



Opportunities for Energy Efficiency in Low-Income Michigan Housing

Louise Sharrow, Margaret Garascia,
and Tim Skrotzki

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Executive Summary

Michigan's nearly 10 million residents live in 4.5 million units of housing, which are as diverse and dispersed as the state itself. This housing can include multifamily apartment buildings in urban areas, single family homes in residential neighborhoods, or manufactured housing in a rural county. Each type of housing serves low-income families, whose numbers have grown since the Great Recession. This paper compiles a range of data sources to understand the breakdown of low-income households, housing type, and utility usage throughout the state of Michigan.

In order to drive investments in energy efficiency, renewable energy, and water conservation, it is paramount to understand the existing residential building stock. Such analysis is important and timely because it can be used to estimate the potential for renewable energy investments; develop a pipeline of available buildings in a given geography; and communicate to implementers, funders, and advocates the widespread need for interventions like energy and water retrofits and distributed generation and storage.

This paper demonstrates that whether urban or rural, nearly 47% of Michigan's 3.5 million households are considered low-income, i.e., they earn 80% of the

area median income (AMI) for their metro area or rural county.

To understand the patterns of where these 1.7 million low-income Michigan households live and work, this paper takes a county-based approach. Michigan consists of 83 counties, and nearly 20% of Michigan households live in a rural county. Specifically, this analysis highlights six counties which account for a quarter of the state's households; two of them are urban and four are rural; and they represent the Detroit area, southwest Michigan, central Michigan, and the Upper Peninsula. Affordable housing in urban areas is dominated by multifamily apartment buildings and single family homes. Rural counties are more likely to contain affordable single family and mobile homes.

Michigan's residential energy consumption¹ ranks higher than the regional and national average despite not being the coldest state in that region. Thus, there is a great deal of efficiency opportunity remaining in Michigan to help bring usage and expenditure closer to the national average. High electric prices point to the potential of high energy burdens on low-income households. Multifamily units in Michigan are dominated by renters, and often susceptible to the split incentive problem, wherein the person who has power to make

efficiency upgrades to a system does not receive the resulting utility bill savings, and therefore has less incentive to spend money on improvements.

Programs to incentivize energy savings, water efficiency, and solar energy will have different approaches and designs depending on whether they are for rural housing, multifamily units, or single family homes. This research identifies significant diversity in households and housing stock between rural and urban Michigan, higher energy costs relative to the rest of the country and region, and the limited number of energy programs available to help these families. To achieve energy and cost savings across the state, Michigan needs a multipronged strategy that delivers utility cost savings that will reduce water, electric, natural gas, and/or propane costs designed to reach each unique community. There are proven interventions that can accomplish the goal of reducing the energy utility costs for a diverse housing sector. These interventions include comprehensive energy and water retrofits and community solar implemented at scale. Successful intervention would make Michigan families more energy secure, resulting in benefits such as reduced poverty, a stronger economy, and more resilient communities.

1. Electricity, natural gas, propane, fuel oil/kerosene, and propane. Energy Information Administration - Residential Energy Consumption Survey, 2009.

Purpose

This paper seeks to demonstrate the size of the low-income housing market in Michigan in order to drive investments in energy efficiency, renewable energy, and water conservation. To make the case for these investments, it is paramount to understand the existing residential building stock, which typically accounts for a significant portion of a given city or state's energy consumption. Such analysis is important and timely because it can be used to estimate the potential for energy efficiency and renewable energy investments; develop a pipeline of available buildings in a given geography; and communicate to implementers, funders, and advocates the widespread need for interventions like energy and water retrofits and distributed generation and storage.

This paper is aimed at low-income advocates, champions of energy efficiency and renewable energy, leaders in affordable housing, and their funders. A secondary audience is community leaders, elected officials, and others who want to learn more about the housing stock in their area and the extent to which it serves low-income Michiganders.

Substantial changes in the energy industry are already underway, prompted by a mix of factors including declining prices for solar photovoltaic panels and natural gas; international, federal, and state regulations; and increasing competition for customers within the utility industry. Over the next seven years, Michigan will lose more than 5,000 megawatts of coal-

fired generation as aging plants are decommissioned in response to regulations and changing economics.² Michigan's need to retire aging infrastructure and replace it with newer and cleaner sources of generation, as well as reduce demand, creates an opportunity to simultaneously address the climate crisis, assure that low- and moderate-income communities are accessing these clean energy investments, and create high-paying clean energy jobs for millions of un- and underemployed workers.

Michigan has made significant progress in promoting clean energy. The state's 2008 energy efficiency standard continues to outperform its goals. According to the Michigan Public Service Commission, the Energy Optimization Standard provided \$4.35 in benefits for every dollar spent in 2015, and will provide lifecycle benefits of \$1.08 billion to customers.³

These benefits of clean and affordable energy, however, are largely reaching upper-income communities and the corporate sector, while low- and moderate-income communities struggle with a high energy burden and face barriers to participating in the clean energy economy. For example, recent research from University of California, Berkeley indicates that of the \$18 billion spent on federal clean energy tax credits, only 10% went to households in the bottom three income quintiles.⁴ These investments, which include energy efficient windows, furnaces, air conditioners, water

heaters, insulation materials, and photovoltaic systems, are the foundation of many state and utility energy efficiency programs. The solar energy boom has been slow to reach lower-income households: only 5% of solar installations, for example, have been for households earning less than \$40,000 per year.

Michigan's nearly 10 million residents live in 4.5 million units of housing, which are as diverse and dispersed as the state itself. This housing can include multifamily apartment buildings in urban areas, single family homes in residential neighborhoods, or manufactured housing in a rural county. Each type of housing serves low-income families, whose numbers have grown since the Great Recession. This paper compiles a range of data sources to understand the breakdown of low-income households, housing type, and utility usage throughout the state of Michigan. This data is presented in three ways for this paper: statistics for the state of Michigan overall, at the County level, and by investor-owned utility territory.

This paper begins with an explanation of the public datasets that are used and how the authors define affordable housing and low-income households; next, it examines the low-income population and residential building stock by state, utility, and county; the paper includes a discussion of the energy efficiency programs aimed at low-income residents; and it concludes with considerations to deliver affordable energy to even more low-income Michigan households.

2. MLive: http://www.mlive.com/news/index.ssf/2016/11/michigans_biggest_electric_pro.html ; RTO Insider: <https://www.rtoinsider.com/michigan-energy-bill-35641/> ; The Detroit Free Press: <http://www.freep.com/story/money/business/michigan/2015/10/10/25-michigan-coal-plants-set-retire-2020/73335550/>

3. Talberg, et al, Michigan Public Service Commission. 2016 Report on the Implementation of P.A. 295 Utility Energy Optimization Programs. http://www.michigan.gov/documents/mpsc/2016_Energy_Optimization_Report_to_the_Legislature_with_Appendix_Nov_30_543919_7.pdf

4. Borenstein and Davis, 2015: The Distributional Effects of U.S. Clean Energy Tax Credits. NBER Tax Policy and the Economy, University of Chicago Press: 30(1), 191 - 234 (2016)

Methodology

Several data sets are analyzed to explore the residential landscape in Michigan. Data is focused on three topic areas: 1) low-income population, 2) housing stock, and 3) energy usage. The data is also analyzed at three geographic levels: 1) statewide, 2) investor-owned utility territory, and 3) county. Data sources are updated at different intervals, so this analysis is completed using 2014 data in most cases in order to use a common year that is available in all sources.⁵ Table 1 shows the data sources used and what topics they cover.

