

AUSTIN ENERGY  
DISTRIBUTED ENERGY SERVICES  
MARKET RESEARCH & PRODUCT DEVELOPMENT

# RESIDENTIAL ELECTRICITY BURDEN

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AN INVESTIGATION OF AMERICAN  
COMMUNITY SURVEY DATA  
(2006-2008)



AUSTIN ENERGY  
NOVEMBER 5, 2010

# RESIDENTIAL ELECTRICITY BURDEN

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## EXECUTIVE SUMMARY

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In this study, Austin Energy examines the burden on households living in Travis County arising from their expenditures on electricity. The “Electricity Burden” of a household is defined as the share of a household’s income spent on electricity service. Information provided in this report is based on a variety of data sources, including American Community Survey (ACS) data and American Housing Survey data (both available from the U.S. Census Bureau); Center for Public Policy Priorities family economic security data; Travis County Appraisal District data; Austin Energy Program data, and Energy Efficiency Literature / Case Studies. This comprehensive data set allows for a broader view of electricity burden across many different sources.

Current analysis indicates that AE provides some of the most affordable residential customer electric rates and electric bills of major metropolitan areas examined in Texas, as well as generous customer-assistance discount policies and programs. Although the ACS data may suggest Austin fares relatively well in comparison with other areas, this does not discount the fact that households in this area, as in other communities in Texas, struggle with electricity costs and are vulnerable to potential increases in these costs.

Within literature focused on the plight of households regarding electricity or other energy costs, one series of reports are often cited as particularly relevant. *On the Brink: The Home Energy Affordability Gap* are state-level analyses conducted on an annual basis which seek to inform policy by identifying and analyzing the impact of energy costs on households, particularly those at the lower end of the income distribution<sup>1</sup>. In this report, we attempt to replicate the methodology found in these reports where possible. One clarification should be provided up front: throughout this report, the term “electricity burden” will be used, which is slightly different from “energy burden” which is generally referred to in policy related analyses. Electricity burden is focused solely on the costs of electricity while energy burden generally includes the cost of using gas heat. While this report does provide some indication of this burden as well, the primary focus is on electricity.

The current analysis found similar findings to that provided in the *On the Brink* reports in that utility burden (or the percentage a household pays for all utilities) is correlated with electricity burden. This means a household that is struggling with electricity costs is also more likely to be struggling with water/sewer, gas, or other utility costs. This finding demonstrates that the driving factor for high energy burden is primarily household income rather than simply energy costs. Therefore, when considering policies aimed at reducing energy burden, a holistic approach that evaluates income in relation to poverty levels is due as well as an analysis of costs of electricity.

Nonmonetary programs targeting vulnerable households can help to reduce household electricity burden. Preliminary analysis suggests that homes that participate under free weatherization achieved an average savings of about 800 kWh per year. Assuming the current residential rate structure, that would equate to a savings of roughly \$80-\$100 per year.

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<sup>1</sup> For more information, see <http://www.homeenergyaffordabilitygap.com/index.html>.

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## INTRODUCTION

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The following information provides an analysis of key variables that impact the affordability of electric bills. The majority of this analysis relates to electricity cost burden, a metric that is based on the cost of electric service relative to household income, poverty, and demographic information that identifies the most vulnerable households with respect to electricity burden.

As readers of this report may know, the impetus for this report is based on direction from City Council in April 2010 as they deliberated Austin Energy's Generation and Resource Plan, which provides a roadmap for the utility as it relates to future generation priorities and goals. At that time, Austin Energy was directed to produce what was termed an "affordability matrix" which sought to highlight the potential impact of any new generation resource on the community and in particular, those segments most vulnerable to potential cost increases. This report provides one component of the affordability matrix in providing a basis for future policy discussions. It should be noted, however, that the primary role of the current analysis is not to assign value to various economic, environmental, and societal outcomes of the Generation and Resource Plan. Rather, this analysis is meant to detail the landscape and characteristics of residential energy usage.

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## METHODOLOGY

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Information provided in this summary is based in varying degree on the following sources:

- American Community Survey (ACS): Census Bureau
- American Housing Survey (AHS): Census Bureau
- Family Budget Estimator Tables: Center for Public Policy Priorities (CPPP)
- Travis County Appraisal District Data
- Austin Energy Program Data & Collateral
- Energy Efficiency Literature / Case Studies

The American Community Survey is conducted by the U.S. Census Bureau (within the Department of Commerce). It represents the largest source of data used in this report<sup>2</sup>. Data from the American Community Survey (ACS) represents actual individual-level responses from a nation-wide household survey conducted on a monthly basis with identical questions and a consistent methodology. For the purposes of this analysis, the most recent three-year (2006-2008) pooled compilation of this data is being utilized. A data set consisting of three years of pooled data is being used for two reasons: 1) the larger sample size (compared to a single year file) provides a greater level of precision when calculating electricity cost burden; and 2) weather differences inherent in a single year data file might produce less than reliable results than a three-year pooled data file.

The American Community Survey has been used to generate estimates of electricity cost burden. Electricity cost burden, or simply electricity burden is defined as the median monthly cost of

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<sup>2</sup> For public access to the data, See [http://factfinder.census.gov/home/en/acs\\_pums\\_2008\\_3yr.html](http://factfinder.census.gov/home/en/acs_pums_2008_3yr.html)

electricity divided by median monthly household income, either for all households or a particular segment of households. The “median” represents the point at which 50 percent of households fall below and 50 percent above; for example, if the median monthly electric bill was \$100, 50 percent of households would pay less than \$100 and 50 percent would pay greater than \$100. Where presented, “utility burden” is defined as the median total monthly expenditures for all utilities as collected by Census (including electricity, gas, water/sewer, and other fuel) divided by median monthly household income. Through analysis of the ACS data, electricity cost burden can be viewed based on many different characteristics singularly or in combination including type of housing structure, family composition, income (including distribution and poverty status), labor force and disability status.

As the ACS data is the primary source of information related to electricity cost burden, it is important to provide the context under which this survey is conducted. Based on the actual questionnaire provided to households, information is collected first about the residents living within the household and the relationships among each person within the household<sup>3</sup>. Following this section of the questionnaire, the respondent is asked to provide information about their housing characteristics. This includes the following questions related to the cost of utilities:

1. LAST MONTH, what was the cost of electricity for this house, apartment, or mobile home?
2. This same question is asked with reference to gas, water/sewer, and other fuel (e.g. oil, coal, kerosene, wood, etc.)<sup>4</sup>.

