

# **Low-income Energy Burden in Madison, Wisconsin: A Climate Justice Challenge**

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## Executive Summary

Energy affordability is an important issue for all Madisonians in this era of supply disruptions, inflationary pressures, and extreme weather events. But the energy affordability challenge is particularly acute for lower-income residents who already spend a significantly higher proportion of their income on direct energy costs than do middle and high-income residents. In fact, energy typically represents the third or fourth largest monthly expense for lower-income American households, along with housing, transportation, and food (ACEEE, 2016). This high percent of income, or “energy burden,” has implications for the health and well-being of families. It ties directly to issues surrounding housing affordability. And it is a climate justice issue as well since without programs and policies designed to assist lower-income renters and home-owners, their energy burden is likely to increase dramatically in the coming years as climate change accelerates. A just transition to a fossil-fuel free future must include the most economically vulnerable.

This report aims to provide a picture of energy affordability for lower-income Madisonians, primarily using the US Department of Energy’s [LEAD \(Low-Income Energy Affordability Data\) Tool](#). Drawing on data from the U.S. Census Bureau’s 2018 American Community Survey, the LEAD tool provides estimated energy data for households at different income levels across the nation, states, counties, cities, and census tracts. (See the “Data Source and Limitations” section on p. 10 for important information about the data.) It offers an overview of key facets of energy expenditures and energy burden for Madison households at different income levels, which are defined by percentage of Area Median Income (AMI).

Key findings are:

- 46% of Madison’s housing units are occupied by households with low AMI (Table 1);
- On average, the annual utility bills of low income households are only ~\$800 less than those of high income households, suggesting that low income homes are less energy efficient (Graph 1);
- While the overall average energy burden for Madison households is 2%, it is 4% for low income households (<80% AMI), and 10% for extremely low households (<30% AMI). Most national studies consider >6% to be “unaffordable” (Graph 2);
- In all income categories, homeowners have a substantially higher energy burden than renters, with homeowners in the extremely low-income group paying 17% and renters paying 9% of their income on energy (Table 2 and Graph 3);
- While 22% of Madison households with “unaffordable” energy burden are concentrated in 5 census tracts, the other 78% are dispersed in pockets all across the city.

Recommendations for addressing the energy burden evident from the findings presented here are:

- Increase public knowledge and awareness of this situation;
- Integrate low carbon building features into all affordable housing policies and programs;
- Provide direct assistance to help low-income residents take advantage of existing energy efficiency programs;
- Establish new climate justice programs that simultaneously address high energy burdens.

## Findings

This report offers an overview of key facets of energy expenditures and energy burden for Madison households at five different income levels. The levels are defined by percentage of Area Median Income (AMI) as follows: 0-30%, 30-60%, 60-80%, 80-100%, and 100+%. Note that the federal government defines a household with income less than 80% of AMI as “low-income.” and households with 30% or less AMI as “extremely low income.” (For reference, according to the U.S. Census Bureau, [median household income in Madison](#) in 2016-2020 was \$67,565 (in 2020 dollars) while the [Dane County median household income](#) was \$75,179. When considering median income in Madison, bear in mind that in 2018 UW-Madison and Madison College enrolled close to 44,000 and 13,000 students, respectively.) Table One, below, shows the proportion of Madison housing units that are occupied by households at these five different income levels; it is noteworthy that 46% of the city’s housing units are occupied by low-income households. We will further analyze variations in energy burden by other factors, most notably housing tenure (renter-occupied vs owner-occupied) and geographic distribution. The report concludes with a discussion of the implications of these data in the context of the city’s climate and equity goals, and our recommendations for programs and policies that can lessen the energy burden borne by the lowest income residents while simultaneously addressing the affordable housing and climate crises.

**Table One - Number City of Madison<sup>1</sup> Housing Units by Household Income Level**

<b>Household Income Level (% Area Median Income)</b>	<b># of units</b>	<b>% of total</b>
0%-30%	17,445	16%
30%-60%	20,169	19%
60%-80%	12,358	11%
80%-100%	11,204	10%
100%+	47,142	44%
<b>Totals</b>	<b>108,318</b>	<b>100%</b>

