

LOW-INCOME ENERGY AFFORDABILITY DATA (LEAD) TOOL

HOW-TO INSTRUCTIONS

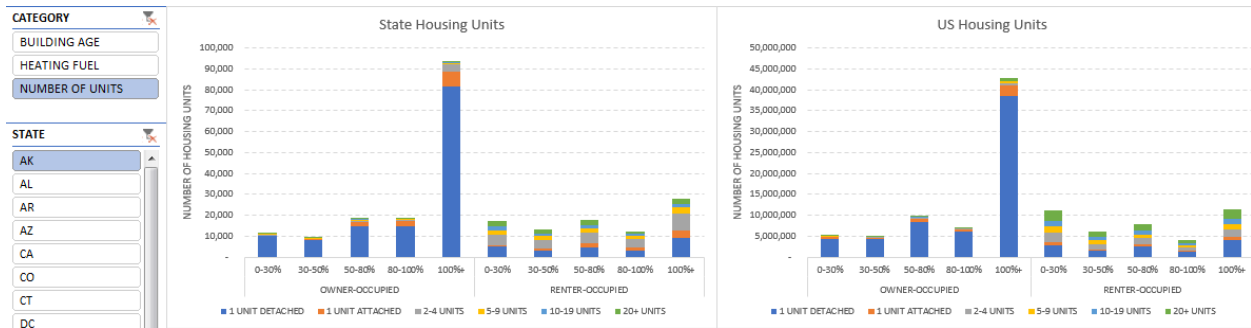


HOW TO ACCESS

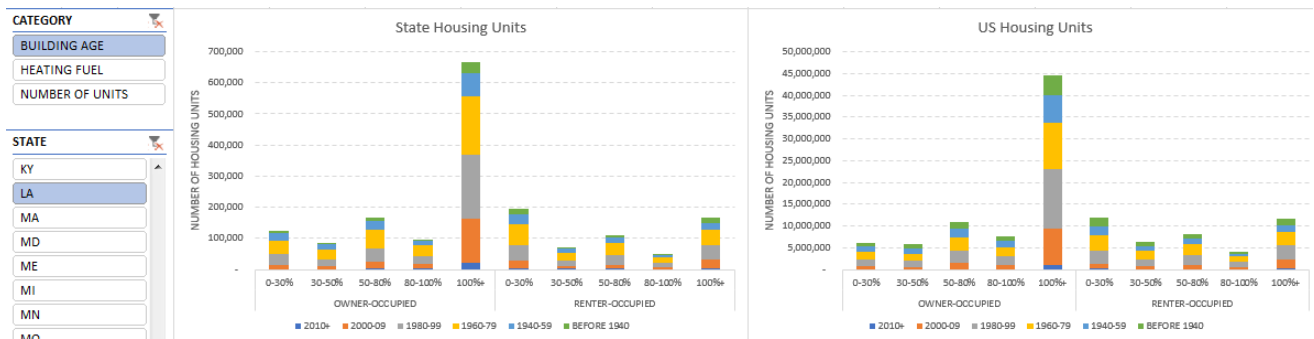
1. The LEAD tool datasets, including state (organized by U.S. Census Division), city, county, and tract level-data on uploaded on the OpenEI website.
2. **Link:** <https://openei.org/doe-opendata/dataset/celica-data>
3. For more information, the first three files that appear on the OpenEI LEAD Tool website explain:
 - a. [Description of Files](#) contains similar information listed above.
 - b. [Data Dictionary](#) provides the description of the units.
 - c. [Methodology](#) document covers data sources and calculations for this tool.

