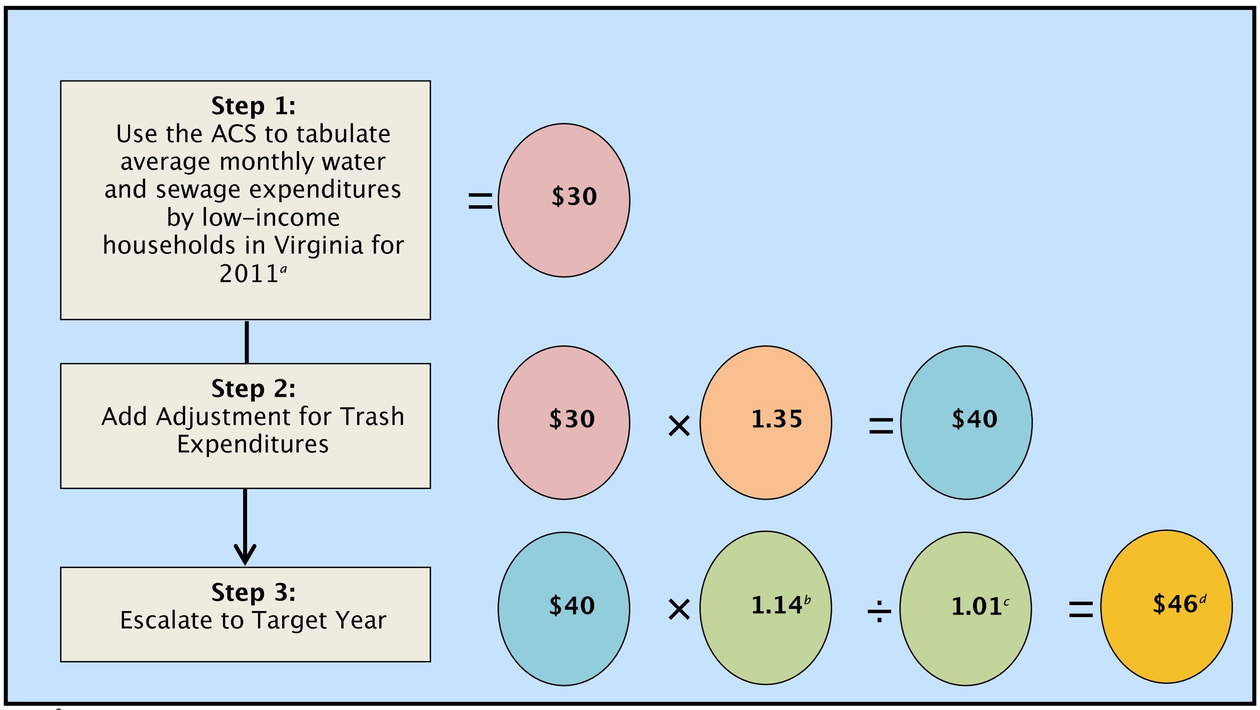
The proposed method is based on using the ACS, which reports on expenditures by low-income households for water and sewage services combined. To address the lack of data on trash expenditures, we used a simple scaling factor. The CEX provides expenditure data for water/sewage/garbage services combined, and a comparison of these national-level data with ACS national-level data for water and sewage suggest that garbage expenditures add approximately 35 percent to the combined expenditures for water and sewage.

The method used to calculate the SUS is similar to the one used for the SUSs for fuels. The State-level 2011 ACS data for water and sewage expenditures (shown in Appendix Table G-5) are extracted and then adjusted using the 35-percent scaling factor mentioned above. The results are then extrapolated to 2014 using average historical growth rates derived from the ACS data. These growth rates were computed for each State using the average growth in water/sewage expenditures over three 3-year periods: 2011/2008, 2010/2007, and 2009/2006. The use of average 3-year growth rates is appropriate since we are extending the 2011 data 3 years out to 2014. Use of the ACS historical growth rates will also eliminate the need to merge the 2011 ACS data with other sources.[35]

[35] As noted previously, there is some evidence that survey respondents overstate their utility costs when their answers are based on recall. This issue is particularly relevant when utility charges vary over time due to seasonal fluctuations in

The results for all States are presented in Appendix Table K-1. To illustrate the methodology, consider the Commonwealth of Virginia. The third column of the table shows that low-income households spent on average $359 per year for water and sewage services combined. This figure is based upon 2011 ACS data obtained from Appendix Table G-5; it is converted to a monthly basis in Column 4. The average growth rate used to escalate the $30 average monthly expenditure is shown in the eighth column and is 1.14; it was calculated as the simple average of the three 3-year growth rates presented in columns 5–7, which were derived from the data in Appendix Table G-5. The final result is produced by increasing the 2011 average monthly expenditure of $30 by 35 percent, then multiplying by 1.14—the average 3-year growth rate, and then dividing by the household formation growth rate reported in Column 9. The result shown in the last column suggests that low-income households in Virginia will spend $46 per month on average for water, sewage, and trash services combined. This example is provided in the following graphic.

Figure 3: Development of 2014 Water/Sewage/Trash SUS for Virginia



[a] Shown in column 4, Appendix Table K-1.
[b] Expenditure growth rate, shown in column 8, Appendix Table K-1.
[c] Household formation growth rate, shown in column 9, Appendix Table K-1.
[d] Shown in column 10, Appendix Table K-1.

IV.C. Telephone

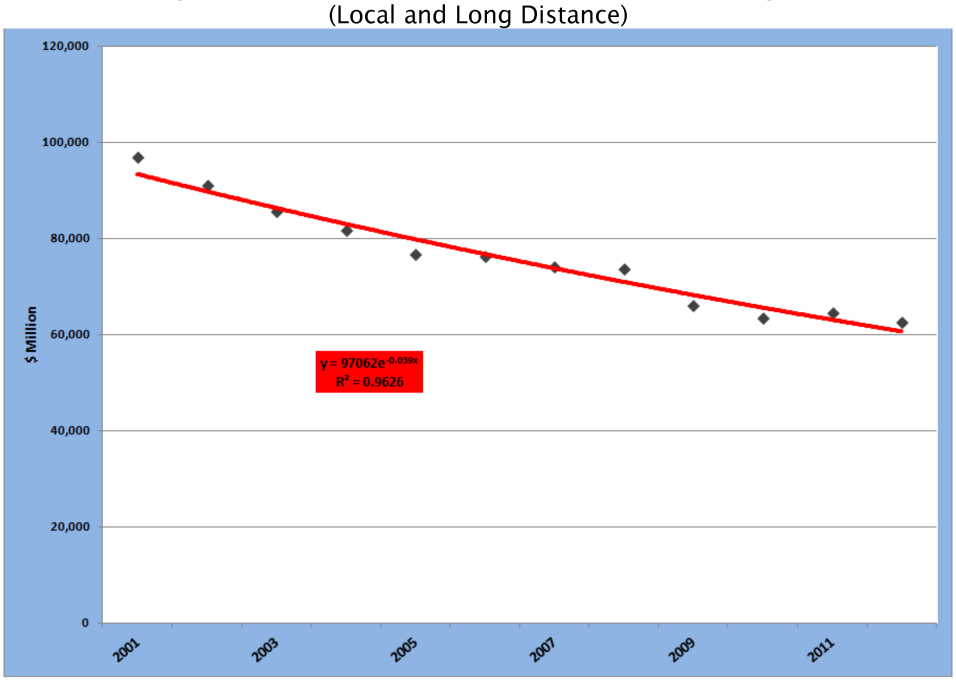
This section reports on a method to standardize the development of utility allowances for landline telephone services. A single methodology was used to develop these estimates.

usage or energy prices, as respondents tend to more easily remember their relatively "higher" utility bills. We do not have any evidence but suspect that this potential bias is less of an issue for water/sewage/trash expenditures, which do not exhibit the same seasonal fluctuations.

The methodology employs a disaggregation approach that utilizes a number of different data sources to allocate national-level expenditures to States and low-income households. National-level expenditures for all households were obtained from BEA's NIPA detailed data table (Table 2.4.5U) for personal consumption expenditures (PCE). This table provides time-series (1959–2012) expenditure information for numerous consumer services and products. Included in the table is a line item (line 277) for Landline Telephone Services—Local Charges, and a line item (line 278) for Landline Telephone Services—Long-distance Charges; both series are presented in Appendix Table L-1.

The approach used to disaggregate these data consists of four primary steps. First, the total landline expenditure series was extrapolated out to 2015 using an exponential trend.[36] The trend equation is shown in Figure 4, with the resulting forecasts shown in Table 3. Prior to year 2000, landline telephone expenditures increased annually; after that, they began to decline as a result of increased cell phone usage. This change in the historical trend is why the equation in Figure 4 is based on data starting in 2001 rather than an earlier year.

Figure 4: Total U.S. Landline Telephone Service Charges
(Local and Long Distance)



[36] We considered using the CPI to extend the series, an approach that would be much easier to implement. However, the CPI for landline telephone services—which reflects only price changes—has been increasing due to deregulation, whereas total landline expenditures have been falling as a result of cell phone usage.

Table 3: Forecasts of PCE for Total Landline Telephone Services From BEA's Detailed NIPA Data
($ Millions)

	2013	2014	2015
Total Local and Long-Distance Charges	58,460	56,224	54,074

Second, data from BLS' CEX were used to allocate these totals to low-income households. An analysis of CEX data indicates that low-income households account for approximately 32 percent of landline telephone expenditures. This percentage was applied to the total landline expenditure forecast in Table 3 to produce national-level forecasts of landline expenditures by low-income households.

The third step comprised apportioning the national-level estimates for low-income households to each State. Assuming that expenditures for landline telephone services vary by income, we used ACS data for 2009–2011 to tabulate each State's average share of personal income for low-income households in the Nation (shown in Appendix Table L-2). We then applied those shares to the national-level expenditure estimates to produce the allocation.

The final step involved dividing the State-level low-income household PCE estimates by the projected number of low-income households (presented in Appendix D) and by the number of months in the year to convert the annual estimates to a monthly expenditure estimate per low-income household. These results are shown in Appendix Table L-3.

IV.D. LUAs

LUAs are constructed simply by adding the relevant single SUSs. The main exception is that the electricity and natural gas/other fuels SUSs cannot be combined because both electricity and natural gas usage are lower on average in households with mixed fuels than in households that only use one or the other. To account for this issue, we use the SUS procedures described above to develop estimates reflecting *total* energy expenditures (all fuel types combined) on non-heating/non-cooling end-uses.

The procedure based on the ACS uses the same four-step approach described in Section IV.A.1 to develop the SUSs. The computations utilize the expenditure tabulations for total energy presented in Appendix Table G-4, and the RECS adjustment parameter for total energy presented in Appendix Table H-1. The results for all States are presented in Appendix Table I-3.

The procedure based on RECS uses the same two-step approach described in Section IV.A.2 to develop the SUSs. The computations utilize the total energy (all fuels combined) expenditure tabulations for non-heating and non-cooling end-uses presented in Appendix Table H-1. The results for all States are presented in Appendix Table J-3.

These total energy estimates can be used by themselves or can be used in conjunction with one of the other non-energy-related utilities to create a LUA. Using results from the ACS-based approach as an example, the last column in Appendix Table I-3 indicates that low-income households in Colorado will spend approximately $53 per month on energy (all fuels combined) for non-heating and non-cooling end-uses in 2014. Appendix Table K-1 shows that those households will spend an average of $50 a month for water/sewage/trash services. Therefore, an LUA defined in terms of energy and water/sewage/trash expenses would be equal to $103 per month.

IV.E. Computation of HCSUAs

This section describes the standardized methodology used to develop HCSUAs for each State. The overall methodology consists of two steps. First, we estimate the average energy expenditures for households that incur heating and/or cooling expenses and directly pay for all of their energy end-uses. Second, we add these average energy expenditures to the SUAs for water, sewage, trash, and telephone.

IV.E.1. American Community Survey

The method used to develop the energy component of the ACS-based HCSUA is similar to the ones previously described for constructing the SUSs. As we noted earlier, the ACS collects expenditure data for total energy usage (electricity, natural gas, and other fuels) but does not provide detail by end-use. Therefore, it is not possible to use the ACS directly to estimate energy expenditures for those households that incur heating and cooling expenses, a requirement for computing the HCSUAs. In order to develop these types of SUAs using the ACS, it is necessary to apply an adjustment mechanism that will essentially isolate the energy expenditures of those households that do incur heating and cooling expenses.

The method used to develop the HCSUAs consists of four steps:

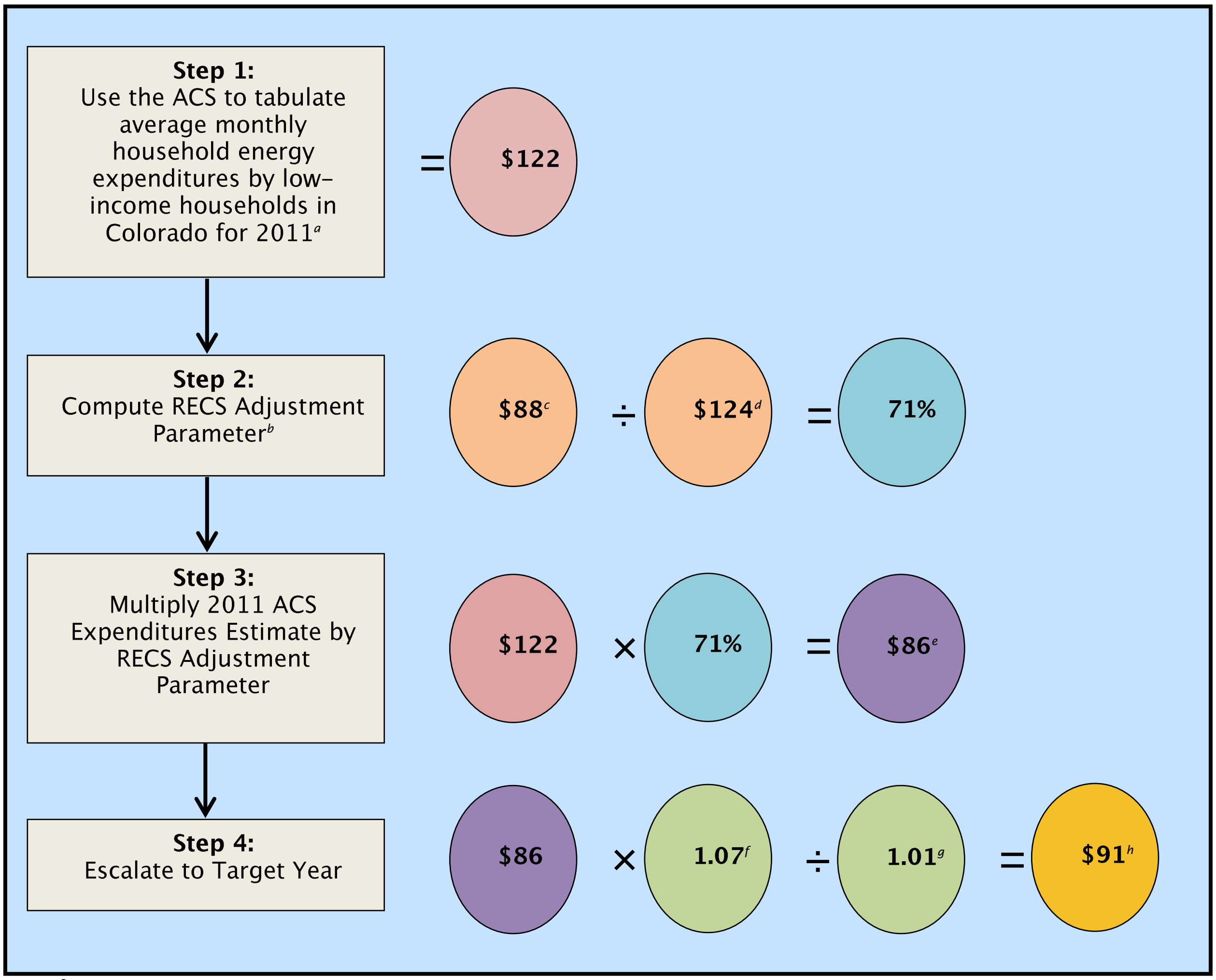
1. First, we used the ACS to tabulate by State the average household energy expenditure (all fuel sources combined) for low-income households (shown in Appendix Table G-4).
2. Next, we developed an adjustment parameter that can be used to isolate expenditures incurred by households that have heating/cooling expenses. This adjustment is necessary because the average energy expenditure tabulations based solely on the ACS data include households that both have heating and cooling expenses and do not have heating and cooling expenses; therefore, in most cases, the ACS average will be slightly lower than an average derived only from households that have heating and cooling expenses. Because RECS is the only reliable source that provides energy expenditure information by end-use, we used it to develop the adjustment parameter (shown in Appendix H-2). The parameter is defined as the ratio between total energy expenditures of low-income households that have heating and cooling expenses—tabulated using 2009 RECS data—and total average energy expenditures of all low-income households—tabulated using 2009 ACS data. The parameter essentially converts the ACS data into RECS equivalents, addressing at the same time any potential upward bias in the ACS estimates due to the fact that they are based on customer recall. Separate adjustment parameters are calculated for the 16 States and 11 multi-State regions included in RECS.
3. Third, we multiplied the 2011 ACS expenditure estimates (shown in Appendix G) by the adjustment parameters to develop base year (2011) estimates of low-income household

energy expenditures (all fuels combined) by those households that incur heating and cooling expenses.

4. Finally, we escalated these figures to the target year by multiplying them by the applicable expenditure growth rates presented in Appendix F[37] and dividing by the low-income household formation growth rates presented in Appendix E. The results are presented in Appendix M-1.

The following graphic illustrates how the energy component of the HCSUA for Colorado was developed.

Figure 5: Use of ACS to Develop 2014 Energy Component of HCSUA for Colorado



[a] Shown in column 5, Appendix Table M-1.
[b] Shown in column 6 of Appendix Table M-1, and in column 5 of Appendix Table H-2.
[c] 2009 RECS estimate of average monthly energy expenses paid for directly by low-income households that incur heating and cooling expenses (shown in Appendix Table H-2, column 4).
[d] 2009 ACS estimate of average monthly energy expenditures (all end-uses and fuel types) by low-income households (shown in Appendix Table H-2, column 3).
[e] Shown in column 7, Appendix Table M-1.

[37] Our initial efforts used STEO forecasts for this purpose; however, validation of the results indicated that an alternative extrapolation method based upon the CPI produced more accurate results and would be easier to implement.

[f] Expenditure growth rate, shown in column 8, Appendix Table M-1.
[g] Household formation growth rate, shown in column 9, Appendix Table M-1.
[h] Shown in column 10, Appendix Table M-1.

To compute the final HCSUA, the energy component is added to the estimated SUAs for water/sewage/trash and telephone. These estimates are provided in Appendix M-2. To continue the example for Colorado, Appendix Table M-2 shows that low-income households with heating and cooling expenses spent the following per month on utilities:

Energy		91
Water/Sewage/Trash	+	50
Telephone	+	54
HCSUA	=	196

IV.E.2. Residential Energy Consumption Survey

The RECS-based method used to develop the energy component of the HCSUAs consists of two steps:

1. The first step involves using RECS to tabulate the following:
   - the average low-income household expenditure for electricity, natural gas, and other fuels combined,
   - paid directly by the occupant,
   - for all end-uses,
   - by those who incur heating/cooling expenses.
2. The second step entails escalating these tabulations to the target year by multiplying them by the total energy expenditure growth rates and dividing by the low-income household formation growth rates presented in Appendix E. The results are presented in Appendix N. Appendix Table N-1 provides detail on the construction of the energy component of the HCSUA. The final HCSUAs, shown in Appendix Table N-2, combine the energy components with the estimated SUAs for water/sewage/trash and telephone.

Appendix O summarizes all of the standardized SUAs developed using the ACS and RECS.

IV.F. Adjustments to SUAs

As noted in Section I.D, two objectives for this study include developing methodologies that take into consideration the possibility of making adjustments to the SUAs based on household size or geographic location within the State. These objectives coincide with the practices of several States, which differentiate their SUAs based on these two factors. This section addresses these adjustments.

IV.F.1. Household Size

To provide for differences in utility expenditures by household size, we developed household-size parameters that can be applied to average SUAs to adjust them accordingly. The parameters were developed using RECS and are presented in Appendix P.

For each State and multi-State group, we used RECS to tabulate, by household size and for all households, the average household expenditure for all fuels combined, paid directly by occupants who directly pay for their heating/cooling expenses.

Using these tabulations, we divided the average for each household size by the average for all households to create the parameter.[38]

Due to small sample sizes, we were not able to tabulate household adjustment parameters by type of utility, by type of SUA, or specifically using low-income households. This same issue also made it necessary to aggregate household sizes greater than five into a single category. In other words, for each State there is only one set of household adjustment parameters that could be applied to any or all of their SUAs.

IV.F.2. Sub-State Geographies

Our plan for developing standardized SUAs for sub-State regions in New York and Alaska (those States that currently use different SUAs for sub-State areas) consisted of developing adjustment parameters that could be applied to the State averages. We intended to use the ACS for this purpose because of its large sample size and ability to provide estimates for small geographic areas.[39] However, due to the very small populations in Alaska, we were not able to develop SUAs for the current sub-State regions it uses.

IV.F.3. Construction of Fiscal Year Estimates

Under current law, most States update their SUAs at the beginning of the fiscal year. The previous examples describe how to create calendar-year SUAs. Calendar-year SUAs could be converted to a fiscal-year basis by using a prorating procedure in which the SUAs for 2 calendar years are weighted according to the number of months in the fiscal year. For example, for the 2014 fiscal year beginning on October 1, 2013, the FY SUA would be computed as the weighted average of the 2013 and 2014 calendar-year SUAs, with the weights being 25 percent (3 months) for calendar-year 2013 and 75 percent (9 months) for calendar-year 2014.

IV.G. Validation and Testing of Methods to Develop Base-Year SUAs

This section reports on different analyses that were conducted to validate and test the methods used to develop the base-year SUAs. The validation analyses examined whether the proposed methodologies produce reasonable proxies for household utility costs. The testing analyses

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[38] The parameters were constructed using data on energy expenditures since energy comprises by far the largest component of household utility expenditures.

[39] The ACS provides 1-year, 3-year, and 5-year estimates, which vary in terms of the populations sizes covered.

compared the SUAs produced by the proposed methodologies with the actual SUAs being used by the States.

IV.G.1. Validation of Methodologies

To validate the methodologies, we first need to specify a standard or benchmark against which the estimated results could be evaluated. We believe the RECS produces the most accurate estimates of household utility costs when compared to other readily available data sources that could be used for this effort. Unlike other surveys, RECS provides expenditure information on different end-uses (such as heating and cooling), and its data collection effort relies heavily upon actual utility bills from service providers. The problem with RECS is that it only provides representative State-level estimates for 16 specific States, and the latest release (in 2009) was the first time representative estimates were provided for more than 4 States. Until the next RECS release is issued, this aspect makes it difficult to use RECS as a benchmark within a validation protocol.

Recall that both the ACS-based and RECS-based methodologies include a step that extrapolates the most recent data to the target year. The ACS-based approach also includes an additional step in which adjustment parameters are used to convert the estimates into equivalent RECS figures. Due to the RECS limitations noted above and the fact that the proposed methodologies were designed to convert the estimates into equivalent RECS figures, this validation exercise focuses on the extrapolation of the ACS data to the target year (discussed below).[40] We were not able to address any estimation errors in the ACS-based approach that could arise from changes in the adjustment parameters over time.