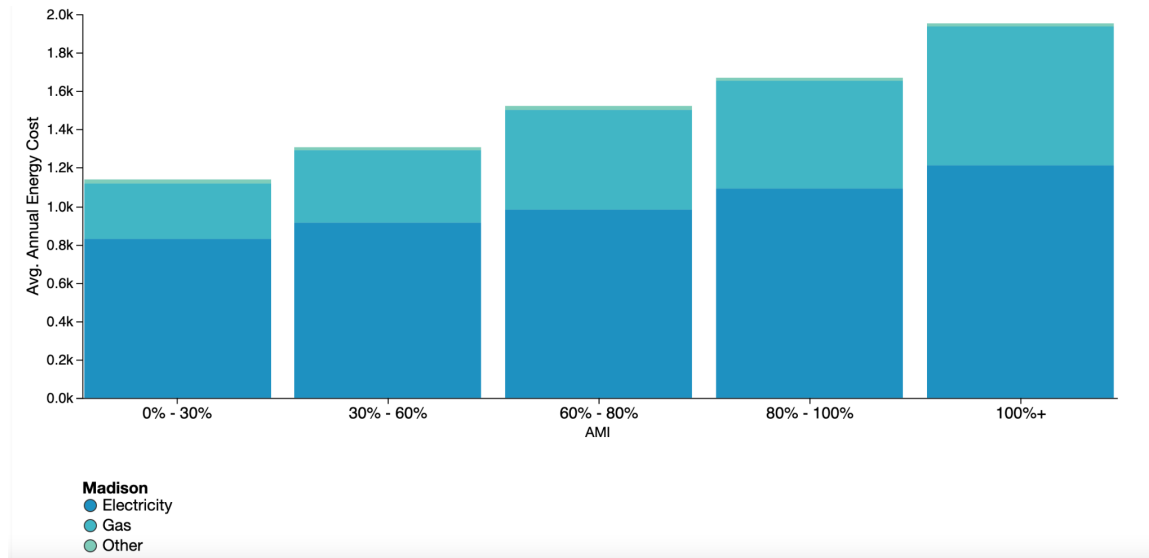
Looking first at estimated annual energy expenditures, the LEAD data indicate that Madison households spend an average of \$1621 – lower than the national average of \$2177 and the Wisconsin average of \$2051. Graph One, below, breaks out the average annual energy expenditures by households into the five income levels. We note that households at the higher income levels spend more on average than lower income households. That said, studies have shown that low-income households nationally spend as much as 25% more per square foot on energy (see [ACEEE, Lifting the High Energy Burden in America’s Largest Cities](#)). It is likely that this also is the case for Madison because the difference in energy expenditures between the highest and lowest income groups in Madison is not proportional to the difference in income between the two groups. Electricity costs, in particular, differ only by a few hundred dollars per year between the extremely low-income households (<30% AMI) and those earning 100%+ of AMI. The total average difference in utility bills between these two groups amounts to approximately \$800, which is not proportional to the large difference in income between the two groups. These findings

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<sup>1</sup> Source for all tables and graphs in this report: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, *Low-Income Energy Affordability Data (LEAD) Tool*. [www.energy.gov/eere/slsc/maps/lead-tool](http://www.energy.gov/eere/slsc/maps/lead-tool). Accessed May 2022.

suggest that low-income families pay a higher energy cost per square foot, which in turn suggests that their homes are less energy efficient.

**Graph One: City of Madison Average Annual Energy Cost by Income Group**  
 (Y axis indicates Average Annual Energy Cost, and X axis indicates Average Median Income (AMI))



We now consider these data on energy expenditures in terms of a household’s energy burden – the percentage of annual gross income that goes towards paying energy bills. To contextualize this discussion, it is important to note that while there is no “official” definition of what constitutes an unacceptably high energy burden, most studies consider >6% to be unaffordable ([ACEEE, Understanding Energy Affordability](#)).<sup>2</sup>