Low-Income Population

“Low-income households” is a group often discussed but not always similarly defined. For this paper, three definitions of “low-income” are referenced: households at or below 50% of the area median income (AMI), at or below 80% of the area median income, and at or below 200% of the Federal Poverty Level (FPL) Guidelines. AMI is a designation set by the U.S. Department of Housing and Urban Development (HUD), established for every metropolitan statistical area (MSA) and for each county outside of an MSA. The FPL is established by the U.S. Department of Health and Human Services. Both AMI and FPL are recalculated every year, and each set different thresholds for every size household. AMI is typically used for housing rather than FPL because it better reflects local market conditions, while FPL is the same across all states and jurisdictions. This means

Table 1, Data Sources

Source	Topic
American Community Survey (ACS) ⁶	Unit Counts, Household Counts, Income, Utility Payment, Heating Fuel
National Housing Preservation Database (NHPD)	Subsidized Housing (mainly multifamily)
U.S. Department of Housing and Urban Development (HUD)	Area Median Income and Income Limits ⁷
U.S. Department of Health and Human Services (HHS)	Federal Poverty Guidelines
New Market Tax Credit (NMTC)- Novogradac data	Low Income Census Tract Designations ⁸
Platts Shapefiles	Investor-Owned Utility (IOU) Territory ⁹
Michigan Public Service Commission (MPSC)	Utility Filings, Prices
Energy Information Administration (EIA)/ Residential Energy Community Survey (RECS)	Energy Consumption and Average Prices
U.S. Office of Management and Budget (OMB)	Metropolitan Statistical Area (MSA) Metro/Urban Designations

that in some areas, FPL may include more households than 80% or 60% AMI, while in other areas it does not. This has significant implications for establishing program budgets, eligibility, and outreach.

These three definitions were chosen for this paper as they align with various industry standards and program eligibility requirements. The federal Weatherization Assistance Program and many utility programs use 200% FPL, 50% AMI is designated as “very” low-income and therefore is used as a threshold for some affordable housing programs, and 80% AMI is generally considered the upper threshold for low-income by most

advocates and housing practitioners. Using American Community Survey (ACS) data on household income, we determined how many households at each census tract would qualify under various definitions of low-income. These counts are then summed up at the county, MSA, IOU, or state level.

Table 2 shows the national and statewide income thresholds for reference and comparison. These numbers were not used for calculation and are included here only for context.

Low-income household estimates used the area median incomes, which vary from MSA to MSA and

5. The EIA data is the main exception to this- RECS data is only available for 2009, while energy price data is from 2016. MPSC may include more recent data as well.
 6. 2014 5-Year Estimates. Our analysis, based on NHPD, finds that ACS data may undercount units in large multifamily buildings. When evidence suggests that ACS is an undercount, we use our internal analysis for total units. For example, ACS may indicate a particular census tract has 80 units. However NHPD provides information on a building in that tract which has 100 units. Going forward with analysis, we will assume this tract has 100 units, as NHPD has more granular data on particular multifamily buildings.
 7. 2014 Income Limits were used in this analysis, to align with the most recently available ACS and NHPD data.
 8. NMTC Designations are based on 2010 Census data. No more recent designations are available from NMTC.
 9. Platts shapefiles are available only for IOU territories and do not provide territory files for cooperative or municipal utilities, so those are not included in this analysis.

therefore from county to county. For example, the 80% AMI threshold for a 4-person household in the Detroit metro area is \$51,700, while Houghton County has a lower threshold of \$42,250. These thresholds are based on actual area income and reflect market characteristics. So while the “low-income” households in each area may be making slightly different amounts, they are considered low-income in relation to their neighbors and to housing prices in their area. As you can see, 200% of FPL falls below the Detroit AMI but above Houghton County’s.

Housing Stock

Housing stock analysis used a combination of American Community Survey (ACS) data on units by building size, National Housing Preservation database (NHPD) data on specific subsidized buildings, and New Markets Tax Credit (NMTC) designations

Table 2, 2014 Income Thresholds, for a 4 Person Household

	\$25,000	\$50,000	\$75,000
National Median Family Income (HUD)		\$63,900	
Michigan Median Family Income (HUD)		\$60,400	
80% Michigan Median Income (HUD)		\$48,300	
200% Federal Poverty Level (HHS)		\$47,700	
50% Michigan Median Income (HUD)		\$30,200	

of low-income areas. This allowed analysis around two main categories: **A. Size.** ACS provided unit counts by building size category, at the census tract level. Five building size/type categories are used here: single family homes (this includes attached and detached structures), buildings of 2 to 4 units, 5 to 49 units, more than 50 units, and then housing types categorized as “Other” in the Census,

which includes mobile homes, boats, RVs, etc. This data is inclusive of occupied and vacant units.

B. Affordability. Following standard industry definitions, a housing unit is considered affordable if it serves individuals at or below 80% of AMI. This is determined in two ways:

- If the unit receives any type of housing subsidy¹¹, it is automatically considered

Geographic Designations

Running analysis on American Community Survey (ACS) census data relies on a number of specific geographic breakdowns that are not in common usage. Here are some definitions that may be helpful:

Census Tract:¹⁰ A census tract is a “statistical subdivision” of a county used as an area of analysis by the Census. It allows analysis at a much smaller level than a County, providing more geographical nuance and also allowing better matching to non-County borders such as utility territories. Census tracts are typically between 1,200 and 8,000 people. The state of Michigan has 2,913 total census tracts across 83 counties, ranging from rural counties with 3 or 4 tracts to 611 in Wayne County.

Metropolitan Statistical Area (MSA): An MSA is a geographical area that is focused around one or several main cities. It typically contains several counties around a center city and the name of the MSA reflects the main cities in that area. For example, the Lansing-East Lansing MSA contains Eaton, Clinton, and Ingham counties. MSA designations are set by the U.S. Office of Management and Budget.

Urban/Metro/Rural: There are many ways to distinguish between urban and rural areas. For the purposes of this paper, in order to align with AMI methods, we refer to counties as “rural” if they are not a part of a designated MSA. Any county within an MSA is counted as a “metro” county for this analysis. MSA designations alone do not differentiate between center city/urban areas as opposed to suburban areas, so for this paper we are simply using the two designations of “metro” and “rural.”