Validation Methodology

To evaluate the extrapolation procedures, we used the procedures to generate a historical forecast for a year in which data are now available and then compared the forecasts to those data. The test was applied to each State and fuel combination. Because forecasts are sensitive to the historical periods on which they are based, we also conducted the test over three different periods to take into account the robustness of the extrapolation procedure. This also helped increase the number of observations used to create forecast errors for the evaluation. For each fuel type, we produced 150 forecasts errors (50 States × 3 periods). The periods were defined using a base year and a target year, with a 2-year interval between them to simulate the likely process that will be used in practice.

These periods used include the following:

- 2007 Base Year/2009 Target Year.
- 2008 Base Year/2010 Target Year.
- 2009 Base Year/2011 Target Year.

An example using ACS electricity expenditures for Alabama will help illustrate the process. We started by using the extrapolation procedure to extend 2007 ACS expenditure data for Alabama to 2009; then we computed the deviation between the forecast for 2009 and the actual ACS value for

[40] Although both the ACS-based approach and the RECS-based approach utilize extrapolations, RECS provides estimates for only a single year and therefore cannot be used to validate the extrapolation procedure. After the next release of RECS, it would be worthwhile to reassess the extrapolation procedure using RECS, as well as evaluate the extent to which the adjustment parameters change over time, which would inform both the development and updates of the SUAs.

2009. This exercise was repeated using 2008 and 2009 for base years, generating three forecast errors for Alabama. We then duplicated this exercise for every State, producing a total of 150 forecast errors. Finally, we used these 150 forecast errors to tabulate the minimum forecast error, the maximum forecast error, and the average forecast error.

The extrapolation method is based on using expenditure growth rates derived from the STEO, adjusted for household formation. To implement the validation protocol, we retrieved archived STEO reports appropriate for each target year. For example, for the 2010 target year we used the STEO publication from June 2009.

We also included two other extrapolation approaches here for comparison purposes: using a 3-year moving average of the relevant CPIs, adjusted for household formation, and using trend analysis. Again, each approach was used to extrapolate historical ACS data, by State, to a target year; the target-year forecasts were then compared with the observed ACS data to produce estimated errors for each State. For the STEO and CPI approaches, we applied this technique to 3 different target years: 2009, 2010, and 2011. For each State, we calculated an average forecast error derived from the three target-year forecasts; then, we calculated on overall average across all of the States, reported in Table 4. For the trend analysis, there currently is not enough history in the ACS data to be able to generate multiple forecast errors for different time periods; therefore, the trend analysis was applied to only 1 target year: 2011.

Results of Validation

Table 4 summarizes the results of an analysis that compares the precision of different methods that could be used to extrapolate utility expenditure data to the target year. Regarding the ACS-based approach for developing the SUAs, the 3-year moving average CPI performed the best out of the three alternatives; it generated the lowest average prediction errors, and the highest errors produced were lower than the highest errors produced by the other approaches. The trend analysis did not perform as well as the CPI and STEO approaches, but that could change in the future as more data are added to the pool used to establish the trend. In addition, the trend analysis did perform relatively well in extrapolating water and sewage expenditures, which had the smallest average deviation (3.2 percent) across all of the utilities and approaches.

Table 4: Average Absolute Deviations for Procedures to Extrapolate Base-Year Data to the Target Year

SUA Development Approach	Extrapolation Approach / Metric	Utility				
		Electricity	Natural Gas	Other Fuels	Total Energy	Water & Sewage
ACS	***Trend***					
	Avg	7.1%	16.1%	13.7%	8.9%	3.2%
	Min	0.4%	1.1%	0.2%	0.3%	0.1%
	Max	25.7%	35.0%	30.2%	26.1%	9.5%
	STEO					
	Avg	4.7%	16.2%	NA	6.0%	NA
	Min	1.2%	4.9%	NA	2.3%	NA
	Max	11.6%	23.3%	NA	12.2%	NA
	CPI					
	Avg	4.6%	7.2%	NA	4.4%	NA
	Min	0.4%	1.4%	NA	1.0%	NA
	Max	12.0%	18.1%	NA	10.9%	NA

IV.G.2. Comparison of Standardized SUAs with Current SUAs

Table 5 presents the standardized ACS-based and RECS-based HCSUAs side by side and contrasts them with the actual HCSUAs being used by the States. In almost all instances, the actual HCSUAs exceed the standardized SUAs by a considerable amount. All of the RECS-based estimates fall below those being used by the States, and only one ACS-based estimate (Mississippi) exceeds or falls within the range of SUAs being used. A possible explanation for this finding may be that, while the ACS- and RECS-based estimates use average costs, States may set their SUAs higher than the average cost to minimize benefit loss for households with very high utility expenses. To evaluate this possibility, we used ACS data on the distribution of total household utility expenditures to compute ACS-based HCSUAs below which 85 percent of households fall, shown in the fourth column in Table 5.[41] Many States fall below this threshold; however, 21 States have SUAs that exceed the 85th percentile estimates. Further research is needed to evaluate this finding. All of the standardized SUAs are presented together in Appendix O.

[41] For each State, the household utility expenditure (all utilities combined) for the 85th percentile of low-income households was divided by the mean low-income household utility expenditure; this ratio was then applied to the estimated ACS-based HCSUA to escalate it to an 85th percentile estimate. The RECS sample is not large enough to be able to develop percentile estimates.

Table 5: Comparison of HCSUAs

State	RECS	ACS Mean	ACS 85th Percentile	FY 2014 SUA
Alabama	240	285	446	348
Alaska	187	237	520	341 - 1090
Arizona	226	270	453	280 - 378
Arkansas	211	221	344	273
California	194	218	390	363
Colorado	182	196	341	453
Connecticut	226	303	566	694
Delaware	220	288	467	431
District of Columbia	203	189	405	305
Florida	216	246	410	335
Georgia	221	276	431	343
Hawaii	266	231	450	NA
Idaho	204	216	360	424
Illinois	237	245	423	380
Indiana	228	224	374	378
Iowa	220	223	388	338
Kansas	238	249	406	371
Kentucky	240	234	381	291
Louisiana	201	231	363	331
Maine	234	262	470	659
Maryland	214	253	448	NA
Massachusetts	212	247	491	608
Michigan	242	241	420	553
Minnesota	203	199	377	459
Mississippi	232	260	413	235
Missouri	222	234	380	318
Montana	185	207	349	477
Nebraska	227	213	358	434
Nevada	200	257	427	259
New Hampshire	233	249	484	557
New Jersey	268	296	557	454
New Mexico	203	225	370	314
New York	230	259	497	623 - 753
North Carolina	207	234	376	347 - 499
North Dakota	197	199	408	590
Ohio	225	221	380	463
Oklahoma	216	228	369	345
Oregon	204	205	348	441
Pennsylvania	234	251	441	536
Rhode Island	237	254	501	601
South Carolina	209	246	385	271
South Dakota	221	202	361	683
Tennessee	212	222	360	319 - 426
Texas	246	259	424	329
Utah	213	235	395	305
Vermont	247	244	451	771
Virginia	220	250	418	NA
Washington	211	213	379	409
West Virginia	241	238	387	347
Wisconsin	215	226	395	450
Wyoming	197	213	372	341

IV.G. Implementation of Base-Year SUAs

This section discusses different alternatives for implementing the proposed methodologies for constructing base-year SUAs. The methodologies under consideration include the following:

1. Use the ACS as the primary data source to develop the base-year SUAs, while incorporating RECS to create parameters for adjusting the ACS data.
2. Use RECS to develop the base-year SUAs.

Although methodologies that can be easily implemented by the States are preferred, the data sources that can be used to standardize the SUAs do not lend themselves to easy implementation directly by the States, at least not for all of the different types of SUAs. In some cases, it may be necessary for FNS to develop the estimates and provide them to the States. Alternatives for implementing the approaches are discussed below and used as one criterion for developing the recommendations presented later in the report.

IV.G.1. American Community Survey

In order for the States to implement the ACS approach, at a minimum they would have to download very large files from the Census Bureau's Website, load those data into a statistical software package, and develop programming code to tabulate average household expenditures. Coding issues that would have to be addressed include treatment of missing values, weighting of the survey responses, and definition of low-income households. For most States, these requirements may not be a major barrier.

The ACS could be used to develop the major components of most of the SUAs. As noted above, RECS would also be needed to develop different adjustment parameters that could be applied to the ACS data in order to construct the SUAs. RECS is needed to adjust the ACS data because the ACS does not distinguish among end-uses, whereas development of the SUAs requires information on heating and cooling expenses. Once developed, the parameters could be hard-coded in the ACS processing code and used for approximately 4 years until the next RECS publication.

To construct new adjustment parameters, RECS data would have to be downloaded, loaded, processed, and merged with the ACS data. As with the ACS data, coding the RECS data would require addressing missing values, weighting the survey responses, and defining low-income households. In addition, the RECS sample is fairly small, and small sample sizes occasionally have to be addressed. An option would be for FNS to develop the adjustment parameters once every 4 years and make them available to the States.

Telephone and trash expenditures would need to be developed separately since the ACS does not provide information for these items. For the trash expenditures, we are proposing the use of a simple scaling factor that would be applied to the ACS expenditure estimates for water and sewage services; this would be fairly easy to incorporate in the ACS processing code.

The option we presented for developing the telephone expenditure estimates would require obtaining a national-level control figure from BEA, scaling that figure using a percentage derived from national-level CEX data, allocating the result using income shares based on ACS data, and then converting the result to a household-level basis using information on the number of low-income households in the State. This process by itself is not too complicated; however, extrapolating the telephone expenditures and number of households (which in this case is required) to the target year could be a significant undertaking for a State. There are other development options that would easier to implement. One option would be to use for each State the national-level landline expenditures per low-income household obtained from the CEX. This option would lose the State-to-State differentiation in telephone expenditures but would be the easiest option to implement. Another possibility would be to adjust the CEX-based figure using the ratio between average household income in each State and average household income for the United States. Both options could alleviate the need to extrapolate the number of low-income households in the State, as the national-level CEX figure could be extended using historical growth rates in that series.

For the other types of SUAs, the States would also have to implement the procedures needed to extrapolate the most recent ACS data to the target year. For States that do not have forecasts of the number of households, one issue that would make the implementation of the extrapolation procedure more difficult would be the inclusion of a household-growth parameter. As we noted previously, one option here would be for FNS to develop such parameters and make them available to the States (e.g., via the FNS Website). Another option would be for the States to forgo the use of a household-growth parameter, recognizing that the resulting estimates could have a slight upward bias to them.

IV.G.2. Residential Energy Consumption Survey

In order for the States to implement the RECS approach, they would have to download large files from EIA's Website, load those data into a statistical software package, and develop programming code to tabulate average household expenditures. Coding issues that would have to be addressed include the treatment of missing values, weighting of the survey responses, and definition of low-income households. In addition, the RECS sample is fairly small, and the issues of small sample sizes would occasionally have to be addressed. For the 34 States not specifically represented in RECS but included in multiple State regions, a concordance between the States and multiple State regions would have to be developed and used. Telephone, water, sewage, and trash expenditures would need to be developed separately since RECS either does not provide information for these items or the data for them are not believed to be reliable.

V. METHODOLOGIES FOR UPDATING STANDARD UTILITY ALLOWANCES

This section presents different methodological alternatives for making annual updates to the base-year SUAs presented in Section IV. The methodologies can be applied to HCSUAs, LUAs, and single utility allowances. These proposed methods would be easier to implement than the methods used to develop the base-year SUAs and could be used in the intervening years between releases of required data sets needed to compute the base-year SUAs.

The possible alternatives can be divided into two major categories: those that are forward-looking and those that are backward-looking. Forward-looking alternatives attempt to extrapolate current trends to the future target year. Backward-looking alternatives assume that the future is similar to recent historical averages.

For this analysis, we are presenting one forward-looking alternative and one backward-looking alternative. For each alternative, we also consider an optional adjustment for growth in household formation. The alternatives are summarized below:[42]

1. Use projections from the EIA's STEO to compute annual residential utility expenditure growth rates that can be applied to the current SUAs (forward-looking);
2. Using CPI data for relevant utility sectors, compute average annual growth rates that can be applied to the current SUAs (backward-looking).

The alternatives vary in terms of the household expenditure component being used as a proxy for overall growth. Recall that growth in average household utility expenditures consists of three elements: change in the price of the utility, change in the quantity consumed (e.g., cubic feet or kilowatt hours), and change in the number of households.

The first methodological alternative (based solely on STEO expenditure projections) would utilize an average annual expenditure growth rate to update utility allowances but would lack an adjustment for household growth as shown in Equation 1. The second alternative (based solely on the CPI) would utilize an average annual growth rate in prices but would lack any adjustments for growth in quantity consumed or growth in household formation (as shown in Equation 1). It would be possible to adjust both the STEO expenditure growth rates and the CPI growth rates with projected growth rates of household formation; we address this optional adjustment in our analysis but note that it would be more difficult to implement.

V.A. Short-Term Energy Outlook (STEO)

The STEO, a monthly publication released by EIA, provides useful summary data that is easy to access on EIA's Website. The latest STEO produces price and consumption forecasts by energy source out to 2014; however, not all energy sources are covered, and some of the forecasts do not provide detail by geographic region and/or using sector (e.g., residential, commercial, industrial).

[42] We also considered three other alternatives but decided not to pursue them. These alternatives consisted of developing simple growth rates using data from the ACS, data from the CEX, or data from the SEDS. Because the CEX is the only readily available source on household telephone expenditures, it will need to be used to escalate the telephone SUAs.

Therefore, as explained below, some manipulation by the users would be required in order for them to use the STEO to update their SUAs.

V.A.1. Electricity

The STEO provides price and consumption forecasts for the residential electricity sector by Census Division. To use these forecasts, the user will need to select the Census Division corresponding to his or her State and will need to tabulate the following: (1) annual growth rates for prices, quantities, and expenditures (price growth rate × consumption growth rate) and (2) electricity expenditures for the target year (expenditure growth rates × current year electricity expenditures (available on EIA's Website)). The expenditure growth rates could be applied directly to the single electricity SUAs to update them. The electricity expenditures will be needed to compute total energy expenditures and associated growth rates needed to update the HCSUAs and LUAs.

V.A.2. Natural Gas

The STEO provides price forecasts for the residential natural gas sector by Census Division but provides natural gas consumption estimates for the residential sector only for the entire Nation. To use these forecasts, the user will need to select the Census Division corresponding to his or her State and will need to tabulate the following: annual growth rates for natural gas prices, consumption, and expenditures (price growth rate × consumption growth rate) and natural gas expenditures for the target year (expenditure growth rates × current year natural gas expenditures (available on EIA's Website)). The growth rates could be applied directly to the single natural gas/other fuels SUAs to update them. The natural gas expenditures will be needed to compute total energy expenditures and associated growth rates needed to update the HCSUAs and LUAs.

V.A.3. Other Fuels

The STEO does not provide enough information that can be used to forecast State-level expenditures on other fuels (primarily distillate fuel oil and liquefied petroleum gas) by residential sector.

V.A.4. Total Energy Consumption

To update the HCSUAs and LUAs, a forecast of growth in total energy consumption is required. To develop these growth rates, the user will need to add the projected expenditures for electricity and natural gas (described above) and then divide the result by the combined current-year expenditures for electricity and natural gas to create the overall expenditure growth rate.

V.B. Consumer Price Index

Use of the CPIs to update State SUAs requires ensuring that the most representative CPI is selected and applied to the given SUA for the respective State. BLS publishes a large number of CPIs that vary in terms of the type of consumer being reflected, the aggregation level of the product, geographic regions, how the indexes are constructed, time interval, etc. Therefore, a number of decisions have to be made regarding the type of index that is selected.

For example, in terms of the type of index that will be applied, BLS publishes five different indexes, which vary in terms of market baskets and type of consumer reflected:

- All Urban Consumers (Current Series).
- Urban Wage Earners and Clerical Workers (Current Series).
- All Urban Consumers (Chained CPI).
- Average Price Data.
- Department Store Inventory Price Index.

We used the Current Series CPI for All Urban Consumers because it is the most comprehensive in terms of product coverage and the consumer population reflected.

It is also necessary to determine the geography that best represents the user's State. As noted above, CPIs are produced for 4 Census Regions and 27 metropolitan areas; therefore, the selected area could be an aggregate region that encompasses the State or one of the cities in the region. We chose to use the four Census Regions for ease of implementation across all of the States, and because we felt most States would be better represented by an average of multiple metropolitan areas than by a single metropolitan area.

A third decision involved selecting the product categories that best represent the SUAs. For HCSUAs, we used the CPI for "Fuels and Utilities," which captures everything except telephone services. For LUAs, we would recommend using the CPI for total "Household Energy" (which includes electricity, natural gas, and fuel oils). For SUSs, we used the CPIs for electricity and natural gas that correspond to those SUAs. For water, sewage, trash, and telephone services, we had to use the corresponding CPIs at the national level because CPIs for these services are not available for the Census Regions or Metropolitan areas.

The time period of the CPIs is another specification that has to be made when computing the annual average growth rates. BLS reports calendar-year averages, as well as seasonally adjusted and not-seasonally adjusted monthly averages. For testing purposes, we used annual averages that could be compared to the growth rates in the ACS and the CEX. However, we suggest that the States use the not-seasonally adjusted monthly CPIs to define custom annual periods (e.g., July 2012 through June 2013) corresponding to the updates of their SUAs; this will allow them to use the most recent data possible. Once the period has been determined, the State will need to use the monthly data to tabulate average annual price indexes for the defined period and compute the average annual growth rates.

Finally, the number of periods used to calculate the CPI growth rates needs to be specified. For example, one option would be to simply use the growth rate over the previous year. Another option would be to compute a 2-year or 3-year moving average based upon annual growth rates over the previous 2 or 3 years.[43] Test results discussed below show that a moving average growth rate of the CPI from the previous 3 years performs slightly better than averages from the previous

[43] Note that CPI approach is based on historical data, which need to be averaged in order to use for forecasting purposes. The STEO approach, on the other hand, utilizes actual EIA forecasts, which are based to a large extent on historical averages; unlike the historical CPI data, the STEO forecasts do not need to be averaged before using.

2 years or previous year in predicting CEX and ACS growth rates. We believe using a 3-year moving average would smooth out large recent shocks that may not hold in the future.

V.C. Optional Adjustment for Household Growth Rate

This option would involve adjusting the STEO-based growth rates (computed in Section V.A) or the CPI-based growth rates[44] (computed in Section V.B) to account for household formation, which was shown to be a component of household utility expenditure growth in Equation 1. The adjustment would be carried out by dividing each State's STEO or CPI growth rates (presented above) by the projected growth rate for the number of households in each State (shown in Appendix E).

This alternative could be implemented in two different ways. One option would be for FNS to compute and provide the household formation growth rates for each State. In Appendix D, we discuss how to forecast the number of low-income households by State and present estimates based on that procedure (shown in Appendix E). A similar procedure could be used to project the total number of households in each State. FNS could update the growth rates annually and make them available to the States in a spreadsheet or PDF file that could be accessed on the FNS Website. The second option would be to encourage the States to apply this alternative using their own household projections. Most States do develop their own economic and population forecasts, which may include household projections or could be used to develop household projections. FNS could encourage this option while still making available FNS-computed household growth rates. Note that in both options we are assuming that the States would be tabulating the expenditure or price growth rates (as discussed above) and dividing them by the household formation growth rates.

V.D. Validation and Testing of Methods to Update Base-Year SUAs

This section attempts to answer two main questions:

1. Whether the proposed methodologies for updating the SUAs are a reasonable proxy for year-to-year changes in utility costs.
2. Whether the recommended timeframe for making annual adjustments minimizes adverse impacts on SNAP households resulting from seasonal fluctuations in energy costs.

V.D.1. Reasonableness of Proposed Update Methodologies

This section evaluates whether growth rates derived from the STEO and the CPI are reasonable proxies for year-to-year changes in utility costs. The assessment compares the derived annual growth rates from these sources with annual growth rates calculated using the ACS and the CEX as benchmarks for evaluating the proposed update methodologies.[45] The comparisons were

[44] Although the CPI approach does not have an explicit component as detailed in Equation 1, it is still conceptually preferable to include the household formation growth rate; in this case, the consumption is assumed to remain constant at current levels.

[45] As noted previously, there is reason to believe that self-reported utility costs, such as those reported in the ACS and CEX, have an upward bias to them. However, we assume that the upward bias is similar each year, so that the growth rates are not impacted.

conducted for each available and compatible expenditure category.[46] The comparisons spanned multiple years, the number of which depended on data availability. Comparisons of the STEO and CPI against the ACS benchmark were conducted using data for 2006–2011.[47] Comparisons against the CEX benchmark were conducted using data for 2004–2012. For each year, we tabulated the absolute differences between the STEO/CPI growth rates and the benchmark growth rates. These differences were then used to calculate the average absolute deviations over the respective periods.

The section first analyzes unadjusted STEO and CPI growth rates and then evaluates growth rates adjusted for household formation.

Calculation of STEO Annual Growth Rates

We used the June issues of the STEO for years 2004–2013 to extract both historical data and historical forecasts for monthly prices and quantities. Average monthly expenditures for the calendar years were then computed based on these data. Projected growth rates were calculated as projected expenditures in year (*t*) divided by actual expenditures in year (*t*-1). To illustrate, STEO price and quantity forecasts for 2006 were obtained from the June 2005 STEO and used to produce an expenditure forecasts for 2006. A projected expenditure growth rate was calculated by dividing the 2006 expenditure forecast by observed expenditures in 2005, which were based on data obtained from the June 2006 STEO.

Calculation of CPI Annual Growth Rates

To implement the CPI-based approach for updating SUAs, growth rates based on the most recently available historical CPIs would be used as proxies to forecast expenditure growth expected to occur over the next year. Therefore, the comparisons between the CPI and the ACS/CEX benchmarks need to take into account the 1-year lag between the year the CPI growth rate is based on and the year being projected. As a result, the analyses compare growth rates in the ACS and CEX benchmarks with previous year growth rates from the CPI. For the previous year CPI growth rates, we considered a 2-year moving average and a 3-year moving average in addition to the single-year growth rate.

[46] The STEO provides estimates for Electricity, Natural Gas, and Total Energy. The CPI provides indices for a greater number of expenditure categories, which include Fuels and Utilities, Household Energy, Fuel Oil and Other Fuels, Electricity, Piped Gas, and Water/Sewage/Trash.

[47] At the time the analyses were conducted, 2012 ACS data had not been released.

Results of Comparison

Table 6 presents the average absolute deviations in growth rates between the STEO/CPI update approaches and the CEX/ACS benchmarks. The table shows that the STEO growth rate for "Household Energy" is, on average, 6 percentage points higher or lower than the corresponding growth rate in the CEX or the ACS. To provide some context for this difference, consider a family that pays on average $200 per month for household energy. A 1-percent increase in that value would be $2.00, whereas a 7-percent increase (a difference of six percentage points) would be $14.00— a difference of $12.00 per month.

The results for the CPI show that a moving average growth rate of the CPI from the previous 3 years performs slightly better than averages from the previous 2 years or previous year in predicting CEX and ACS growth rates. The table shows that the CPI for "Fuels and Utilities" is, on average, 4 percentage points higher or lower than the corresponding growth rates in the CEX and the ACS. To provide some context for this difference, consider a family that pays on average $235 per month for fuels and utilities. A 1- percent increase in that value would be $2.35, whereas a 5-percent increase (a difference of four percentage points) would be $11.75— a difference of $9.40 per month. In most cases, the 3-year moving average of the CPI performs slightly better than the STEO.