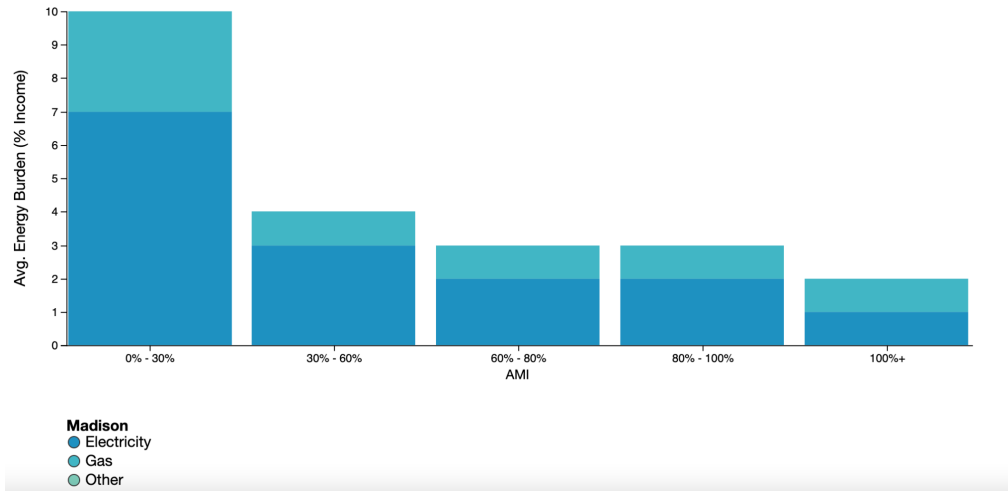
Madison’s overall energy burden compares favorably to the US and Wisconsin. The overall average energy burden for city households is 2% vs. 3% at the national and state levels. For low-income Madison households (<80% AMI), the average energy burden is double the city average at 4% (5% for low-income residents who live in buildings constructed before 1960). Again, these figures compare favorably to the 7% average energy burden for low-income households nationally and 6% average for low-income Wisconsin households.

But while the average energy for low-income Madison households is below the 6% unaffordability threshold, the situation for extremely low-income households is not as favorable. Graph Three, below, shows that households in the extremely low-income group (<30% AMI) spend an average of 10% of their income for energy – more than double the energy burden of households at the next income level (30-60% AMI) and five times the energy burden of the highest income group (100%+ AMI). This is a significant burden for the lowest income families in Madison as it is likely that energy is one of the three or four largest expenditures in their monthly budget, along with housing, transportation, and food. It is worth noting that building age also has a significant impact on these averages; extremely low-income

<sup>2</sup> This figure is based on the calculation that affordable housing should cost no more than 30% of a household’s gross income and that energy should represent no more than 20% of the cost of housing.

households residing in buildings constructed before 1960 have an average energy burden of 12% vs. 9% in post-1960 buildings.

**Graph Two: City of Madison Average Annual Energy Burden by Household Income**  
(Y axis=Average Annual Energy Burden, and X axis=Household Income Group as % of AMI)



Further insights into the energy burdens borne by extremely low-income households can be found by organizing these data by housing tenure, that is, renter-occupied vs. owner-occupied. As the data in Table Two indicates, although the majority of lower income Madisonians are renters, a not-insignificant number own their homes – including 13% of the extremely low-income households.

**Table Two - City of Madison**  
**Renter- and Owner-Occupied Housing Units by Household Income Level**

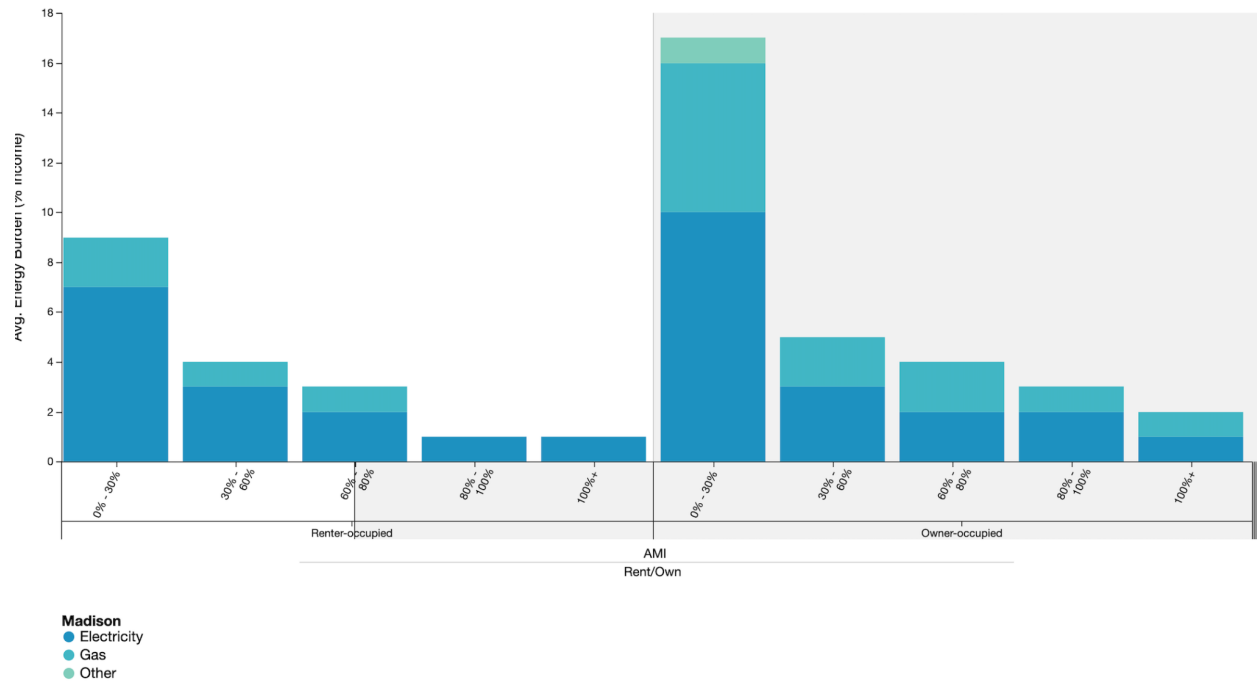
Household Income Level (% of Area Median Income)	Housing Counts		
	Renter-Occupied	Owner-Occupied	Total units
0%-30%	15,221	2,224	17,445
30%-60%	15,409	4,760	20,169
60%-80%	7,405	4,953	12,358
80%-100%	5,522	5,682	11,204
100%+	14,118	33,024	47,142
Totals	57,675	50,643	108,318