Additional questions are related to the types of income being secured by the household. The ACS survey asks these questions based on the most recent 12-month period (relative to the month in which the household is being interviewed). Collection of this information includes an accounting of the receipt of income from the following eight sources:

- Wages, salaries, commissions, bonuses, or tips from all jobs;
- Self-employment income from own non-farm businesses or farm businesses, including proprietorships and partnerships;
- Interest, dividends, net rental income, royalty income, or income from estates and trusts;
- Social Security or Railroad Retirement;
- Supplemental Security Income (SSI);
- Any public assistance or welfare payments from the state or local welfare office;
- Retirement, survivor, or disability pensions;
- Any other sources of income received regularly such as Veterans’ (VA) payments, unemployment compensation, child support, or alimony.

These questions allow for the summation of the eight sources to provide total household income upon which electricity cost burden is calculated. It also allows for classification of households according to the types of income they receive (i.e., wage/salary vs. fixed income).

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<sup>3</sup> For a copy (pdf) of the actual American Community Survey questionnaire (2008 version), see <http://www.census.gov/acs/www/Downloads/SQuest08.pdf>

<sup>4</sup> Information regarding expenditures for water/sewer and other fuel are based on the previous 12 months (relative to the month in which the interview takes place).

All dollar amounts collected by the ACS survey are based on the nominal value at the time they were collected. All dollar values for 2006 and 2007 have been adjusted to represent 2008 constant dollars according to adjustment factors provided by Census and based on changes in the Consumer Price Index (CPI).

Travis Central Appraisal District (TCAD) data was used to provide general information on local housing characteristics, particularly square footage. However, the TCAD data cannot be merged in any practical fashion with the ACS data due to the lack of specific identifying information (i.e. physical address) in the ACS data. For that reason, analysis of electricity cost burden based on square footage cannot be included. Nevertheless, AE data and program information have been used to analyze the impact of energy efficiency on customer bills and, potentially, cost burden.

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#### AMERICAN COMMUNITY SURVEY DATA LIMITATIONS

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As a caution with regard to how one may interpret the information presented in this report, it is critical that a number of data limitations be recognized. Some of these limitations are based on the structure of the data itself, how it is collected, or other constraints.

- 1) Information collected from households is self-reported. In other words, with some exceptions, there is no independent verification that the amount stated by the respondent is indeed what appeared on their electric bill. As the result of conversations with Census technical personnel, the fact that a number of other utilities are included in a single bill may be a potential issue. When averages of the electricity cost reported by households in Travis County are compared with Austin Energy internal billing data, there is a difference which may suggest an overestimation of electric cost by households. Nevertheless, Austin Energy is not comfortable proposing an adjustment factor given the lack of certainty on how this effect is distributed across all households.
- 2) For the purposes of this report, the Austin region is defined as Travis County. While AE provides electric service to a large portion of Travis County, the ACS sample includes some Travis County customers served by other electric service providers. Therefore, electricity expenditures may be based on bills from these other providers.
- 3) Due to the structure of the ACS household-level data, the month in which the interview took place is not provided with the public versions of this data. This makes it impossible to view electricity cost burden across different months of the year. This is a significant limitation given that customer electric bills vary significantly between the winter and summer, primarily attributed to the variation in heating and cooling costs. Therefore, estimates of electricity cost burden represent a monthly average taken over a 36-month period from January 2006 through December 2008.
- 4) The ACS data provides no indication of the level of energy usage exhibited by each household. It is important to keep in mind that a customer's electric bill is based on two primary components (other than administrative or other surcharges): one, the rate being paid for the electricity; and two, the amount of electricity consumed or used. The first is typically constant while the second is not. Understanding the level of usage a particular household exhibits is critical to understanding what options exist to mitigate any cost impacts. Understanding average usage per household across different areas of the state

- also informs the impact of conservation activities and how these actions, at the aggregate level, contribute to lower usage, and subsequently, to lower bills.
- 5) The ACS data does not collect information on square footage, which would be useful in analyzing impacts of electricity cost as they relate to square footage, an indicator of the energy efficiency or energy conservation behaviors of a home.
  - 6) The ACS data is based solely on information collected during the 36 months from January 2006 through December 2008; therefore, this analysis does not attempt to project what costs may be in 2009, 2010, or any future projections.

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### **COST OF LIVING INFORMATION**

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Cost of living information provides insight into how variation in the cost of goods and services essential for a basic standard of living among different cities impacts cost burden. Cost of living information for residential households used in this study is based upon household budget information provided by the Center for Public Policy Priorities (CPPP). The CPPP is a non-partisan, non-profit policy institute based in Austin that provides research-based and rigorous estimates of costs paid across different areas of the State of Texas. The actual data comes from the center's Family Budget Estimator<sup>5</sup> tables for metro areas across Texas, including those chosen for comparison within this analysis. While the exact county definitions used by CPPP are somewhat different from those used in our analysis of the ACS data, these differences are minor and we feel do not impact the overall results.

Household budget information developed by CPPP is provided under two scenarios: one in which employer-sponsored health insurance is available and one in which it is not available. Households contained in the ACS data are classified according to whether they have the ability to afford household expenditures as indicated by CPPP information. Due to differences in how household budget items are defined by CPPP and Census, the data from CPPP is only used to provide estimates on the necessary minimum monthly income required to meet basic household necessities overall, rather than for specific household items such as electricity or other utilities. This provides a manner by which one can make comparisons across metropolitan areas based on cost of living.

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### **GEOGRAPHIC COVERAGE**

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In this document, Austin Energy staff has provided a high-level summary of where the Austin area falls in relation to other metropolitan areas chosen. Metropolitan areas were chosen for comparison based on population; these include: Dallas-Fort Worth-Arlington, Houston-Sugar Land-Baytown, San Antonio-New Braunfels, Austin-Round Rock, El Paso, Corpus Christi, and Brownsville-Harlingen. Given that the Austin region was defined as close as possible to the Austin Energy service territory, the selection of ACS counties from Metropolitan Statistical Areas (MSAs) has been narrowed to include only "core" urban counties. It was felt under this method that comparisons between Austin and other areas would be more precise.

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<sup>5</sup> To access this data and information, see <http://www.cppp.org/fbe/>.