Table 6: Average Absolute Deviation Between CEX/ACS Annual Growth Rates and STEO/CPI Annual Growth Rates

			CPI		
Benchmark	**Expenditure Item**	**STEO**	**Previous Year**	**Average of Previous 2 Years**	**Average of Previous 3 Years**
CEX	Fuels and Utilities		0.05	0.04	0.04
	Houshold Energy	0.06	0.06	0.05	0.05
	Fuel Oil and Other Fuels		0.23	0.22	0.15
	Electricity	0.03	0.04	0.04	0.04
	Piped Gas	0.15	0.11	0.10	0.08
	Water Sewage Trash		0.03	0.03	0.03
	Water and Sewage				
ACS	Fuels and Utilities		0.05	0.04	0.04
	Houshold Energy	0.06	0.06	0.05	0.05
	Fuel Oil and Other Fuels		0.16	0.14	0.11
	Electricity	0.03	0.03	0.03	0.03
	Piped Gas	0.12	0.10	0.08	0.07
	Water Sewage Trash				
	Water and Sewage		0.02	0.02	0.02

Adjustments for Household Growth

Table 7 presents average absolute deviations between household-adjusted CPI/STEO growth rates and the CEX and ACS growth rates. The table shows that the CPI, adjusted for household growth, performs slightly better than the household-adjusted STEO in predicting per household utility expenditure growth in the CEX and the ACS. When comparing the household-adjusted CPI results in Table 7 with the unadjusted CPI results in Table 6, the household-adjusted CPI performs slightly better than the unadjusted CPI.

Table 7: Average Absolute Deviations Accounting for Household Growth

Survey	Expenditure Item	CPI			STEO[τ]
		Previous Year	Previous 2 Years	Previous 3 Years	
CEX[†]	Fuels and Utilities	0.05	0.04	0.03	
	Houshold Energy	0.06	0.05	0.04	0.06
	Fuel Oil and Other Fuels	0.22	0.21	0.15	
	Electricity	0.04	0.03	0.03	0.04
	Piped Gas	0.10	0.10	0.07	0.14
	Water Sewage Trash	0.04	0.03	0.03	
	Water and Sewage				
ACS[‡]	Fuels and Utilities	0.05	0.04	0.03	
	Houshold Energy	0.05	0.05	0.04	0.06
	Fuel Oil and Other Fuels	0.16	0.13	0.10	
	Electricity	0.04	0.03	0.02	0.04
	Piped Gas	0.10	0.08	0.07	0.11
	Water Sewage Trash				
	Water and Sewage	0.02	0.02	0.02	

[†]Based on the average absolute deviation in growth rates from 2004 - 2012.

[‡]Based on the average absolute deviation in growth rates from 2006 - 2011.

[τ]Based on actual household growth rates rather than projected household growth rates.

V.D.2 Recommended Timeframes for Making Annual Adjustments

Given that the SUAs are based on annual averages, it is not possible to address seasonality issues by changing the timeframe: whether it is January–December or June–May, the data will span 12 months, incorporating and smoothing out seasonal changes. Table 8 demonstrates this conclusion, which presents average annual growth rates over different annual periods for selected national-level CPIs. For any given price item, there is very little deviation in the growth rates over the different periods.

Table 8: Average Annual Growth Rates for Selected Monthly CPIs, 2003–2012

	Annual Period											
Price Item	Jan-Feb	Feb-Jan	Mar-Feb	Apr-Mar	May-Apr	Jun-May	Jul-Jun	Aug-Jul	Sep-Aug	Oct-Sep	Nov-Oct	Dec-Nov
Fuels and Utilities	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Houshold Energy	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Fuel Oil and Other Fuels	1.11	1.12	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.10
Energy Services	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Electricity	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Piped Gas	1.00	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.00
Water Sewage Trash	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Water and Sewage	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Garbage and Trash	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04

For the same reason, we do not believe that requiring the States to update their SUAs more than once per year would have a noticeably positive impact on SNAP recipients. For example, computing average monthly utility costs over two different 6-month periods (e.g., January–June and July–December) will produce a result that is the same as calculating an annual average over 12 months; using two separate 12-month averages results in similar growth rates for those periods.

If the choice is made to implement a backward-looking approach for updating the SUAs (e.g., using the historical growth rate in the CPI), our suggestion is to use a timeframe as close to the period of coverage as possible. This will ensure use of the most recent data available.

VI. FINDINGS AND RECOMMENDATIONS

Standardizing the development of SUAs is an extremely complex process primarily because no single data source provides all of the information and characteristics needed to compute standardized SUAs. Various data sources have to be merged in unique ways in order to obtain the desired estimates. In addition, small sample size issues have to be addressed in some—but not—all cases, and this is accomplished by determining the most appropriate level of aggregation in the data that will resolve the problem without noticeably compromising the accuracy of the estimate being sought. Another factor is that extrapolation procedures are needed to address the substantial lags between the target year of the SUA and the most recent publication date of the data being used to develop the standardized SUAs. Finally, the States currently use a wide array of SUAs, which can vary in terms of customized sub-State geographic regions, household size categories, composition of utilities used to develop LUAs, and cost thresholds that are applied to ensure that a sizeable portion of SNAP recipients are covered by the SUA. This complexity is exacerbated by the desire to meet competing goals (administrative efficiency, equity, protection of the most vulnerable). Because of the complexity, any effort to standardize development of SUAs is likely to require some FNS involvement.

VI.A. Recommended Data Sources

Based on the analysis of data sources presented in Section II, and the evaluations of the methodologies presented in Sections IV and V, these are the best data sources to use for standardizing the SUAs:[48]

- Energy Related Utilities: ACS and RECS
- Water/Sewage/Trash: ACS in conjunction with CEX
- Telephone: BEA's NIPA data in conjunction with CEX and ACS
- Updates to SUAs: CPIs

Neither the RECS nor the ACS can be used by itself to estimate all of the different SUAs. The main advantage of the ACS is that it is based on a very large sample and can provide representative estimates for every State; it is large enough that it can also provide enough observations needed to develop percentile or variance estimates, or compute reasonable estimates for specific subcategories such as the low-income group by household size. The main problem with the ACS is that it does not differentiate between heating/cooling end-use expenditures and other energy expenditures—information that is needed in order to develop SUAs that include heating and cooling expenditures (HCSUAs) and SUAs that exclude them because they are included in rent or condo fees (LUAs and SUSs).

RECS theoretically provides all of the data needed to estimate the energy components of the SUAs. It is also the most accurate source of those reviewed. However, RECS does have several limitations. State-level estimates are available for only 16 States, with estimates for the remaining States aggregated into 11 multi-State regions. Another issue with RECS is its timeliness: the survey is conducted only once every 4 years, and there is an additional 3- to 4-year lag before the data are

[48] None of the sources could incorporate the U.S. territories within a standardized approach.

published. Finally, the sample size is too small to be able to produce reliable estimates when the data are divided into numerous subcategories.

Because it is the only source that provides expenditure information on end-uses, RECS will be required in any approach that is used. If used by itself to develop the standardized SUAs, FNS will have to grapple with its limitations, notably the lack of State representation for every State and the lack of timeliness. The ACS will need to be incorporated in any approach that requires distribution information that will allow the SUAs to be set at a specified point above the mean/median. By using the ACS in conjunction with RECS, the limitations of each data source are somewhat offset by the advantages of the other. **Therefore, we recommend using the ACS-based approach, which relies upon both data sources**.

VI.B. Estimation Results

- A major finding of the research effort is that *average* utility expenses for low-income households are considerably lower than the SUAs currently being used by the States. As shown in Table 5, both the ACS-based approach and the RECS-based approach produce HCSUAs that are significantly lower than actual HCSUAs being used by States.
- As noted previously, this may be because—while the ACS- and RECS-based estimates use average costs—States may set their SUAs higher than the average cost to minimize benefit loss for households with very high utility expenses. To evaluate this possibility, we computed ACS-based HCSUAs below which 85 percent of households fall, shown in the fourth column in Table 5. Many States fall below this threshold; however, 21 States have SUAs that exceed the 85th percentile estimates. **Further research is needed to evaluate this finding**.
- The estimates based on the RECS methodology are lower than the estimates based on the ACS approach. Because the base-year ACS data are essentially converted into RECS equivalents, this difference is likely due to the fact that the approaches start from different base years (2009 for RECS, 2011 for the ACS) to extrapolate their base-year estimates to the 2014 target year. In other words, there is more error in extrapolating older data to a future year.
- A 3-year moving average of the CPI (adjusted for household formation) outperformed both the STEO (also adjusted for household formation) and trend as a method for extrapolating ACS data to the target year when developing the base-year SUAs. **Therefore, we recommend using the 3-year moving average of the CPI when developing base-year SUAs**.
- Trend analysis did perform relatively well when extrapolating State-level household water and sewage expenditures from the ACS. As more data become available, **FNS may wish to re-examine whether trend analysis is a better method for extrapolating ACS to the target year for other utility allowances.**
- None of the sources could be used to develop a standardized approach that would incorporate the ability to produce SUAs for areas with very small populations (e.g., sub-State regions in Alaska). **FNS or the States may need to explore other alternatives for generating sub-State SUAs if the ACS methodology were implemented**.

- Data anomalies occur in different places. For example, in Appendix Table H-1, Florida and Arizona have adjustment parameters that are very different from the other States and seem to suggest that natural gas expenditures for households without heating and cooling expenses are higher than expenditures for households with heating and cooling expenses. **In practice, such parameters would probably need to be replaced with more reasonable estimates**; however, we left them in the report so that FNS could see and understand that any type of standardization approach will have to address situations where data anomalies occur.
- In terms of updating the base-year SUAs, Table 6 shows that the CPI approach slightly outperformed the STEO in forecasting utility expenditures. **Therefore, we recommend using a 3-year moving average of the CPI when updating base-year SUAs**.
- A comparison of Tables 6 and 7 indicates that adding an adjustment for household growth yields a slight improvement in the performance of the CPI approach for updating the SUAs. Therefore, **our recommendation is to use the CPI, adjusted for household growth**.
- Changing the timeframe on when the SUAs are computed does not produce notable differences in the resulting growth rates that are calculated.

VI.C. Implementation

Development of SUAs

Because of the complexity involved in developing base-year SUAs, any standardized approach is likely to require substantial FNS involvement. For either approach, the effort required to develop the RECS adjustment parameters and telephone SUAs, and extend the estimates to the target year, could be substantial. For this reason, we recommend that FNS either construct the base-year SUAs and make them available to the States or develop and provide to the States any parameters applied to the underlying data set. We would suggest that the information be made available to the States on the FNS Website.[49] FNS involvement will help reduce the duplication of startup time and effort that will occur if all of the States use the same approach to develop their SUAs but carry out those efforts separately.

The ACS approach would be more difficult to implement but would provide specific State-level estimates and could be easily redone in the intervening years between RECS releases to take advantage of more recent ACS data. The RECS approach would be easier to implement and would provide the best accuracy for the base year for those States with State-level representation, but would have to be extended for 4 years until the next release (without any interim updates) and would have to utilize multi-State regional estimates for those States without State representation. By using the ACS in conjunction with RECS, the limitations of each data source are somewhat offset by the advantages of the other. **Therefore, we recommend using the ACS-based approach, which relies upon both data sources**.

[49] If desired, the information could be provided on a secure portion of the Website with restricted access. To facilitate implementation, we believe it will be easier for the States to access the data over the Internet rather than having them sent by email or CD-ROM.

Update of SUAs

It would not require a significant effort for the States to implement either of the alternative update methodologies. However, including an adjustment for household growth could increase the difficulty, depending on whether or not the State would need to develop the household growth rates or could utilize existing ones. For updating the SUAs, **our recommendation is to use the CPI, adjusted for household growth**. FNS could develop and make available household growth factors for each State.

APPENDIX A:
IDENTIFICATION AND REVIEW OF OTHER DATA SOURCES AND MODELS THAT WERE CONSIDERED

Review of Other Data Sources

Low Income Home Energy Assistance Program (LIHEAP)

The Low Income Home Energy Assistance Program (LIHEAP) is administered at the Federal level by the Administration for Children and Families (ACF) within the U.S. Department of Health and Human Services. The program provides grants in order "to assist low income households, particularly those with the lowest income, that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs."[50] In its *LIHEAP Home Energy Notebook,* ACF provides LIHEAP grantees with the latest national and regional data on home energy consumption, expenditures, and burden; low-income home energy trends; and the LIHEAP performance measurement system. Data in the notebook are obtained primarily from RECS, but ACF adjusts it for inflation and climate changes in the intervening years between surveys. ACF also uses the data to estimate energy expenditures for LIHEAP beneficiaries.

Housing Affordability Data System

The Housing Affordability Data System (HADS) is a set of data files maintained by HUD and derived from the AHS.[51] This system categorizes housing units by affordability and households by income, with respect to the adjusted median income, Fair Market Rent (FMR), and poverty income. The data set includes a utility cost variable that reflects the sum of all applicable utility costs in the AHS (gas, oil, electricity, other fuel, trash collection, and water). No new utility data is collected.

Home Energy Affordability Gap Model

This model, developed by Fisher, Sheehan & Colton, calculates the difference between estimated utility expenditures and expenditures defined as affordable. The calculations use RECS data and climate data to estimate utility expenses at the county level for different demographic and housing attributes.

Other Sources of Utility Cost

The Census Bureau's Survey of Income and Program Participation (SIPP) and Panel Study of Income Dynamics (PSID) are two other potential sources of data on utility expenditures. These sources are not timely and cannot be used to produce reliable State-level results. In addition, the questions used in the surveys are broad in nature and do not provide the detail needed to estimate SUAs for FNS. For example, the SIPP simply asks "How much did this household pay for electricity, gas, basic telephone service, and other utilities last month?"

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50 The Human Services Amendments of 1994, Public Law 103-252, Sec. 2602(a) as amended.
51 See http://www.huduser.org/datasets/hads/hads.html.

Weather Data

The National Climate Data Center (NCDC) provides State- and county-level data on the average monthly number of HDDs and CDDS.[52] These data are designed to provide information needed to determine fuel demand on a Statewide basis; as such, they are tabulated using population weights that reflect the percentage of total State population accounted for by each sub-State climate division. Our analyses found that the relationship between these State-level weather data and State-level energy consumption is weak, indicating that the weather data should not be the primary driver used to forecast State-level energy consumption.

Census of Government Finances

The U.S. Census Bureau publishes annual fiancé information on revenues and expenditures from Federal, State, and local governments. State and local government data are summarized by State and include separate revenues and charges for different public works programs such as sewerage, solid waste management, and water supply. We evaluated using the data to disaggregate national-level control totals on these utilities from BEA, but the routine did not produce credible estimates.

Review of Federal Methodologies

We reviewed several models that were developed by other Federal agencies and are used to compute utility allowances or estimate energy consumption. These models were evaluated to see if they could be adapted to meet FNS' objectives. These models include (1) the U.S. Department of Housing and Urban Development (HUD) Office of Public and Indian Housing (PIH) Utility Schedule Method, (2) the HUD Utility Schedule Model (HUSM), and (3) the Department of Energy's DOE-2 model. The first two models are used to calculate utility allowances applied under HUD's Section 8 Housing Choice Voucher Program, and the DOE-2 is used in building design and energy conservation studies. Much of this information was obtained from online sources, such as HUD's Website, and a report prepared for HUD by Joe Riley and Alan Fox.[53]

As noted in HUD's user guide[54] for calculating utility allowances, Federal housing regulations stipulate the factors that housing authorities (HAs) have to use in developing a utility allowance for a specific category of units (e.g., by building construction type and size). These factors include the following:

- Climate Conditions.
- Dwelling Unit Size.
- Number of Occupants.
- Type of Construction and Design of the Housing Development.
- Energy Efficiency of Appliances and Equipment.
- Physical Condition of the Development.

[52] For example, see http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html#51overview.
[53] Riley & Associates and Alan Fox Consulting, *Comparative Study of HUD Utility Schedule Calculation Methods and Options for Improvement*, report prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research, December 28, 2009.
[54] U.S. Department of Housing and Urban Development, *Utility Allowance Guidebook*, September 1998.

- Indoor Temperature.
- Hot Water Temperature.

Although some of the factors—such as indoor temperature—can be used to characterize specific housing units, it could be difficult to develop meaningful State averages for them, and models that incorporate such factors could be difficult to apply at the State level.

The regulations do not dictate the method to be used as long as the required factors are taken into consideration.[55] The Guidebook does provide detail on two basic methodologies that can be used to calculate utility allowances: an engineering-based approach and a consumption-based approach. The engineering approach uses technical data (e.g., heat-loss rates and appliance efficiency) and engineering calculations to compute energy and water consumption by type of dwelling and end-use (e.g., lighting, cooking, refrigeration). The consumption approach uses historical data on past consumption to establish the allowance. To ensure that the allowance estimates are representative, the data are usually subjected to a quality control process that removes atypical or inaccurate records attributable to vacant units, inaccurate meter readings, or other causes. Both approaches produce quantity estimates (e.g., kilowatt-hours) that must be combined with price data to calculate expenditures.

HUD PIH Utility Schedule Method

This consumption-based method originated in the 1970s and is designed to help HAs fill out HUD's Form HUD-52667, which is the form HAs are required to complete to establish their utility allowances. Instructions on the form include national average utility consumption data for a 2½-bedroom dwelling unit with the following characteristics:

- Located in the North Central U.S., with an average local water temperature of 50° F.
- Housing is insulated for the installed heating systems.
- 4,000 heating degree days (HDDs) and 0° F outside design temperature.
- 1,000 cooling degree days (CDDs).

The data were developed in the 1970s and have not been subsequently updated, but HAs are allowed to use them "where local sources are inadequate." Instructions on the form also include adjustment factors that can be applied to data for the average unit size (2½ bedrooms) to generate estimates for other unit sizes (e.g., a 4-bedroom unit).

A few private vendors have developed models based on these early data, which HAs can utilize to help them fill out Form 52667. Because HUD does not provide guidance on how to incorporate its consumption estimates into the development of utility allowances, various approaches have been put forward to adjust the base-level consumption estimates to account for differences in geographic location, the passage of time (i.e., investments in energy conservation and changes in the relative prices and quantities of energy stocks), and other unit characteristics. For example, Alan Fox developed an Excel-based spreadsheet application that uses multiplicative factors to adjust HUD's base-level consumption estimates for differences in the number of local HDDs or CDDs, the number of bedrooms, the type of structure (single family, mobile home, duplex, apartment),

[55] Ibid., page 4.

and improvements in heating and air conditioning efficiency. The updated consumption estimates are then used in conjunction with local utility rates to estimate monetary utility allowances.[56]

Such models are relatively simple and only require the numbers of HDDs and CDDs and utility rate information as data inputs from the user. In addition, they could be deployed in a number of ways (e.g., as a spreadsheet application or as a Web application), and could be relatively easy for the States to implement. However, there were some caveats to the approach. For example, information on utility rates/prices are needed as inputs into such models, which would require States to construct Statewide average utility rates. Given the complexity and lack of uniformity in rate schedules across utilities, such an exercise could lead to the introduction of errors and variation in terms of how the averages are constructed. As documented in Nelrod's *Public Housing Utility Allowance Guidebook*, utility rates can vary by a multitude of factors, such as utility company and coverage area, season, location (county vs. city), tariff, and meter type, and may consist of numerous components, such as volume and fixed charges, surcharges, and different types of taxes.[57] Utilities also use different billing methods, and bills on a bimonthly or quarterly basis would need to be converted to a monthly basis.

HUD Utility Schedule Model (HUSM)

This downloadable spreadsheet model[58]—employed by the IRS to determine utilities for its Low Income Housing Tax Credit program and by an indeterminate number of HAs for HUD's Section 8 program—uses utility rate and location information to calculate consumption estimates. The model incorporates parameters statistically estimated using data from the DOE's RECS. According to the 2009 *Comparative Study of HUD Utility Schedule Calculation Methods*:

> The only utility allowance calculation method examined that can be said to be based on actual current utility usage patterns and costs is the HUSM model. This model can be thought of as hybrid of the engineering and utility-cost utilization model approaches. It closely approximates average local RECS-based utility consumption numbers for different structure types and utility uses in a wide range of climate zones. Total utility consumption estimates for any given fuel and structure type is based on reported data. Detailed local utility rates are needed to convert consumption estimates into utility cost estimates.[59]

HUSM first appeared in 2003, based on analysis done by GARD Analytics of the 1997 RECS; this was the first update of utility allowance methodology since the mid-1970s.[60] Since 2003, the model has been revised several times, notably in 2007 with engineering-based adjustments for the degradation of heat pump heating efficiency at lower temperatures.[61] HUD staff also implemented other enhancements, but these are not documented. The model is currently being reprogrammed

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56 For documentation and an example of this model, see http://www.AFoxConsulting.com.
57 The Nelrod Company, *Public Housing Utility Allowance Guidebook*, prepared for HUD under contract number C-OPC-22394, Task Order DEN-TO003.
58 Available at http://www.huduser.org/resources/utilmodel.html.
59 Riley & Associates and Alan Fox Consulting, 2009, page 2.
60 Described in GARD Analytics, *Utility Allowance Model Final Report*, June 5, 2003.
61 GARD Analytics, *Final Report on HUD52667 Spreadsheet Update,* February 12, 2007.

using new parameters developed by Riley & Associates and based on combined RECS data (1997, 2001, and 2005);[62] however, its operational date is uncertain.

As with the PIH Utility Schedule Method previously described, the model is designed to help HAs complete HUD Form 52667 and therefore includes a lot of detail that would not be needed by FNS. Required inputs to the model include the number of HDDs and CDDs by month (which can be retrieved via a ZIP Code lookup utility), as well as detailed information on utility tariffs.

The model produces a number of different allowances by structure type and utility end-use. Allowances for heating, cooking, and water heating are further itemized by type of fuel (natural gas, bottled gas, electric, and other). Most of the allowances are also itemized by the number of bedrooms in the structure.

Department of Energy's DOE-2 Utility Estimation Model (DOE-2)

The DOE-2 model uses a very complicated engineering approach to estimate utility consumption.[63] The model is based on engineering calculations and to some extent on RECS, and uses data on detailed structural characteristics as well as climate data. Although the model can be very accurate under certain conditions—if it is applied to specific buildings with known use patterns, if good assumptions are made, and if all of the required input data are available and utilized—in practice it is seldom used because of the time and costs involved. According to the HUD *Comparative Study* previously cited:

> The current version of the model has 92 major data entry categories, some of which require detailed engineering measurement sub-entries on building characteristics…. The climatic information required is contained in additional model components…. Applying even a "simplified" variation to each Section 8 voucher unit is clearly infeasible because the necessary prerequisites are almost never met.[64]

A number of commercially available engineering models have surfaced that are loosely based on the DOE-2 approach, but which attempt to simplify its application and requirements. Still, these models often require detailed building specifications and are not well suited to providing utility allowances for an entire program or an entire State. Therefore, we do not consider this approach to be a viable option for FNS.

Conclusion

For a number of reasons, we do not think any of these Federal models would serve as a good guide for developing an application that FNS could deploy to the States. The DOE-2 model is too complicated and requires very detailed inputs, and therefore would not be useful for a State-level model.

The PIH-based models not only face the problem of having to develop average State utility tariffs that are commensurate with the underlying quantity estimates, but some of our analyses indicate a

[62] Riley & Associates, *HUD Utility Model (HUSM) Rebenchmarking*, December 12, 2012.
[63] See http://www.doe2.com.
[64] Riley & Associates and Alan Fox Consulting, 2009, page 14.

weak relationship between the number of CDDs/HDDS and utility consumption—the main input drivers of those models.