STATE AND COUNTY-LEVEL DATA

2. State and county level data has been bucketed by Census Division:
 - a. West North Central -- **IA, KS, MN, MO, ND, NE, SD**
 - b. West South Central – **AR, LA, OK, TX**
 - c. Pacific -- **AK, CA, HI, OR, WA**
 - d. New England -- **CT, MA, ME, NH, RI, VT**
 - e. Mid Atlantic -- **NJ, NY, PA**
 - f. South Atlantic – **DC, DE, FL, GA, MD, NC, SC, VA, WV**
 - g. East North Central -- **IL, IN, MI, OH, WI**
 - h. East South Central -- **AL, KY, MS, TN**
 - i. Mountain – **AZ, CO, ID, MT, NM, NV, UT, WY**
 - j. Each file is named: COUNTY_CENSUSDIVISIONREGION_2015 – you can locate your state in your respective Census Division, and also able to compare your state against others in your region, and drill down to the county-level detail. All counties in your state are pre-loaded.
 - k. To look at county-level data, click on your state and hit CTRL+SHT+R to refresh the county data and graphs
 - l. Enabling Macros – this is important for you to refresh data and charts
 - i. Ensure your macros are enabled, or try running your macros in the ‘View’ tab
 - ii. Try to ‘Refresh All’ button in the ‘Data’ tab



3. Each data file contains these main buckets of information, or variables, which includes:
 - a. Building Age
 - b. Heating Fuel
 - c. Number of Units
 - d. And also includes Energy Burden graphs on the state, county, and city level
4. To view state-level charts for all states in the continental U.S. and compare your state against the US average, download STATE_ALL_2015 file.
 - a. Click on Building Type, Heating Fuel or Number of Units and different states to do state-by-state comparisons or state v. US national comparisons

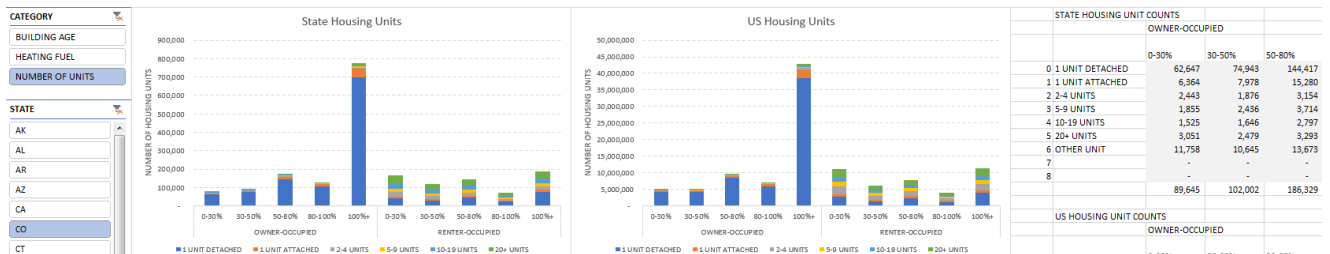


- b. The above table shows the breakdown of building ages by income band.
 - i. Each graph contains income levels that follow HUD guidelines:
 1. 0-30% Area Median Income (AMI) – extremely low income
 2. 30-50% AMI – very low income
 3. 50-80% AMI low income
 4. Over 80% AMI is no longer considered low income
 5. 100%+ AMI is above median income
- c. On the very right-hand side of the Charts tab on the spreadsheet, there are unit breakdowns that correspond with each graph:

| STATE HOUSING UNIT COUNTS | | | | | | | | | | | | | |
|---------------------------|----------------|--------|---------|---------|---------|-----------------|--------|---------|---------|---------|----------------|-----------------|-----------|
| | OWNER-OCCUPIED | | | | | RENTER-OCCUPIED | | | | | OWNER-OCCUPIED | RENTER-OCCUPIED | ALL |
| | 0-30% | 30-50% | 50-80% | 80-100% | 100%+ | 0-30% | 30-50% | 50-80% | 80-100% | 100%+ | | | |
| 0 2010+ | 1,886 | 1,366 | 3,167 | 2,275 | 22,918 | 4,754 | 1,961 | 2,276 | 1,276 | 5,153 | 31,612 | 15,420 | 47,031 |
| 1 2000-09 | 13,990 | 8,852 | 21,941 | 14,996 | 140,225 | 25,189 | 9,105 | 13,823 | 6,288 | 26,375 | 200,004 | 80,779 | 280,783 |
| 2 1980-99 | 34,594 | 21,725 | 43,297 | 27,068 | 206,913 | 48,105 | 19,080 | 31,134 | 14,641 | 45,306 | 333,597 | 158,266 | 491,863 |
| 3 1960-79 | 41,772 | 31,231 | 58,774 | 32,449 | 185,929 | 67,221 | 24,104 | 38,554 | 16,613 | 49,997 | 350,155 | 196,490 | 546,645 |
| 4 1940-59 | 23,814 | 17,335 | 29,154 | 15,020 | 73,679 | 33,310 | 11,596 | 16,247 | 7,375 | 22,173 | 159,002 | 90,700 | 249,702 |
| 5 BEFORE 1940 | 7,721 | 5,388 | 8,896 | 4,816 | 35,520 | 15,376 | 6,134 | 8,183 | 3,562 | 16,298 | 62,340 | 49,554 | 111,894 |
| 6 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 123,777 | 85,897 | 165,228 | 96,624 | 665,184 | 193,954 | 71,981 | 110,216 | 49,756 | 165,303 | 1,136,709 | 591,210 | 1,727,919 |

