



Oregon Affordable Housing Assessment

How-to Guide and Methodology

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Getting Started

Affordable Housing Assessment is a web application designed to understand energy use in the affordable housing stock and to identify areas of the greatest energy need and gaps in existing resources to better inform efforts to reduce energy burden and achieve maximum efficiency in low-income and affordable housing, including identifying energy assistance and weatherization programs and other energy efficiency work in the state of Oregon. The tools and icons marked on the map interface as shown in Figure 1 will help you to navigate the map and set your display preferences. Below are the three items that are marked on the map interface in Figure 1.

Affordable Housing Assessment Web Application: https://bit.ly/OHCS_AHA

1. Zoom Tools – Help you to navigate the map
2. Search Box – Helps you to search for any city, county, etc.
3. Legend and Layers Icons – Display or hide the map legend and the layer options

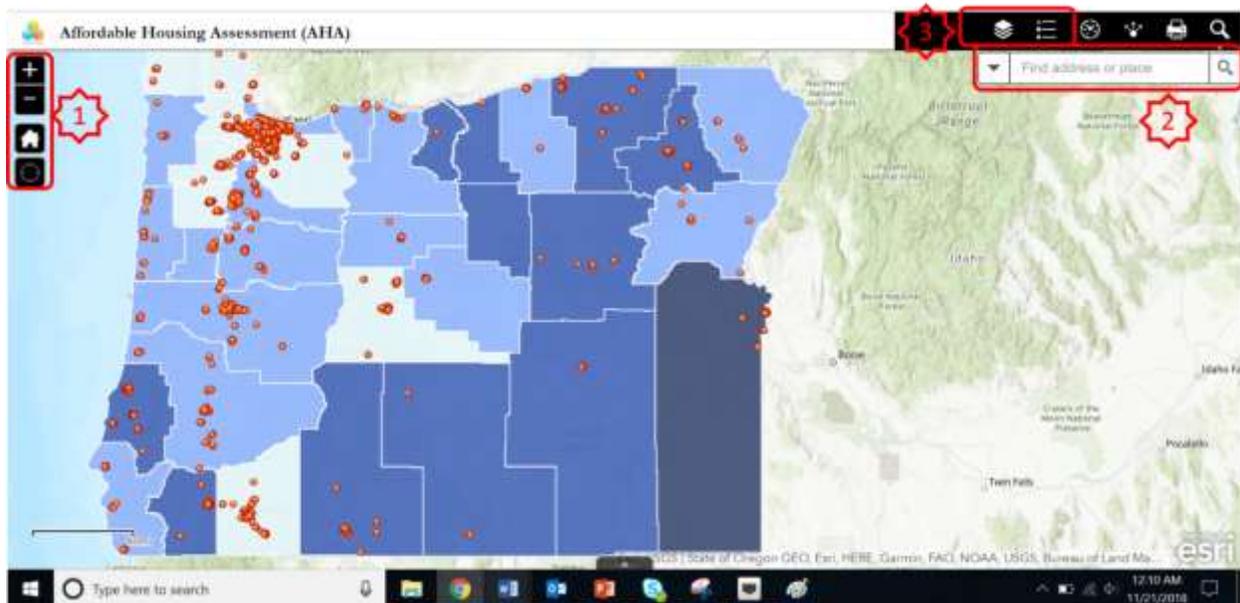


Figure 1: Map Interface



Zoom Tools

The zoom in (+), zoom out (-), and 'Home' buttons are shown on the top left corner of the map.

To zoom in, click the '+' button.

To zoom out, click the '-' button.

To return to the default map extent, click the 'Home' (🏠) button.

Using the Search Box

The search box appears at the top right of the interface when you click the search icon. In the search box you can search for any city, county, or exact address and the map will zoom to that area.

Legend and Layers

The Legend and Layers icons are located in the top right corner on the navigation bar. Clicking on the Legend icon will show or hide the legend explaining the map features (as shown in Figure 2).

The legend for this map indicates that the red dots are multifamily properties and map colors reflect values of index by county territory.