Regarding HUSM, efforts to convert it to a State-level model would encounter the same issues faced by the PIH-based models, in particular the problem of developing average State utility tariffs that are commensurate with the underlying quantity estimates. In addition, HUSM's detailed calculations and results would have to be consolidated to match the goals of FNS. Third, due to the model's complexity, it could be a significant undertaking to update HUSM's parameters after subsequent releases of RECS data. As noted above, HUSM is currently being revised, and one of the modifications is the estimation of the parameters and formulas using combined data from multiple RECS surveys rather than a single survey. Given that the data have to be split into at least 30 different categories for HUSM analysis purposes, the sample sizes for some of the categories are very small, leading to inconsistencies in some of the estimates.[65] Fourth, given the large number of analysis categories in HUSM and RECS small sample size, it would not be possible to restrict the calculations to low-income groups, and the consumption estimates would not accurately reflect the consumption patterns of low-income groups. Finally, although both models are used by HAs across the country, they do not necessarily produce representative estimates for each State.

[65] Riley & Associates, *HUD Utility Model (HUSM) Rebenchmarking*, December 12, 2012, page 4.

APPENDIX B: PRELIMINARY ALTERNATIVES

Based on our review of existing models and data sources, we developed a preliminary list of alternative approaches that could be used to develop, obtain, or calculate standardized SUAs:

1. Use data from the American Community Survey (ACS). This source provides most of the relevant data needed to compute the SUAs, but requires the application of RECS-based adjustments parameters to (1) isolate heating and cooling expenses for purposes of developing the SUAs and (2) account for upward bias in the ACS self-reported utility expenditure estimates.

2. Develop a simplified version of the HUD Utility Schedule Model (HUSM) based on utility consumption data from the DOE RECS and climate data—heating degree days (HDDs) and cooling degree days (CDDs)[66]—from the National Oceanic and Atmospheric Administration (NOAA). The model would not distinguish among utility end-uses, as the HUD models do, but may provide detail by structure type, number of bedrooms, or household size in order to develop more accurate estimates; in that case, the detailed results would be aggregated to produce the proper SUAs. The consumption quantities estimated by the model would need to be multiplied by corresponding price estimates to generate expenditure estimates.

3. Disaggregate State-level utility expenditure data from DOE's State Energy Data System (SEDS) to income categories (and/or SNAP participation status) using ACS distributions on utility expenses. The approach would attempt to combine the advantages of DOE's utility expenditure data (accuracy and availability for all States) and the advantages of the ACS data (level of detail).

4. Hybrid of recommendations 2 and 3: Estimate the parameters that characterize the relationship between NOAA climate data and SEDS State-level consumption data, and use these parameters in conjunction with NOAA's State-level 14-month forecast of HDDs and CDDs to project State-level utility consumption for the SUA reference year. The forecast would need to be converted to expenditures using price data and then allocated to income groups using the ACS.

5. Place the SUAs on a scalable basis rather than using a fixed number. Using an average or fixed number results in some people not having their expenses fully covered while others have more than their actual expenses covered. A scalable SUA definition—for example, one based on a percentage of income[67]—would mitigate this problem. A scalable SUA based on percentage of income could be defined in a number of ways, depending on equity concerns or other considerations. For example, instead of using a fixed percentage, the percentage could be specified to decline as income rises, or it could be designated to decline above a certain income threshold.

6. Develop a weighted average of Housing Authority utility allowances in each State. HAs across the country are required to recalculate their utility allowances on an annual basis. At this time, these data are not gathered into a single repository or published. An option would be to work with HUD to develop a system that would capture these data and then use the data to construct the SUAs.

[66] Heating degree days (HDDs) and cooling degree days (CDDs) are metrics that reflect the quantity of energy needed to heat or cool a building, respectively. The metrics compare average temperatures over a specific period of time with base temperatures in which heating or cooling is not required.
[67] Another option would be to estimate regression coefficients in which income is a predictor of utility expenses.

7. Water, sewage, and trash utilities: Use an approach that disaggregates national-level control totals to each State. BEA's National Economic Accounts provide estimates for these expenditures, which would serve as the control totals. The estimates would be allocated to the State level using data on local and State Government revenues from water supply and from charges for sewage and solid waste management, available in the Census Bureau's Local and State Government Finance Data. Allocation to income groups would be accomplished using ACS data on personal income or similar utility expenditures.
8. Landline Telephone: Estimates for these expenditures would be developed using an approach that disaggregates national-level control totals to each State. BEA's National Economic Accounts provide estimates for residential landline telephone expenditures, which will serve as the control totals. The estimates would be allocated to the State level using either data on total personal income (available from BEA) or data on industry revenues for wired telecommunication carriers (available from the Census Bureau's Service Annual Survey).
9. Use RECS directly to develop the energy components of all of the different types of SUAs. RECS provides all of the data needed to estimate these components and would require the fewest linkages to other sources to carry out the approach.

Subsequent analyses helped identify problems or weaknesses with some of the alternatives, which were then dropped from consideration. The rationales for dropping these other alternatives are presented below.

Rationale for Dropping Alternatives #2 and #4: Both of these alternatives depended on the existence of a strong correlation between energy consumption (specified in British Thermal Units or BTUs) and climate metrics reflecting the number of HDDs and CDDs. Analyses, however, indicate weak relationships between these variables at the State level. The results suggest that energy consumption is a function of considerably more than just the climate, and that models that only use climate variables to predict State-level energy consumption are not warranted.

Rationale for Dropping Alternative #3: Although SEDS provides very good information on State-level energy expenditures, the data are highly aggregated and numerous processes are needed to allocate those data, which together introduce considerable error. The SEDS data represent total expenditures in the State and are not defined on a household basis; therefore, they have to be allocated to households based upon assumptions of household usage by different income groups. Furthermore, the data reflect total expenditures, including those paid directly by occupants and those included in occupant rental fees; as a result, an additional allocation procedure is needed to isolate those expenditures paid for directly. The data do not provide information on households that use multiple utilities (e.g., electricity for cooling and natural gas for heating) and have to be adjusted for those instances. Finally, adjustments have to be applied to isolate heating and cooling expenses from other types of end-uses (required to develop the LUAs and SUSs).

Rationale for Dropping Alternative #5: The primary reason we decided to drop Alternative #5 (i.e., defining SUAs as a percentage of income) is that we do not think there is sufficient data to support this approach. RECS would still be needed to implement this alternative (for example, to develop adjustment parameters that could be used to remove heating and cooling expenses from ACS estimates); however, RECS is based on a relatively small sample, which becomes an issue when dividing it up into subcategories. Although we were able to use RECS to develop estimates for the entire group of households with incomes at or below 150 percent of the poverty level, subdividing that group into more detailed income tiers results in very small sample sizes and in some cases no observations. In addition, time-series data would be needed to establish a stable picture of the relationship between utility expenditures and income by State. RECS is conducted once every 4 years, and surveys prior to 2009 provide State-level estimates for only 4 States in contrast to the 16 States provided in the 2009 survey.

Rationale for Dropping Alternative #6: This option was not pursued under this contract because it would require HUD's cooperation and would probably take considerable time to implement. However, it is still an option FNS may want to explore.

APPENDIX C: HOUSEHOLD UTILITY EXPENDITURES AND COMPONENT GROWTH RATES

Household Utility Expenditures and Component Growth Rates

$$U_0 = \frac{E_t}{H_t} = \frac{P_t \times Q_t}{H_t},$$

$$U_{t+1} = \frac{E_{t+1}}{H_{t+1}} = \frac{(E_t \times AAGR_E)}{(H_t \times AAGR_H)},$$

$$U_{t+1} = \frac{E_{t+1}}{H_{t+1}} = \frac{P_{t+1} \times Q_{t+1}}{H_{t+1}} = \frac{(P_0 \times AAGR_P) \times (Q_0 \times AAGR_Q)}{(H_0 \times AAGR_H)} = U_0 \times \frac{AAGR_P \times AAGR_Q}{AAGR_H},$$

where U_t refers to average utility expenditures per household at time "t," E refers to total utility expenditures, H refers to the number of households, P refers to the utility price, Q refers to the quantity of the utility consumed, $AAGR_E$ refers to the average annual growth rate in utility expenditures, $AAGR_P$ refers to the average annual growth rate in utility prices between time "t" and time t+1, $AAGR_Q$ refers to the average annual growth rate in the quantity of the utility consumed, and $AAGR_H$ refers to the average annual growth rate in the number of households. The last term in the third equation shows how future household utility expenditures are related to current household utility expenditures and the average annual growth rates for prices, quantities, and the number of households.

APPENDIX D:
PROCEDURES USED TO EXTRAPOLATE BASE YEAR STANDARD UTILITY ALLOWANCES TO TARGET YEAR

The SUAs are first developed using the latest available data. Due to the lag between the last year of available data and the target year (2014), these base year SUAs are then extended to the target year using a combination of extrapolation procedures that take into account the different growth rates for prices, quantities, and household formation (explained in Equation 1 and Appendix C).

For example, at the time of writing, data for 2011 was the most recent available from the ACS; for RECS, it was 2009. The extrapolations address changes in prices, consumption (i.e., quantity such as kilowatt hours) and household growth expected to take place between these base years and the 2014 target year.

For the household and energy expenditure extrapolations, we felt that it was important to base the extrapolation procedures on an official Government projection if possible. For the household procedure, we were able to utilize the Census Bureau's population projections. To extrapolate energy expenditures, we relied on EIA's Short Term Energy Outlook (STEO).[68,69]

Extrapolation of Households

The procedure used to extrapolate the number of low-income households by State relies on national population projections from the Census Bureau to forecast the number of households for the Nation.[70] These household projections are then allocated to income groups and States using a disaggregation procedure.

To forecast the total number of households for the Nation, we utilized population and household data from the Current Population Survey (CPS). There are several different sources and definitions of population and household data; we chose to use the CPS because it provides both data series using a consistent definition (civilian non-institutionalized population). The historical data for the series were evaluated and used to develop a regression relationship with households as the dependent variable and population as the independent variable. Figure D1 depicts the relationship and shows the linear regression that was estimated. It can be seen that there is a strong relationship between the two variables.

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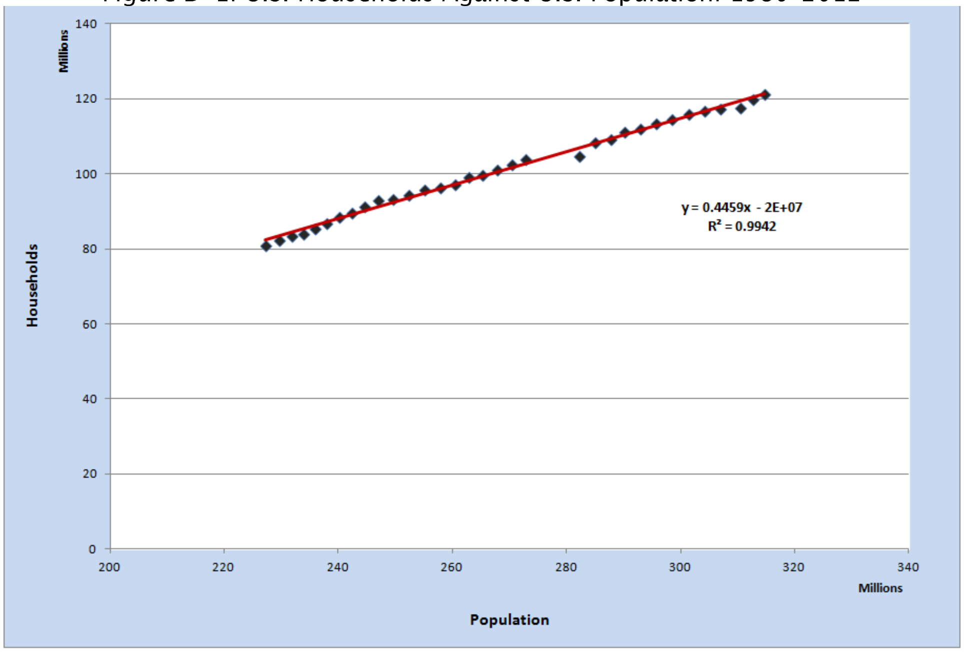
[68] EIA also produces the Annual Energy Outlook; however, it lacks the useful regional information provided in the STEO.

[69] During the validation of the approaches, we discovered that using a CPI-based approach would be slightly more accurate and easier to implement than using the STEO to extrapolate expenditures to the target year; as a result, we are now recommending use of the CPI-based approach.

[70] Note that the Census Bureau no longer produces population projections by State.

Figure D-1: U.S. Households Against U.S. Population: 1980-2012



The parameters estimated in the regression were then used in conjunction with the Census Bureau's projections of the U.S. resident population to extrapolate the number of households. Because the resident population definitions used in the CPS and in the Census Bureau's population projections are slightly different, we computed the growth rates in the population projections and applied those to the CPS historical data to generate a forecast that is consistent with the underlying historical data. These CPS-based population forecasts were then used in the regression equation to estimate total households for the Nation. The results of the calculations are presented in Table D1.

Table D-1: Extrapolation of Total Households for the Nation

Calendar Year	Census Resident Population Projection	Annual Growth Rates	Extrapolation of Civilian Noninstitutional Population: Population	Households
2012	314,004,465		314,687,369	
2013	316,438,601	1.0078	317,126,799	122,515,060
2014	318,892,103	1.0078	319,585,637	123,611,499
2015	321,362,789	1.0077	322,061,696	124,715,617
2016	323,848,670	1.0077	324,552,983	125,826,525

The extrapolated number of total households in the Nation was then apportioned into low-income households and other households, where low income was defined as having income at or below 150 percent of the poverty line[71]. Data from the ACS show that low-income households constitute

[71] We defined low-income households as having household income at or below 150 percent of the poverty line. This figure was used rather than 130 percent—a figure often used to define low-income—because RECS provides a field that specifies whether or not the household is at 150 percent of the poverty-line. In order to use 130 percent, we would have had to specify the poverty line for each household size in RECS, compute 130 percent of the poverty line by

a fairly stable percentage of total households, ranging between 16.5 percent and 18.7 percent between 2005 and 2011. It is difficult to detect any trend in this percentage over that period, so we calculated the average for the last years (2009–2011)—18.3 percent—and applied that percentage to the extrapolated number of total households to produce a forecast for the number of low-income households in the Nation (shown in Table D2).

Table D-2: Projection of Low-Income Households for the Nation

Year	Low-Income Households
2005	20,042,015
2006	19,241,425
2007	19,372,728
2008	19,258,628
2009	20,938,951
2010	21,474,832
2011	22,441,568
2012	22,139,051
2013	22,400,707
2014	22,601,180
2015	22,803,058

Finally, we allocated the projected number of low-income households to each State using each State's historical share of low-income households in the country. Analysis of ACS data indicates that State shares of low-income households in the country remained fairly constant between 2005 and 2011. Using data for 2009–2011, we computed each State's average share and then applied those averages to the forecast number of low-income households in the Nation. The results are shown in Appendix E.

Extrapolation of Energy Expenditures

To reiterate, we need to extrapolate the energy expenditures to the target year (2014) to take into account the lag between the vintage year of the most recent data available and the target year. For the ACS, the vintage of the most recent data available at the time of writing was 2011; for RECS, it was 2009. The expenditure extrapolations address changes in prices and consumption (i.e., quantity such as kilowatt-hours) that take place between the vintage year of the data and the target year.

For the household and energy expenditure extrapolations, we felt that it was important to base the extrapolation procedures on an official Government projection if possible. For the household procedure, we were able to utilize the Census Bureau's population projections. To extrapolate energy expenditures, we relied on EIA's STEO.[72]

The latest STEO produces price and consumption forecasts by energy source out to 2014; however, not all energy sources are covered and some of the forecasts do not provide detail by geographic region and/or using sector (e.g., residential, commercial, industrial). Therefore, as

household size, and then compare the household income of each observation with the applicable household size low-income threshold.

[72] EIA also produces the Annual Energy Outlook; however, it lacks the useful regional information provided in the STEO

explained below, we had to use several different approaches to adapt the forecasts to this effort. In addition, the forecasts currently do not extend beyond calendar year 2014, which is necessary in order to compute forecasts for FY 2015. EIA extends the forecasts 1 year with the STEO's January release, but we do not know when the States actually revise their SUAs relative to the upcoming target year. For those States that revise their SUAs prior to January of the preceding target year, the STEO forecasts will need to be extrapolated 1 year, which we have done.

Electricity

The STEO provides price and consumption forecasts for the residential electricity sector by Census Division. Growth rates tabulated from these series (shown in Appendix Table F-1) were used to create different expenditure growth rates using 2009 and 2011 as base years (which correspond to the last year of available data for RECS and the ACS, respectively).

For example, Appendix Table F-1 shows that residential energy consumption was 256 kilowatt-hours per day in the Mountain Census Division in 2009, and 260 kilowatt-hours in 2011. For 2014, the STEO is projecting residential energy consumption for the Mountain Census Division to be 259 Kilowatt-hours per day. Dividing the 2014 value by the 2009 and 2011 values yields consumption growth rates of 1.012 and 0.996, respectively. In a similar fashion, residential energy prices were shown to be 10.18 and 10.56 cents per kilowatt-hour in the Mountain Census Division in 2009 and 2011 respectively. Dividing the 2014 projected residential energy price (11.51) by these values produces price growth rates of 1.13 and 1.09, respectively. Finally, the expenditure growth rate for residential electricity is computed by multiplying the respective price and consumption growth rates. For a 2009 base year (the last year of available data for RECS), the expenditure growth rate is equal to 1.012 X 1.13, or 1.14. For a 2011 base year, (the last year of available data for the ACS), the expenditure growth rate is equal to 0.996 X 1.09, or 1.086. These figures are then applied to the estimated base year SUAs in the States in the Mountain Census Division (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming). Dividing the results by the corresponding household growth rates shown in Appendix D is the final step needed to escalate the base year estimates; using Colorado as an example, the household growth rate between 2014 and 2009 is projected to be 1.102 and the growth rate between 2014 and 2011 is projected to be 1.021.

Natural Gas

The STEO provides price forecasts for the residential natural gas sector by Census Division but provides natural gas consumption estimates for the residential sector only for the entire Nation (shown in Appendix Table F-2). Growth rates tabulated from these series were used to create different expenditure growth rates using 2009 and 2011 as base years (which correspond to the last year of available data for RECS and the ACS/SEDS, respectively).

Total Energy

Total energy growth rates needed to construct the LUAs and HCSUAs, were developed using the electricity and natural gas/other fuels forecasts.

APPENDIX E: PROJECTED NUMBER OF LOW-INCOME HOUSEHOLDS BY STATE

								Growth Rates					
								Base Year: 2009			Base Year: 2011		
	2009	2010	2011	2012	2013	2014	2015	2013	2014	2015	2013	2014	2015
Alabama	457,501	441,271	462,513	464,974	470,469	474,679	478,919	1.028	1.038	1.047	1.017	1.026	1.035
Alaska	26,198	30,347	33,017	30,519	30,880	31,156	31,434	1.179	1.189	1.200	0.935	0.944	0.952
Arizona	429,197	466,255	497,619	475,128	480,743	485,046	489,378	1.120	1.130	1.140	0.966	0.975	0.983
Arkansas	287,444	281,439	295,749	295,275	298,765	301,438	304,131	1.039	1.049	1.058	1.010	1.019	1.028
California	2,081,798	2,211,618	2,369,938	2,273,043	2,299,908	2,320,490	2,341,217	1.105	1.115	1.125	0.970	0.979	0.988
Colorado	290,692	314,514	313,760	313,708	317,416	320,257	323,117	1.092	1.102	1.112	1.012	1.021	1.030
Connecticut	166,111	182,442	191,058	184,066	186,242	187,908	189,587	1.121	1.131	1.141	0.975	0.984	0.992
Delaware	45,355	49,141	47,315	48,431	49,003	49,442	49,883	1.080	1.090	1.100	1.036	1.045	1.054
District of Columbia	44,752	42,509	47,654	46,051	46,595	47,012	47,432	1.041	1.051	1.060	0.978	0.987	0.995
Florida	1,352,251	1,421,097	1,494,594	1,456,417	1,473,630	1,486,819	1,500,099	1.090	1.100	1.109	0.986	0.995	1.004
Georgia	721,120	748,281	791,065	771,426	780,543	787,528	794,563	1.082	1.092	1.102	0.987	0.996	1.004
Hawaii	60,457	58,063	65,364	62,755	63,496	64,065	64,637	1.050	1.060	1.069	0.971	0.980	0.989
Idaho	114,862	120,259	120,657	121,485	122,921	124,021	125,128	1.070	1.080	1.089	1.019	1.028	1.037
Illinois	820,589	804,360	855,980	847,100	857,112	864,783	872,507	1.045	1.054	1.063	1.001	1.010	1.019
Indiana	460,429	468,285	477,464	480,205	485,880	490,229	494,608	1.055	1.065	1.074	1.018	1.027	1.036
Iowa	201,991	204,245	207,885	209,738	212,217	214,116	216,029	1.051	1.060	1.069	1.021	1.030	1.039
Kansas	185,947	190,974	192,886	194,590	196,890	198,652	200,426	1.059	1.068	1.078	1.021	1.030	1.039
Kentucky	421,878	405,906	422,741	427,187	432,236	436,104	439,999	1.025	1.034	1.043	1.022	1.032	1.041
Louisiana	389,824	396,826	438,780	418,044	422,985	426,770	430,582	1.085	1.095	1.105	0.964	0.973	0.981
Maine	104,757	102,672	112,374	109,156	110,446	111,434	112,430	1.054	1.064	1.073	0.983	0.992	1.000
Maryland	245,164	256,602	267,033	262,396	265,497	267,873	270,266	1.083	1.093	1.102	0.994	1.003	1.012
Massachusetts	357,777	390,677	402,891	392,834	397,477	401,034	404,616	1.111	1.121	1.131	0.987	0.995	1.004
Michigan	752,341	744,799	770,164	774,360	783,512	790,524	797,585	1.041	1.051	1.060	1.017	1.026	1.036
Minnesota	305,128	308,730	312,332	316,339	320,078	322,942	325,827	1.049	1.058	1.068	1.025	1.034	1.043
Mississippi	306,008	304,181	315,618	316,166	319,903	322,766	325,649	1.045	1.055	1.064	1.014	1.023	1.032
Missouri	460,235	465,907	476,131	478,881	484,541	488,877	493,244	1.053	1.062	1.072	1.018	1.027	1.036
Montana	70,365	76,200	80,327	77,400	78,314	79,015	79,721	1.113	1.123	1.133	0.975	0.984	0.992
Nebraska	123,601	121,915	126,806	127,156	128,659	129,810	130,970	1.041	1.050	1.060	1.015	1.024	1.033
Nevada	153,193	168,599	186,014	173,098	175,144	176,711	178,290	1.143	1.154	1.164	0.942	0.950	0.958
New Hampshire	61,069	61,908	65,441	64,317	65,077	65,659	66,246	1.066	1.075	1.085	0.994	1.003	1.012
New Jersey	418,278	428,354	448,631	442,146	447,371	451,375	455,407	1.070	1.079	1.089	0.997	1.006	1.015
New Mexico	167,740	178,970	189,483	182,930	185,092	186,748	188,416	1.103	1.113	1.123	0.977	0.986	0.994
New York	1,297,776	1,322,421	1,389,608	1,368,786	1,384,963	1,397,357	1,409,839	1.067	1.077	1.086	0.997	1.006	1.015
North Carolina	772,290	789,246	822,778	813,966	823,586	830,957	838,379	1.066	1.076	1.086	1.001	1.010	1.019
North Dakota	42,716	48,384	47,311	47,240	47,798	48,226	48,656	1.119	1.129	1.139	1.010	1.019	1.028
Ohio	880,024	882,920	912,791	913,726	924,525	932,799	941,130	1.051	1.060	1.069	1.013	1.022	1.031
Oklahoma	318,820	313,418	325,121	326,981	330,845	333,806	336,788	1.038	1.047	1.056	1.018	1.027	1.036
Oregon	264,706	279,836	290,642	285,031	288,399	290,980	293,580	1.090	1.099	1.109	0.992	1.001	1.010
Pennsylvania	849,595	872,872	880,849	889,044	899,552	907,602	915,709	1.059	1.068	1.078	1.021	1.030	1.040
Rhode Island	69,753	71,867	75,036	73,955	74,829	75,499	76,173	1.073	1.082	1.092	0.997	1.006	1.015
South Carolina	393,589	400,191	424,285	415,760	420,674	424,439	428,230	1.069	1.078	1.088	0.991	1.000	1.009
South Dakota	61,628	58,042	58,683	60,963	61,683	62,235	62,791	1.001	1.010	1.019	1.051	1.061	1.070
Tennessee	558,131	556,212	575,760	577,178	583,999	589,226	594,489	1.046	1.056	1.065	1.014	1.023	1.033
Texas	1,816,372	1,835,494	1,913,515	1,900,154	1,922,612	1,939,818	1,957,145	1.058	1.068	1.078	1.005	1.014	1.023
Utah	131,545	143,437	149,244	144,730	146,441	147,751	149,071	1.113	1.123	1.133	0.981	0.990	0.999
Vermont	38,927	38,400	36,210	38,823	39,282	39,633	39,987	1.009	1.018	1.027	1.085	1.095	1.104
Virginia	416,465	429,299	441,577	439,512	444,706	448,686	452,694	1.068	1.077	1.087	1.007	1.016	1.025
Washington	368,182	398,874	412,391	402,443	407,199	410,843	414,513	1.106	1.116	1.126	0.987	0.996	1.005
West Virginia	186,049	185,114	186,204	190,415	192,666	194,390	196,126	1.036	1.045	1.054	1.035	1.044	1.053
Wisconsin	358,139	369,007	390,297	381,374	385,881	389,335	392,812	1.077	1.087	1.097	0.989	0.998	1.006
Wyoming	30,193	32,451	29,984	31,653	32,027	32,313	32,602	1.061	1.070	1.080	1.068	1.078	1.087

APPENDIX F: FORECASTS AND CALCULATED GROWTH RATES FROM THE SHORT-TERM ENERGY OUTLOOK (STEO)[73]

[73] During the validation of the approaches, we discovered that using a CPI-based approach would be slightly more accurate and easier to implement than using the STEO to extrapolate expenditures to the target year; as a result, we are now recommending use of the CPI-based approach.