| US HOUSING UNIT COUNTS | | | | | | | | | | | | | |
|------------------------|----------------|-----------|------------|-----------|------------|-----------------|-----------|-----------|-----------|------------|----------------|-----------------|------------|
| | OWNER-OCCUPIED | | | | | RENTER-OCCUPIED | | | | | OWNER-OCCUPIED | RENTER-OCCUPIED | ALL |
| | 0-30% | 30-50% | 50-80% | 80-100% | 100%+ | 0-30% | 30-50% | 50-80% | 80-100% | 100%+ | | | |
| 0 2010+ | 73,311 | 46,385 | 115,323 | 97,551 | 908,584 | 186,009 | 88,404 | 116,922 | 67,918 | 282,915 | 1,241,154 | 742,168 | 1,983,322 |
| 1 2000-09 | 638,890 | 527,288 | 1,312,466 | 1,027,734 | 8,513,175 | 1,166,087 | 623,125 | 931,720 | 528,206 | 2,030,235 | 12,019,553 | 5,279,372 | 17,298,925 |
| 2 1980-99 | 1,570,162 | 1,352,081 | 2,794,102 | 1,985,168 | 13,637,107 | 2,849,062 | 1,619,453 | 2,246,716 | 1,157,876 | 3,347,358 | 21,338,620 | 11,220,465 | 32,559,085 |
| 3 1960-79 | 1,707,040 | 1,652,814 | 3,026,666 | 2,033,244 | 10,601,867 | 3,631,418 | 1,991,898 | 2,454,417 | 1,180,189 | 2,956,274 | 19,021,631 | 12,214,195 | 31,235,827 |
| 4 1940-59 | 1,250,323 | 1,276,411 | 2,146,663 | 1,417,296 | 6,239,828 | 2,026,234 | 1,069,875 | 1,294,575 | 628,437 | 1,556,701 | 12,330,521 | 6,575,822 | 18,906,342 |
| 5 BEFORE 1940 | 884,355 | 857,775 | 1,429,158 | 930,638 | 4,658,686 | 1,935,142 | 1,003,469 | 1,137,200 | 556,320 | 1,550,062 | 8,760,612 | 6,182,192 | 14,942,804 |
| 6 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 6,124,082 | 5,712,753 | 10,824,378 | 7,491,630 | 44,559,248 | 11,793,952 | 6,396,222 | 8,181,550 | 4,118,945 | 11,723,545 | 74,712,091 | 42,214,214 | ##### |

- d. For example in the table above, for extremely low income (0-30% AMI) households, most owner-occupied housing units were constructed between the years 1960-1979 at 41,772 units. There are 1,886 of owner-occupied housing units constructed after 2010, compared to the 7,721 constructed before 1940 in the state of Louisiana. Therefore, we can conclude that low-income households tend to reside in older housing stock, compared to higher income households.
- e. In addition, by clicking on the Number of Units, you can view the housing type:



- f. For example, in the state of Colorado, extremely low income households tend to live in single family homes, as demonstrated by the graph on the left. If you look to the right you can see the line '1 Unit Detached' and that there are 62,647 households that live in single-family homes in the 0-30% AMI category.