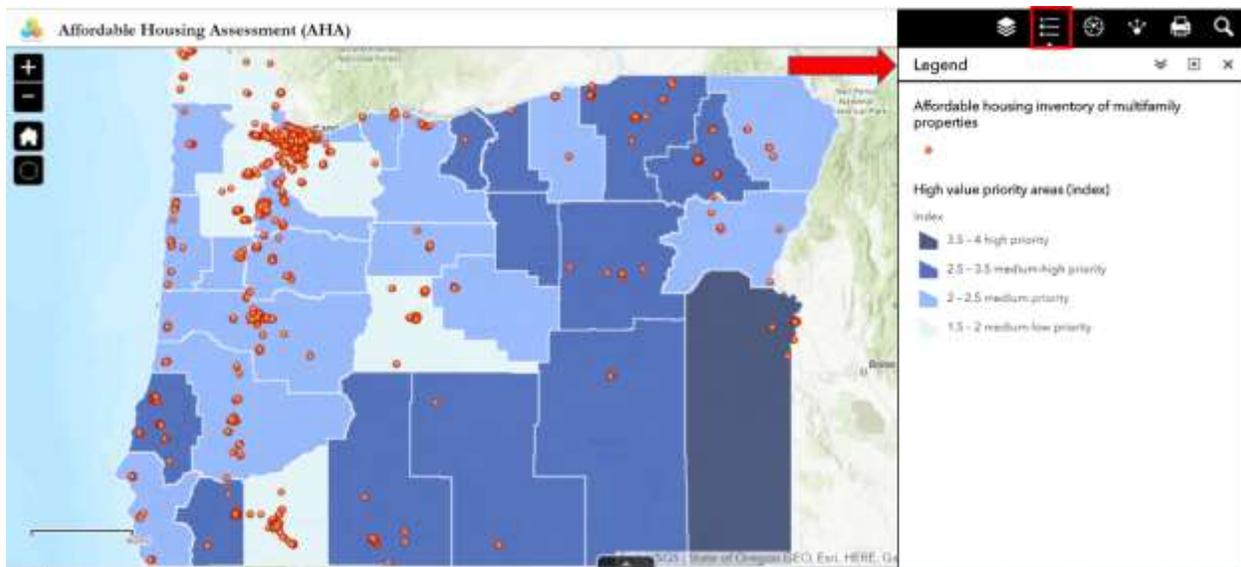


Figure 2: Legend

OHCS multifamily properties and the index are represented as two separate layers in this map. As you first open the map, by default only these two layers are shown. Clicking on the Layers icon will show the Layer List, which can be used to turn on or off the rest of the layers in the map. Figure 3 shows the layer list and highlights a check box to turn on or off layers.

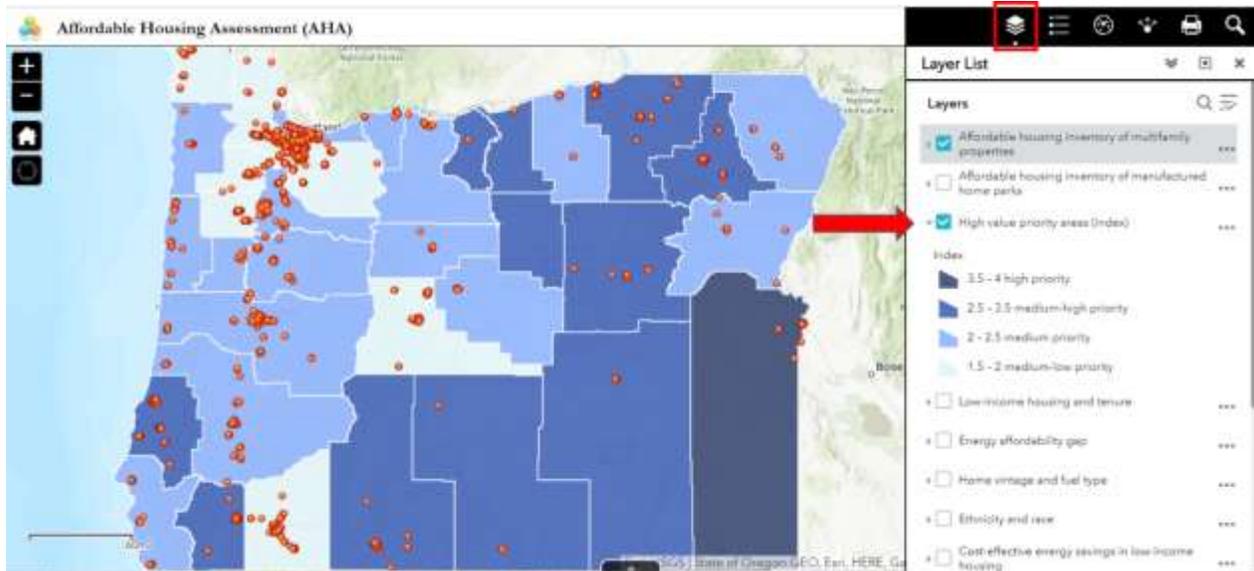


Figure 3: Layers list

If you click on any county (or a dot) on the map, a pop-up box will appear for that particular layer of information as shown in Figure 4.