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## RESEARCH FINDINGS / STATEWIDE COMPARATIVE ANALYSIS

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Comparative results indicated in Table 1 (page 8) demonstrate that Austin Energy provides some of the most affordable residential customer electricity bills of major metropolitan areas examined in Texas, as well as arguably one of the more generous customer-assistance discount policies and programs. As Table 1 demonstrates, the Austin region fares favorably compared to other areas of the State with regard to electricity burden.

Table 1 also provides an overview of some of the key characteristics for each community under study in this report. We begin by examining general characteristics of the income distribution of households. In addition to the relationship between household income and official poverty indicators, we analyze household income as it relates to the CPPP family budget tables described on the previous page. The CPPP information provides an advantage over the official poverty definition because it takes into account household costs not considered in determining the federal poverty threshold. For instance, poverty definitions account for food costs borne by households but do not take into account the following costs (which are considered by CPPP): housing, child care, medical care, transportation, other necessary costs (such as phone service, clothing, and other household items that most observers would consider necessities). The goal of the Family Economic Budget exercise undertaken by CPPP is to estimate a more *realistic* measure of what it takes to maintain a basic standard of living.

There are a number of takeaways from Table 1 which inform policy decisions surrounding not only electricity burden but the general economic burden of households. The difference between the average monthly household income that should be obtained to stay above the poverty line and the estimated amount produced by CPPP indicates the inadequacies inherent in the federal definition of poverty. On a rounded basis, the CPPP estimates are approximately double the federal definition threshold<sup>6</sup>. This is further highlighted by the percentage of households that fall below the CPPP threshold.

As will be reiterated later in this report, there is a general correlation between electricity burden and other burdens related to household necessities (such as housing), meaning policy prescriptions seeking to mitigate the impacts of electricity burden should consider a holistic approach. While both average monthly and median monthly electric bills are presented in Table 1, the differences between these two statistics should be clarified. The average is simply the total monthly amount paid by households for electricity service divided by the number of households. The median is the point at which 50% of households pay below and 50% pay above. The median is not impacted by extreme values and is generally considered a better measure of central tendency. For that reason, unless otherwise noted, the median is used in this report as a primary indicator.

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<sup>6</sup> It should be noted that the CPPP produces two sets of estimates for each area; one in which health insurance is provided by the employer and one in which health insurance is not provided. For the purposes of this report, we have used the latter.

**Table 1: Household Income and Electricity Burden Measures by Area (2006-2008)**

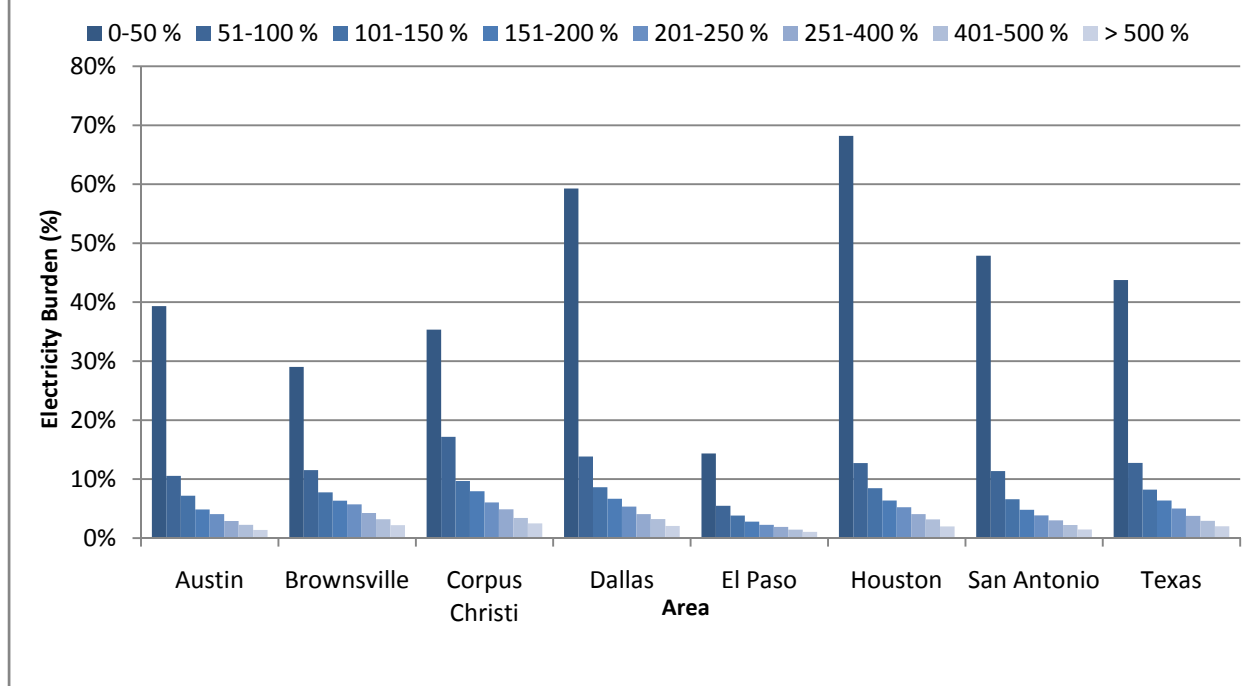
Measure	Austin		Brownsville		Corpus Christi		Dallas		El Paso		Houston		San Antonio		Texas	
Total Households	381,300		116,700		140,800		1,828,700		232,900		1,599,800		542,800		8,258,100	
Households Below Poverty:	46,400		37,500		24,700		204,900		59,700		199,900		83,200		1,183,600	
% of All Households	12%		32%		18%		11%		26%		12%		15%		14%	
Households by Percent of Poverty	Num (000s)	Pct of Total	Num (000s)	Pct of Total	Num (000s)	Pct of Total	Num (000s)	Pct of Total	Num (000s)	Pct of Total	Num (000s)	Pct of Total	Num (000s)	Pct of Total	Num (000s)	Pct of Total
0-50 %	21.1	5.5%	14.9	12.8%	8.3	5.9%	77.6	4.2%	20.6	8.9%	74.5	4.7%	34.7	6.4%	444.5	5.4%
51-100 %	25.3	6.6%	22.6	19.3%	16.4	11.7%	127.3	7.0%	39.1	16.8%	125.5	7.8%	48.5	8.9%	739.2	9.0%
101-150 %	27.7	7.3%	18.2	15.6%	16.5	11.7%	160.9	8.8%	32.6	14.0%	151.4	9.5%	55.4	10.2%	838.1	10.1%
151-200%	28.8	7.6%	12.5	10.7%	14.6	10.4%	154.4	8.4%	24.7	10.6%	140.6	8.8%	54.3	10.0%	771.1	9.3%
201-250%	29.6	7.8%	9.7	8.4%	13.3	9.4%	150.5	8.2%	21.5	9.2%	131.8	8.2%	50.5	9.3%	725.3	8.8%
251-400%	80.2	21.0%	19.9	17.0%	28.5	20.2%	380.7	20.8%	44.9	19.3%	318.0	19.9%	117.0	21.6%	1,730.4	21.0%
401-500%	40.0	10.5%	6.4	5.5%	14.5	10.3%	201.8	11.0%	15.8	6.8%	161.0	10.1%	55.2	10.2%	833.8	10.1%
> 500 %	128.7	33.8%	12.5	10.7%	28.6	20.3%	575.5	31.5%	33.8	14.5%	497.0	31.1%	127.1	23.4%	2,175.8	26.3%
Median Annual Household Income	\$54,200		\$30,300		\$42,200		\$54,900		\$35,300		\$54,200		\$46,100		\$48,900	
CPPP Income Requirement (Month)	\$3,000		\$2,500		\$2,800		\$3,100		\$2,900		\$3,100		\$2,900		N/A	
% < CPPP Income Requirement <sup>7</sup>	31%		54%		43%		34%		54%		36%		40%		N/A	
Electricity Burden Measures																
Average Monthly Electric Bill	\$149		\$184		\$216		\$205		\$88		\$203		\$149		\$186	
Median Monthly Electric Bill	\$125		\$160		\$197		\$180		\$75		\$180		\$125		\$160	
Median Monthly Household Income	\$4,583		\$2,546		\$3,590		\$4,752		\$3,055		\$4,663		\$4,074		\$4,223	
<b>Electricity Burden<sup>8</sup> (%)</b>	<b>2.72</b>		<b>6.29</b>		<b>5.50</b>		<b>3.79</b>		<b>2.45</b>		<b>3.86</b>		<b>3.06</b>		<b>3.79</b>	