CITY-LEVEL DATA

5. To view city level data, you will download the template, CITY_SHORT_2015 and your city data, CITY_SH_YOURSTATE_2015
 - a. All 50 states are pre-populated and selectable – they appear as buttons in the CHARTS tab.
 - i. i.e. if you are the state of New York, your city data will be CITY_SH_NY_2015.
 - b. Instructions:

Copy this whole dataset, pictured below. Make sure you scroll all the way to the right and down to the bottom of the data to ensure you have copied the whole dataset.

| 1 | ABV | NAME | TYPE | PLACEFP | CATEGOR | SLICE | OWNER 0- | OWNER 3- | OWNER 5- | OWNER 8- | OWNER 10- | RENTER 0- | RENTER 3- | RENTER 5- | RENTER 8- | RENTER 10- |
|----|-----|-----------|------------|---------|---------|-------------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|------------|
| 2 | NY | Adams vil | Incorporat | 3600199 | YBL | 2010+ | 0 | 0 | 0 | 0 | 0 | 0.576589 | 0.527107 | 1.89531 | 0.462883 | 0.348885 |
| 3 | NY | Adams vil | Incorporat | 3600199 | YBL | 2000-09 | 3.752855 | 2.907204 | 9.097478 | 5.548496 | 68.39875 | 1.021129 | 0.611724 | 0.646882 | 0.676204 | 4.977795 |
| 4 | NY | Adams vil | Incorporat | 3600199 | YBL | 1980-99 | 13.26015 | 9.081666 | 17.60717 | 7.513132 | 97.40235 | 15.53683 | 24.61292 | 33.2815 | 3.039507 | 17.27435 |
| 5 | NY | Adams vil | Incorporat | 3600199 | YBL | 1960-79 | 8.719929 | 15.46523 | 16.49905 | 5.490742 | 79.93196 | 3.828566 | 3.986012 | 7.372279 | 1.648341 | 14.25861 |
| 6 | NY | Adams vil | Incorporat | 3600199 | YBL | 1940-59 | 3.365855 | 3.215291 | 4.587872 | 1.830874 | 24.76542 | 2.441861 | 3.364075 | 6.24256 | 0.539609 | 2.066125 |
| 7 | NY | Adams vil | Incorporat | 3600199 | YBL | BEFORE 1940 | 21.94701 | 11.50106 | 27.76798 | 9.325621 | 86.897 | 16.61872 | 11.20692 | 25.8853 | 3.296757 | 30.84285 |
| 8 | NY | Adams vil | Incorporat | 3600199 | YBL | ALL | 51.0458 | 42.17046 | 75.55955 | 29.70887 | 357.3955 | 40.02369 | 44.30876 | 75.32383 | 9.663301 | 69.76865 |
| 9 | NY | Adams vil | Incorporat | 3600199 | YBL | BURDEN | | | | | | | | | | |
| 10 | NY | Adams vil | Incorporat | 3600199 | BLD | 1 DETACH | 27.831 | 27.55061 | 44.00514 | 20.23434 | 286.3616 | 13.28457 | 10.54353 | 17.83318 | 4.045557 | 36.0462 |
| 11 | NY | Adams vil | Incorporat | 3600199 | BLD | 1 ATTACH | 0 | 0 | 0 | 0 | 0 | 0.972786 | 0.758151 | 1.299025 | 0.301733 | 0.2109823 |
| 12 | NY | Adams vil | Incorporat | 3600199 | BLD | 2-4 UNIT | 12.13456 | 2.329581 | 8.645793 | 2.182299 | 13.27533 | 4.276364 | 6.349035 | 18.01589 | 2.044209 | 11.52277 |
| 13 | NY | Adams vil | Incorporat | 3600199 | BLD | 5-19 UNIT | 0 | 0 | 0 | 0 | 0 | 4.107324 | 2.018419 | 2.340572 | 0.330013 | 1.199617 |
| 14 | NY | Adams vil | Incorporat | 3600199 | BLD | 20+ UNIT | 0.130289 | 0.3169 | 0.039355 | 0.012671 | 1.946297 | 5.330126 | 5.73502 | 4.784794 | 0.526337 | 3.876538 |
| 15 | NY | Adams vil | Incorporat | 3600199 | BLD | OTHER UN | 10.94995 | 11.97336 | 22.86927 | 7.279555 | 55.81223 | 12.05253 | 18.9046 | 31.05038 | 2.415453 | 15.0137 |
| 16 | NY | Adams vil | Incorporat | 3600199 | BLD | ALL | 51.0458 | 42.17046 | 75.55955 | 29.70887 | 357.3955 | 40.02369 | 44.30876 | 75.32383 | 9.663301 | 69.76865 |
| 17 | NY | Adams vil | Incorporat | 3600199 | BLD | BURDEN | | | | | | | | | | |
| 18 | NY | Adams vil | Incorporat | 3600199 | HFL | UTILITY GA | 27.40758 | 24.52475 | 47.8108 | 17.05045 | 209.5075 | 21.59934 | 25.9529 | 52.39815 | 7.141131 | 44.24047 |