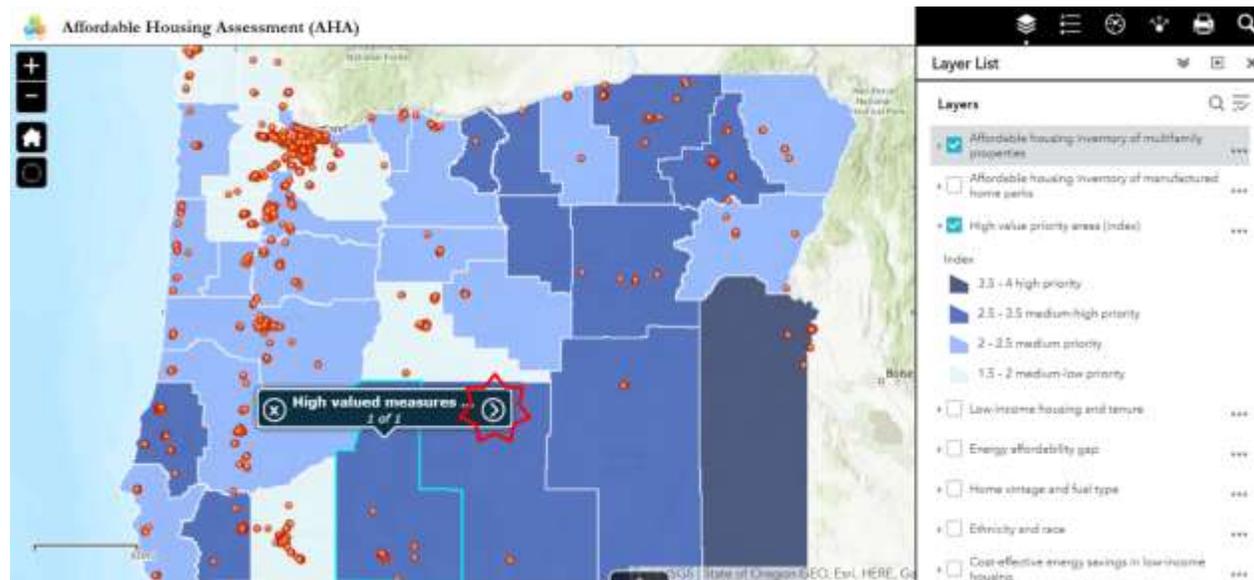


Figure 4: Pop-up

Click on the arrow in the pop-up box (highlight in red in Figure 4) to display detailed information for that layer. The following screen will appear (Figure 5).