As seen in Graph Three, below, the LEAD data suggest that homeowners in all income categories have a substantially higher energy burden than renters. For the extremely low-income group this discrepancy in energy burden is particularly large: 9% in renter-occupied housing units vs. 17% in owner-occupied units (80% of which are single-family homes). This large discrepancy may be due to a number of factors,

including differences in dwelling and/or household size, building age and condition, and the lower energy cost associated with shared walls in multi-family rental units.

It is also worth noting in Graph Three that natural gas appears to make up a substantially lower percentage of energy costs for renters than for home-owners, especially for both the extremely low-income group and the high-income groups (>80% AMI). There may be several explanations for this phenomenon. First, according to the LEAD tool, 48% of all renter-occupied housing units in Madison are electrically heated (presumably with electrical resistance heating<sup>3</sup>). This appears to be most common in large multi-family buildings (10+ units) and 63% of extremely low-income renters live in this type of building. Second, it is also possible that some of this discrepancy in gas usage is an artifact of the LEAD tool’s methodology. This could occur when landlords, rather than tenants, pay the gas bill, in which case the cost of gas is not reflected in these data. In these situations, tenants indirectly pay for gas through increased rent. Such situations are not captured in the LEAD tool, which relies on data from household surveys of directly billed energy expenditures. While this is a limitation to the LEAD Tool, this graph still is able to clearly show that extremely low-income households bear the largest energy burden, no matter if the residence is rented or owned.

**Graph Three: City of Madison Average Annual Energy Burden by Income Group in Renter vs Owner Occupied Households**  
(Y axis=Average Annual Energy Burden and X axis=Income Levels by Renter and Owner-Occupied Cohorts)



We also drilled down to the census tract level to get a sense of the geographic distribution of high energy burdens across the city. Upon analyzing the average energy burden in Madison’s approximately 60

<sup>3</sup> [Energy and Rental Housing: A Wisconsin Characterization Study](#)

census tracts, all but five have a 2-3% average energy burden. Four of these five tracts are located in central Madison (spanning Alder Districts 2, 4, and 8): 16.03 (6% average energy burden), 11.02 (5%), 16.04 (4%), and 11.01 (4%). It is important to note that these tracts are immediately adjacent to the UW campus. The majority of residents in these tracts are in their twenties and, on average, 78% of households in these tracts are below the poverty line; both of these facts suggest that most residents are students. The age of housing stock in the central areas of the city (~30% were built before 1960) likely also contributes to the high energy burden in this area.

Census Tract 25, the fifth census tract with a relatively high average energy burden, has a 4% average energy burden. This tract is located on Madison's north side, immediately adjacent to Truax Field, in Alder District 12. While large in area, tract 25 is relatively small in population. It has a poverty rate significantly above the city average and is racially much more diverse than the city as a whole (58% white, 22% Black, and 18% Hispanic).