Paste your city data into the CITY_SHORT_2015 (which is the city template) in the CITY tab starting after cell A27 in the template (do not erase the cells above cell A27).

(Clear out the pre-loaded data here by selecting 'Clear Contents' and pasting the values in).

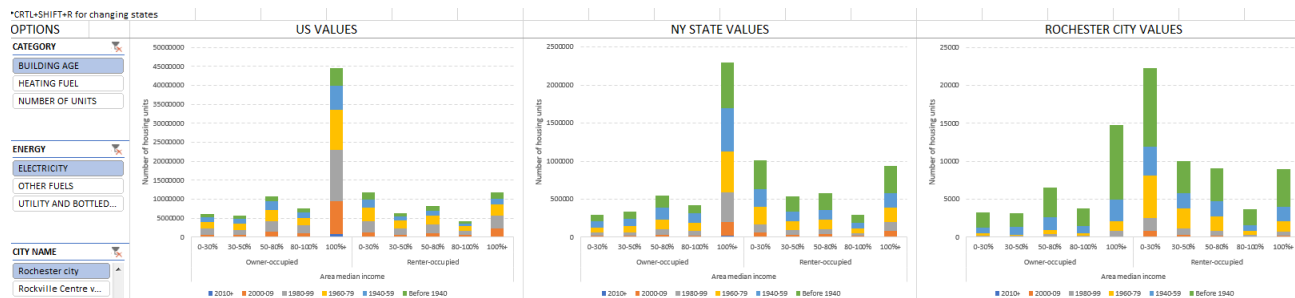
| | | | | | | | | | | | | | | | | | | |
|----|-----|----------------|------------------|---------|-----|-------------|-------------|--------------|--------------|---------------|-------------|--------------|---------------|---------------|----------------|--------------|-------------------|--------------------|
| 21 | NY | Rochester city | County Subdivisi | 3663000 | HFL | OTHER | 149.887 | 73.3623 | 484.179 | 117.59 | 300.833 | 373.724 | 127.789 | 104.983 | 107.063 | 410.333 | 1734.39 | 4700.3 |
| 22 | NY | Rochester city | County Subdivisi | 3663000 | HFL | OTHER | 26.6658 | 20.5978 | 13.9652 | 33.8272 | 58.0503 | 204.452 | 161.148 | 5.80235 | 13.5411 | 84.0844 | 23990 | 23989.7 |
| 23 | NY | Rochester city | County Subdivisi | 3663000 | HFL | NONE | 27.5524 | 2.49338 | 3.03184 | 1.75531 | 22.167 | 323.11 | 107.469 | 83.2795 | 50.4159 | 100.746 | 14648.3 | 14134.2 |
| 24 | NY | Rochester city | County Subdivisi | 3663000 | HFL | ALL | 3311.53 | 3138.76 | 6538.82 | 3845.82 | 14794 | 22320.9 | 10002.5 | 9096.08 | 3666.18 | 8919.57 | 10415.8 | 22649.2 |
| 25 | NY | Rochester city | County Subdivisi | 3663000 | HFL | BURDEN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.25092 | 0.10176 |
| 26 | | 11691 | | | | | | | | | | | | | | | | |
| 27 | ABV | NAME | TYPE | PLACEFP | RY | SLICE | OWNER 0-30% | OWNER 30-50% | OWNER 50-80% | OWNER 80-100% | OWNER 100%+ | RENTER 0-30% | RENTER 30-50% | RENTER 50-80% | RENTER 80-100% | RENTER 100%+ | OWNER HINCP 0-30% | OWNER HINCP 30-50% |