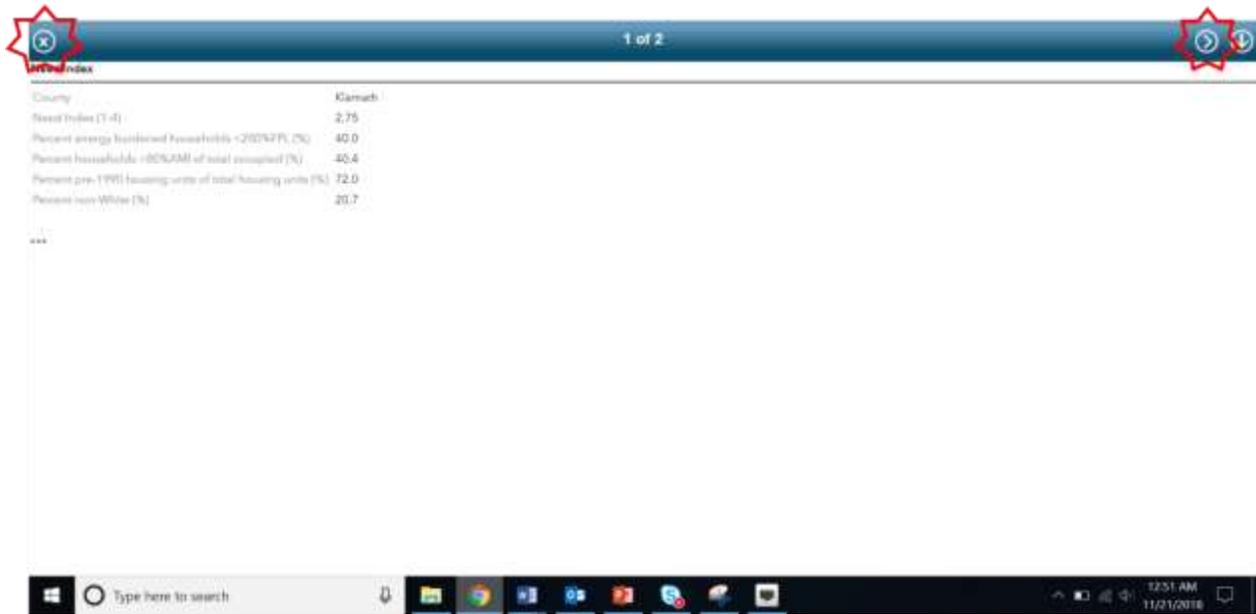


Figure 5: Detailed Pop-up

If there are several layers activated at the same time, click on the arrow at the top right corner of the pop-up window (highlighted in red in Figure 5) to see detailed information for the next active layer. To go back to the map, click X at the top left corner of the screen.

Methodology

Layers presented in the map

Data in this map is presented in three types of resolutions: county, Community Action Agencies (CAAs) and electric and natural gas utilities territories. Majority of the information is presented as county level data because that's the finest level at which the most accurate information exists across several variables to-date.

Layer 1

Income or rent restricted multifamily properties

Layer Background

Individual points are all publicly funded affordable multifamily rental housing properties in Oregon, defined as those properties that have received funding from any level of government that include units with income or rent restrictions. These data were compiled by Oregon Housing and Community Services (OHCS) for their Oregon Affordable Housing Inventory, and included 2091 properties at the time of the assessment.



The list of properties in this inventory has been compiled from the following partners: Oregon Housing and Community Services, HUD, USDA, Metro, Network for Oregon Affordable Housing, all 20 of Oregon's Housing Authorities, and many county and city governments. OHCS cannot and does not guarantee that there are no errors. Please note that certain special needs properties were not included in this layer, including homeless shelters, group homes, transitional housing, assisted living facilities, residential care facilities, on-farm housing, and mobile home parks.

Pop-up Window

- ❖ Name of multifamily rental property
- ❖ Number of units within that property

Layer 2

Manufactured home park directory

Layer Background

Individual points are locations of all mobile/manufactured home parks registered with OHCS. Red circles represent family parks, green circles represent 55+ park communities, and blue circles either have no defined specialty population or did not report it. The relative size of each circle indicates the number of total spaces within the park.

Pop-up Window

- ❖ Name of the manufactured park
- ❖ Type of park
- ❖ Number of spaces within the park

Layer 3

High priority area index

To more easily identify areas with the greatest energy burden we created an index that encompasses high valued measures to understanding energy burden. The index included a measure of energy burden itself along with some factors that drive energy burden such as affordability hardship due to low household income (economic driver); poor home energy efficiency due to older home vintage (physical driver); and ethnicity/race (systemic driver). Research clearly shows that there are other factors that can lead to a household experiencing energy burden. However, these initial metrics that we included in the index represent a starting point from which we can expand our analysis in the future.

We calculated the index by breaking down each measure's values into a low (score of 1) to high (score of 4) continuum based on their mean and standard deviation, and then averaging the scores of the four



variables for each county. The variables and corresponding methods for calculating their scores were as follows.

Index Components

❖ Energy burden

Percent energy burdened households <200% federal poverty level (FPL) of total occupied households

Energy burden is defined as percent of income spent on energy bills. Commonly, if energy burden exceeds 6%, a household is considered energy burdened. This map utilized Fisher, Sheehan and Colton's (FSC) 2017 *Home Energy Affordability Gap* measure of energy burden. A more detailed description of FSC's energy burden calculation can be accessed at their website:

<http://www.homeenergyaffordabilitygap.com/>.