Of note, these five census tracts account for only 22% of Madison housing units that have unaffordable high energy burdens. That finding makes clear that the high energy burden situation is dispersed widely across the city. Because the great majority of these other low-income areas are scattered in small neighborhoods across the city, often crossing both census and alder district lines, it is difficult to identify these areas using the LEAD Tool's data. That said, it is very likely that every census tract in Madison has some lower income, high energy burden pockets – even census tracts with average energy burdens of only 1%. In fact, some very high energy burden pockets can be found in otherwise relatively affluent areas. For example, 6% of the housing units (69 of the 1082 total) in census tract 4.02 on the west-side of the city (Alder District 10) are extremely low-income housing units where the average energy burden of 16% is one of the highest in the city. This widely dispersed pockets of poverty of the Madison landscape contrasts to a city like [Milwaukee, where high energy burden is more highly concentrated in predominantly African-American and Hispanic areas](#). While beyond the scope of this report, it may be helpful in the future to delve more deeply into the geographic patterns of high energy burden in specific areas of the city.

While the LEAD tool does not provide direct data about the racial or ethnic dimensions of high energy burden, [a recent study of major urban centers in the U.S.](#) showed that African-American households experience a median energy burden 64% greater than white households (5.4% versus 3.3%, respectively), and that Latino households have a median burden 24% greater than white households (4.1% and 3.3%, respectively). There is no reason to believe that the situation in Madison differs substantially from this national pattern but again, this issue warrants further investigation by the city or local researchers.

## **Implications and Recommendations**

As the LEAD data clearly demonstrate, a significant proportion of Madison residents are burdened with high energy costs that exceed the threshold of affordability. This economic hardship is most severe for the lowest-income households in the city; households that also are disproportionately African-American and Hispanic. These high energy burdens are a contributing factor in the affordable housing crisis in Madison, and negatively impact the health and well-being of individuals and families in myriad ways.

Climate change threatens to worsen these vulnerable residents' energy burden even further, which makes high energy burdens a matter of climate justice as well. For instance, according to a recent [350 Wisconsin statement on climate inequality in Madison](#),<sup>4</sup> "...as the average temperature rises, so does the annual number of days above 100°F in Madison. Since lower-income people are more likely to live without cooling units, which are also quite expensive to run, they suffer more heat stroke and other health problems during each heatwave." Because demand for energy will only increase as the climate changes, the need to proactively redress the energy burden borne by low income residents is all the more pressing.

Because the climate crisis can't be solved without addressing the climate justice crisis, we therefore ask that, when making policy decisions, the City of Madison leaders and other local organizations exercise their power to mitigate both. We can help lower the energy bill for low-income families while simultaneously achieving climate goals to decrease carbon emissions by increasing the energy efficiency of their homes, and providing access to renewable energy technologies. With this in mind, we offer below a list of possible solutions that can both mitigate high energy burden and help the city achieve its carbon reduction and sustainability goals.

*Increase public knowledge and awareness.* The most important first step to solving the energy burden issue is to increase awareness among all our city's residents. Citizens of all income levels need to ask policy makers to address this energy burden issue. In particular, citizens need to advocate for increases in local, state, and federal funding for weatherization assistance, beneficial electrification, and other energy efficiency programs for low-income residents.

*Integrate low carbon building features into all publically-supported affordable housing policies and programs.* City, county, state and federal policy should require, and at the least incentivize, extremely low emissions/extremely high energy efficiency in all new affordable housing.<sup>5</sup> Such policies and practices will reduce future costs for both tenants and landlords while reducing climate warming emissions. Many other states are far ahead of Wisconsin in requiring these building policies for any developers seeking low income housing tax funding, and nothing stops Wisconsin cities from requiring high energy efficiency standards for any buildings they finance.

Increasingly, data are available that show these changes in building design and construction cost either no more, or only an increment more, while the cost of running these buildings is substantially less every month for decades to come. Recent reports on the cost of building green include the [Business Case for Green Building](#),<sup>6</sup> [Construction Costs Comparison between Green and Conventional Office Buildings](#), and [The True Costs of Building Green](#). Of special note is Madison's Bayview Redevelopment Project, which presents itself as "[net zero for all](#)." The Bayview Foundation is implementing this low-carbon, low-income housing project based on the priorities of current residents and with no public policy requirements.

*Provide direct assistance/support to low-income residents* so that they can take advantage of existing federal, state and local programs such as Focus on Energy and the Wisconsin Weatherization Assistance

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<sup>4</sup> This document was prepared at the request of Alder Barbara McKinney and distributed via 350 Wisconsin's Madison Alder Liaison team.