| 28 | NY | Adams village | Incorporated Pla | 3600199 | YBL | 2010+ | 0 | 0 | 0 | 0 | 0 | 0.57659 | 0.52711 | 1.89531 | 0.46288 | 0.34889 | 0 | 0 |
| 29 | NY | Adams village | Incorporated Pla | 3600199 | YBL | 2000-09 | 3.75285 | 2.9072 | 9.09748 | 5.5485 | 68.3988 | 1.02113 | 0.61172 | 0.64688 | 0.6762 | 4.97779 | 9831.38 | 20783.3 |
| 30 | NY | Adams village | Incorporated Pla | 3600199 | YBL | 1980-99 | 13.2601 | 9.08167 | 17.6072 | 7.51313 | 97.4024 | 15.5368 | 24.6129 | 33.2815 | 3.03951 | 17.2743 | 8946.38 | 20181.5 |
| 31 | NY | Adams village | Incorporated Pla | 3600199 | YBL | 1960-79 | 8.71993 | 15.4652 | 16.4991 | 5.49074 | 79.932 | 3.82857 | 3.98601 | 7.37228 | 1.64834 | 14.2586 | 7568.54 | 19053.1 |
| 32 | NY | Adams village | Incorporated Pla | 3600199 | YBL | 1940-59 | 3.36585 | 3.21529 | 4.58787 | 1.83087 | 24.7654 | 2.44186 | 3.36408 | 6.24256 | 0.53961 | 2.06612 | 7766.2 | 16947.3 |
| 33 | NY | Adams village | Incorporated Pla | 3600199 | YBL | BEFORE 1940 | 21.947 | 11.5011 | 27.768 | 9.32562 | 86.897 | 16.6187 | 11.2069 | 25.8853 | 3.29676 | 30.8429 | 8885.72 | 19951.2 |
| 34 | NY | Adams village | Incorporated Pla | 3600199 | YBL | ALL | 51.0458 | 42.1705 | 75.5596 | 29.7089 | 357.395 | 40.0237 | 44.3088 | 75.3238 | 9.6633 | 69.7687 | 8625.59 | 19481 |

Then scroll down and select your state by clicking on the NY button in the CHARTS tab.



Press CTRL+SHIFT+R to refresh the pivot tables (make sure macros are enabled).

Select a city of interest using the CITY NAME button, which would be Rochester city.



- The tract level files for each state simply contain states' raw data, for those of you would like to utilize this data for your own tools and projects.

| | |
|--|---|
| TRACT_CA_2015 2015 Census tract-level data for the state of California | Preview Download |
| TRACT_CO_2015 2015 Census tract-level data for the state of Colorado. | Preview Download |