Appendix Table F-1: STEO Electricity Forecasts

	Census Division	2009	2010	2011	2012	2013	2014	Calculated Growth Rates 2014 ÷ 2009	Calculated Growth Rates 2014 ÷ 2011
Residential Electricity Consumption (Million Kilowatthours per Day)	East North Central	500	535	525	514	508	500	1.000	0.952
	East South Central	318	356	336	314	316	316	0.994	0.940
	Alaska and Hawaii	14	14	14	13	13	13	0.929	0.929
	Middle Atlantic	353	374	371	362	368	361	1.023	0.973
	Mountain	256	256	260	260	263	259	1.012	0.996
	New England	126	133	130	128	132	129	1.024	0.992
	Pacific Contiguous	401	386	395	395	394	386	0.963	0.977
	South Atlantic	948	1029	971	918	926	926	0.977	0.954
	West North Central	279	295	291	281	283	278	0.996	0.955
	West South Central	543	583	605	569	568	562	1.035	0.929
Retail Price of Electricity in Residential Sector (Cents per Kilowatthour)	East North Central	10.93	11.41	11.79	12.01	12.15	12.36	1.131	1.048
	East South Central	9.61	9.58	10.14	10.26	10.46	10.62	1.105	1.047
	Alaska and Hawaii	21.31	23.22	27.49	28.73	28.12	27.91	1.310	1.015
	Middle Atlantic	14.84	15.81	15.8	15.33	15.83	16.04	1.081	1.015
	Mountain	10.18	10.49	10.56	10.9	11.28	11.51	1.131	1.090
	New England	17.47	16.24	15.89	15.75	15.98	16.33	0.935	1.028
	Pacific Contiguous	12.15	12.3	12.43	13.08	13.61	13.86	1.141	1.115
	South Atlantic	11.32	10.96	11.19	11.36	11.38	11.51	1.017	1.029
	West North Central	9.14	9.64	10.12	10.55	10.84	10.94	1.197	1.081
	West South Central	11.04	10.67	10.42	10.33	10.84	10.99	0.995	1.055
Residential Sector Electricity Expenditures[†] (Millions of Dollars)	East North Central	54.65	61.04	61.90	61.73	61.72	61.80	1.131	0.998
	East South Central	30.56	34.10	34.07	32.22	33.05	33.56	1.098	0.985
	Alaska and Hawaii	2.98	3.25	3.85	3.73	3.66	3.63	1.216	0.943
	Middle Atlantic	52.39	59.13	58.62	55.49	58.25	57.90	1.105	0.988
	Mountain	26.06	26.85	27.46	28.34	29.67	29.81	1.144	1.086
	New England	22.01	21.60	20.66	20.16	21.09	21.07	0.957	1.020
	Pacific Contiguous	48.72	47.48	49.10	51.67	53.62	53.50	1.098	1.090
	South Atlantic	107.31	112.78	108.65	104.28	105.38	106.58	0.993	0.981
	West North Central	25.50	28.44	29.45	29.65	30.68	30.41	1.193	1.033
	West South Central	59.95	62.21	63.04	58.78	61.57	61.76	1.030	0.980

[†]Calculated by Econometrica

Appendix Table F-2: STEO Natural Gas Forecasts

	Census Division	2009	2010	2011	2012	2013	2014	Calculated Growth Rates 2014 ÷ 2009	Calculated Growth Rates 2014 ÷ 2011
Residential Natural Gas Consumption (Billion Cubic Feet per Day)	Total U.S.	13.09	13.10	12.91	11.42	13.22	12.82	0.979	0.993
Residential Natural Gas Price (Dollars per Thousand Cubic Feet)	East North Central	10.72	10.25	9.81	9.2	9.26	10.36	0.966	1.056
	East South Central	13.19	11.43	11.2	11.28	10.98	12.73	0.965	1.137
	Middle Atlantic	14.83	13.4	12.88	12.2	12.62	14.11	0.951	1.095
	Mountain	10.4	9.65	9.39	9.41	9.29	10.22	0.983	1.088
	New England	15.04	14.83	14.03	13.73	13.92	15.09	1.003	1.076
	Pacific Contiguous	10.44	10.35	10.36	9.75	10.22	10.6	1.015	1.023
	South Atlantic	14.97	13.55	13.61	13.71	13.17	15.03	1.004	1.104
	West North Central	10.34	9.92	9.88	9.6	9.35	10.37	1.003	1.050
	West South Central	11.67	11.05	10.54	11.12	10.65	11.7	1.003	1.110
	Alaska†	10.23	8.89	8.77	8.47	*8.88*	*9.21*	0.900	*1.050*
	Hawaii‡	36.37	44.5	55.28	52.86	*60.30*	*68.78*	1.891	*1.244*
Residential Natural Gas Expenditures¥	East North Central							0.946	1.049
	East South Central							0.945	1.129
	Middle Atlantic							0.932	1.088
	Mountain							0.962	1.081
	New England							0.983	1.068
	Pacific Contiguous							0.994	1.016
	South Atlantic							0.983	1.097
	West North Central							0.982	1.042
	West South Central							0.982	1.102
	Alaska†							0.882	1.043
	Hawaii‡							1.852	1.235

Note: shaded areas with figures in italics represent estimates developed by Econometrica.

†Growth rates were assumed to be equal to Pacific Contiguous for 2013-2014.

‡For 2013-2014, growth rates were assumed to be equal to the average annual growth rate from 2009-2012.

¥Expenditures were not computed because consumption estimates are not published by Census Division. Expenditure growth rates are the product of the corresponding Census Division price growth rate and the consumption growth rate for the total U.S.

APPENDIX G: ACS AVERAGE UTILITY EXPENDITURES BY LOW-INCOME HOUSEHOLDS

Appendix Table G-1: Average *Monthly* Electricity Costs per Household for All End-Uses

FIPS	State	2005	2006	2007	2008	2009	2010	2011
1	Alabama	118	132	144	152	166	178	178
2	Alaska	103	111	114	108	135	109	116
4	Arizona	103	109	116	123	124	130	133
5	Arkansas	111	124	125	130	129	139	136
6	California	72	80	80	86	84	86	85
8	Colorado	79	89	87	92	87	93	93
9	Connecticut	93	110	121	127	131	131	132
10	Delaware	122	130	147	172	158	162	184
11	District of Columbia	84	104	104	111	126	114	131
12	Florida	121	138	140	143	155	159	153
13	Georgia	116	129	132	138	144	161	168
15	Hawaii	114	124	137	146	144	153	164
16	Idaho	74	79	83	90	102	99	100
17	Illinois	88	88	100	103	104	108	113
18	Indiana	91	98	102	110	116	118	123
19	Iowa	100	100	100	103	102	109	112
20	Kansas	92	98	99	105	108	118	125
21	Kentucky	94	101	108	116	126	133	136
22	Louisiana	132	146	148	158	141	157	158
23	Maine	79	87	94	100	105	98	99
24	Maryland	109	125	142	161	167	165	158
25	Massachusetts	75	89	93	98	97	92	88
26	Michigan	80	92	93	102	105	112	118
27	Minnesota	78	80	85	87	89	92	100
28	Mississippi	126	140	138	150	149	161	160
29	Missouri	97	102	104	109	111	124	134
30	Montana	81	86	90	94	102	91	96
31	Nebraska	85	94	96	93	99	106	115
32	Nevada	107	118	130	133	133	134	134
33	New Hampshire	81	83	89	84	97	98	89
34	New Jersey	108	115	122	139	134	147	145
35	New Mexico	76	79	83	93	86	88	91
36	New York	102	109	110	122	117	123	126
37	North Carolina	123	124	129	129	138	152	150
38	North Dakota	75	78	73	84	86	83	95
39	Ohio	85	90	94	98	102	110	109
40	Oklahoma	104	119	113	117	119	129	138
41	Oregon	81	85	91	99	104	105	110
42	Pennsylvania	84	85	89	97	99	105	114
44	Rhode Island	66	93	77	89	95	94	91
45	South Carolina	129	137	139	143	155	171	171
46	South Dakota	78	86	91	91	101	105	102
47	Tennessee	114	126	128	139	152	157	166
48	Texas	130	155	149	152	155	155	154
49	Utah	64	71	73	77	81	83	88
50	Vermont	86	93	87	92	93	101	103
51	Virginia	106	112	121	128	141	148	149
53	Washington	88	95	99	105	106	106	110
54	West Virginia	87	89	92	92	100	116	129
55	Wisconsin	90	99	103	109	110	111	119
56	Wyoming	70	77	80	78	97	86	94
US Avg		98	108	111	117	120	126	128

Appendix Table G-2: Average *Monthly* Natural Gas Costs per Household for All End-Uses

FIPS	State	2005	2006	2007	2008	2009	2010	2011
1	Alabama	97	119	110	111	112	116	109
2	Alaska	79	103	143	132	134	106	107
4	Arizona	53	59	62	64	61	60	59
5	Arkansas	89	99	93	109	99	94	88
6	California	46	50	47	51	44	46	46
8	Colorado	77	91	78	85	77	77	70
9	Connecticut	115	122	119	134	132	118	122
10	Delaware	110	126	121	127	127	114	122
11	District of Columbia	107	118	105	105	110	113	100
12	Florida	64	69	68	67	70	72	69
13	Georgia	99	116	102	109	103	107	100
15	Hawaii	57	70	44	87	62	62	68
16	Idaho	63	82	73	80	82	71	73
17	Illinois	112	136	120	131	121	108	104
18	Indiana	102	119	99	115	114	89	94
19	Iowa	95	106	102	106	96	96	89
20	Kansas	88	100	99	103	92	89	84
21	Kentucky	92	110	94	102	107	89	92
22	Louisiana	69	77	73	76	68	76	65
23	Maine	82	70	78	89	76	73	89
24	Maryland	99	114	107	124	114	108	108
25	Massachusetts	115	126	125	127	125	108	110
26	Michigan	108	129	115	128	124	114	114
27	Minnesota	107	112	105	116	108	92	100
28	Mississippi	85	105	93	108	95	98	92
29	Missouri	101	112	107	117	108	98	104
30	Montana	80	98	95	104	97	85	90
31	Nebraska	91	105	99	103	100	96	88
32	Nevada	71	76	69	73	70	66	60
33	New Hampshire	113	110	121	115	120	96	109
34	New Jersey	100	117	114	122	129	112	106
35	New Mexico	75	88	84	91	74	73	73
36	New York	99	110	104	111	107	99	101
37	North Carolina	113	122	114	120	110	124	116
38	North Dakota	102	114	107	136	122	113	134
39	Ohio	114	126	111	119	119	100	98
40	Oklahoma	79	89	88	97	87	88	82
41	Oregon	70	79	78	85	86	72	77
42	Pennsylvania	113	126	112	120	122	107	106
44	Rhode Island	107	125	127	128	139	120	126
45	South Carolina	97	110	106	112	104	113	102
46	South Dakota	97	113	103	112	113	102	95
47	Tennessee	84	100	91	91	101	91	89
48	Texas	56	64	63	66	58	63	57
49	Utah	67	85	77	74	75	68	72
50	Vermont	117	92	88	104	119	108	114
51	Virginia	106	117	111	116	108	109	111
53	Washington	70	91	92	93	94	85	92
54	West Virginia	102	124	114	110	117	101	96
55	Wisconsin	102	107	104	116	109	92	92
56	Wyoming	70	96	90	92	100	90	94
US Avg		86	98	91	98	93	87	86

Appendix Table G-3: Average *Annual* Household Costs for Other Fuels for All End-Uses

FIPS	State	2005	2006	2007	2008	2009	2010	2011
1	Alabama	509	615	626	630	621	604	653
2	Alaska	1,460	1,633	1,929	2,180	2,024	1,810	2,223
4	Arizona	508	473	492	571	517	517	533
5	Arkansas	524	588	568	558	629	602	633
6	California	418	437	465	519	482	519	588
8	Colorado	525	606	578	636	603	549	682
9	Connecticut	1,216	1,437	1,430	1,687	1,649	1,518	1,795
10	Delaware	897	894	922	1,158	1,147	992	1,044
11	District of Columbia	635	758	632	926	1,367	1,411	791
12	Florida	494	474	547	652	662	596	587
13	Georgia	519	576	595	574	545	621	609
15	Hawaii	468	239	359	451	467	956	557
16	Idaho	528	563	675	799	664	636	677
17	Illinois	745	862	950	1,023	1,014	880	762
18	Indiana	738	849	890	957	906	842	825
19	Iowa	771	931	884	1,240	884	934	877
20	Kansas	746	708	617	785	696	783	746
21	Kentucky	551	603	606	687	663	581	683
22	Louisiana	420	573	577	594	489	617	496
23	Maine	1,093	1,296	1,292	1,587	1,569	1,339	1,528
24	Maryland	921	1,051	1,111	1,211	1,220	1,130	1,212
25	Massachusetts	1,214	1,490	1,448	1,828	1,727	1,495	1,751
26	Michigan	854	933	980	1,067	1,076	974	978
27	Minnesota	883	1,005	980	1,310	1,132	1,107	1,176
28	Mississippi	497	606	573	545	644	681	686
29	Missouri	632	597	689	704	729	654	625
30	Montana	694	691	616	771	781	767	747
31	Nebraska	707	732	714	1,062	870	828	1,239
32	Nevada	601	675	640	684	731	702	578
33	New Hampshire	1,146	1,387	1,412	1,780	1,606	1,397	1,671
34	New Jersey	1,162	1,349	1,352	1,519	1,458	1,422	1,580
35	New Mexico	481	509	552	563	548	647	591
36	New York	1,276	1,484	1,499	1,776	1,773	1,520	1,791
37	North Carolina	630	691	728	808	779	758	817
38	North Dakota	827	1,022	962	1,370	1,200	1,146	1,298
39	Ohio	845	866	941	1,093	1,032	940	1,038
40	Oklahoma	474	635	550	575	569	581	671
41	Oregon	484	579	549	714	616	573	618
42	Pennsylvania	994	1,151	1,185	1,394	1,340	1,222	1,473
44	Rhode Island	1,150	1,272	1,426	1,872	1,569	1,421	1,587
45	South Carolina	490	602	656	636	652	648	743
46	South Dakota	808	691	1,011	1,111	928	738	1,122
47	Tennessee	521	552	653	658	659	660	683
48	Texas	432	501	537	526	523	547	522
49	Utah	420	537	490	578	526	514	607
50	Vermont	1,056	1,391	1,340	1,686	1,564	1,402	1,606
51	Virginia	718	829	812	963	912	864	954
53	Washington	557	670	608	804	719	640	790
54	West Virginia	675	722	738	783	855	713	728
55	Wisconsin	829	963	1,021	1,086	1,140	1,052	1,039
56	Wyoming	539	797	634	654	656	580	970
US Avg		855	988	1,016	1,180	1,137	1,038	1,166

Appendix Table G-4: Average *Annual* Energy (All Fuels Combined) Costs per Household for All End-Uses[74]

FIPS	State	2005	2006	2007	2008	2009	2010	2011
1	Alabama	1,989	2,280	2,332	2,445	2,553	2,706	2,660
2	Alaska	1,704	1,935	2,095	2,156	2,697	2,021	2,053
4	Arizona	1,429	1,545	1,619	1,719	1,725	1,764	1,794
5	Arkansas	1,957	2,180	2,092	2,273	2,145	2,246	2,138
6	California	1,181	1,282	1,250	1,359	1,280	1,318	1,303
8	Colorado	1,415	1,585	1,422	1,518	1,486	1,532	1,468
9	Connecticut	1,769	2,001	2,185	2,363	2,384	2,306	2,352
10	Delaware	2,074	2,277	2,418	2,679	2,685	2,574	2,806
11	District of Columbia	1,143	1,387	1,228	1,382	1,664	1,573	1,583
12	Florida	1,535	1,713	1,734	1,773	1,917	1,951	1,871
13	Georgia	1,991	2,188	2,127	2,208	2,213	2,448	2,498
15	Hawaii	1,198	1,284	1,294	1,507	1,390	1,549	1,589
16	Idaho	1,209	1,381	1,419	1,561	1,656	1,578	1,572
17	Illinois	1,793	1,980	1,996	2,096	2,025	1,992	2,038
18	Indiana	1,731	1,924	1,779	2,024	2,065	1,907	2,000
19	Iowa	1,804	1,844	1,759	1,858	1,750	1,806	1,771
20	Kansas	1,797	1,999	1,959	2,086	2,030	2,077	2,098
21	Kentucky	1,539	1,665	1,671	1,771	1,907	1,910	1,949
22	Louisiana	1,953	2,173	2,148	2,269	2,033	2,253	2,169
23	Maine	1,547	1,669	1,805	1,956	2,067	1,810	2,009
24	Maryland	1,719	1,947	2,019	2,348	2,381	2,296	2,246
25	Massachusetts	1,496	1,756	1,754	1,944	1,855	1,676	1,675
26	Michigan	1,787	2,071	1,947	2,168	2,187	2,160	2,197
27	Minnesota	1,558	1,584	1,598	1,669	1,637	1,571	1,690
28	Mississippi	2,095	2,412	2,310	2,516	2,418	2,524	2,422
29	Missouri	1,842	1,969	1,948	2,088	2,018	2,084	2,215
30	Montana	1,469	1,559	1,497	1,563	1,691	1,603	1,621
31	Nebraska	1,624	1,793	1,855	1,791	1,837	1,843	1,897
32	Nevada	1,638	1,844	1,946	2,028	2,011	1,968	1,947
33	New Hampshire	1,734	1,648	1,854	1,819	2,004	1,787	1,861
34	New Jersey	1,794	1,972	2,040	2,241	2,197	2,300	2,238
35	New Mexico	1,469	1,617	1,647	1,737	1,648	1,682	1,701
36	New York	1,665	1,765	1,744	1,914	1,853	1,842	1,908
37	North Carolina	1,951	1,970	2,002	2,040	2,062	2,261	2,215
38	North Dakota	1,308	1,309	1,238	1,598	1,414	1,392	1,533
39	Ohio	1,827	1,959	1,876	2,005	2,030	1,974	1,967
40	Oklahoma	1,827	2,071	1,964	2,046	2,032	2,156	2,179
41	Oregon	1,209	1,277	1,327	1,503	1,525	1,485	1,578
42	Pennsylvania	1,827	1,949	1,858	2,069	2,085	2,014	2,130
44	Rhode Island	1,364	1,780	1,699	1,788	1,972	1,806	1,809
45	South Carolina	1,946	2,035	2,031	2,099	2,225	2,387	2,350
46	South Dakota	1,464	1,609	1,667	1,634	1,792	1,666	1,693
47	Tennessee	1,656	1,828	1,796	1,934	2,091	2,115	2,200
48	Texas	1,799	2,102	2,030	2,085	2,067	2,095	2,032
49	Utah	1,353	1,599	1,560	1,498	1,542	1,545	1,632
50	Vermont	1,782	1,957	1,726	2,039	2,116	2,139	2,307
51	Virginia	1,693	1,792	1,874	1,970	2,068	2,125	2,136
53	Washington	1,210	1,342	1,393	1,470	1,528	1,455	1,540
54	West Virginia	1,655	1,770	1,760	1,733	1,833	1,932	2,014
55	Wisconsin	1,638	1,736	1,738	1,901	1,853	1,755	1,847
56	Wyoming	1,347	1,572	1,578	1,560	1,705	1,538	1,678
US Avg		1,667	1,816	1,811	1,956	1,961	1,938	1,975

[74] Note that the estimates in Tables G-1 and G-2 are published on a monthly basis, whereas the estimates in Table G-3 are published on an annual basis. It is not possible to convert the data in Tables G-1 and G-2 to an annual basis and then add them to the data in Table G-3 to produce the numbers reported in this table. For example, the figures in Table G-3 reflect average expenditures by those households who utilize fuels other than or in addition to natural gas and electricity. Relatively few households, however, fall into this category so simply summing the numbers in the tables would over-estimate average household expenditures for total energy.