This measure was broken down into categories from low=1 to high=4:

1 = 15% to 27% 2 = 27% to 35% 3 = 35% to 43% 4 = 43% to 50%

❖ Low-income households

Percent households <80% area median income (AMI) of total occupied households

U.S. Department of Housing and Urban Development (HUD) defines low-income as households whose incomes do not exceed 80% AMI. The OHCS threshold for low-income is also those households earning less than 80% median household income.

Data source: The U.S. Department of Energy's (DOE) Low-Income Energy Affordability Data (LEAD) Tool, County Pacific 2015 dataset that is based on American Community Survey 5-Year Estimates for 2011-2015 (US Census Bureau). The full data can be accessed here: <https://openei.org/doe-opendata/dataset/celica-data>

This measure was broken down into categories from low=1 to high=4:

1 = 33.8% to 38% 2 = 38% to 42% 3 = 42% to 46% 4 = 46% to 52%

❖ Home vintage

Percent homes built prior to 1990 of total housing units

The measure of the percent of total housing units built prior to 1990 attempts to identify housing stock that may be less energy efficient due to being built to a less strict building code. Oregon's first energy conservation requirements were developed in 1975 and were limited to residential buildings. This code was upgraded in 1978 and again in 1980 to reflect the new editions of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards. Since 1980, the residential energy conservation requirements have been amended on a three-year cycle through the 1990's in sequence



with the Oregon One- and Two- Family Dwelling Specialty Code. More information on building codes can be found here: <https://www.energycodes.gov/adoption/states/oregon>.

Data source: ACS 2012-2016 5-year estimates, table DP04 *Selected Housing Characteristics*.

This measure was broken down into categories from low=1 to high=4:

1 = 42% to 59% 2 = 59% to 68% 3 = 68% to 77% 4 = 77% to 84%.

❖ **Ethnicity and race**

Percent People of Color

By including percent people of color, we want to understand whether energy burden is distributed disproportionately among different ethnic groups and racial categories. Research has supported that this inequitable distribution is widespread. One such study from the American Council for an Energy Efficient Economy (ACEEE 2016) shows that African-American and Latino households are forced to spend disproportionate amounts of their income on energy when compared to other racial and ethnic categories. The report can be found here: <https://aceee.org/press/2016/04/report-energy-burden-low-income>.

Data source: ACS 2012-2016 5-year estimates, table B03002 *Hispanic or Latino Origin by Race*. NOTE: those who identified as Hispanic or Latino are presented as a separate standalone ethnic group that includes all races that identified as Hispanic or Latino. This means the measure includes e.g. White Hispanic/Latino, Black Hispanic/Latino and others. We chose to classify everyone who identified as Hispanic/Latino as just Hispanic/Latino rather than complicating the metric with the inclusion of multi-tiered racial identification categories. Categories such as Black or African American, White, Asian and others mean that they are non-Hispanic. The people of color category is inclusive of everyone that did not identify as White alone.

This measure was broken down into categories from low=1 to high=4:

1 = 5.7% to 9% 2 = 9% to 19% 3 = 19% to 29% 4 = 29% to 40%

The index measures summary statistics is displayed in Table 1. The index ranges from the minimum of 1.5 (Polk county) to the maximum of 4 (Malheur county).



Variable	Mean	Standard deviation	Minimum	Maximum
Percent households <80% AMI of total occupied households	41.5%	4.2	33.8% (Washington county)	51.8% (Lake county)
Percent energy burdened households <200% FPL of total occupied households	35.4%	8	15.3% (Clackamas county)	50% (Lake county)
Percent pre-1990 housing units of total housing units	67.8%	8.8	42.7% (Deschutes county)	83.6% (Sherman county)
Percent people of color	18.6%	9.8	5.7% (Wheeler county)	39.9% (Jefferson county)

Table 1: Index Summary Statistics

Layer 4

Low-income housing and tenure

Layer Background

This layer highlights the percent of total occupied households per county that earn <80% AMI, and also contains detail on the distribution of housing types that these low-income households are occupying. Source: DOE's Low-Income Energy Affordability Data (LEAD) Tool, County Pacific 2015 dataset. The full data can be found here: <https://openei.org/doe-opendata/dataset/celica-data>. Household numbers and percentages in the LEAD dataset are based on ACS 2011-2015 5-year estimates.