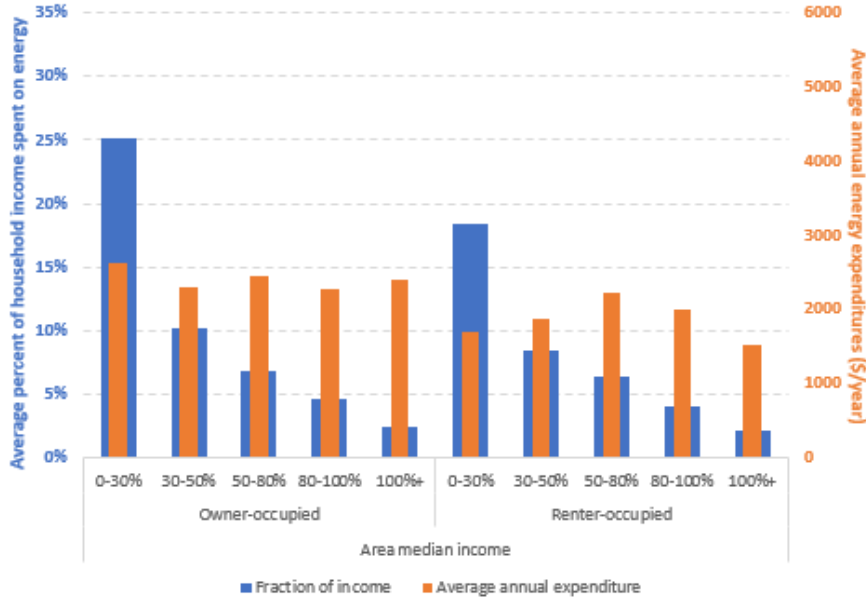
HOW TO INTERPRET THE GRAPHS IN THE CHARTS TAB

Each graph contains information to help you identify and understand low income energy needs. The graphs themselves can be utilized to communicate low income energy needs in presentations, etc.

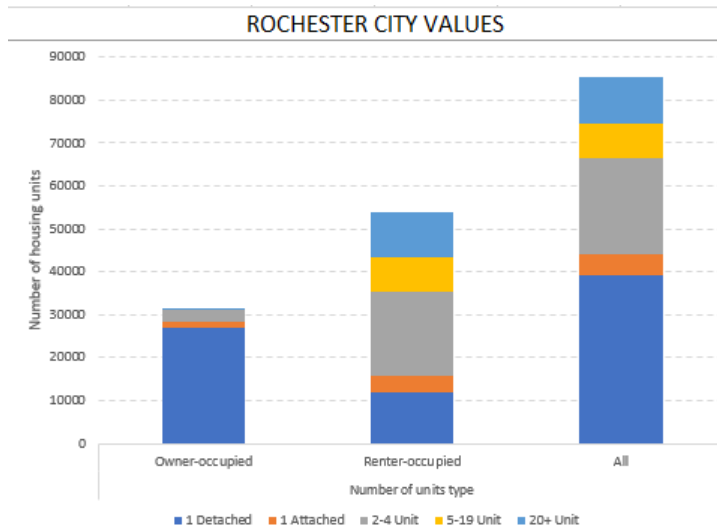
- The variables, state/county/city names will appear on the left, the charts in the middle, and the breakdown of units on the right-hand side of the data files
- Each graph contains income levels that follow HUD guidelines:
 - 0-30% Area Median Income (AMI) – extremely low income
 - 30-50% AMI – very low income
 - 50-80% AMI low income
 - Over 80% AMI is no longer considered low income
 - 100%+ AMI is above median income
 - For unit descriptions and more information, see the [Methodology](#) document on OpenEI.
- For the county / state data, each of the main variables you may choose from (Building Age, Heating Type, Number of Units). The graphs illustrate the variable selected as it relates to housing units, average monthly expenditures, and energy burden, by income and owner versus renter.
 - This allows the user to identify if low-income households live in single family or multifamily buildings, what size of multifamily buildings, how old the buildings are, what type of fuel they use, and the energy burden of a particular county, city, or state.
- For the city data, there are two additional graphs that illustrate average monthly energy expenditures and housing units by combined income bands of renter versus owner.
- Each graph on the CHARTS tab (with the exception of the new combined income graphs available in the CITY_SHORT_2015 file), can be viewed as two graphs, as it illustrates both owner and renter data.
- The energy burden graph can be interpreted as followed: the blue bars represent energy burden at each income level, which is the average percent of household income spent on energy. The

orange bar represents the average dollar amount that households spent on energy bills (energy expenditures) by income band – so 0-30% AMI is extremely low income, and generally spending 0-80% AMI is considered the low income bracket.