Appendix Table G-5: Average *Annual* Water/Sewage Costs per Household

FIPS	State	2005	2006	2007	2008	2009	2010	2011
1	Alabama	306	336	341	365	379	385	406
2	Alaska	269	248	283	268	307	312	313
4	Arizona	376	411	437	462	485	499	513
5	Arkansas	317	344	353	366	368	379	389
6	California	365	385	403	428	445	455	466
8	Colorado	312	343	337	367	370	377	408
9	Connecticut	198	195	203	220	218	220	236
10	Delaware	242	264	287	298	315	316	336
11	District of Columbia	165	201	165	190	208	214	230
12	Florida	332	350	362	373	390	395	409
13	Georgia	286	311	322	328	340	357	373
15	Hawaii	351	370	358	433	459	524	509
16	Idaho	258	273	280	298	313	323	318
17	Illinois	268	276	280	294	298	312	328
18	Indiana	264	271	279	303	316	333	347
19	Iowa	307	311	313	340	346	364	380
20	Kansas	321	342	351	364	373	396	420
21	Kentucky	296	296	315	339	351	367	389
22	Louisiana	287	301	304	327	336	340	361
23	Maine	147	146	149	157	160	159	154
24	Maryland	231	247	254	282	278	288	297
25	Massachusetts	272	289	290	315	306	310	321
26	Michigan	243	260	268	280	286	291	308
27	Minnesota	219	230	239	250	251	260	262
28	Mississippi	287	301	310	323	335	339	349
29	Missouri	265	282	292	317	317	330	349
30	Montana	216	217	233	241	239	250	243
31	Nebraska	220	226	243	244	246	255	274
32	Nevada	284	312	331	348	359	366	367
33	New Hampshire	147	142	152	167	160	169	175
34	New Jersey	310	327	337	360	359	380	390
35	New Mexico	312	334	330	353	351	348	369
36	New York	172	178	182	191	195	197	207
37	North Carolina	232	248	262	276	284	304	315
38	North Dakota	269	289	286	304	301	324	325
39	Ohio	288	300	316	335	346	356	367
40	Oklahoma	320	348	354	370	378	392	418
41	Oregon	314	338	339	363	377	394	403
42	Pennsylvania	314	324	336	357	368	378	392
44	Rhode Island	224	250	251	280	280	288	294
45	South Carolina	277	300	315	324	339	347	356
46	South Dakota	275	285	277	310	327	313	325
47	Tennessee	261	280	293	321	327	331	340
48	Texas	398	436	435	463	482	487	523
49	Utah	325	338	355	373	384	392	387
50	Vermont	130	142	153	150	154	152	155
51	Virginia	269	291	296	318	329	343	359
53	Washington	370	396	410	428	445	461	478
54	West Virginia	348	359	384	403	421	426	423
55	Wisconsin	230	238	242	256	263	276	278
56	Wyoming	277	303	299	339	320	347	344
US Avg		294	312	321	341	350	361	375

APPENDIX H: RECS ADJUSTMENT PARAMETERS FOR ACS[75]

[75] The ACS does not differentiate between heating/cooling end-use expenditures and other energy expenditures - information that is needed in order to develop SUAs that include heating and cooling expenditures (HCSUAs) and SUAs that exclude them because they are included in rent or condo fees (LUAs and SUSs). As mentioned previously there is also evidence that respondents tend to overestimate self-reported utility expenditures. Therefore, it is necessary to develop adjustment parameters to (1) ensure that heating and cooling expenses are either included in the development of the HCSUAs or excluded from the other SUAs and (2) account for upward bias in the ACS self-reported utility expenditure estimates. RECS is the best source for this purpose since it provides expenditure detail on end-uses and its data are validated against utility company records.

Appendix Table H-1: RECS Adjustment Parameters for ACS-Based SUSs and LUAs[76,77]

		2009 ACS: Average Monthly Energy Expenditures (for All End-Uses) per Low-Income Household			2009 RECS: Average Monthly Non-Heating/Non-Cooling Expenses Paid for Directly by Low-Income Households			Adjustment Parameters for ACS-Based Single SUAs and LUAs		
RECS Code	State/Multi-State Group	Electricity	Gas/Other	Total Energy	Electricity	Gas/Other	Total Energy	Electricity	Gas/Other	Total Energy
1	Connecticut, Maine, New Hampshire, Rhode Island, Vermont	111	88	181	85	35	94	76%	40%	52%
2	Massachusetts	97	80	155	56	36	77	58%	45%	50%
3	New York	117	61	154	62	41	84	53%	67%	54%
4	New Jersey	134	67	183	80	35	105	60%	52%	58%
5	Pennsylvania	99	86	174	74	45	92	75%	52%	53%
6	Illinois	104	74	169	57	30	78	55%	41%	46%
7	Indiana, Ohio	116	67	172	67	20	80	58%	30%	46%
8	Michigan	105	86	182	66	29	85	63%	34%	47%
9	Wisconsin	110	57	154	66	25	82	60%	44%	53%
10	Iowa, Minnesota, North Dakota, South Dakota	94	58	139	56	23	66	60%	40%	47%
11	Kansas, Nebraska	104	68	163	63	26	82	61%	38%	50%
12	Missouri	102	78	169	68	25	80	67%	33%	47%
13	Virginia	141	45	172	79	23	86	56%	50%	50%
14	Delaware, District of Columbia, Maryland, West Virginia	138	58	179	87	27	99	63%	46%	56%
15	Georgia	144	48	184	82	28	94	57%	59%	51%
16	North Carolina, South Carolina	144	39	176	82	25	87	57%	65%	49%
17	Florida	155	12	160	89	23	93	57%	195%	58%
18	Alabama, Kentucky, Mississippi	119	58	169	79	24	89	66%	41%	53%
19	Tennessee	152	33	174	77	15	80	51%	46%	46%
20	Arkansas, Louisiana, Oklahoma	134	51	177	69	23	81	52%	46%	46%
21	Texas	155	28	172	77	27	91	50%	93%	53%
22	Colorado	87	48	124	42	17	51	48%	36%	41%
23	Idaho, Montana, Utah, Wyoming	93	54	135	68	13	68	73%	25%	50%
24	Arizona	124	31	144	61	35	81	49%	112%	57%
25	Nevada, New Mexico	109	52	152	58	24	78	53%	46%	52%
26	California	84	30	107	44	22	62	52%	74%	58%
27	Alaska, Hawaii, Oregon, Washington	132	39	160	74	31	83	56%	79%	52%

76 For the SUSs and LUAs, the adjustment parameters remove heating and cooling expenses from the ACS estimates. For each fuel type, the parameter is defined as the ratio between non-heating/non-cooling energy expenditures estimated using 2009 RECS data and the corresponding total energy expenditures estimated using 2009 ACS data. The parameter essentially converts the ACS data into RECS equivalents, addressing at the same time any potential upward bias in the ACS estimates because they are based on household recall.

77 Slight differences in the computations may exist due to rounding.

Appendix Table H-2: RECS Adjustment Parameters for ACS-Based HCSUAs[78,79]

RECS Code	State/Multi-State Group	Adjustment Parameters for ACS-Based HCSUA: 2009 ACS‡	2009 RECS†	Ratio
1	Connecticut, Maine, New Hampshire, Rhode Island, Vermont	181	192	1.07
2	Massachusetts	155	166	1.08
3	New York	154	170	1.10
4	New Jersey	183	185	1.01
5	Pennsylvania	174	150	0.86
6	Illinois	169	148	0.88
7	Indiana, Ohio	172	133	0.77
8	Michigan	182	156	0.86
9	Wisconsin	154	135	0.87
10	Iowa, Minnesota, North Dakota, South Dakota	139	117	0.84
11	Kansas, Nebraska	163	134	0.82
12	Missouri	169	128	0.76
13	Virginia	172	143	0.83
14	Delaware, District of Columbia, Maryland, West Virginia	179	152	0.85
15	Georgia	184	146	0.79
16	North Carolina, South Carolina	176	131	0.74
17	Florida	160	136	0.85
18	Alabama, Kentucky, Mississippi	169	141	0.83
19	Tennessee	174	122	0.70
20	Arkansas, Louisiana, Oklahoma	177	119	0.67
21	Texas	172	136	0.79
22	Colorado	124	88	0.71
23	Idaho, Montana, Utah, Wyoming	135	111	0.82
24	Arizona	144	121	0.84
25	Nevada, New Mexico	152	119	0.78
26	California	107	84	0.78
27	Alaska, Hawaii, Oregon, Washington	160	111	0.70

‡Average Monthly Energy Expenditures (All Fuels Combined) of Low-Income Households

†Average Monthly Energy Expenditures (All Fuels Combined) Paid Directly by Low-Income Households Who Have Heating/Cooling Expenses

78 For the HCSUAs, the adjustment parameter ensures that the expenditure estimates only represent households that have heating/cooling expenses. This adjustment is necessary because the average energy expenditure tabulations based solely on the ACS data include households that both have heating and cooling expenses and do not have heating and cooling expenses. The parameter is defined as the ratio between total energy expenditures of low-income households that have heating and cooling expenses—tabulated using 2009 RECS data—and total average energy expenditures of all low-income households—tabulated using 2009 ACS data. The parameter essentially converts the ACS data into RECS equivalents, addressing at the same time any potential upward bias in the ACS estimates due to the fact that they are based on customer recall.

79 Slight differences in the computations may exist due to rounding.

APPENDIX I: USE OF ACS TO COMPUTE SINGLE UTILITY STANDARDS AND LIMITED UTILITY ALLOWANCES

Appendix Table I-1: Development of 2014 ACS-Based SUS for Electricity[80]

				A	B	C = A x B	D	E	F = (C x D) / E
FIPS	State	Census Division	RECS_Code	2011 ACS[a]	RECS Adjustment Parameter[b]	2011 Non-Heating / Non-Cooling Expenditures	2014 Expenditure Growth Rate[c]	Household Growth Rate[d]	2014 Electricity SUA
1	Alabama	East South Central	18	178	66%	117	0.98	1.02	113
2	Alaska	Alaska	27	116	56%	65	0.94	0.94	65
4	Arizona	Mountain	24	133	49%	65	1.09	0.97	73
5	Arkansas	West South Central	20	136	52%	70	0.98	1.02	68
6	California	Pacific Contiguous	26	85	52%	44	1.09	0.98	49
8	Colorado	Mountain	22	93	48%	45	1.09	1.01	48
9	Connecticut	New England	1	132	76%	100	1.02	0.99	103
10	Delaware	South Atlantic	14	184	63%	115	0.98	1.03	110
11	District of Columbia	South Atlantic	14	131	63%	82	0.98	0.99	81
12	Florida	South Atlantic	17	153	57%	88	0.98	0.99	87
13	Georgia	South Atlantic	15	168	57%	96	0.98	0.98	95
15	Hawaii	Hawaii	27	164	56%	92	0.94	0.97	89
16	Idaho	Mountain	23	100	73%	74	1.09	1.01	79
17	Illinois	East North Central	6	113	55%	62	1.00	1.01	61
18	Indiana	East North Central	7	123	58%	71	1.00	1.03	69
19	Iowa	West North Central	10	112	60%	67	1.03	1.03	67
20	Kansas	West North Central	11	125	61%	76	1.03	1.02	76
21	Kentucky	East South Central	18	136	66%	89	0.98	1.03	86
22	Louisiana	West South Central	20	158	52%	82	0.98	0.97	83
23	Maine	New England	1	99	76%	75	1.02	0.99	77
24	Maryland	South Atlantic	14	158	63%	99	0.98	1.00	97
25	Massachusetts	New England	2	88	58%	51	1.02	0.99	53
26	Michigan	East North Central	8	118	63%	74	1.00	1.03	72
27	Minnesota	West North Central	10	100	60%	59	1.03	1.04	59
28	Mississippi	East South Central	18	160	66%	105	0.98	1.03	101
29	Missouri	West North Central	12	134	67%	89	1.03	1.03	90
30	Montana	Mountain	23	96	73%	70	1.09	0.99	77
31	Nebraska	West North Central	11	115	61%	70	1.03	1.04	69
32	Nevada	Mountain	25	134	53%	71	1.09	0.95	81
33	New Hampshire	New England	1	89	76%	68	1.02	1.00	69
34	New Jersey	Middle Atlantic	4	145	60%	87	0.99	1.00	86
35	New Mexico	Mountain	25	91	53%	48	1.09	0.98	54
36	New York	Middle Atlantic	3	126	53%	67	0.99	1.01	66
37	North Carolina	South Atlantic	16	150	57%	85	0.98	1.01	83
38	North Dakota	West North Central	10	95	60%	57	1.03	1.02	58
39	Ohio	East North Central	7	109	58%	63	1.00	1.02	62
40	Oklahoma	West South Central	20	138	52%	71	0.98	1.02	68
41	Oregon	Pacific Contiguous	27	110	56%	62	1.09	0.99	67
42	Pennsylvania	Middle Atlantic	5	114	75%	86	0.99	1.02	83
44	Rhode Island	New England	1	91	76%	69	1.02	1.00	71
45	South Carolina	South Atlantic	16	171	57%	98	0.98	1.00	95
46	South Dakota	West North Central	10	102	60%	61	1.03	1.06	59
47	Tennessee	East South Central	19	166	51%	84	0.98	1.02	81
48	Texas	West South Central	21	154	50%	77	0.98	1.01	74
49	Utah	Mountain	23	88	73%	65	1.09	1.00	70
50	Vermont	New England	1	103	76%	78	1.02	1.11	72
51	Virginia	South Atlantic	13	149	56%	84	0.98	1.01	81
53	Washington	Pacific Contiguous	27	110	56%	62	1.09	0.99	68
54	West Virginia	South Atlantic	14	129	63%	81	0.98	1.04	76
55	Wisconsin	East North Central	9	119	60%	71	1.00	1.00	71
56	Wyoming	Mountain	23	94	73%	69	1.09	1.03	73

[a] Tabulated from the 2011 ACS and shown in Appendix Table G-1.
[b] From Appendix Table H-1.
[c] From Appendix Table F-1
[d] From Appendix Table E-1

[80] Slight differences may exist due to rounding.

Appendix Table I-2: Development of 2014 ACS-Based Natural Gas / Other Fuel SUS[81]

				A	B	C = A x B	D	E	F = (C x D) / E
FIPS	State	Census Division	RECS_Code	2011 ACS[a]	RECS Adjustment Parameter[b]	2011 Non-Heating / Non-Cooling Expenditures	2014 Expenditure Growth Rate[c]	Household Growth Rate[d]	2014 NG / OF SUA
1	Alabama	East South Central	18	109	41%	45	1.13	1.02	50
2	Alaska	Alaska	27	107	79%	85	1.04	0.94	94
4	Arizona	Mountain	24	59	112%	66	1.08	0.97	73
5	Arkansas	West South Central	20	88	46%	40	1.10	1.02	44
6	California	Pacific Contiguous	26	46	74%	34	1.02	0.98	35
8	Colorado	Mountain	22	70	36%	25	1.08	1.01	27
9	Connecticut	New England	1	122	40%	49	1.07	0.99	53
10	Delaware	South Atlantic	14	122	46%	56	1.10	1.03	60
11	District of Columbia	South Atlantic	14	100	46%	46	1.10	0.99	51
12	Florida	South Atlantic	17	69	195%	135	1.10	0.99	149
13	Georgia	South Atlantic	15	100	59%	59	1.10	0.98	66
15	Hawaii	Hawaii	27	68	79%	53	1.24	0.97	68
16	Idaho	Mountain	23	73	25%	18	1.08	1.01	19
17	Illinois	East North Central	6	104	41%	42	1.05	1.01	44
18	Indiana	East North Central	7	94	30%	28	1.05	1.03	28
19	Iowa	West North Central	10	89	40%	35	1.04	1.03	36
20	Kansas	West North Central	11	84	38%	32	1.04	1.02	32
21	Kentucky	East South Central	18	92	41%	38	1.13	1.03	41
22	Louisiana	West South Central	20	65	46%	30	1.10	0.97	34
23	Maine	New England	1	89	40%	36	1.07	0.99	39
24	Maryland	South Atlantic	14	108	46%	50	1.10	1.00	55
25	Massachusetts	New England	2	110	45%	50	1.07	0.99	54
26	Michigan	East North Central	8	114	34%	39	1.05	1.03	40
27	Minnesota	West North Central	10	100	40%	40	1.04	1.04	40
28	Mississippi	East South Central	18	92	41%	38	1.13	1.03	41
29	Missouri	West North Central	12	104	33%	34	1.04	1.03	34
30	Montana	Mountain	23	90	25%	22	1.08	0.99	24
31	Nebraska	West North Central	11	88	38%	33	1.04	1.04	34
32	Nevada	Mountain	25	60	46%	27	1.08	0.95	31
33	New Hampshire	New England	1	109	40%	44	1.07	1.00	47
34	New Jersey	Middle Atlantic	4	106	52%	55	1.09	1.00	60
35	New Mexico	Mountain	25	73	46%	33	1.08	0.98	37
36	New York	Middle Atlantic	3	101	67%	68	1.09	1.01	73
37	North Carolina	South Atlantic	16	116	65%	75	1.10	1.01	82
38	North Dakota	West North Central	10	134	40%	53	1.04	1.02	55
39	Ohio	East North Central	7	98	30%	29	1.05	1.02	30
40	Oklahoma	West South Central	20	82	46%	37	1.10	1.02	41
41	Oregon	Pacific Contiguous	27	77	79%	61	1.02	0.99	62
42	Pennsylvania	Middle Atlantic	5	106	52%	55	1.09	1.02	58
44	Rhode Island	New England	1	126	40%	51	1.07	1.00	54
45	South Carolina	South Atlantic	16	102	65%	66	1.10	1.00	72
46	South Dakota	West North Central	10	95	40%	38	1.04	1.06	37
47	Tennessee	East South Central	19	89	46%	41	1.13	1.02	45
48	Texas	West South Central	21	57	93%	53	1.10	1.01	58
49	Utah	Mountain	23	72	25%	18	1.08	1.00	19
50	Vermont	New England	1	114	40%	46	1.07	1.11	44
51	Virginia	South Atlantic	13	111	50%	55	1.10	1.01	60
53	Washington	Pacific Contiguous	27	92	79%	73	1.02	0.99	75
54	West Virginia	South Atlantic	14	96	46%	44	1.10	1.04	47
55	Wisconsin	East North Central	9	92	44%	40	1.05	1.00	42
56	Wyoming	Mountain	23	94	25%	23	1.08	1.03	24

[a] Tabulated from the 2011 ACS and shown in Appendix Table G-2.
[b] From Appendix Table H-1.
[c] From Appendix Table F-2
[d] From Appendix Table E-1

81 Slight differences may exist due to rounding.

Appendix Table I-3: Development of Energy Component of ACS-Based LUA[82]

				A	B	C = A x B	D	E	F = (C x D) / E
FIPS	**State**	**Census Division**	**RECS_Code**	**2011 ACS**[a]	**RECS Adjustment Parameter**[b]	**2011 Non-Heating / Non-Cooling Expenditures**	**2014 Expenditure Growth Rate**[c]	**Household Growth Rate**[d]	**2014 LUA**
1	Alabama	East South Central	18	222	53%	117	1.01	1.02	115
2	Alaska	Alaska	27	171	52%	89	1.06	0.94	100
4	Arizona	Mountain	24	149	57%	84	1.12	0.97	97
5	Arkansas	West South Central	20	178	46%	81	1.01	1.02	81
6	California	Pacific Contiguous	26	109	58%	63	1.08	0.98	70
8	Colorado	Mountain	22	122	41%	50	1.07	1.01	53
9	Connecticut	New England	1	196	52%	102	1.05	0.99	108
10	Delaware	South Atlantic	14	234	56%	130	0.99	1.03	125
11	District of Columbia	South Atlantic	14	132	56%	73	1.03	0.99	76
12	Florida	South Atlantic	17	156	58%	90	1.06	0.99	96
13	Georgia	South Atlantic	15	208	51%	107	1.04	0.98	113
15	Hawaii	Hawaii	27	132	52%	69	1.08	0.97	76
16	Idaho	Mountain	23	131	50%	66	1.07	1.01	70
17	Illinois	East North Central	6	170	46%	78	1.01	1.01	78
18	Indiana	East North Central	7	167	46%	77	0.98	1.03	74
19	Iowa	West North Central	10	148	47%	70	1.00	1.03	68
20	Kansas	West North Central	11	175	50%	88	1.01	1.02	87
21	Kentucky	East South Central	18	162	53%	86	1.00	1.03	83
22	Louisiana	West South Central	20	181	46%	83	1.04	0.97	89
23	Maine	New England	1	167	52%	87	1.05	0.99	93
24	Maryland	South Atlantic	14	187	56%	104	1.02	1.00	106
25	Massachusetts	New England	2	140	50%	70	1.05	0.99	74
26	Michigan	East North Central	8	183	47%	86	0.99	1.03	82
27	Minnesota	West North Central	10	141	47%	67	1.00	1.04	64
28	Mississippi	East South Central	18	202	53%	107	0.99	1.03	103
29	Missouri	West North Central	12	185	47%	87	1.01	1.03	85
30	Montana	Mountain	23	135	50%	68	1.10	0.99	76
31	Nebraska	West North Central	11	158	50%	80	1.00	1.04	76
32	Nevada	Mountain	25	162	52%	84	1.14	0.95	101
33	New Hampshire	New England	1	155	52%	81	1.04	1.00	85
34	New Jersey	Middle Atlantic	4	187	58%	107	1.02	1.00	110
35	New Mexico	Mountain	25	142	52%	73	1.11	0.98	83
36	New York	Middle Atlantic	3	159	54%	86	1.03	1.01	89
37	North Carolina	South Atlantic	16	185	49%	91	1.02	1.01	92
38	North Dakota	West North Central	10	128	47%	60	1.02	1.02	61
39	Ohio	East North Central	7	164	46%	76	0.99	1.02	74
40	Oklahoma	West South Central	20	182	46%	83	1.00	1.02	82
41	Oregon	Pacific Contiguous	27	131	52%	68	1.06	0.99	73
42	Pennsylvania	Middle Atlantic	5	178	53%	94	1.00	1.02	92
44	Rhode Island	New England	1	151	52%	79	1.04	1.00	82
45	South Carolina	South Atlantic	16	196	49%	96	1.02	1.00	98
46	South Dakota	West North Central	10	141	47%	67	0.98	1.06	61
47	Tennessee	East South Central	19	183	46%	84	1.01	1.02	83
48	Texas	West South Central	21	169	53%	90	1.02	1.01	90
49	Utah	Mountain	23	136	50%	69	1.09	1.00	75
50	Vermont	New England	1	192	52%	100	0.94	1.11	85
51	Virginia	South Atlantic	13	178	50%	89	1.02	1.01	90
53	Washington	Pacific Contiguous	27	128	52%	66	1.06	0.99	71
54	West Virginia	South Atlantic	14	168	56%	93	0.98	1.04	88
55	Wisconsin	East North Central	9	154	53%	82	1.02	1.00	83
56	Wyoming	Mountain	23	140	50%	71	1.05	1.03	72

[a] Tabulated from the 2011 ACS and shown in Appendix Table G-4.

[b] From Appendix Table H-1.