10. U.S. Census Bureau, Geographic Terms and Concepts https://www.census.gov/geo/reference/gtc/gtc_ct.html

11. As determined by NHPD- see Methodology section above for more details.

12. Housing subsidies included in NHPD include: Low Income Housing Tax Credits, Section 8 property-based vouchers other HUD subsidies including 202, 236, & FHA, Rural Housing subsidies including 515 and 538, HOME, and public housing. It does NOT include single family mortgage insurance or other single family mortgage programs, or Section 8 tenant-based housing vouchers.

affordable. This information was provided by NHPD, which tracks a wide range of federal housing subsidies by building.¹² However, NHPD's subsidy data for single family, 2-4 unit, and "Other" buildings is not as robust so subsidy data is presented here only for multifamily buildings.

- Units are also considered affordable if they are located in low-income census tracts, as determined by the New Market Tax Credits program. While rents are rising and may be above the 30% threshold in these areas, the units are housing low-income residents and therefore fall within the affordability definition for these purposes. These units are what is often referred to as "unsubsidized" or "naturally occurring" affordable housing: units that have affordable rent due to location and building age/condition but not through a housing subsidy. It is also likely that many of these "unsubsidized" units are home to renters who are receiving individual housing assistance through the Housing

Choice Voucher (Section 8) rent assistance program—data was not available to track voucher use by area or building type.

Additionally, ACS data was used to identify the split of renter and owner-occupied units, and was combined with Platts territory shapes and OMB MSA designations to assign units to the different geographic designations.

Energy

Energy consumption data is not available at the same level of detail as the other data sets. In order to understand consumption, utility and state-level data was examined from the EIA surveys and price data and utility filings with the Michigan PSC. ACS data identifying what fuel is used for heating, and whether or not renter households pay anything extra for utilities (as opposed to having all costs paid by owner or "invisibly" included in the rent), allows greater understanding of energy differences between states and counties. In general, past studies suggest that multifamily homes use more energy per square foot than single family, though larger multifamily tend to be

more efficient than small multifamily buildings. This is balanced by the fact that single family homes tend to have more square feet per unit.¹³ This same pattern is seen when comparing rental housing to owner-occupied housing: rental housing tends to have higher energy use per square foot than owner-occupied, though less total consumption because the units are smaller (whether multifamily or single family).¹⁴ Usage per square foot is important because it highlights opportunities for efficiency better than total consumption. While we are aware of these patterns generally, the data was not available to confirm if they remain true across Michigan.

To obtain utility territory estimates, every census tract in Michigan was assigned to a territory using Platts geographic shapefiles. If a majority of a census tract fell within that territory's shapefile, the tract is considered part of that utility and therefore all households and housing units in that tract are assigned to that utility. However, data is not available on every household in that territory to know if they are using an alternative supplier, off-grid, or other means of obtaining energy.

13. National Multifamily Housing Council, [http://www.nmhc.org/News/Research-Notes--Are-Apartments-Energy-Efficient--\(June-2013\)/](http://www.nmhc.org/News/Research-Notes--Are-Apartments-Energy-Efficient--(June-2013)/) and http://www.nmhc.org/uploadedFiles/Final_Govt_Affairs_Research_Insight_Content/Research-Reports/Obrinsky-and-Walter-Energy%20Efficiency%20in%20Multifamily.pdf; Natural Resources Defense Council, <https://www.nrdc.org/experts/khalil-shahyd/study-highlights-energy-burden-households-and-how-energy-efficiency-can-help>

14. Joint Center for Housing Studies of Harvard University. American's Rental Housing, 2013. http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/carliner_research_brief_0.pdf

Statewide Analysis

This section explores the results of this analysis at the statewide level, as well as some comparison between counties in designated metropolitan areas and rural counties (see Geographic Designations box above). Later sections examine the same analysis at the utility territory and county levels for more detailed and localized understanding of patterns and differences.

Michigan's Low-Income Population

Michigan has 3.8 million total households, of which almost half (46%) are considered low-income using the 80% AMI definition. Table 3 above shows the income breakdowns for the state, as well as how they compare across rural or metro counties. Rural counties are home to 20% of all Michigan households, slightly above the national percentage of 16% of households in rural counties. While there are fewer low-income households in rural counties than in metro

Table 3, Total Low-Income Households

	All Counties	Rural Counties	Metro Counties
Total Households	3,827,880	779,302	3,048,578
50% AMI	1,124,961 (29%)	228,202 (29%)	896,759 (29%)
200% FPL	1,492,390 (39%)	332,343 (43%)	1,160,047 (38%)
80% AMI	1,764,578 (46%)	358,833 (46%)	1,405,745 (46%)

counties as they make up less of the population overall, the distribution of income levels is quite similar. In both rural and metro counties 46% of households are considered low-income at the 80% AMI standard, and more than half of those (29% of total households) are considered "very" low-income at the 50% AMI threshold. Note that the percentages are cumulative and therefore not mutually exclusive – i.e., all of the households at 50% AMI are included in the percentage below 80% AMI. The population at 200% of FPL fluctuates more. This is likely the result of area median incomes being closer or further from the FPL depending on

the area (see Methodology section for more details).

Michigan's Housing Stock

Table 4 displays how housing units are distributed across several housing types, and how location concentrations and ownership type vary across building size categories. Michigan contains over 4.5 million total housing units (vacant and occupied), an average amount for the region.¹⁵ Of these, more than a third of the units are affordable, and

Table 4, Unit Distribution by Building Size Category for the State of Michigan

	Total Units*	Percent Affordable	Percent of Affordable Units with Subsidy*	Percent Renter-Occupied^	Percent in Rural Counties
All Building Types	4,649,049	37%	12%	28%	23%
Single Family (SF)	3,465,677	31%	N/A	15%	24%
2 to 4 unit building	238,046	55%	N/A	83%	16%
5 to 49 unit building	451,725	45%	13%	93%	12%
50+ unit building	243,614	87%	86%	95%	11%
Other housing types#	249,987	37%	N/A	21%	43%

*Total unit counts represent both occupied and vacant units, as well as NHPD overcounting discussed in methodology.

"Other" building types includes Census categories for mobile home and for boat, RV, van, etc.

+ NHPD does not provide subsidy data on small buildings or "other" building types- these units certainly receive subsidies but no data at a sub-state level was available for this analysis.

^ This represents the percentage of all occupied units in that size category which are occupied by renters, rather than owners- it does not account for vacant units.

15. Illinois and Ohio contain more units while Minnesota and Wisconsin have quite a bit fewer- IL, OH, and MI are in the top ten of all states for number of units.

more than a quarter are occupied by renters. Rural counties contain almost a quarter of the housing units. Overall, every building type is represented in all areas and categorizations. The main anomaly to that is the “Other” category of housing, which is predominately rural—even though only 20% of total units are in rural areas, 43% of the “Other” units are in rural counties.