<sup>7</sup> Note: Percentage of households reaching CPPP Monthly Required Income based on subset of households (CPPP does not calculate estimates for households with greater than three children).

<sup>8</sup> Electricity burden calculations based on subset of households and do not include households for which electric expenditures are bundled with rent or condominium fees, households which reported no charges or usage, or households for which gas and electric charges were combined. Percentages of these households vary across areas but generally comprise 5% of households in the Austin area.



**Figure 1: Electricity Burden by Percent of Poverty Threshold**



A key application of this analysis is that the data, and hence the results, can be used to examine more closely the most vulnerable households in our community as it relates to electricity consumption. Figure 1<sup>9</sup> provides an indication of electricity burden according to where households fall relative to the Federal Poverty Threshold<sup>10</sup>. With some variation, most areas exhibit quite high electricity burdens for those households earning between 0 percent and 50 percent of the poverty threshold, with burden decreasing as income rises. Austin finds itself somewhere in the middle of areas around the state with regard to poverty status and electricity burden. While it may seem odd to find Brownsville and El Paso among areas characterized by lower electricity burdens, this is likely due to a higher percentage of households within lower income segments. Households at 0-50% or 51-100% of the federal poverty threshold, based on national data, are more likely to live in housing that is not air conditioned space<sup>11</sup>. As Table 1 on page 8 indicates, Brownsville and El Paso have a higher proportion of these households than any other area under study (32% and 26% respectively compared to 14% for the state overall). Given that air conditioning usage contributes greatly to higher usage, it is possible lower usage is dampening electricity burden in these areas.

<sup>9</sup> Source: U.S. Census Bureau, American Community Survey (2006-2008); based on tabulation of PUMS micro-data, Austin Energy MRPD.

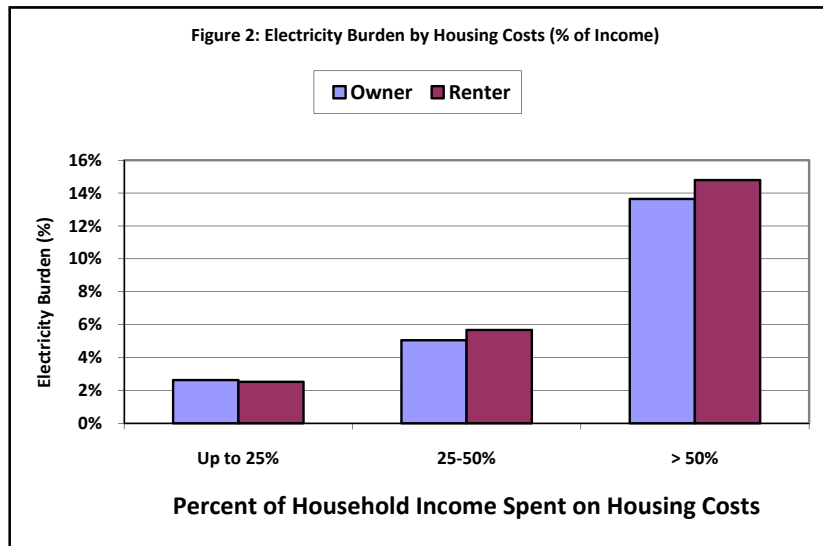
<sup>10</sup> Federal Poverty Threshold information was used for each year (2006, 2007, and 2008) and is based on the number of people within the household.

See <http://www.census.gov/hhes/www/poverty/data/threshld/index.html> for actual thresholds.

<sup>11</sup> Based on 2005 EIA Residential Usage Indicators (the latest available); of the 16.6 million households classified as below the poverty line at that time, 10.2 million households (61%) had zero square feet of conditioned space.