[c] Calculated for each state as: (2014 Electricity SUA + 2014 Natural Gas_Other Fuel SUA) ÷ (2011 Electricity SUA + 2011 Natural Gas_Other Fuel SUA)

[d] From Appendix Table E-1

82 Slight differences may exist due to rounding.

APPENDIX J: USE OF RECS TO COMPUTE SINGLE UTILITY STANDARDS AND LIMITED UTILITY ALLOWANCES

Appendix Table J-1: Development of 2014 RECS-Based SUA for Electricity[83]

FIPS	State	Census Division	RECS_Code	A 2009 RECS: Non-Heating / Non-Cooling Electricity Expenditures Paid Directly by Occupant[a]	B 2009 - 2014 Expenditure Growth Rate[b]	C Household Growth Rate[c]	D = (A x B) / C 2014 Electricity SUA
1	Alabama	East South Central	18	79	1.10	1.05	83
2	Alaska	Alaska	27	74	1.22	1.22	74
4	Arizona	Mountain	24	61	1.14	1.14	61
5	Arkansas	West South Central	20	69	1.03	1.06	68
6	California	Pacific Contiguous	26	44	1.10	1.12	43
8	Colorado	Mountain	22	42	1.14	1.11	43
9	Connecticut	New England	1	85	0.96	1.13	72
10	Delaware	South Atlantic	14	87	0.99	1.11	78
11	District of Columbia	South Atlantic	14	87	0.99	1.07	80
12	Florida	South Atlantic	17	89	0.99	1.10	80
13	Georgia	South Atlantic	15	82	0.99	1.10	74
15	Hawaii	Hawaii	27	74	1.22	1.07	84
16	Idaho	Mountain	23	68	1.14	1.10	71
17	Illinois	East North Central	6	57	1.13	1.06	61
18	Indiana	East North Central	7	67	1.13	1.07	71
19	Iowa	West North Central	10	56	1.19	1.06	63
20	Kansas	West North Central	11	63	1.19	1.07	70
21	Kentucky	East South Central	18	79	1.10	1.04	83
22	Louisiana	West South Central	20	69	1.03	1.10	65
23	Maine	New England	1	85	0.96	1.07	76
24	Maryland	South Atlantic	14	87	0.99	1.10	78
25	Massachusetts	New England	2	56	0.96	1.14	47
26	Michigan	East North Central	8	66	1.13	1.05	70
27	Minnesota	West North Central	10	56	1.19	1.06	63
28	Mississippi	East South Central	18	79	1.10	1.05	82
29	Missouri	West North Central	12	68	1.19	1.08	76
30	Montana	Mountain	23	68	1.14	1.10	71
31	Nebraska	West North Central	11	63	1.19	1.04	72
32	Nevada	Mountain	25	58	1.14	1.16	57
33	New Hampshire	New England	1	85	0.96	1.09	74
34	New Jersey	Middle Atlantic	4	80	1.11	1.09	81
35	New Mexico	Mountain	25	58	1.14	1.12	59
36	New York	Middle Atlantic	3	62	1.11	1.08	64
37	North Carolina	South Atlantic	16	82	0.99	1.08	76
38	North Dakota	West North Central	10	56	1.19	1.12	60
39	Ohio	East North Central	7	67	1.13	1.07	71
40	Oklahoma	West South Central	20	69	1.03	1.06	68
41	Oregon	Pacific Contiguous	27	74	1.10	1.11	73
42	Pennsylvania	Middle Atlantic	5	74	1.11	1.08	76
44	Rhode Island	New England	1	85	0.96	1.11	73
45	South Carolina	South Atlantic	16	82	0.99	1.08	75
46	South Dakota	West North Central	10	56	1.19	1.02	66
47	Tennessee	East South Central	19	77	1.10	1.06	80
48	Texas	West South Central	21	77	1.03	1.07	74
49	Utah	Mountain	23	68	1.14	1.11	70
50	Vermont	New England	1	85	0.96	1.03	79
51	Virginia	South Atlantic	13	79	0.99	1.09	72
53	Washington	Pacific Contiguous	27	74	1.10	1.13	72
54	West Virginia	South Atlantic	14	87	0.99	1.05	82
55	Wisconsin	East North Central	9	66	1.13	1.08	69
56	Wyoming	Mountain	23	68	1.14	1.11	71

[a] Tabulated from the 2009 RECS and shown in Appendix Table H-1.

[b] From Appendix Table F-1

[c] From Appendix Table E-1

[83] Slight differences may exist due to rounding.

Appendix Table J-2: Development of 2014 RECS-Based Natural Gas / Other Fuel SUA[84]

				A	B	C	D = (A x B) / C
FIPS	State	Census Division	RECS_Code	2009 RECS: Non-Heating / Non-Cooling Natural Gas / Other Fuel Expenditures Paid Directly by Occupant[a]	2009 - 2014 Expenditure Growth Rate[b]	Household Growth Rate[c]	2014 NG / OF SUA
1	Alabama	East South Central	18	24	0.95	1.05	21
2	Alaska	Alaska	27	31	0.88	1.22	22
4	Arizona	Mountain	24	35	0.96	1.14	29
5	Arkansas	West South Central	20	23	0.98	1.06	22
6	California	Pacific Contiguous	26	22	0.99	1.12	19
8	Colorado	Mountain	22	17	0.96	1.11	15
9	Connecticut	New England	1	35	0.98	1.13	31
10	Delaware	South Atlantic	14	27	0.98	1.11	24
11	District of Columbia	South Atlantic	14	27	0.98	1.07	25
12	Florida	South Atlantic	17	23	0.98	1.10	21
13	Georgia	South Atlantic	15	28	0.98	1.10	25
15	Hawaii	Hawaii	27	31	1.85	1.07	53
16	Idaho	Mountain	23	13	0.96	1.10	12
17	Illinois	East North Central	6	30	0.95	1.06	27
18	Indiana	East North Central	7	20	0.95	1.07	17
19	Iowa	West North Central	10	23	0.98	1.06	22
20	Kansas	West North Central	11	26	0.98	1.07	24
21	Kentucky	East South Central	18	24	0.95	1.04	22
22	Louisiana	West South Central	20	23	0.98	1.10	21
23	Maine	New England	1	35	0.98	1.07	32
24	Maryland	South Atlantic	14	27	0.98	1.10	24
25	Massachusetts	New England	2	36	0.98	1.14	31
26	Michigan	East North Central	8	29	0.95	1.05	26
27	Minnesota	West North Central	10	23	0.98	1.06	22
28	Mississippi	East South Central	18	24	0.95	1.05	21
29	Missouri	West North Central	12	25	0.98	1.08	23
30	Montana	Mountain	23	13	0.96	1.10	12
31	Nebraska	West North Central	11	26	0.98	1.04	24
32	Nevada	Mountain	25	24	0.96	1.16	20
33	New Hampshire	New England	1	35	0.98	1.09	32
34	New Jersey	Middle Atlantic	4	35	0.93	1.09	30
35	New Mexico	Mountain	25	24	0.96	1.12	20
36	New York	Middle Atlantic	3	41	0.93	1.08	35
37	North Carolina	South Atlantic	16	25	0.98	1.08	23
38	North Dakota	West North Central	10	23	0.98	1.12	20
39	Ohio	East North Central	7	20	0.95	1.07	18
40	Oklahoma	West South Central	20	23	0.98	1.06	22
41	Oregon	Pacific Contiguous	27	31	0.99	1.11	27
42	Pennsylvania	Middle Atlantic	5	45	0.93	1.08	39
44	Rhode Island	New England	1	35	0.98	1.11	31
45	South Carolina	South Atlantic	16	25	0.98	1.08	23
46	South Dakota	West North Central	10	23	0.98	1.02	23
47	Tennessee	East South Central	19	15	0.95	1.06	14
48	Texas	West South Central	21	27	0.98	1.07	24
49	Utah	Mountain	23	13	0.96	1.11	12
50	Vermont	New England	1	35	0.98	1.03	34
51	Virginia	South Atlantic	13	23	0.98	1.09	20
53	Washington	Pacific Contiguous	27	31	0.99	1.13	27
54	West Virginia	South Atlantic	14	27	0.98	1.05	25
55	Wisconsin	East North Central	9	25	0.95	1.08	22
56	Wyoming	Mountain	23	13	0.96	1.11	12

[a] Tabulated from the 2009 RECS and shown in Appendix Table H-1.

[b] From Appendix Table F-1

[c] From Appendix Table E-1

[84] Slight differences may exist due to rounding.

Appendix Table J-3: Development of RECS-Based LUA[85]

FIPS	State	Census Division	RECS_Code	A 2009 RECS: Non-Heating / Non-Cooling Total Fuel Expenditures Paid Directly by Occupant[a]	B 2009 - 2014 Expenditure Growth Rate[b]	C Household Growth Rate[c]	D = (A x B) / C 2014 LUA
1	Alabama	East South Central	18	89	1.02	1.05	87
2	Alaska	Alaska	27	83	0.92	1.22	63
4	Arizona	Mountain	24	81	0.94	1.14	67
5	Arkansas	West South Central	20	81	0.96	1.06	74
6	California	Pacific Contiguous	26	62	0.95	1.12	52
8	Colorado	Mountain	22	51	0.99	1.11	46
9	Connecticut	New England	1	94	0.85	1.13	71
10	Delaware	South Atlantic	14	99	0.89	1.11	80
11	District of Columbia	South Atlantic	14	99	0.92	1.07	86
12	Florida	South Atlantic	17	93	0.90	1.10	76
13	Georgia	South Atlantic	15	94	0.90	1.10	77
15	Hawaii	Hawaii	27	83	1.31	1.07	102
16	Idaho	Mountain	23	68	1.01	1.10	63
17	Illinois	East North Central	6	78	1.01	1.06	74
18	Indiana	East North Central	7	80	1.02	1.07	76
19	Iowa	West North Central	10	66	1.07	1.06	66
20	Kansas	West North Central	11	82	1.05	1.07	81
21	Kentucky	East South Central	18	89	1.02	1.04	87
22	Louisiana	West South Central	20	81	0.93	1.10	69
23	Maine	New England	1	94	0.90	1.07	80
24	Maryland	South Atlantic	14	99	0.90	1.10	81
25	Massachusetts	New England	2	77	0.85	1.14	58
26	Michigan	East North Central	8	85	1.02	1.05	83
27	Minnesota	West North Central	10	66	1.07	1.06	66
28	Mississippi	East South Central	18	89	1.01	1.05	86
29	Missouri	West North Central	12	80	1.06	1.08	78
30	Montana	Mountain	23	68	1.01	1.10	62
31	Nebraska	West North Central	11	82	1.09	1.04	85
32	Nevada	Mountain	25	78	0.94	1.16	64
33	New Hampshire	New England	1	94	0.89	1.09	77
34	New Jersey	Middle Atlantic	4	105	0.97	1.09	94
35	New Mexico	Mountain	25	78	0.98	1.12	69
36	New York	Middle Atlantic	3	84	0.96	1.08	74
37	North Carolina	South Atlantic	16	87	0.92	1.08	74
38	North Dakota	West North Central	10	66	1.01	1.12	60
39	Ohio	East North Central	7	80	1.02	1.07	77
40	Oklahoma	West South Central	20	81	0.97	1.06	74
41	Oregon	Pacific Contiguous	27	83	0.96	1.11	72
42	Pennsylvania	Middle Atlantic	5	92	0.96	1.08	82
44	Rhode Island	New England	1	94	0.87	1.11	74
45	South Carolina	South Atlantic	16	87	0.92	1.08	73
46	South Dakota	West North Central	10	66	1.11	1.02	72
47	Tennessee	East South Central	19	80	1.01	1.06	76
48	Texas	West South Central	21	91	0.95	1.07	81
49	Utah	Mountain	23	68	1.00	1.11	61
50	Vermont	New England	1	94	0.94	1.03	86
51	Virginia	South Atlantic	13	86	0.91	1.09	72
53	Washington	Pacific Contiguous	27	83	0.95	1.13	69
54	West Virginia	South Atlantic	14	99	0.95	1.05	90
55	Wisconsin	East North Central	9	82	1.00	1.08	76
56	Wyoming	Mountain	23	68	1.01	1.11	62

[a] Tabulated from the 2009 RECS and shown in Appendix Table H-1.
[b] Calculated for each state as: (2014 Electricity SUA + 2014 Natural Gas_Other Fuel SUA) ÷ (2009 Electricity SUA + 2009 Natural Gas_Other Fuel SUA)
[c] From Appendix Table E-1

85 Slight differences may exist due to rounding.

APPENDIX K:
USE OF THE ACS TO COMPUTE WATER/SEWAGE/TRASH EXPENDITURES BY LOW-INCOME HOUSEHOLDS

Appendix Table K-1: Average Monthly Expenditures for Water/Sewage/Trash[86]

		A	B				C	D	E = (A x B x C) ÷ D
		2011 ACS Water and Sewage Expenditures by Low-Income Households[a]	Escalation Adjustment for Trash Expenditures[b]	Historical ACS Growth Rates for Water and Sewage Expenditures by Low-Income Households[c]				Household Growth Rate[d]	Average Monthly Water/Sewage/Trash Expenditures by Low-Income Households
FIPS	State	Monthly	2011	2009/2006	2010/2007	2011/2008	Average	2014/2011	2014
1	Alabama	34	1.35	1.13	1.13	1.11	1.12	1.02	50
2	Alaska	26	1.35	1.24	1.10	1.17	1.17	0.94	44
4	Arizona	43	1.35	1.18	1.14	1.11	1.14	0.97	68
5	Arkansas	32	1.35	1.07	1.07	1.06	1.07	1.02	46
6	California	39	1.35	1.16	1.13	1.09	1.13	0.98	60
8	Colorado	34	1.35	1.08	1.12	1.11	1.10	1.01	50
9	Connecticut	20	1.35	1.11	1.08	1.07	1.09	0.99	29
10	Delaware	28	1.35	1.19	1.10	1.13	1.14	1.03	42
11	District of Columbia	19	1.35	1.04	1.30	1.21	1.18	0.99	31
12	Florida	34	1.35	1.11	1.09	1.10	1.10	0.99	51
13	Georgia	31	1.35	1.09	1.11	1.14	1.11	0.98	47
15	Hawaii	42	1.35	1.24	1.46	1.18	1.29	0.97	76
16	Idaho	27	1.35	1.15	1.16	1.07	1.12	1.01	40
17	Illinois	27	1.35	1.08	1.11	1.11	1.10	1.01	40
18	Indiana	29	1.35	1.17	1.19	1.15	1.17	1.03	44
19	Iowa	32	1.35	1.11	1.16	1.12	1.13	1.03	47
20	Kansas	35	1.35	1.09	1.13	1.15	1.12	1.02	52
21	Kentucky	32	1.35	1.18	1.16	1.15	1.17	1.03	50
22	Louisiana	30	1.35	1.12	1.12	1.10	1.11	0.97	47
23	Maine	13	1.35	1.09	1.06	0.98	1.05	0.99	18
24	Maryland	25	1.35	1.13	1.14	1.05	1.10	1.00	37
25	Massachusetts	27	1.35	1.06	1.07	1.02	1.05	0.99	38
26	Michigan	26	1.35	1.10	1.08	1.10	1.10	1.03	37
27	Minnesota	22	1.35	1.09	1.09	1.05	1.07	1.04	30
28	Mississippi	29	1.35	1.11	1.09	1.08	1.09	1.03	42
29	Missouri	29	1.35	1.12	1.13	1.10	1.12	1.03	43
30	Montana	20	1.35	1.10	1.07	1.01	1.06	0.99	29
31	Nebraska	23	1.35	1.09	1.05	1.12	1.09	1.04	32
32	Nevada	31	1.35	1.15	1.11	1.05	1.10	0.95	48
33	New Hampshire	15	1.35	1.13	1.11	1.05	1.10	1.00	22
34	New Jersey	32	1.35	1.10	1.13	1.08	1.10	1.00	48
35	New Mexico	31	1.35	1.05	1.05	1.04	1.05	0.98	44
36	New York	17	1.35	1.10	1.08	1.09	1.09	1.01	25
37	North Carolina	26	1.35	1.14	1.16	1.14	1.15	1.01	40
38	North Dakota	27	1.35	1.04	1.13	1.07	1.08	1.02	39
39	Ohio	31	1.35	1.15	1.13	1.09	1.12	1.02	45
40	Oklahoma	35	1.35	1.09	1.11	1.13	1.11	1.02	51
41	Oregon	34	1.35	1.11	1.16	1.11	1.13	0.99	52
42	Pennsylvania	33	1.35	1.14	1.12	1.10	1.12	1.02	48
44	Rhode Island	24	1.35	1.12	1.15	1.05	1.11	1.00	37
45	South Carolina	30	1.35	1.13	1.10	1.10	1.11	1.00	44
46	South Dakota	27	1.35	1.15	1.13	1.05	1.11	1.06	38
47	Tennessee	28	1.35	1.17	1.13	1.06	1.12	1.02	42
48	Texas	44	1.35	1.11	1.12	1.13	1.12	1.01	65
49	Utah	32	1.35	1.14	1.11	1.04	1.09	1.00	48
50	Vermont	13	1.35	1.08	1.00	1.04	1.04	1.11	16
51	Virginia	30	1.35	1.13	1.16	1.13	1.14	1.01	46
53	Washington	40	1.35	1.12	1.12	1.12	1.12	0.99	61
54	West Virginia	35	1.35	1.17	1.11	1.05	1.11	1.04	51
55	Wisconsin	23	1.35	1.11	1.14	1.09	1.11	1.00	35
56	Wyoming	29	1.35	1.06	1.16	1.01	1.08	1.03	40

[a] Tabulated from the 2011 ACS and shown in Appendix Table G-5.

[b] Calculated at the national level as total 2011 expenditures for water/sewage/trash from the CEX divided by total 2011 expenditurs for water/sewage from the ACS.

[c] Tabulated from the ACS, various years.

[d] From Appendix Table E-1

86 Slight differences may exist due to rounding.

APPENDIX L:
COMPUTATION OF TELEPHONE UTILITY ALLOWANCES

Appendix Table L-1: PCE Data for Landline Telephone Services
From BEA's Detailed NIPA Table 2.4.5U ($ Millions)

	Local Charges (Line 277)	Long-Distance Charges (Line 278)	Total Charges
1975	9,119	8,622	17,741
1976	10,193	9,636	19,829
1977	11,086	10,479	21,565
1978	12,272	11,602	23,874
1979	13,218	12,499	25,717
1980	14,064	13,510	27,574
1981	15,868	15,021	30,889
1982	18,048	17,092	35,140
1983	20,017	18,622	38,639
1984	22,129	19,657	41,786
1985	23,994	21,883	45,877
1986	25,866	23,222	49,088
1987	26,846	24,791	51,637
1988	27,219	26,580	53,799
1989	28,313	28,470	56,783
1990	29,484	28,972	58,456
1991	30,704	30,211	60,915
1992	32,226	33,907	66,133
1993	33,809	34,776	68,585
1994	35,834	36,936	72,770
1995	37,793	36,100	73,893
1996	40,408	38,628	79,036
1997	43,313	44,130	87,443
1998	46,872	44,753	91,625
1999	51,060	44,736	95,796
2000	55,856	41,780	97,636
2001	60,215	36,602	96,817
2002	61,092	29,815	90,907
2003	57,741	27,761	85,502
2004	55,166	26,500	81,666
2005	52,921	23,627	76,548
2006	54,438	21,664	76,102
2007	53,082	20,823	73,905
2008	52,833	20,622	73,455
2009	48,014	17,979	65,993
2010	47,560	15,778	63,338
2011	48,407	16,039	64,446
2012	46,812	15,708	62,520

Appendix Table L-2: Percentages Used to Allocate National Level Estimates to Each State

	Total Personal Income of Low-Income Households ($ Millions)							State Shares of US Total Personal Income of Low-Income Households			
State	2005	2006	2007	2008	2009	2010	2011	2009	2010	2011	Avg
1	5,888	5,799	6,334	6,071	7,007	6,839	7,235	2.01%	1.88%	1.94%	1.95%
2	480	471	500	379	462	547	605	0.13%	0.15%	0.16%	0.15%
4	6,075	5,965	6,152	6,500	7,351	8,342	8,526	2.11%	2.30%	2.29%	2.23%
5	3,919	3,791	4,043	4,304	4,582	4,751	4,796	1.32%	1.31%	1.29%	1.30%
6	33,434	32,699	34,413	34,784	39,447	42,418	44,526	11.34%	11.68%	11.95%	11.66%
8	3,820	3,976	4,151	4,326	4,729	5,218	5,368	1.36%	1.44%	1.44%	1.41%
9	2,025	2,099	2,170	2,384	2,466	2,868	2,912	0.71%	0.79%	0.78%	0.76%
10	625	636	716	732	778	837	801	0.22%	0.23%	0.21%	0.22%
11	521	490	548	526	553	550	564	0.16%	0.15%	0.15%	0.15%
12	18,165	17,613	18,698	19,353	22,410	23,375	24,229	6.44%	6.44%	6.50%	6.46%
13	8,929	9,188	9,829	10,160	11,959	12,334	12,983	3.44%	3.40%	3.48%	3.44%
15	762	798	724	821	1,044	925	1,103	0.30%	0.25%	0.30%	0.28%
16	1,564	1,676	1,720	1,822	2,193	2,299	2,323	0.63%	0.63%	0.62%	0.63%
17	10,743	10,956	11,471	11,421	13,623	13,477	14,179	3.92%	3.71%	3.81%	3.81%
18	5,785	5,713	6,127	6,552	7,913	8,146	7,837	2.27%	2.24%	2.10%	2.21%
19	2,916	2,910	3,021	3,008	3,400	3,511	3,377	0.98%	0.97%	0.91%	0.95%
20	2,749	2,785	2,911	2,807	3,205	3,258	3,337	0.92%	0.90%	0.90%	0.90%
21	5,277	5,067	5,617	5,508	6,507	6,448	6,584	1.87%	1.78%	1.77%	1.80%
22	5,640	5,184	5,668	5,473	6,091	6,357	6,793	1.75%	1.75%	1.82%	1.77%
23	1,312	1,345	1,509	1,615	1,759	1,670	1,828	0.51%	0.46%	0.49%	0.49%
24	3,428	3,227	3,270	3,283	3,797	4,172	4,208	1.09%	1.15%	1.13%	1.12%
25	4,452	4,670	4,669	4,921	5,213	5,855	6,026	1.50%	1.61%	1.62%	1.58%
26	9,108	9,568	10,193	10,286	12,141	12,286	12,207	3.49%	3.38%	3.28%	3.38%
27	3,772	3,881	4,066	4,397	4,956	5,206	5,134	1.42%	1.43%	1.38%	1.41%
28	4,243	4,318	4,355	4,422	4,719	5,003	5,015	1.36%	1.38%	1.35%	1.36%
29	6,044	6,214	6,616	6,566	7,302	7,754	7,659	2.10%	2.14%	2.06%	2.10%
30	1,020	1,050	1,076	959	1,153	1,242	1,381	0.33%	0.34%	0.37%	0.35%
31	1,654	1,790	1,834	1,663	2,210	2,116	2,139	0.64%	0.58%	0.57%	0.60%
32	2,020	1,911	2,095	2,250	2,752	2,890	3,250	0.79%	0.80%	0.87%	0.82%
33	697	718	797	829	956	1,025	986	0.27%	0.28%	0.26%	0.27%
34	5,587	5,430	5,631	5,848	6,630	7,018	7,253	1.91%	1.93%	1.95%	1.93%
35	2,475	2,480	2,581	2,631	2,870	2,951	3,105	0.82%	0.81%	0.83%	0.82%
36	17,514	17,588	18,309	18,401	20,254	21,326	22,113	5.82%	5.87%	5.93%	5.88%
37	10,061	9,777	10,735	10,645	12,670	13,091	13,483	3.64%	3.61%	3.62%	3.62%
38	625	757	665	691	661	768	762	0.19%	0.21%	0.20%	0.20%
39	10,989	11,220	11,644	11,572	13,694	14,148	14,123	3.94%	3.90%	3.79%	3.87%
40	4,521	4,482	4,717	4,694	5,341	5,310	5,378	1.54%	1.46%	1.44%	1.48%
41	3,730	3,578	4,018	3,968	4,551	4,848	4,916	1.31%	1.34%	1.32%	1.32%
42	11,588	11,442	12,254	12,052	13,249	13,710	13,902	3.81%	3.78%	3.73%	3.77%
44	865	930	1,037	885	1,090	1,110	1,167	0.31%	0.31%	0.31%	0.31%
45	4,916	4,914	5,098	5,184	6,170	6,485	6,694	1.77%	1.79%	1.80%	1.79%
46	854	788	807	879	1,010	956	949	0.29%	0.26%	0.25%	0.27%
47	7,145	7,213	7,441	7,668	8,884	8,968	9,157	2.55%	2.47%	2.46%	2.49%
48	27,157	26,726	28,021	28,374	32,366	33,252	34,033	9.30%	9.16%	9.13%	9.20%
49	2,216	2,282	2,232	2,167	2,707	2,926	3,003	0.78%	0.81%	0.81%	0.80%
50	542	557	557	520	650	656	586	0.19%	0.18%	0.16%	0.17%
51	5,410	5,509	5,935	6,099	6,634	7,103	7,186	1.91%	1.96%	1.93%	1.93%
53	5,579	5,277	5,468	5,307	6,315	6,958	7,101	1.82%	1.92%	1.91%	1.88%
54	2,564	2,548	2,655	2,556	2,963	2,944	2,802	0.85%	0.81%	0.75%	0.80%
55	4,806	4,844	5,192	5,040	6,034	6,218	6,414	1.73%	1.71%	1.72%	1.72%
56	455	422	436	463	513	551	586	0.15%	0.15%	0.16%	0.15%
US	286,667	285,271	300,728	303,768	347,936	363,018	372,624				