Figure 1 below shows size categories by location type. Single family is the predominant housing type in all areas, but is less likely than larger buildings to be affordable or occupied by renters. Large multifamily buildings have the highest percentage of affordable and renter-occupied units by building type, and also are predominately subsidized housing of some type. Overall, affordable housing is more diversified across

building types, particularly affordable housing in metro areas. This suggests that any programs meant to serve low-income households need to be inclusive of all building sizes. This is important because different building types have different energy and programmatic needs. For example, 50+ unit buildings are very likely to have commercial-scale equipment, while single family homes will have individual systems—different contractors and programs serve those equipment types. Buildings with 2 to 4 units may or may not be considered multifamily depending on program requirements, and are more likely to be owned by individuals than companies as compared to the larger multifamily.

For both energy efficiency and affordability, the renter designation is very important. Renters have less

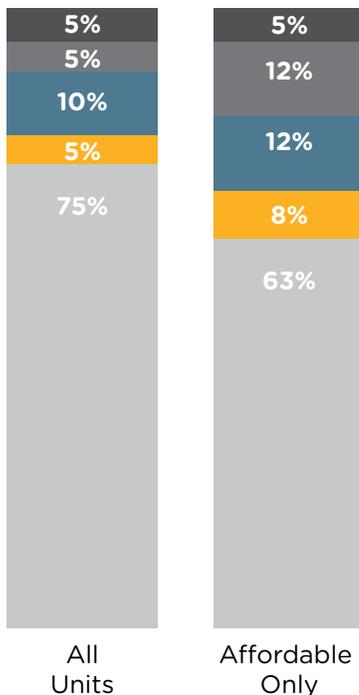
control over making changes to their homes, and as rents across the country rise they are vulnerable to increasing costs of housing. For single family homes, homeowners likely have more programs available to them than renters, while in multifamily homes programs which only target renters in an individual unit are not able to address all the energy issues. Multifamily bill payment varies as well, and if renters pay their own bills (often the case, particularly with electricity) it reduces the incentive for the owner to make upgrades. Often, water is the only utility a multifamily building owner will pay. As seen in Figure 2, multifamily units are dominated by renters while single family and other housing types are more likely to be occupied by their owner, but all housing types contain renter populations that need to be addressed differently.

Figure 1, Distribution of Units by Building Size

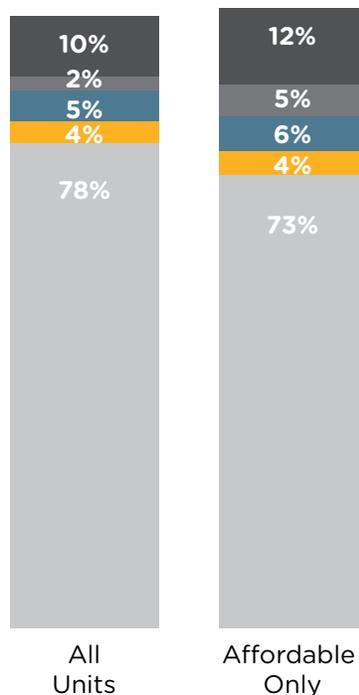
Building types:

Single Family 2 to 4 unit building 5 to 49 unit building 50+ unit building Other

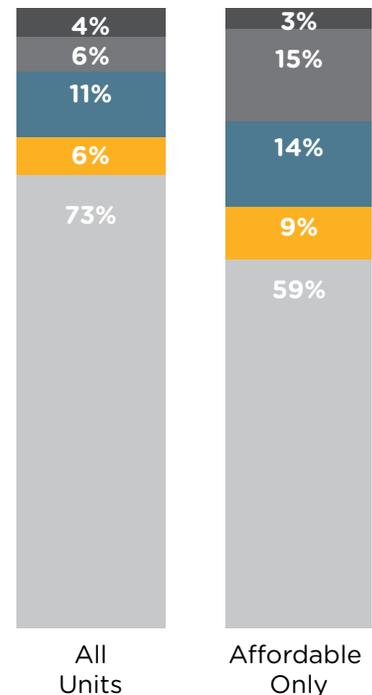
Statewide Distribution of Units by Building Size



Rural Counties



Metro Counties



Michigan Energy

Table 5 displays energy data for the state of Michigan, and how it compares to the rest of the region.¹⁶ Regionally and nationally, Michigan is above average on residential energy consumption¹⁷ and energy expenditure, although it is below average on consumption of electricity (approximately 7% higher per household annual consumption than other states in the region, and 38% higher than the national average). It also has older homes on average and more homes heated with gas, all of which interacts to contribute to higher combined consumption. Even though gas prices in Michigan are more moderate than electric prices, which are the highest of all 5 states in the region, total expenditure is still above average—since Michigan homes are smaller than other regional states on average, consumption per square foot and overall is a main contributor to these higher costs.¹⁸ This indicates that there is a great deal of efficiency

opportunity remaining in Michigan to help bring usage and expenditure closer to the national average. High electric prices point to the potential of high energy burdens on low-income households.

Another key energy statistic that is relevant to low-income households is the percent of renters paying for one or more utilities. When renters pay for utilities, including electricity, gas, and water, it introduces a split-incentive problem in which the person who has power to make efficiency upgrades to a system does not receive the resulting bill savings, and therefore has less incentive to spend money on improvements. This is especially common in multifamily buildings, though multifamily building owners are likely to at least pay a water bill. As shown above, multifamily units are dominated by renters and also a significant portion of the affordable housing in the state, so understanding the scenarios when the split incentive is present is important in designing effective programs.

Figure 2, Units by Building Size, by Occupancy

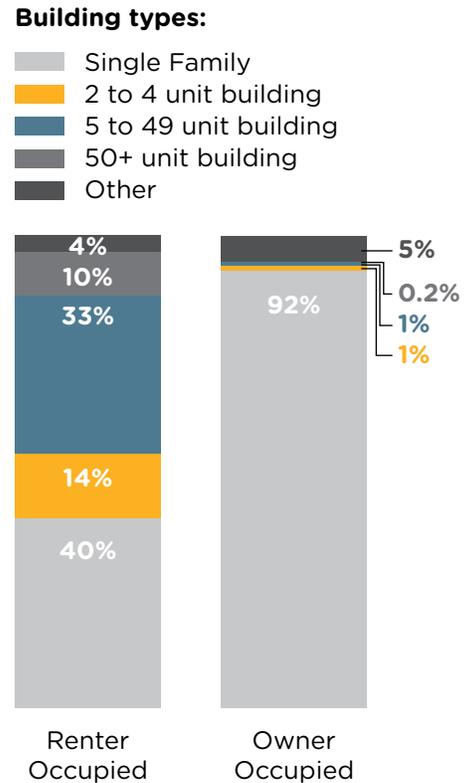


Table 5, Energy Data for Michigan and the surrounding Region

	Average Energy Consumption* (BTU/household)	Avg. Electricity Consumption* (kWh/home/yr)	Average Annual Household Energy Expenditure*	Average Retail Electric Price (cents/kWh)^	Average Retail Gas Price (\$/Mcf)^
Michigan	123 million	~8,500	\$2,100	14.87	8.14
Region+	~115 million	~10,000	~\$1,100	12.33	8.3

	Heating with Utility Gas **	Heating with Electricity**	Percent of Renters Paying One or More Utilities**	Percent of Rural Renters Paying One or More Utilities**	Percent of Homes Built Before 1980
Michigan	77%	8%	90%	86%	74%
Region+	71%	17%	90%	n/a	69%

+ East North Central Census Region: Illinois, Indiana, Michigan, Ohio, and Wisconsin

*Residential Energy Consumption Survey, 2009

^U.S. EIA 2016 Price Rankings. Electricity only available monthly - average of January 2016 and January 2017 prices. Gas available annually, 2016 average.