While Figure 1 highlights some differences across the metropolitan areas of the state, there are some general observations that can be made which apply to all areas:

- As indicated to the right (Figure 2) and clarified in the subsequent section focusing on Austin-specific data, other economic burdens (in particular housing) tend to be correlated with energy burden<sup>12</sup>. Figure 2 is developed as follows: households are selected into three groups based upon the percentage of income households spend on housing.



households include households which spend up to 25% of their household income on housing costs, those that spend between 25-50%, and those households that spend greater than 50% on housing costs. As the figure indicates, those households that pay greater than 50% of their income for housing costs are also impacted by a higher electricity burden. Stated plainly, if a household struggles with housing burden, they are more likely to struggle with electricity burden. The same is true of other utility burdens (e.g. gas, water/sewer). This finding demonstrates that the driving factor of electricity burden is primarily income rather than simply energy costs. Therefore, with regard to policy prescriptions, affordability is not only an issue with regard to the cost of electricity, but requires a holistic approach that seeks to address other burdens that exacerbate the impact of electricity burden.

- Tenure (e.g. owner or renter) appears to be a general predictor of whether a household struggles with energy burden. While median bills tend to be lower for renter-occupied households, the percentage of their income spent on electricity tends to be higher. This result is apparent in every area under study, though the difference in electricity burden is small. This effect is likely masking income effects since – all things being equal – renter-occupied households have lower average incomes than do owner-occupied households.
- Larger households tend to have higher energy burdens; in particular, those with children. Single-headed households with children are the most vulnerable with regard to electricity burden. Statewide, median electricity burden for single-headed households and three children is 2.5 times greater than electricity burden for households with one person.
- As will be covered in more detail later in this report, electricity burden is not based simply on what rate is paid for electricity, but rather is dependent upon the level of usage exhibited by households in each region. All else being equal, two separate areas could be subject to the exact same rates yet have average or median bills very different from each other; the difference between the two areas would be based solely on the inherent level of conservation or energy efficiency.

<sup>12</sup> Housing costs defined as follows: owner: mortgage, property taxes, insurance, and utility costs; renter: gross rent, in addition to utility costs.

As noted previously, while the ACS data may suggest Austin fares relatively well in comparison with other areas, this should not diminish the fact that households in this area struggle with electricity burden, and are vulnerable to potential increases in electricity costs. This section provides some details regarding the experience of households in the Austin area. This description focuses on analyzing those items that contribute most to electricity burden, denoted here as key contributors.

#### Key Contributor: Household Income

This analysis attempts to replicate work provided to Austin Energy staff and conducted by Fisher, Sheehan, and Colton in their widely recognized annual report among researchers entitled *On the Brink*<sup>13</sup>. Fisher, Sheehan, and Colton's research examines home energy affordability and the gap between actual costs and Low Income Home Energy Assistance Program (LIHEAP) allocations<sup>14</sup>. The main goal of the analysis in this section is to identify the most vulnerable households that may be impacted by any potential cost changes in electric service by examining household incomes in detail.

For the Austin region, analysis of the ACS data indicates findings similar to those explored in *On The Brink* regarding poverty level of the household and electricity burden. As noted, *utility burden*, as opposed to *electricity burden* covered to this point, includes not only electricity but other utilities such as natural gas, water/sewer and other fuels<sup>15</sup>. As described earlier, households were classified according to their annual household income in relation to federal poverty thresholds for each of the years under study (2006-2008). As indicated, burden for those households at 0-50% of the poverty level was highest, experiencing an average electricity burden of 39% and an overall utility burden of 72%. Median utility burdens decline as income relative to poverty increases, with average utility burdens of 21%, 13%, 9%, and 8% for the 51-100, 101-150, 151-200, and 201-250 household segments respectively. The current analysis had similar findings as provided in *On the Brink* in that utility burdens are correlated with electricity burden, meaning a household that is struggling with electricity cost is also more likely to be struggling with water/sewer, gas, or other utility costs. Table 3 on the following page highlights some of the relevant data related to these findings, including the number of households impacted within the Austin area.

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<sup>13</sup> *On The Brink: Home Energy Affordability Gap*. For example report (National & Census Division), see <http://portal.hud.gov/portal/page/portal/HUD/topics/energy/On%20the%20Brink.pdf>.

<sup>14</sup> LIHEAP (Low Income Home Energy Assistance Program) is a federal source of funds allocated as a block grant or contingency (FY 2010 appropriations equaled \$5.1 billion for block grants and \$490 million for contingency).

<sup>15</sup> Other fuels are defined as oil, coal, kerosene, wood, etc; the use of these fuels are rare and based on the data being analyzed, impact less than 5% of households statewide.

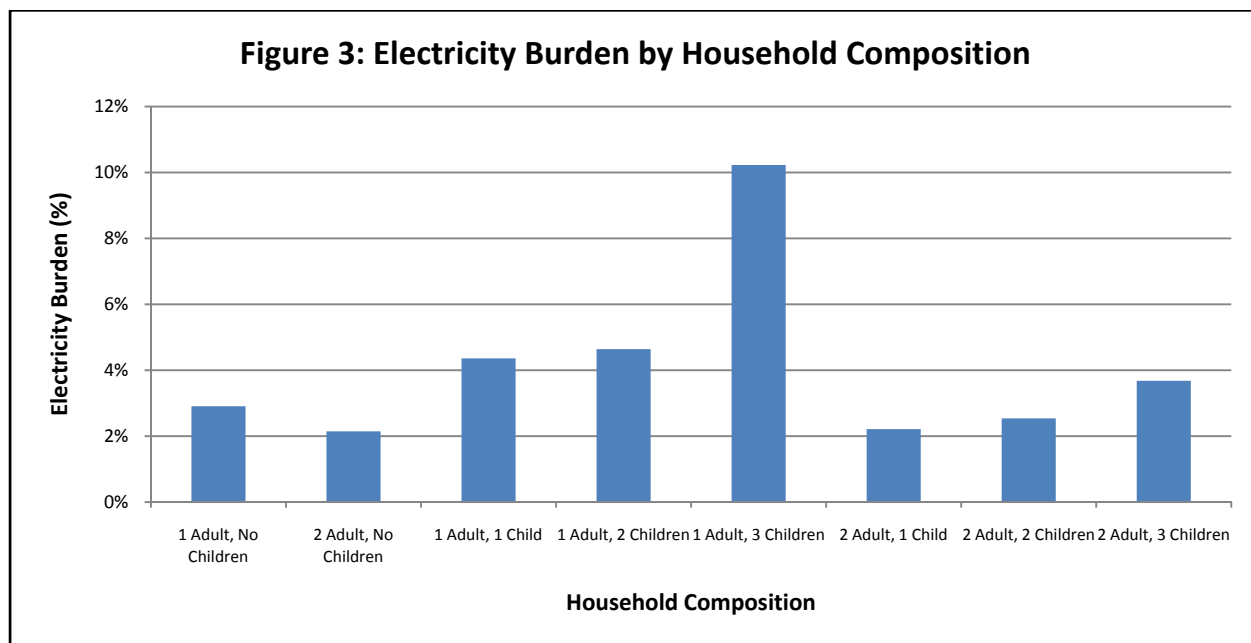
Percent of Federal Poverty Threshold	Income Limit (Family of 4)	Households		Cost Burdens				Utility Burden
		Number	Percent	Electricity Burden	Gas Burden	Water & Sewer Burden	Other Fuel Burden	
0-50 %	\$10,514	21,105	5.5	39.3	15.2	10.1	7.6	<b>72.2</b>
51-100%	\$21,027	25,251	6.6	10.5	4.2	3.1	2.9	<b>20.7</b>
101-150%	\$31,541	27,680	7.3	7.2	2.5	1.9	1.0	<b>12.5</b>
151-200%	\$42,054	28,801	7.6	4.9	1.8	1.3	0.6	<b>8.6</b>
201-250%	\$52,568	29,617	7.8	4.1	1.5	1.1	0.9	<b>7.5</b>
251-400%	\$84,108	80,155	21.0	2.9	1.0	0.8	0.7	<b>5.4</b>
401-500%	\$105,135	39,976	10.5	2.3	0.7	0.6	0.3	<b>3.9</b>
> 500%	N/A	128,723	33.8	1.4	0.4	0.4	0.3	<b>2.5</b>
<b>Total Households</b>		<b>381,307</b>	<b>100</b>	<b>2.7</b>	<b>0.9</b>	<b>0.7</b>	<b>0.5</b>	<b>4.8</b>