Appendix Table L-3: Average Monthly Expenditures on Landline Telephone Services by Low-Income Households

	2014 Low-Income Household Expenditures by State ($ Millions)	***Total Landline Expenditures (Local + Long-Distance) by Low-Income Households ($ per Household)***
Total US Landline Expenditures ($Millions)	56,224	
US Low-Income Landline Expenditures ($ Millions)	17,716	56
Alabama	334	52
Alaska	27	59
Arizona	407	58
Arkansas	232	56
California	2,070	63
Colorado	255	54
Connecticut	140	52
Delaware	41	55
District of Columbia	27	42
Florida	1,141	54
Georgia	602	55
Hawaii	45	52
Idaho	112	62
Illinois	658	55
Indiana	398	57
Iowa	171	56
Kansas	159	55
Kentucky	315	53
Louisiana	310	54
Maine	81	54
Maryland	204	54
Massachusetts	286	49
Michigan	600	54
Minnesota	254	55
Mississippi	244	55
Missouri	378	54
Montana	61	54
Nebraska	103	56
Nevada	141	56
New Hampshire	50	54
New Jersey	343	55
New Mexico	144	55
New York	1,041	54
North Carolina	639	55
North Dakota	37	52
Ohio	690	53
Oklahoma	259	56
Oregon	237	56
Pennsylvania	669	52
Rhode Island	54	50
South Carolina	316	54
South Dakota	47	54
Tennessee	438	54
Texas	1,623	60
Utah	143	66
Vermont	32	54
Virginia	347	54
Washington	340	56
West Virginia	144	53
Wisconsin	303	55
Wyoming	27	56

APPENDIX M:
USE OF THE ACS TO COMPUTE HCSUAS

Appendix Table M-1: Development of the Energy Component of ACS-Based HCSUAs[87]

FIPS	State	Census Division	RECS_Code	A 2011 ACS[a]	B RECS Adjustment Parameter[b]	C = A x B 2011 Heating, Cooling and Other Expenditures	D 2014 Expenditure Growth Rated[c]	E Household Growth Rate[d]	F = (C x D) / E 2014 Energy for SUA
1	Alabama	East South Central	18	222	83%	185	1.01	1.02	182
2	Alaska	Alaska	27	171	70%	119	1.06	0.94	134
4	Arizona	Mountain	24	149	84%	125	1.12	0.97	144
5	Arkansas	West South Central	20	178	67%	120	1.01	1.02	118
6	California	Pacific Contiguous	26	109	78%	85	1.08	0.98	95
8	Colorado	Mountain	22	122	71%	86	1.07	1.01	91
9	Connecticut	New England	1	196	107%	209	1.05	0.99	221
10	Delaware	South Atlantic	14	234	85%	198	0.99	1.03	191
11	District of Columbia	South Atlantic	14	132	85%	112	1.03	0.99	116
12	Florida	South Atlantic	17	156	85%	133	1.06	0.99	141
13	Georgia	South Atlantic	15	208	79%	164	1.04	0.98	174
15	Hawaii	Hawaii	27	132	70%	92	1.08	0.97	103
16	Idaho	Mountain	23	131	82%	107	1.07	1.01	114
17	Illinois	East North Central	6	170	88%	149	1.01	1.01	149
18	Indiana	East North Central	7	167	77%	129	0.98	1.03	123
19	Iowa	West North Central	10	148	84%	124	1.00	1.03	120
20	Kansas	West North Central	11	175	82%	144	1.01	1.02	142
21	Kentucky	East South Central	18	162	83%	136	1.00	1.03	132
22	Louisiana	West South Central	20	181	67%	121	1.04	0.97	131
23	Maine	New England	1	167	107%	178	1.05	0.99	190
24	Maryland	South Atlantic	14	187	85%	159	1.02	1.00	162
25	Massachusetts	New England	2	140	108%	150	1.05	0.99	159
26	Michigan	East North Central	8	183	86%	157	0.99	1.03	150
27	Minnesota	West North Central	10	141	84%	118	1.00	1.04	113
28	Mississippi	East South Central	18	202	83%	168	0.99	1.03	163
29	Missouri	West North Central	12	185	76%	140	1.01	1.03	137
30	Montana	Mountain	23	135	82%	110	1.10	0.99	123
31	Nebraska	West North Central	11	158	82%	130	1.00	1.04	124
32	Nevada	Mountain	25	162	78%	127	1.14	0.95	152
33	New Hampshire	New England	1	155	107%	165	1.04	1.00	173
34	New Jersey	Middle Atlantic	4	187	101%	188	1.02	1.00	193
35	New Mexico	Mountain	25	142	78%	111	1.11	0.98	125
36	New York	Middle Atlantic	3	159	110%	175	1.03	1.01	180
37	North Carolina	South Atlantic	16	185	74%	137	1.02	1.01	139
38	North Dakota	West North Central	10	128	84%	107	1.02	1.02	108
39	Ohio	East North Central	7	164	77%	126	0.99	1.02	123
40	Oklahoma	West South Central	20	182	67%	122	1.00	1.02	120
41	Oregon	Pacific Contiguous	27	131	70%	92	1.06	0.99	98
42	Pennsylvania	Middle Atlantic	5	178	86%	153	1.00	1.02	150
44	Rhode Island	New England	1	151	107%	161	1.04	1.00	168
45	South Carolina	South Atlantic	16	196	74%	145	1.02	1.00	148
46	South Dakota	West North Central	10	141	84%	119	0.98	1.06	109
47	Tennessee	East South Central	19	183	70%	129	1.01	1.02	127
48	Texas	West South Central	21	169	79%	133	1.02	1.01	134
49	Utah	Mountain	23	136	82%	111	1.09	1.00	121
50	Vermont	New England	1	192	107%	205	0.94	1.11	173
51	Virginia	South Atlantic	13	178	83%	148	1.02	1.01	150
53	Washington	Pacific Contiguous	27	128	70%	89	1.06	0.99	96
54	West Virginia	South Atlantic	14	168	85%	142	0.98	1.04	134
55	Wisconsin	East North Central	9	154	87%	134	1.02	1.00	136
56	Wyoming	Mountain	23	140	82%	114	1.05	1.03	117

[a] Tabulated from the 2011 ACS and shown in Appendix Table G-4.

[b] From Appendix Table H-2.

[c] Calculated for each state as: (2014 Electricity SUA + 2014 Natural Gas_Other Fuel SUA) ÷ (2011 Electricity SUA + 2011 Natural Gas_Other Fuel SUA)

[d] From Appendix Table E-1

[87] Slight differences in the computations may exist due to rounding.

Appendix Table M-2: Development of ACS-Based HCSUA[88]

		Components of 2014 HCSUAs			
FIPS	**State**	**Energy**	**Water/Sewage/Trash**	**Telephone**	**2014 HCSUA**
1	Alabama	182	50	52	285
2	Alaska	134	44	59	237
4	Arizona	144	68	58	270
5	Arkansas	118	46	56	221
6	California	95	60	63	218
8	Colorado	91	50	54	196
9	Connecticut	221	29	52	303
10	Delaware	191	42	55	288
11	District of Columbia	116	31	42	189
12	Florida	141	51	54	246
13	Georgia	174	47	55	276
15	Hawaii	103	76	52	231
16	Idaho	114	40	62	216
17	Illinois	149	40	55	245
18	Indiana	123	44	57	224
19	Iowa	120	47	56	223
20	Kansas	142	52	55	249
21	Kentucky	132	50	53	234
22	Louisiana	131	47	54	231
23	Maine	190	18	54	262
24	Maryland	162	37	54	253
25	Massachusetts	159	38	49	247
26	Michigan	150	37	54	241
27	Minnesota	113	30	55	199
28	Mississippi	163	42	55	260
29	Missouri	137	43	54	234
30	Montana	123	29	54	207
31	Nebraska	124	32	56	213
32	Nevada	152	48	56	257
33	New Hampshire	173	22	54	249
34	New Jersey	193	48	55	296
35	New Mexico	125	44	55	225
36	New York	180	25	54	259
37	North Carolina	139	40	55	234
38	North Dakota	108	39	52	199
39	Ohio	123	45	53	221
40	Oklahoma	120	51	56	228
41	Oregon	98	52	56	205
42	Pennsylvania	150	48	52	251
44	Rhode Island	168	37	50	254
45	South Carolina	148	44	54	246
46	South Dakota	109	38	54	202
47	Tennessee	127	42	54	222
48	Texas	134	65	60	259
49	Utah	121	48	66	235
50	Vermont	173	16	54	244
51	Virginia	150	46	54	250
53	Washington	96	61	56	213
54	West Virginia	134	51	53	238
55	Wisconsin	136	35	55	226
56	Wyoming	117	40	56	213

[88] Slight differences in the computations may exist due to rounding.

APPENDIX N:
USE OF RECS TO COMPUTE HCSUAS

Appendix Table N-1: RECS-Based Combined Energy Estimates for HCSUAs[89]

FIPS	State	Census Division	RECS_Code	A 2009 RECS: Total Fuel Expenditures Paid Directly by Low-Income Households with Heating/Cooling Expenses[a]	B 2009 - 2014 Expenditure Growth Rate[b]	C Household Growth Rate[c]	D = (A x B) / C 2014 Energy for HCSUA
1	Alabama	East South Central	18	141	1.02	1.05	137
2	Alaska	Alaska	27	111	0.92	1.22	84
4	Arizona	Mountain	24	121	0.94	1.14	99
5	Arkansas	West South Central	20	119	0.96	1.06	108
6	California	Pacific Contiguous	26	84	0.95	1.12	71
8	Colorado	Mountain	22	88	0.99	1.11	78
9	Connecticut	New England	1	192	0.85	1.13	145
10	Delaware	South Atlantic	14	152	0.89	1.11	122
11	District of Columbia	South Atlantic	14	152	0.92	1.07	131
12	Florida	South Atlantic	17	136	0.90	1.10	111
13	Georgia	South Atlantic	15	146	0.90	1.10	119
15	Hawaii	Hawaii	27	111	1.31	1.07	137
16	Idaho	Mountain	23	111	1.01	1.10	102
17	Illinois	East North Central	6	148	1.01	1.06	141
18	Indiana	East North Central	7	133	1.02	1.07	127
19	Iowa	West North Central	10	117	1.07	1.06	118
20	Kansas	West North Central	11	134	1.05	1.07	131
21	Kentucky	East South Central	18	141	1.02	1.04	138
22	Louisiana	West South Central	20	119	0.93	1.10	101
23	Maine	New England	1	192	0.90	1.07	162
24	Maryland	South Atlantic	14	152	0.90	1.10	124
25	Massachusetts	New England	2	166	0.85	1.14	125
26	Michigan	East North Central	8	156	1.02	1.05	151
27	Minnesota	West North Central	10	117	1.07	1.06	118
28	Mississippi	East South Central	18	141	1.01	1.05	135
29	Missouri	West North Central	12	128	1.06	1.08	125
30	Montana	Mountain	23	111	1.01	1.10	101
31	Nebraska	West North Central	11	134	1.09	1.04	139
32	Nevada	Mountain	25	119	0.94	1.16	96
33	New Hampshire	New England	1	192	0.89	1.09	157
34	New Jersey	Middle Atlantic	4	185	0.97	1.09	165
35	New Mexico	Mountain	25	119	0.98	1.12	104
36	New York	Middle Atlantic	3	170	0.96	1.08	151
37	North Carolina	South Atlantic	16	131	0.92	1.08	112
38	North Dakota	West North Central	10	117	1.01	1.12	106
39	Ohio	East North Central	7	133	1.02	1.07	127
40	Oklahoma	West South Central	20	119	0.97	1.06	109
41	Oregon	Pacific Contiguous	27	111	0.96	1.11	97
42	Pennsylvania	Middle Atlantic	5	150	0.96	1.08	134
44	Rhode Island	New England	1	192	0.87	1.11	150
45	South Carolina	South Atlantic	16	131	0.92	1.08	111
46	South Dakota	West North Central	10	117	1.11	1.02	129
47	Tennessee	East South Central	19	122	1.01	1.06	117
48	Texas	West South Central	21	136	0.95	1.07	120
49	Utah	Mountain	23	111	1.00	1.11	100
50	Vermont	New England	1	192	0.94	1.03	176
51	Virginia	South Atlantic	13	143	0.91	1.09	120
53	Washington	Pacific Contiguous	27	111	0.95	1.13	94
54	West Virginia	South Atlantic	14	152	0.95	1.05	138
55	Wisconsin	East North Central	9	135	1.00	1.08	125
56	Wyoming	Mountain	23	111	1.01	1.11	100

[a] Tabulated from the 2009 RECS and shown in Appendix Table H-2.
[b] Calculated for each state as: (2014 Electricity SUA + 2014 Natural Gas_Other Fuel SUA) ÷ (2009 Electricity SUA + 2009 Natural Gas_Other Fuel SUA)
[c] From Appendix Table E-1

89 Slight differences in the computations may exist due to rounding.

Appendix Table N-2: RECS-Based HCSUAs[90]

		Components of 2014 HCSUAs			
FIPS	State	Energy	Water/Sewage/Trash	Telephone	2014 HCSUA
1	Alabama	137	50	52	240
2	Alaska	84	44	59	187
4	Arizona	99	68	58	226
5	Arkansas	108	46	56	211
6	California	71	60	63	194
8	Colorado	78	50	54	182
9	Connecticut	145	29	52	226
10	Delaware	122	42	55	220
11	District of Columbia	131	31	42	203
12	Florida	111	51	54	216
13	Georgia	119	47	55	221
15	Hawaii	137	76	52	266
16	Idaho	102	40	62	204
17	Illinois	141	40	55	237
18	Indiana	127	44	57	228
19	Iowa	118	47	56	220
20	Kansas	131	52	55	238
21	Kentucky	138	50	53	240
22	Louisiana	101	47	54	201
23	Maine	162	18	54	234
24	Maryland	124	37	54	214
25	Massachusetts	125	38	49	212
26	Michigan	151	37	54	242
27	Minnesota	118	30	55	203
28	Mississippi	135	42	55	232
29	Missouri	125	43	54	222
30	Montana	101	29	54	185
31	Nebraska	139	32	56	227
32	Nevada	96	48	56	200
33	New Hampshire	157	22	54	233
34	New Jersey	165	48	55	268
35	New Mexico	104	44	55	203
36	New York	151	25	54	230
37	North Carolina	112	40	55	207
38	North Dakota	106	39	52	197
39	Ohio	127	45	53	225
40	Oklahoma	109	51	56	216
41	Oregon	97	52	56	204
42	Pennsylvania	134	48	52	234
44	Rhode Island	150	37	50	237
45	South Carolina	111	44	54	209
46	South Dakota	129	38	54	221
47	Tennessee	117	42	54	212
48	Texas	120	65	60	246
49	Utah	100	48	66	213
50	Vermont	176	16	54	247
51	Virginia	120	46	54	220
53	Washington	94	61	56	211
54	West Virginia	138	51	53	241
55	Wisconsin	125	35	55	215
56	Wyoming	100	40	56	197

[90] Slight differences in the computations may exist due to rounding.

APPENDIX O:
SUMMARY OF ALL STANDARDIZED STANDARD UTILITY ALLOWANCES

	2014 ACS-Based SUAs					2014 RECS-Based SUAs				
State	HCSUA	Electricity	Natural Gas / Other Fuels	Water, Sewage, Trash	Telephone	HCSUA	Electricity	Natural Gas / Other Fuels	Water, Sewage, Trash	Telephone
Alabama	285	113	50	50	52	240	83	21	50	52
Alaska	237	65	94	44	59	187	74	22	44	59
Arizona	270	73	73	68	58	226	61	29	68	58
Arkansas	221	68	44	46	56	211	68	22	46	56
California	218	49	35	60	63	194	43	19	60	63
Colorado	196	48	27	50	54	182	43	15	50	54
Connecticut	303	103	53	29	52	226	72	31	29	52
Delaware	288	110	60	42	55	220	78	24	42	55
District of Columbia	189	81	51	31	42	203	80	25	31	42
Florida	246	87	149	51	54	216	80	21	51	54
Georgia	276	95	66	47	55	221	74	25	47	55
Hawaii	231	89	68	76	52	266	84	53	76	52
Idaho	216	79	19	40	62	204	71	12	40	62
Illinois	245	61	44	40	55	237	61	27	40	55
Indiana	224	69	28	44	57	228	71	17	44	57
Iowa	223	67	36	47	56	220	63	22	47	56
Kansas	249	76	32	52	55	238	70	24	52	55
Kentucky	234	86	41	50	53	240	83	22	50	53
Louisiana	231	83	34	47	54	201	65	21	47	54
Maine	262	77	39	18	54	234	76	32	18	54
Maryland	253	97	55	37	54	214	78	24	37	54
Massachusetts	247	53	54	38	49	212	47	31	38	49
Michigan	241	72	40	37	54	242	70	26	37	54
Minnesota	199	59	40	30	55	203	63	22	30	55
Mississippi	260	101	41	42	55	232	82	21	42	55
Missouri	234	90	34	43	54	222	76	23	43	54
Montana	207	77	24	29	54	185	71	12	29	54
Nebraska	213	69	34	32	56	227	72	24	32	56
Nevada	257	81	31	48	56	200	57	20	48	56
New Hampshire	249	69	47	22	54	233	74	32	22	54
New Jersey	296	86	60	48	55	268	81	30	48	55
New Mexico	225	54	37	44	55	203	59	20	44	55
New York	259	66	73	25	54	230	64	35	25	54
North Carolina	234	83	82	40	55	207	76	23	40	55
North Dakota	199	58	55	39	52	197	60	20	39	52
Ohio	221	62	30	45	53	225	71	18	45	53
Oklahoma	228	68	41	51	56	216	68	22	51	56
Oregon	205	67	62	52	56	204	73	27	52	56
Pennsylvania	251	83	58	48	52	234	76	39	48	52
Rhode Island	254	71	54	37	50	237	73	31	37	50
South Carolina	246	95	72	44	54	209	75	23	44	54
South Dakota	202	59	37	38	54	221	66	23	38	54
Tennessee	222	81	45	42	54	212	80	14	42	54
Texas	259	74	58	65	60	246	74	24	65	60
Utah	235	70	19	48	66	213	70	12	48	66
Vermont	244	72	44	16	54	247	79	34	16	54
Virginia	250	81	60	46	54	220	72	20	46	54
Washington	213	68	75	61	56	211	72	27	61	56
West Virginia	238	76	47	51	53	241	82	25	51	53
Wisconsin	226	71	42	35	55	215	69	22	35	55
Wyoming	213	73	24	40	56	197	71	12	40	56

APPENDIX P: ADJUSTMENTS FOR HOUSEHOLD SIZE[91]

[91] For each State and multi-State group, we used the 2009 RECS to tabulate the following by household size and for all households: the average household expenditure for all fuels combined, paid directly by occupants who directly pay for their heating/cooling expenses. Using these tabulations, we divided the average for each household size by the average for all households to create the parameter. Due to small sample sizes, we were not able to tabulate household adjustment parameters by type of utility, by type of SUA, or specifically using low-income households. This same issue also made it necessary to aggregate household sizes greater than five into a single category.

Appendix Table P-1: Household Size Adjustment Parameters

Average Household Energy Expenditures (those paid directly) for Each Household Size Divided by the Average Household Energy Expenditures (those paid directly) for All Households						
State	Household Size					
	1	2	3	4	5	6+
Alabama	67%	93%	107%	110%	100%	149%
Alaska	63%	96%	98%	114%	106%	176%
Arizona	76%	96%	82%	121%	124%	109%
Arkansas	65%	102%	122%	126%	110%	120%
California	58%	99%	101%	98%	100%	120%
Colorado	70%	104%	101%	105%	121%	76%
Connecticut	52%	86%	99%	112%	115%	106%
Delaware	57%	77%	84%	100%	93%	99%
District of Columbia	57%	77%	84%	100%	93%	99%
Florida	57%	92%	99%	135%	102%	120%
Georgia	71%	104%	119%	123%	108%	101%
Hawaii	63%	96%	98%	114%	106%	176%
Idaho	56%	90%	95%	113%	109%	120%
Illinois	51%	89%	94%	123%	119%	120%
Indiana	71%	104%	119%	111%	96%	108%
Iowa	63%	90%	91%	103%	126%	98%
Kansas	70%	103%	108%	113%	126%	105%
Kentucky	67%	93%	107%	110%	100%	149%
Louisiana	65%	102%	122%	126%	110%	120%
Maine	52%	86%	99%	112%	115%	106%
Maryland	57%	77%	84%	100%	93%	99%
Massachusetts	60%	84%	94%	113%	118%	119%
Michigan	71%	85%	102%	104%	97%	120%
Minnesota	63%	90%	91%	103%	126%	98%
Mississippi	67%	93%	107%	110%	100%	149%
Missouri	84%	105%	108%	106%	122%	124%
Montana	56%	90%	95%	113%	109%	120%
Nebraska	70%	103%	108%	113%	126%	105%
Nevada	59%	88%	106%	110%	114%	114%
New Hampshire	52%	86%	99%	112%	115%	106%
New Jersey	52%	87%	100%	104%	112%	108%
New Mexico	59%	88%	106%	110%	114%	114%
New York	55%	75%	81%	94%	112%	109%
North Carolina	71%	103%	118%	112%	131%	136%
North Dakota	63%	90%	91%	103%	126%	98%
Ohio	71%	104%	119%	111%	96%	108%
Oklahoma	65%	102%	122%	126%	110%	120%
Oregon	63%	96%	98%	114%	106%	176%
Pennsylvania	68%	94%	110%	99%	137%	138%
Rhode Island	52%	86%	99%	112%	115%	106%
South Carolina	71%	103%	118%	112%	131%	136%
South Dakota	63%	90%	91%	103%	126%	98%
Tennessee	69%	109%	110%	120%	114%	116%
Texas	65%	95%	100%	120%	117%	110%
Utah	56%	90%	95%	113%	109%	120%
Vermont	52%	86%	99%	112%	115%	106%
Virginia	65%	75%	115%	100%	116%	158%
Washington	63%	96%	98%	114%	106%	176%
West Virginia	57%	77%	84%	100%	93%	99%
Wisconsin	71%	98%	98%	114%	123%	141%
Wyoming	56%	90%	95%	113%	109%	120%