** American Community Survey, 2015 5-year Estimates

16. Michigan is part of the Census East North Central division, which includes Illinois, Indiana, Ohio, and Wisconsin as well as Michigan.

17. Electricity, natural gas, propane, fuel oil/kerosene, and propane. Energy Information Administration - Residential Energy Consumption Survey, 2009.

18. Energy Information Administration, <https://www.eia.gov/state/rankings/#/series/28> and https://www.eia.gov/dnav/ng/ng_pri_sum_a_EPGO_PRSDMcf_a.htm

Investor-Owned Utility Analysis

According to filing data, Michigan has nine investor-owned electric utilities and ten investor-owned gas utilities. Of those investor-owned utilities (IOUs), three provide both electricity and gas: DTE Energy (DTE), Consumers Energy (Consumers), and Northern States Power (Xcel). For this paper, those utilities' electric and gas territories are examined separately. This means that the numbers for Consumers-electric and Consumers-gas include overlapping customers as some people will receive both gas and electric from the same utility, yet be counted separately for the two fuel-type territories. This method was chosen due to the nature of the data available, and because programs are designed and budgeted by fuel. Platts shapefiles do not include municipal or cooperative utilities, so those

companies are not included in this analysis, though their customers are likely to be included in the "no utility" category. According to the Michigan Public Service Commission, around 320,000 households use propane for heat, typically also receiving electricity from a cooperative. There are approximately 10 electricity cooperatives, and at least 40 municipal electric cooperatives in the state.

Details for some of the larger IOUs and those with a high percentage of affordable housing are found below in Tables 6 and 7. The remaining data can be found in Appendices 2 and 3. DTE Energy and Consumers Energy territories cover the greatest number of households, serving over 1.5 million households each. DTE Energy's electric territory comprises

slightly more households than Consumer's electric, while there are slightly more households in Consumer's gas territory than DTE Energy's gas territory (formerly/also known as Michigan Consolidated Gas Co.). These utilities also serve the greatest number of low-income households because of their territory sizes. However, when considering low-income households and affordable housing as a percentage of total households in a territory, the picture is rather different. Northern States Power (Xcel Energy) and areas with no utility have among the highest percentages of low-income households for both gas and electric utilities at over 50%, and high affordable housing at over ¾ of units being affordable. Peninsular Gas and DTE Energy's gas

Table 6, Low-Income Population and Affordable Housing for Selected Utility Territories**

Utilities are shown in rank order by total households.

	Total Households	Percent below 50% AMI	Percent below 80% AMI	Percent below 200% FPL	% Affordable Housing Units
Electric IOUs					
Consumers Energy Co.	1,624,072	28%	45%	40%	37%
Detroit Edison Co. (DTE)	1,805,314	30%	47%	37%	36%
No Electric Utility	149,682	38%	55%	47%	55%
Indiana Michigan Power Co. (AEP)	132,299	27%	44%	40%	31%
Northern States Power Co. (Xcel)	6,279	38%	53%	53%	82%
Gas IOUs					
Consumers Energy Co.	1,833,909	26%	42%	35%	28%
DTE (Michigan Consolidated Gas Co.)	1,273,728	35%	52%	44%	51%
SEMCO Energy Gas Co.	364,287	27%	44%	38%	29%
Citizens Gas Fuel Co.	21,551	29%	48%	42%	26%
Presque Isle Electric & Gas Coop, Inc.	8,082	28%	43%	43%	100%
Peninsular Gas Co.	4,339	34%	52%	52%	73%

** This table displays data for selected utilities. The full table can be found in Appendices 1 and 2.

Table 7: Pricing and Fuel Use for Selected Utility Territories**

Utilities are shown in rank order by 2017 rate.	2017 Residential Rate*	2014 Residential Rate*	Percent Renters Paying Nothing Extra for Utilities^	Percent Heating with Electricity^	Percent Heating with Utility Gas^
Electric IOUs					
	cents per kWh	cents per kWh			
Upper Peninsula Power Co.	24.01	22.76	23%	58%	8%
Detroit Edison Co. (DTE)	16.38	14.61	9%	86%	8%
Wisconsin Electric Power Co.	16.35	15.06	17%	50%	5%
Consumers Energy Co.	15.78	15	11%	69%	9%
Northern States Power Co. (Xcel)	13.39	12.78	24%	63%	6%
Indiana Michigan Power Co. (AEP)	12.36	10.85	10%	64%	14%
Gas IOUs					
	\$/ccf - 2017	\$/ccf - 2014			
Presque Isle Electric & Gas Coop, Inc.	0.87	1.00	10%	44%	4%
DTE (Michigan Consolidated Gas Co.)	0.72	0.79	11%	77%	8%
Consumers Energy Co.	0.61	0.80	9%	80%	8%
Northern States Power Co. (Xcel)	0.57	0.82	25%	65%	5%
SEMCO Energy Gas Co.	0.54	0.81	14%	69%	9%

*MPSC Average Rates Filings, Feb 1,2017 and Dec 1,2014 Data <http://www.dleg.state.mi.us/mpsc/electric/download/rates1.pdf> and <http://www.michigan.gov/mpsc/0,1607,7-159-16385-41446--,00.html>

^ACS 2014 5-Year Estimates

** This table displays data for selected utilities. The full table can be found in Appendices 1 and 2.

territory also have high percentages of low-income households. Northern States and Presque Isle, both in the Upper Peninsula, also have very high percentages of affordable housing in their territory at over ¾ of units, along with DTE Energy, Wisconsin Electric Power, and Aurora Energy.

Fuel rates vary significantly across the state. While rates change regularly, a comparison of current rates and 2014 rates from MPSC data show some relevant patterns. The two largest utilities do not have the highest energy prices. For electric utilities, it appears that Upper Peninsula Power Co. has had the highest rates, with Wisconsin Electric Power, DTE Energy, and Consumers Energy following (not always in that order). Gas utility rate patterns are less consistent across the

two years, but Presque Isle Electric & Gas has the highest rates at both time points, while Michigan Gas Utilities Corp and Northern States (Xcel) have the lowest (this data includes only those gas utilities whose rates are set by the MPSC, which excludes Aurora, Citizens, and Superior). It is interesting to note the overlap of high fuel rates and high proportions of low-income households in some utilities, such as DTE Energy and particularly those with a smaller customer base such as Presque Isle Electric & Gas. This is an important consideration to identify areas and households which may often have a significant energy burden. Focus is often on the two largest utilities but it is clearly important to ensure the smaller companies are also properly funding support to these households in order to address relative burdens.