Source: U.S. Census Bureau, American Community Survey (2006-2008); based on tabulation of PUMS micro-data, Austin Energy MRPD. Note: Not all households are included in the electricity, gas, water/sewer, or utility burden (See Footnote 6, Page 7). Income limit for family of four based on federal poverty thresholds for 2007, and values reflect point at upper end of percent range (i.e. 50%, 100%, 150%, etc).

Table 3 provides information on electricity burden as presented earlier, as well as describing burdens associated with other utilities. For instance, other utilities such as natural gas, water & sewer, other fuel and a summation of all four utilities (indicated by column labeled “Utility Burden”). Other fuel, as defined by the Census, includes heating oil, kerosene, wood, etc and the use of these fuels is rare (only impacts 5% of households statewide). At any rate, it has been included here for demonstration purposes. Electricity burden, as Table 3 suggests, is the main driver of overall utility burden, accounting for nearly half of median utility burden across all income segments.

An examination of these results provokes a question researchers interested in energy costs and their impact on households have discussed, which is: At what level does any of these utility-related burdens become a public policy issue? With regard to electricity, a number of observers have used 6% as a potential normative threshold upon which households paying above this amount are faced with electricity burden. As Table 3 indicates, households above 150% of the poverty threshold would be below this threshold. Below 150% of the poverty threshold, households experience a very high electricity burden and perhaps what a reasonable observer would suggest is deserving of public policy intervention.

### Key Contributor: Household Composition



Related to information provided earlier regarding necessary monthly income for households according to composition, electricity burdens are more likely to occur in households with certain adult and child compositions. Differences in electricity burden are based on the number of adults and children in the household, as indicated in Figure 3. As the figure suggests, households with either single parents and/or higher numbers of children are more likely to experience a higher electricity burden. One reason is that these households face many challenges economically in addition to electricity burden. Though not presented graphically here, additional analysis into electricity burden by household composition indicates that burden is also further impacted by attachment to the labor market, as those households whose largest source of income is fixed (i.e., not based on wage and salary employment) have energy burdens greater than that of households whose income is based solely on wage and salary employment.

### Key Contributor: Housing Characteristics

Given the relationship between electricity usage and structural conditions, it should come as no surprise that housing characteristics can contribute a great deal to the outcome of electricity burden. The following section focuses on two main variables that explain some of the variation in electricity burden between households on the basis of housing characteristics: Tenure and the year in which the structure was built. While tenure (i.e. owner or renter) is not specifically regarded as a housing unit characteristic, it is included here to highlight potential energy efficiency issues related to renter-occupied households. On average, renters experience a higher median electricity burden than do owners. This difference appears regardless of the type of housing in which the renter is residing (e.g. single vs. multi-family). This outcome may be the result of less than energy-efficient renter-occupied housing; however, the data does not allow us to answer that question sufficiently. Table 4 shows that for a given age of residence, the electricity burden of a renter-occupied household is

higher than that of an owner-occupied household.<sup>16</sup> While these differences may not be significant, an examination of median household income between these two groups reveals some obvious differences.

Housing Tenure	2000-Present	1990-1999	1980-1989	Pre-1980	Total
<b>Owner</b>					
Number of Households (% of Owner-Occupied Households)	46,400 (23)	40,400 (20)	42,100 (20)	76,700 (37)	205,600
Median Monthly Income	\$8,020	\$8,062	\$6,436	\$5,751	\$6,709
Median Monthly Electric Bill	\$160	\$160	\$140	\$145	\$150
Electricity Burden (%)	2.00	1.99	2.18	2.53	2.24
<b>Renter</b>					
Number of Households (% of Renter-Occupied Households)	32,600 (19)	30,100 (17)	40,000 (23)	73,000 (42)	175,700
Median Monthly Income	\$3,525	\$3,272	\$2,885	\$2,631	\$2,945
Median Monthly Electric Bill	\$100	\$90	\$100	\$100	\$96
Electricity Burden (%)	2.84	2.75	3.47	3.80	3.26
<b>Total Households</b>	<b>79,000</b>	<b>70,600</b>	<b>82,100</b>	<b>149,700</b>	<b>381,300</b>

Source: U.S. Census Bureau, American Community Survey (2006-2008); based on tabulation of PUMS micro-data, Austin Energy MRPD. Note: Median Income, Electric Bill and Electricity burden calculated on a subset of households (See Footnote 8, Table 1, page 8).

Electricity burden appears to be have a negative relation to the year the housing structure was built; in other words, older homes tend to have higher electricity burdens. This may be a function of income as well as construction codes in place at the time the housing was developed.