<sup>5</sup> "[Green Building Incentive Programs: Progress in Selected Cities](#)," August, 2021. A Project of 350 Wisconsin's Community Climate Solutions Team.



Program. These energy efficiency programs are designed for low-income homeowners and tenants who cannot pay the upfront costs. That said, the programs are complicated, with varying income and other eligibility requirements, and challenges associated with finding reliable contractors, among others. It is not reasonable to expect people who are struggling economically to find the time or energy to navigate these challenges.

For example, Focus on Energy’s free “Energy Saving” packs (LED bulbs, high-efficiency showerhead, faucet aerators)<sup>6</sup> are available to any household in Madison, but only upon request. Many low-income residents are not even aware of the Focus on Energy program, and thus do not make these requests. Perhaps city government, climate groups and other community organizations could collaborate to provide these for the people who need them most. Engaging with the state weatherization program is even more complex. Ideally, Madison (city plus non-profit organizations) would develop a navigator program that would help low income households work through all these applications, technical requirements, and so forth. Such an initiative could start with the relatively few extremely low and very low-income homeowners- the people whose energy burdens are about double that of comparably low-income renters.

*Establish new climate justice programs that simultaneously address high energy burdens.* For example:

- Accelerate the development of programs designed to improve the energy efficiency of rental housing. The city needs more programs that encourage and enable landlords who rent to the lowest-income residents to make efficiency improvements. The Energy Efficiency Navigator pilot program on Madison’s Northside being implemented by Sustain Dane and Elevate is focused on landlords who own low-income housing. This pilot work needs to be expanded. The city also needs to educate landlords and contractors on the value of installing heat pumps and induction ranges when existing devices need to be replaced.
- Establish a program like the City of Minneapolis’ “[rental energy disclosure](#)” program, which is designed to inform potential renters about the energy efficiency of available rental housing, thereby pressuring landlords to address renters’ energy costs.
- Create a program like Milwaukee’s [Me<sup>2</sup>](#) (Milwaukee Energy Efficiency). This program uses accessible low-interest loans and a significant Me<sup>2</sup> bonus incentive to help home-owners “take some of the dollars you are wasting on high energy bills and put them into energy-saving home improvements.” In addition, it relies on participating Me<sup>2</sup> contractors who are committed to “putting Milwaukee residents to work.” For related recommendations, see Milwaukee’s March 2022 [Climate and Equity Plan](#).
- Consider establishing a program modeled after the Portland Clean Energy Fund, which supports local clean energy solutions and jobs and emphasizes racial and social justice. For more information on this suggestion, see [Potential Financial Strategies for a Madison Version of the Portland Clean Energy Fund](#), a January 2022 report that 350 Wisconsin (then 350 Madison) provided to City of Madison officials.

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<sup>6</sup> A [2005 Energy and Rental Housing in Wisconsin report](#) identified lighting and domestic hot water as the two most immediate types of energy cost-savings for renters.

## Data Source and Limitations

This report aims to provide a picture of energy affordability for lower-income Madisonians, primarily using the US Department of Energy's [LEAD \(Low-Income Energy Affordability Data\) Tool](#). The tool was designed to help communities create better energy strategies and programs by improving their understanding of low-income housing and energy characteristics. Drawing on data from the U.S. Census Bureau's 2018 American Community Survey, the LEAD provides estimated energy data for households at different income levels across the nation, states, counties, cities, and census tracts. Household energy expenditures can be shown either as average annual dollar costs or as average energy burden, defined as the percentage of gross household income spent on energy. The tool also allows comparisons between renter-occupied and owner-occupied housing units and by building types, housing age, and types of heating fuels. (More details can be found in the LEAD Tool [Factsheet](#).)

It should be noted that the LEAD Tool data and the visualizations it generates come with some significant caveats, including:

1. Reliance on estimation techniques;
2. Use of survey data that is already several years out-of-date;
3. Use of energy cost estimations that are based solely on households' reported direct energy expenditures which therefore exclude energy costs that are borne by landlords and passed on to tenants through higher rental prices; and
4. Evidence of rounding errors in some of the graphs and maps generated by this interactive web-based tool.

Despite these limitations, the LEAD data nonetheless provide an excellent starting point for sketching out the broad picture of energy affordability in Madison.