Table 8 examines the breakdowns of housing type by utility territory. These tables focus on the two largest utilities as well as areas with no designated IOU—served by municipal utilities, cooperatives, or other types of fuel that are not on the grid, such as propane tanks. Tables for the remaining utilities are available from the authors by request. Again, gas and electric territories of dual fuel companies are examined separately and cannot be added together, as many households will be represented in each if they receive both fuels from the same company. It is interesting to note that smaller multifamily buildings are still predominately affordable outside IOU territories, and that at least 1 in 10 single family homes are renter occupied.

Table 8, Housing Distribution for Major Utilities

Consumers Energy-electric

	Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types	2,004,700	37%	26%
Single Family	1,501,570	31%	13%
2 to 4 unit building	92,246	53%	87%
5 to 49 unit building	175,152	46%	96%
50+ unit building	82,598	90%	95%
Other building types	153,134	41%	22%
Percent of tracts in rural counties		33%	

Consumers Energy-gas

	Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types	2,087,227	28%	28%
Single Family	1,556,473	21%	13%
2 to 4 unit building	87,428	41%	83%
5 to 49 unit building	236,404	37%	93%
50+ unit building	109,818	84%	97%
Other building types	97,104	31%	20%
Percent of tracts in rural counties		10%	

Detroit Edison (DTE) -electric

	Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types	2,114,861	36%	30%
Single Family	1,561,963	30%	16%
2 to 4 unit building	113,803	55%	80%
5 to 49 unit building	235,247	43%	91%
50+ unit building	135,522	84%	95%
Other building types	68,326	28%	19%
Percent of tracts in rural counties		3%	

DTE - gas (MI Consolidated Gas)

	Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types	1,675,130	51%	31%
Single Family	1,230,659	46%	18%
2 to 4 unit building	102,468	69%	82%
5 to 49 unit building	150,304	58%	93%
50+ unit building	101,922	90%	94%
Other building types	89,777	47%	21%
Percent of tracts in rural counties		23%	

No Electric IOU

	Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types	186,725	55%	37%
Single Family	129,278	50%	20%
2 to 4 unit building	15,931	68%	82%
5 to 49 unit building	20,814	54%	91%
50+ unit building	15,709	91%	98%
Other building types	4,993	49%	22%
Percent of tracts in rural counties		48%	

No Gas IOU

	Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types	135,731	47%	33%
Single Family	97,114	42%	15%
2 to 4 unit building	10,358	70%	88%
5 to 49 unit building	15,075	41%	94%
50+ unit building	6,552	81%	82%
Other building types	6,632	67%	22%
Percent of tracts in rural counties		55%	

*Tables for remaining utilities available from authors by request.

Low-Income Efficiency Programs

Low-income renters and homeowners have access to several options for improving the energy efficiency of their home. There are several utility-provided programs, as well as nonprofit-provided programs and nonprofit and for-profit financing programs. This report will not provide an exhaustive list, but focus on the main programs that low-income households may benefit from.

Utility Programs

Prior to 2008, there were no energy efficiency programs in Michigan. In October of 2008, the Michigan legislature passed Act 295 requiring all Michigan gas and electric utilities to provide energy optimization (EO) programs to their customers and to set increasing energy saving goals. Under that law, utility-provided efficiency options for low-income customers have increased. Most of these programs define income-eligibility as 200% FPL. Based on our analysis, that is approximately 1.5 million people or 39% of all Michigan households. DTE Energy and Consumers Energy, Michigan's largest energy suppliers, have taken significant strides towards providing low-income residents with energy efficiency assistance programs that aim to lower utility costs for consumers.

DTE Energy's Energy Efficiency Assistance Program provides services to help low-income individuals reduce their monthly utility bill. In 2014, DTE helped decrease 550,000 electric and 300,000 gas bills through their residential energy efficiency programs. Eligible customers must go through approved weatherization

agencies, nonprofit organizations, or local governments to receive assistance. This program provides equipment tune-up or replacement and an energy audit with rebates for improvements. However, many of the measures under this program may be less accessible for renters as they would likely need landlord approval for any significant equipment or building envelope changes. DTE's multifamily program is not targeted specifically for affordable housing or low-income customers, but it does provide incentives for tenants (direct install of free energy-saving products) as well as rebate incentives to encourage building owners to make additional improvements that would benefit tenants and common areas. Thirty-seven percent of households in DTE Energy's electric territory and 44% of households in their gas territory would qualify for low-income programs at the 200% FPL threshold, a significant portion of their customers.¹⁹

Consumers Energy's electric territory has 40% of households eligible under 200% FPL, and 44% of gas households. As with DTE, this is well upwards of 650,000 customers.²⁰ Consumers Energy has two programs that are specifically targeted towards low-income households—the Consumers Affordable Resource for Energy (CARE) and the Helping Neighbors Program. The CARE program provides payment assistance to customers with past-due balances, and also includes access to energy-saving tools and in-home energy efficiency upgrades. The Helping Neighbors Program offers free installation of high-efficiency measures and educational information to aid customers in saving energy and money. In 2012,

DTE Energy's Energy Efficiency Assistance Program provides services to help low-income individuals reduce their monthly utility bill. In 2014, DTE helped decrease 550,000 electric and 300,000 gas bills through their residential energy efficiency programs.

19. DTE Energy. Save Energy. <https://www.newlook.dteenergy.com/wps/wcm/connect/dte-web/home/save-energy/residential/incentives+and+programs>

20. Consumers has 650,000 households at 200% FPL in electric territory and 560,000 households in their gas territory, but many of these may be the same households in areas where Consumers provides both electric and gas, so we cannot identify the total number. In DTE the same overlap is present. Electric territory contains 668,000 households at 200% FPL and 560,000 in gas territory.

Many of Michigan's other utilities—investor-owned as well as municipal and co-ops—use the nonprofit Efficiency United (EU) to administer their energy efficiency programs. EU's Energy Efficiency Assistance Program provides weatherization products and services to low-income residential customers in need.

the program successfully provided energy efficiency assistance to over 20,000 households (that is less than 3% of the total households falling under the eligible income threshold, though of course not all of those households would qualify for the program for other reasons such as housing type, living in multifamily units, etc.).²¹ Consumers also has a multifamily program. As with DTE Energy it is not targeted to affordable housing or low-income tenants exclusively, and provides free unit incentives that reduce tenant bills and incentives for larger improvements that may reduce tenant and/or owner bills. Consumers Energy does provide an additional 50% rebate in qualified buildings with rent subsidies, providing an extra boost for owners of buildings with low-income tenants to make improvements that benefit everyone.