Income Source	2000-Present			1990-1999			1980-1989			Pre-1980		
	HH (000s)	Electric Burden (%)	Median Age	HH (000s)	Electric Burden (%)	Median Age	HH (000s)	Electric Burden (%)	Median Age	HH (000s)	Electric Burden (%)	Median Age
Wage/Salary (100%)	47.2	2.3	35	39.2	2.3	37	46.4	2.7	36	75.0	3.0	37
Wage/Salary (50-99%)	19.7	1.8	41	18.7	1.8	44	19.4	2.3	47	33.9	2.3	48
Wage/Salary (1-49%)	5.5	2.9	57	6.4	3.3	65	8.2	2.7	62	19.9	2.8	66
Self-Employed (> 50%)	3.6	2.9	40	3.9	2.6	47	4.5	3.4	45	9.4	3.1	46
Fixed Income <sup>17</sup>	2.9	6.6	61	2.4	7.9	61	3.6	7.5	65	11.5	7.7	70
<b>Total Households</b>	<b>79.0</b>	<b>2.3</b>	<b>38</b>	<b>70.6</b>	<b>2.2</b>	<b>42</b>	<b>82.1</b>	<b>2.8</b>	<b>42</b>	<b>149.7</b>	<b>3.0</b>	<b>45</b>

Source: U.S. Census Bureau, American Community Survey (2006-2008); based on tabulation of PUMS micro-data, Austin Energy MRPD. Note: Electricity burden calculated on a subset of households (See Footnote 8, Table 1, page 8).

Table 5 adds to the component of year the structure was built the impact of types of income and their impact on electricity burden. The ACS data provides information on the types of income that people receive. In Table 5, households are classified according to income source and developed the following categories: Wage/Salary (100%) represents those households in which 100 percent of the household's income is based on earnings related to employment; Wage/Salary (50-99%) is defined the same, except the percentage of income based on employment is between 50 and 99 percent (with the residual supplemented by some other form). Wage/Salary (1-49%) is identical, except the percentage is 1 to 49. The category Self-Employed (> 50%) indicates households where the majority of earnings are accrued through self-employment. Finally, Fixed Income represents households which receive no employment earnings (either self-employed or

<sup>16</sup> Note: With regard to the time periods defining year structure built, optimally we would be able to classify according to time period categories aligned with significant changes in building codes which has an impact on energy costs. Unfortunately, the ACS data is collected based on pre-defined categories.

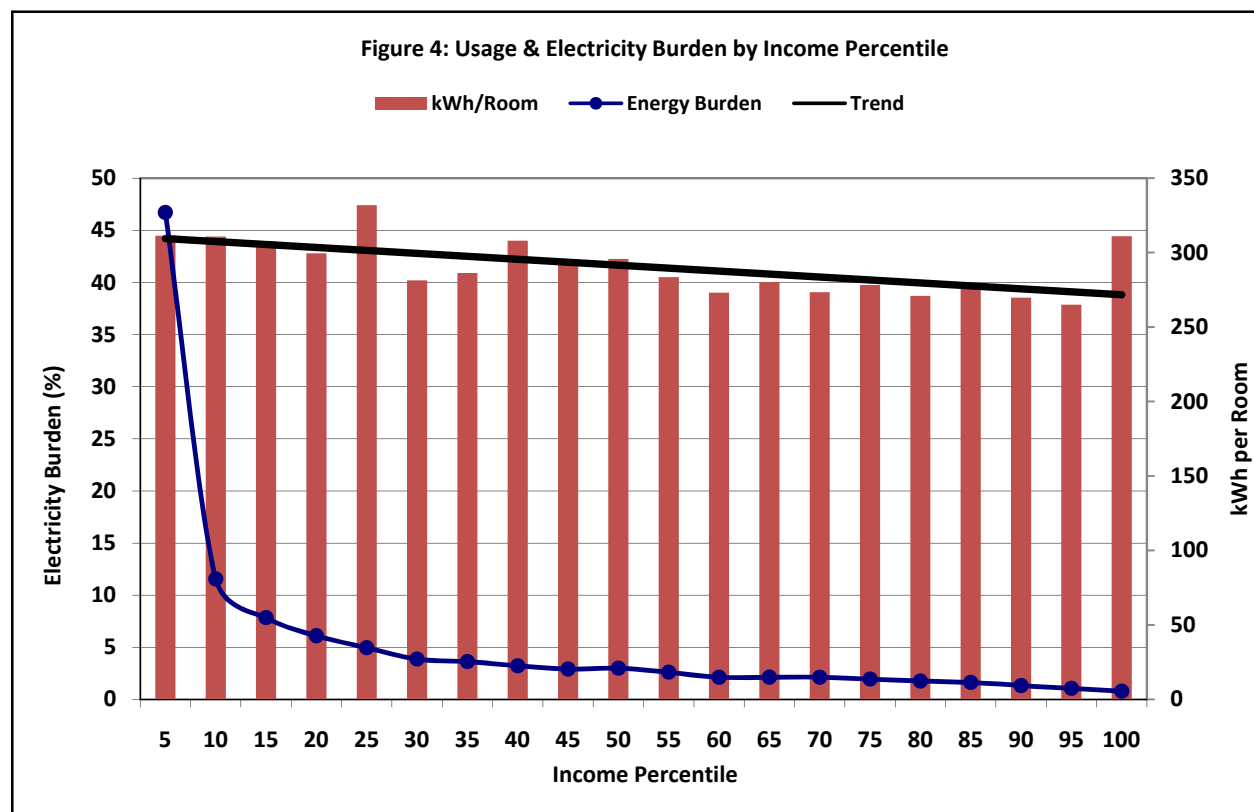
<sup>17</sup> Fixed Income households defined as those which receive no wage/salary, self-employed or interest/dividend earnings. Income sources include Social Security/Railroad Retirement, SSI, Public Assistance, Retirement/Disability, or temporary income such as Unemployment Insurance.

otherwise) or interest/dividend earnings. As indicated in Table 5 (preceding page), these households experience an electricity burden more than three times the rate for all households. These are also households which are characterized by older individuals, as indicated by the median age of the head of household.