Pop-up Window

Low-income households

- ❖ Total number of occupied households
- ❖ Percent households <80% AMI of total occupied households (%)
- ❖ Number of single family renter occupied households <80% AMI (1-unit attached category)
- ❖ Number of single family owner occupied households <80% AMI (1-unit attached category)
- ❖ Number of multifamily households <80% AMI (2-units and more categories)
- ❖ Number of manufactured homes <80% AMI ("other" category)

Affordable housing

- ❖ Publicly funded multifamily units (2018 OHCS affordable housing inventory)



- ❖ Registered manufactured home parks with corresponding number of park spaces (2018 OHCS manufactured home park registry)

Layer 5

Energy affordability gap

Layer Background

Household average energy affordability gap in dollar amount for energy burdened households <200% FPL.

Based on work by Fisher, Sheehan and Colton (2017), the energy affordability gap represents a dollar amount needed to bring energy burdened households to “affordable” (6% of income) level of energy burden. Home Energy Affordability Gap dataset can be found here:

<http://www.homeenergyaffordabilitygap.com/>). FSC calculated energy affordability gap for households <200% FPL based on data from ACS 2012-2016 5-year estimates.

Pop-up Window

- ❖ Total energy affordability gap in dollar amount per county
- ❖ Average energy affordability gap in dollar amount for all energy burdened households <200% FPL
- ❖ Average energy affordability gap in dollar amount for energy burdened households <100% FPL
- ❖ Average energy affordability gap in dollar amount for energy burdened households 100%-150% FPL
- ❖ Average energy affordability gap in dollar amount for energy burdened households 150%-200% FPL
- ❖ Percent energy burdened households of total occupied housing in a county

Layer 6

Home vintage and fuel type

Layer background

Percent of total housing units built pre-1990, with supporting detail on the county’s distribution of primary fuel types. Source: ACS 2012-2016 5-year estimates, table DP04.

Pop-up Window

ACS 2012-2016 5-year estimates, table DP04.

- ❖ Percent pre-1990 housing of total housing units



- ❖ Percent households of total occupied with electricity as primary fuel
- ❖ Percent households of total occupied with utility gas as primary fuel
- ❖ Percent households of total occupied with bottled, tank, or LP gas as primary fuel
- ❖ Percent households of total occupied with fuel oil, kerosene as primary fuel
- ❖ Percent households of total occupied with wood as primary fuel
- ❖ Percent households of total occupied with solar as primary fuel
- ❖ Percent households of total occupied with other as primary fuel

Layer 7

Ethnicity and race

Layer Background

The percent people of color by county. Source: ACS 2012-2016 5-year estimates, table B03002 *Hispanic or Latino Origin by Race*. See the Index description for more details on ethnicity and race.

Pop-up Window

- ❖ Percent White
- ❖ Percent people of color
- ❖ Percent Hispanic or Latino
- ❖ Percent Black or African American
- ❖ Percent American Indian and Alaska Native
- ❖ Percent Asian
- ❖ Percent Native Hawaiian and Other Pacific Islander
- ❖ Percent some other race
- ❖ Percent two or more races

Layer 8

Cost-effective energy savings across low-income households

Estimates of potential energy savings estimates through efficiency improvements across low-income households as calculated by the Energy Trust of Oregon.

Cost-effective potential energy savings were estimated by first calculating the technical achievable potential for energy savings across low-income households over the ten-year period. The technical achievable potential is the amount of energy that efficiency can theoretically be expected to displace assuming the most aggressive program scenario possible (e.g. providing end-users with payments for the entire incremental cost of more efficient equipment). This is often referred to as maximum achievable potential. Technical achievable potential takes into account real-world barriers to convincing



households to adopt efficiency measures without consideration of the cost of adopting efficient measures.

Technical achievable potential represents the sum of energy savings resulting from possible energy efficiency upgrades in a given house, including heating/cooling, appliances, weatherization, lighting, behavioral, and other measures that could theoretically be installed given the current vintage, type, and condition of homes. It includes all the theoretical energy savings that could occur in the specific type of housing unit (e.g. multifamily) relative to the average baseline condition for that unit type. The formula then reduces those savings by 15%¹ to account for real world market barriers.