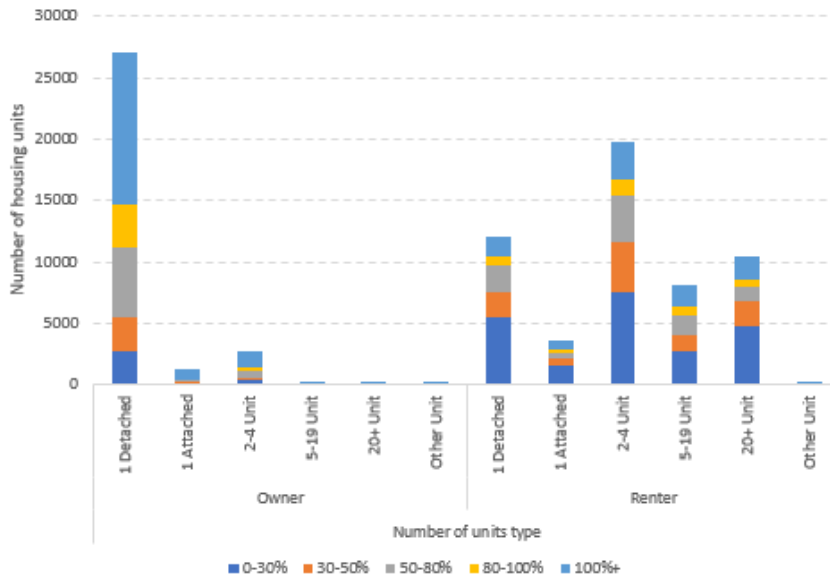
Rochester, NY example



So in the example above, low-income households in Rochester, NY, typically will spend \$2,000--\$3,000 on average per year, and depending on their income level, that amount could be anywhere from 5—25% of their annual income (spent on energy bills) which is their energy burden.



The combined income graphs that can be found in the CITY_SHORT_2015 file can help you compare some variables more easily. So in the example above, these bars represent the combined owner and renter blocks – so across the board, we can easily see that most owner occupied households in Rochester, NY live in single family (1 detached) homes, whereas in comparison, most renter-occupied households live in multifamily buildings (2-4 unit, 5-19 unit, and 20+ unit).



In this example above, we now can see the number of unit types by combined income bands, and compare the owner-occupied versus the renter-occupied units. We saw in the earlier example that most owner-occupied households live in single family homes, and that renter-occupied households live in multifamily buildings. This graph illustrates the proportion of housing types low-income households reside by per income band. Therefore, we can conclude that extremely low-income households mostly reside in small multifamily (2-4 unit) buildings, followed by single-family homes, followed by large multifamily (20+ unit) buildings.

| ROCHESTER CITY AVERAGE ENERGY BURDEN | | | | | | | | | | | | Number of units type | | |
|--------------------------------------|-------|--------|--------|---------|-------|-----------------|--------|--------|---------|-------|------|----------------------|-----------------|-----|
| Area median income | | | | | | | | | | | | Owner-occupied | Renter-occupied | All |
| Owner-occupied | | | | | | Renter-occupied | | | | | | | | |
| | 0-30% | 30-50% | 50-80% | 80-100% | 100%+ | 0-30% | 30-50% | 50-80% | 80-100% | 100%+ | | | | |
| Fraction of income | 25% | 10% | 7% | 5% | 2% | 18% | 8% | 6% | 4% | 2% | 4% | 6% | 5% | |
| Average annual | 2614 | 2305 | 2461 | 2263 | 2400 | 1703 | 1883 | 2214 | 1998 | 1528 | 2409 | 1814 | 2034 | |

To see the units populated to the right of the charts, click on the graph bars to see the highlighted breakdown. In the above example, we clicked on the Rochester NY energy burden graph to see the numbers associated with this graph.

7. Download your state, city, or county data and play around with it! If you have any questions related to the LEAD tool, please direct them at stateandlocal@ee.doe.gov

For more information about DOE's efforts to help state and local governments understand and address low income energy needs, visit:

- <https://betterbuildingsinitiative.energy.gov/accelerators/clean-energy-low-income-communities>
- <https://www.energy.gov/eere/slsc/low-income-community-energy-solutions>