Key Contributor: Electricity Usage

The concluding section covering the analysis of census data provides a good transition into a brief discussion of how energy efficiency can impact household electricity use and potentially mitigate cost increases. While ACS data does not collect information on usage, we have calculated an estimate of usage based on a few assumptions. The first is that a majority of the respondents to the survey within Travis County – it may be assumed – are Austin Energy customers. The service territory of Austin Energy, while larger than the City of Austin political limits, is smaller than Travis County. The geographical identifiers within the ACS data do not allow for the selection of households only in the Austin Energy service territory so all households in Travis County were selected.

Usage information is estimated based on converting the dollar amounts households have reported to usage (kWh) based on known rate information. In order to view differences in usage according to income, income percentiles from 0 to 100 in intervals of 5 were created and households grouped according to these percentile definitions. Usage and energy burden were then examined across these different households. In order to achieve a measure of energy intensity, kWh estimates were converted to kWh per room; Figure 4 indicates results incorporating electricity burden and trend for kWh/room.



Source: U.S. Census Bureau, American Community Survey (2006-2008); based on tabulation of PUMS micro-data, Austin Energy MRPD.

Figure 4 indicates that electricity burden is the highest for those households at the lowest end of the income distribution. The “Income Percentile” as noted in Figure 4 is defined as where households fall relative to all households. The manner in which the income percentiles are determined is as follows: household income for all households is organized in descending order, or more simply put, with households earning the most at the top and those earning the least at the bottom. Percentiles are based on determining the point at which a certain percentage of households is above and below that point. For example, the 50<sup>th</sup> percentile (or median)

indicates the point at which 50 percent of the households are above and 50 percent are below. The 50<sup>th</sup> percentile based on the data analyzed is \$54,230, which is the same (though unrounded) as the median household income indicated in Table 1 (page 8). This process can be completed for different percentiles, as indicated in Figure 4, with the lowest income households on the left of the x axis and the highest income households on the right. Figure 4 clearly demonstrates the relationship between income and electricity burden. The usage information also reveals that, with some exceptions, kWh per room among the household population at the lower end of the income distribution is higher than average. Extending this analysis to take into account housing stock, nearly half of all homes at the lower end of the income distribution (from 0-15<sup>th</sup> percentile) were built before 1980. All else equal, generally older homes (particularly those constructed prior to conservation-focused building codes) use more electricity per square foot.

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**POTENTIAL IMPACTS OF ENERGY EFFICIENCY**

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In order to assess the potential of weatherization to increase the energy efficiency of housing units and reduce costs, Austin Energy staff analyzed energy use before and after the installation of energy efficiency measures for a sample of 1,071 households. This sample is drawn from participants in the free weatherization program<sup>18</sup> administered by Austin Energy Distributed Energy Services.

Free weatherization is an energy efficiency program conducted by AE which provides eligible customers with improvements that can lead to energy savings (and in turn, actual dollar savings). Potential measures include attic insulation, minor duct repair and sealing, caulking around plumbing penetrations (where air leakage may exist), weather stripping around doors, and solar screens.

Households are required to meet eligibility requirements to qualify for free weatherization. Table 6 below indicates the income limits used to determine qualification.

Household Size	<ul style="list-style-type: none"> <li>• Occupant 60 Years of Age or Older <i>OR</i></li> <li>• With Physical or Mental Disability <i>AND</i></li> <li>• Gross Annual Household Income Below:</li> </ul>	<ul style="list-style-type: none"> <li>• Head of Household &lt; 60 Years <i>AND</i></li> <li>• Gross Annual Household Income Below:</li> </ul>
1	\$41,050	\$25,650
2	\$46,900	\$29,300
3	\$52,800	\$33,000
4	\$58,650	\$36,350
5	\$63,350	\$39,600
6	\$68,050	\$42,500
7	\$72,750	\$45,450
8+	\$77,400	\$48,400

Source: Austin Energy;

See <http://www.austenergy.com/Energy%20Efficiency/Programs/Free%20Home%20Energy%20Improvements/income.htm>

Estimates of energy savings were based on an analysis which compared the annual kWh usage during the 12 months prior to the installation of energy efficiency measures and 12 months after the installation of the energy efficiency measure. Ideally, the usage data would be weather-normalized but it should be noted that is not the case in this exercise. The use of a complete 12-month period before and after the measure (across a period of roughly 9 years) may minimize some of the impact of changes in temperature. This analysis is based on single-family homes only, as one of the requirements for free weatherization is that the residence must be

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<sup>18</sup> It should be noted that this discussion is focused only on the existing free weatherization program, not based on the American Recovery and Reinvestment Act (ARRA)-funded program which is based on different eligibility requirements.



a single-family home, mobile home, or duplex. The relevant findings of this preliminary analysis suggest that – on average – homes that participate under free weatherization achieve a savings of about 800 kWh per year. Assuming the current residential rate structure, that would equate to a savings of roughly \$80-\$100 per year. While that may not seem significant, to some area households that struggle paying their electricity bills, this reduction might have a larger impact on reducing electricity burden.

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## CONCLUSIONS

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Based on the findings we have presented, there are a number of conclusions that may be highlighted:

- While electricity burden impacts a relative small number of households, the effects on the households that are impacted are significant. Impacted households, in general, are those at the lower end of the income distribution, as those that earn 150% or less of the federal poverty level (approximately \$31,541 as of 2007).
- In comparison to other areas around the state analyzed in this report, Austin ranks among the lowest levels of electricity burden and is lower than the state overall.
- The existence of electricity burden among area households is driven less by the actual cost of electricity and more by the impact a household's level of income has on their ability to pay. The high correlation between households that struggle with other burdens in addition to electricity burden, such as housing, transportation, child care, and medical expenses underscore the need to develop policies which address these burdens holistically.
- Households which rely on fixed sources of income (e.g. no wage/salary income) experience electricity burdens up to 3 times the level of all households. More than half of these households reside in structures built prior to 1980; though exceptions exist, these housing units are those most likely to reap the maximum benefits from energy efficiency measures.
- As a potential mitigating factor to increases in the cost of electricity, policy prescriptions might focus on the following areas:
  - Rates/Policies specifically designed for lower-income households
  - Policies which focus on a holistic approach to mitigate impacts of increases in energy costs, including coordination among city agencies with regard to policy development, identification of households struggling with multiple burdens, provision of financial literacy as an assistance program component, and increased investment in energy efficiency services provided to vulnerable households.
  - Coordination among social service providers to facilitate one-stop shopping for impacted households to gain efficiencies in the area of identification of need and service delivery.