Cost-effective achievable potential represents the same condition described above, but only includes savings from measures that were able to achieve a savings-to-investment ratio greater than one. This level of potential represents the amount of potential energy saved in kWh for electricity and in therms for natural gas. Individual measures were screened by converting annual energy savings in dollar amounts by applying an average statewide utility rate for each fuel and applying a societal discount rate for future bill savings. Individual measures were also screened by converting annual energy savings into CO₂ equivalents by applying conversion rates specific to Investor Owned Utilities and to BPA territory utilities.

NOTE: There is no guarantee that a household's energy spending or energy bill will definitely go down as a result of these upgrades, because of other factors that may be counteracting the energy efficiency efforts, including factors such as human behavior, energy prices, changing temperatures, and other external influences.

Allocation formula for energy savings per county was designed as follows. We divided the total amount of potential savings in low-income housing based on the proportion of low-income housing in each county. There are some counties that do not have access to natural gas. Thus, natural gas energy savings as a result of energy efficiency measures are not applicable in those counties. Yet, they are displayed as such in this assessment due to data limitations.

We would expect savings from cost-effective achievable potential to persist in low-income housing served by natural gas for 26.69 years and by electricity for 22.42 years based on the weighted average measure lifetime for each fuel.

Layer Background

Total potential cost-effective energy savings for households <80% AMI in dollar amount.

¹ Defining the achievable potential as 85 percent of the technical potential is the generally accepted method employed by many industry experts, including the Northwest Power and Conservation Council (NWPPCC) and National Renewable Energy Lab (NREL).



Pop-up Window

- ❖ Total energy savings in dollars
- ❖ Total energy savings in kWh
- ❖ Total energy savings in therms
- ❖ Total energy savings in CO₂e

Layer 9

Cost-effective energy savings in affordable housing

Cost-effective energy savings in affordable housing (OHCS multifamily and manufactured housing inventory) estimates were calculated by the Energy Trust of Oregon. See detailed methodology in Layer 8.

Affordable housing inventory of multifamily and manufactured homes may include households that are also households <80% AMI. Current available data makes it difficult to find the exact proportion of low-income households that are living in affordable housing. Thus, given this lack of mutual exclusivity between the measures, they should be used independently of one another.

We would expect savings from cost-effective achievable potential to persist in affordable housing served by natural gas for 27.21 years and by electricity for 23.47 years based on the weighted average measure lifetime for each fuel.

Layer Background

Total potential cost-effective energy savings in affordable housing in dollar amount.

Pop-up Window

- ❖ Total energy savings in dollars
- ❖ Total energy savings in kWh
- ❖ Total energy savings in therms
- ❖ Total energy savings in CO₂e

Layer 10

Federal and state energy assistance and weatherization programs

The layer shows Oregon's Community Action Agencies' (CAA) territories and total annual funding for FFY 2018 for weatherization and energy assistance programs by each CAA. This information was provided by the internal Energy Section at OHCS. Assistance programs presented in this layer include:



- ❖ Low Income Home Energy Assistance Program (LIHEAP), weatherization and bill payment assistance
- ❖ U.S. Department of Energy Weatherization Assistance Program (DOE)
- ❖ Bonneville Power Administration Low Income Weatherization Program (BPA)
- ❖ State Home Oil Heating Program (SHOW)

Pop-up Window

- ❖ Name of Community Action Agency
- ❖ Annual funding for each assistance program (**Value of “0” refers to the absence of a particular program in a given CAA territory**)
- ❖ CAA website and contact phone

Some CAAs cover multiple counties. However, we do not have information on energy assistance allocations by county.

Layers 11-14

Energy assistance and weatherization programs administered by electric and natural gas utilities

Information for these layers comes from an internal OHCS database that contains utilities’ self-reported information of administered energy assistance and weatherization funding. NOTE: Due to the self-reported nature of the information, some details about benefit amounts are unavailable in the data.

Layer Background

This layer shows the average annual benefit allocated per household based on the number of households that participated in energy assistance and weatherization programs in a given year. Because information was self-reported, it includes information from different years, however, the majority of energy assistance and weatherization funding allocation presented here is for FFY 2018.

Pop-up Window

- ❖ Utility name
- ❖ Utility rate
- ❖ Name of energy assistance programs
- ❖ Type of program (e.g. bill assistance, weatherization, etc.)
- ❖ Average annual household benefit in dollars (**value of “0” means data is N/A, not that no benefits were given**)
- ❖ Annual funding level in dollars (**value of “0” refers to information is N/A**)

Utility territories that do not have either energy assistance or weatherization programs are not displayed on the map.