Many of Michigan's other utilities—investor-owned as well as municipal and co-ops—use the nonprofit Efficiency United (EU) to administer

their energy efficiency programs.²² EU's Energy Efficiency Assistance Program provides weatherization products and services to low-income residential customers in need.²³ This program also targets 200% FPL. While we were unable to identify the number of households in many of these utilities due to lack of territory data, there are approximately 43,000 households in the IOUs that work with Efficiency United. Efficiency United has served around 9,316 income qualified customers from 2012 to 2014, which is a significant percentage (approximately 22%) of those eligible in IOU territories but there are certainly a great deal of eligible customers in the other territories not counted here. Efficiency United data indicates that they are often at or well above their target enrollments for income-qualified programs indicating that there is still a significant demand and need for these programs. Efficiency United does not offer any multifamily specific programs.

Overall, in 2014, Michigan EO programs across all utilities received a budget of \$257 million. Approximately 11% of the total EO program expenditures benefitted income-qualified customers. However, according to the analysis presented here, income-qualified customers represent a great deal more than 11% of utility customers in Michigan—they represent more than one-third of all households.

Other Programs

The other main program available to low-income customers, alluded to in the utility programs, is federal weatherization support through the Weatherization Assistance Program (WAP). This program is funded with federal dollars and administered by local Community Action Agencies—nonprofit organizations dedicated to reducing poverty in their communities. This program also uses 200% FPL as the income threshold. The program is free of charge and low-income owners and renters are both eligible, though as discussed above renters may not be able to easily access all improvements as some will require owner cooperation. The weatherization programs tend to be in very high demand and are often oversubscribed. All the community action agencies we spoke with had high demand for the funding available, and many (particularly in more populated metro regions) reported long waitlists because of insufficient funding and staffing, indicating a great deal of unmet need. The other federally funded, locally-administered program that addresses energy costs for low-income customers is the Low Income Home Energy Assistance Program (LIHEAP), which primarily offers bill pay assistance.

21. Consumers Energy. Payment Plans and Assistance. <https://www.consumersenergy.com/residential/programs-and-services/payment-assistance>.

22. Alpena Power Company, Baraga Electric Utility, Bayfield Electric Cooperative, The City of Crystal Falls, The City of Dowagiac, The City of Gladstone Department of Powers & Light, The City of Harbor Springs Electric Department, Hillsdale Board of Public Utilities, L'Anse Electric Utility, Michigan Gas Utilities, The City of Negaunee Electric Department, The City of Norway Department of Power & Light, SEMCO ENERGY Gas Company, Upper Peninsula Power Company, We Energies, Wisconsin Public Service, Wisconsin Public Service (Gas Customer), Xcel Energy, and Xcel Energy (Gas Customer).

23. Efficiency United. Savings for a Strong Michigan. <https://efficiencyunited.com/>

A final type of program is energy efficiency financing. While this is often out of reach for low-income customers who cannot take on any debt or renters who do not control their housing unit, it is something that owners of affordable rental housing may use to reduce energy costs in those buildings for themselves and their tenants. There are several programs available through Michigan Saves. A newer financing option is Property Assessed Clean Energy (PACE). This program that allows up-front financing

provided through a public-private partnership of investors and local governments, and is paid back through a voluntary property tax assessment. In Michigan, there is one PACE district for the state, administered by Lean & Green Michigan, offering commercial PACE financing. Each County must pass enabling legislation, and then buildings in that county can apply for PACE funding.²⁴ This program has already been used to finance upgrades for at least two affordable multifamily properties

in the state. An additional new financing tool that may be an option for this sector is on-bill financing, a program type in which energy costs are paid back through charges on utility bills. By recent statute, Michigan investor-owned utilities can offer on-bill financing for energy efficiency improvements for residential customers. Municipal and cooperative utilities can also offer on-bill financing. To date, one municipality has done so and one cooperative piloted a program that has been completed.

County Analysis

Summary

In order to better understand the dynamics of all these categories, six counties—Berrien, Houghton, Kent, Lake, Shiawassee, and Wayne—were

chosen to profile in more detail. These counties represent various regions and utility territories to show how housing stock and income distribution may change throughout the state. Three of the counties are considered metro, meaning they

are located within a metropolitan statistical area (MSA), and the other three fall outside an MSA and are therefore considered rural. Table 9 shows comparative statistics for these six counties, and more detail is provided below.

Table 9

	Total Households	Area Median Income	Metro County?	Percent below 50% AMI	Percent below 200% FPL	Percent below 80% AMI	Percent Affordable
Berrien County	60,320	\$54,900	Yes	28%	42%	45%	35%
Houghton County	13,941	\$50,500	No	34%	52%	52%	47%
Kent County	230,895	\$62,800	Yes	27%	36%	46%	32%
Lake County	4,308	\$40,600	No	44%	62%	62%	100%
Shiawassee County	27,435	\$51,300	No	27%	39%	45%	57%
Wayne County	667,553	\$64,600	Yes	38%	47%	56%	58%

24. The following counties have adopted PACE, as of May 2017, according to the Lean and Green MI website: Antrim, Bay, Calhoun, Delta, Eaton, Genesee, Grand Traverse, Houghton, Huron, Ingham, Kalamazoo, Leelanau, Macomb, Marquette, Midland, Montcalm, Oakland, Saginaw, Washtenaw, and Wayne.

Profiles

Berrien County is located in the southwest corner of the state. It is one of the three metro counties profiled here. Berrien is a part of the Niles-Benton Harbor MSA, as well as part of the larger South Bend-Elkhart-Mishawaka IN-MI CBSA. The county seat is St. Joseph, and it also contains the city of Benton Harbor. Berrien is covered by the Indiana Michigan (AEP) electric territory and by Michigan Gas Utilities and SEMCO for gas. Berrien County is served by Southwest Michigan Community Action Agency (SMCAA) as their weatherization provider, and the County has not yet joined the PACE district. 67% of residents are heating with utility gas, and another 18% heat with electricity, leaving only 14% to heat with other sources, typical for a more urban area. Berrien County has a moderate area median income of the six counties profiled here at \$54,900.



Total Households: **60,320**
 Area Median: **\$54,900**
 Income percent below 50% AMI: **28%**
 Percent below 80% AMI: **45%**
 Percent below 200% FPL: **42%**

Overall, the three metro counties have higher AMIs as compared to the rural counties, though Berrien's is still below the state median average while Kent and Wayne have AMIs higher than the state average. Berrien's higher AMI results in a slightly lower percentage of affordable housing compared to other counties at 35%. There is a significant percentage of renters, matching the state average, and a corresponding higher percentage of multifamily units. Since 2010, population has been slightly decreasing, while the median income has increased very slightly. Berrien's unemployment rate is in the middle range for the state as well at 10.6% unemployment in 2014, per ACS data.

		Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types		79,284 (100%)	35%	28%
Single family		59,527 (75%)	30%	15%
2 to 4 unit building		6,277 (8%)	42%	90%
5 to 49 unit building		6,044 (8%)	48%	98%
50+ unit building		3,550 (4%)	96%	99%
Other building types		3,886 (5%)	31%	21%

Profiles

Houghton County is a rural county, located in Michigan's Upper Peninsula and home to almost 13,000 households as of 2014. There is a range of utilities serving the area, with the majority of tracts in Upper Peninsula Power Co. territory for electric and SEMCO territory for gas, but some tracts falling outside of territories completely, and also a small area covered by Wisconsin Electric and Peninsular Gas.



These utilities, as discussed above, have particularly high energy rates. 58% of households are heating with gas and 9% with electricity, leaving 33% using other sources such as propane. Houghton County is served by Baraga-Houghton-Keweenaw Community Action Agency, Inc. as their weatherization provider, and the County has joined the PACE district though it does not appear that any PACE projects have been completed in the County yet.

Total Households: **13,941**
 Area Median: **\$50,500**
 Income percent below 50% AMI: **34%**
 Percent below 80% AMI: **52%**
 Percent below 200% FPL: **52%**

		Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types		18,927 (100%)	47%	31%
Single family		14,453 (76%)	46%	15%
2 to 4 unit building		986 (5%)	52%	94%
5 to 49 unit building		1,662 (9%)	43%	98%
50+ unit building		546 (3%)	98%	100%
Other building types		1,280 (7%)	37%	24%

Profiles

Kent County is located in the western portion of the state. It is one of the three metro counties of the six profiled here—it is located in the Grand Rapids-Wyoming MI MSA, and the city of Grand Rapids is located in the county. The whole county falls in Consumers territory for electricity, but is split between Consumers Energy and DTE Energy as well as no territory on the gas side, with 85% of homes heating with utility gas. Kent County is served by Area Community Services Employment and Training Council Community Action Agency as their weatherization provider, and the County has not yet joined the PACE district.

Kent County is relatively populous with a high median income, above the state average, that has increased since 2010. Unlike Wayne County, Kent County's high income is accompanied with a relatively low percentage of affordable housing at only 32%. Less than half the households qualify as low-income under any definition, though there is still a fairly high percentage of renters (31%), and a lower percentage of single family homes compared to most counties.



Total Households: **230,895**
 Area Median: **\$62,800**
 Income percent below 50% AMI: **27%**
 Percent below 80% AMI: **46%**
 Percent below 200% FPL: **36%**

		Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types		252,421 (100%)	32%	31%
Single family		177,415 (70%)	23%	13%
2 to 4 unit building		19,682 (8%)	68%	88%
5 to 49 unit building		31,713 (13%)	42%	94%
50+ unit building		14,165 (6%)	83%	85%
Other building types		9,446 (4%)	23%	17%

Profiles

Lake County is a rural county, located in the western portion of the state. It is sparsely populated, with just over 4,000 households. This county falls within the Consumers Energy electric territory and the DTE Energy gas territory, but an extremely high percentage of homes (81%) heat with something other than utility gas or electricity, so it is likely that many residents are not actually customers of one or both of those utilities—not unsurprising for a low-population rural area with many mobile, etc. homes. Lake County is served by FiveCAP Inc. as their weatherization provider, and the County has not yet joined the PACE district.



Total Households: **4,308**
 Area Median: **\$40,600**
 Income percent below 50% AMI: **44%**
 Percent below 80% AMI: **62%**
 Percent below 200% FPL: **62%**

Lake County’s area median income of just over \$40,000 is the lowest in the state, and has fallen since 2010. It also falls in the counties with the 10 highest unemployment rates. The county has only four census tracts and all qualify for New Market Tax Credits under the 80% AMI definition, therefore all the housing units are considered “affordable” by our definition. Almost two-thirds of the population qualifies as low-income under both the 200% FPL and 80% AMI definition. There is almost no multifamily housing and few renters (and the multifamily that exists is exclusively occupied by renters), but a very high percentage of “other” housing types—more than 1 in 4 units are in a mobile home, van, RV, boat, or other type of non-building housing type.

		Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types		15,079 (100%)	100%	19%
Single family		10,318 (68%)	100%	13%
2 to 4 unit building		186 (1%)	100%	100%
5 to 49 unit building		196 (1%)	100%	100%
50+ unit building		150 (1%)	100%	100%
Other building types		4,229 (28%)	100%	20%

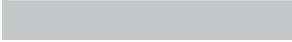
Profiles

Shiawassee County is located in the eastern-central portion of the state, on the periphery of the Lansing MSA. It is a rural county, but with 27,000 households it is more populated than other rural counties in our sample. This county is served by Consumers Energy for electricity and gas, with 60% heating with gas, 8% heating with electric, and 33% with another fuel—another example of Shiawassee’s position in between the other rural counties and the metro counties. Shiawassee County is served by Capital Area Community Services, Inc. as their weatherization provider, and the County has not yet joined the PACE district.

The area median income is also relatively higher than some other rural counties, though still below the state average, and has increased slightly since 2010. Just over half of the housing is considered affordable, though less than half the population would qualify as low-income under any definition, and the renter proportion is also low. Multifamily is not a significant proportion of housing, though there are more units in 2-4 unit buildings than average.



Total Households: **27,435**
 Area Median: **\$51,300**
 Income percent below 50% AMI: **27%**
 Percent below 80% AMI: **45%**
 Percent below 200% FPL: **39%**

		Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types		22,902 (100%)	57%	23%
Single family		18,598 (81%)	55%	13%
2 to 4 unit building		586 (3%)	61%	90%
5 to 49 unit building		928 (4%)	89%	99%
50+ unit building		271 (1%)	100%	100%
Other building types		2,519 (11%)	57%	20%

Profiles

Wayne County is located in the southeast corner of the state. It is the most populous county in the state as it contains the city of Detroit and is the center of the Detroit-Warren-Dearborn MI MSA. It is served by DTE Energy for both electric and gas, and only 2% of households heat with a fuel source other than electricity or utility gas, and 90% heat with gas. Wayne County is served by Wayne-Metropolitan Community Action Agency as their weatherization provider, and is a member of the PACE district.



The area median income is quite high, above the state average, but there is also a great deal of affordable housing (58% of units) and many low-income residents, reflecting wide income ranges. There is a significant percentage of renters and multifamily units, as would be expected for a large city, and most of that multifamily stock in buildings over 5 units is renters, while the smaller multifamily has more owner-occupied units. Buildings over 50 units have the greatest percentage of affordable units. Wayne County's unemployment rate is also in the top five highest of all Michigan counties. Since 2010, the median income has actually stayed very flat, though population has fallen slightly.

Total Households: **667,553**
 Area Median: **\$64,400**
 Income percent below 50% AMI: **38%**
 Percent below 80% AMI: **56%**
 Percent below 200% FPL: **47%**

		Total Units	Percent Affordable	Percent Renter Occupied [^]
All Building Types		849,981 (100%)	58%	36%
Single family		619,243 (73%)	52%	23%
2 to 4 unit building		62,929 (7%)	78%	78%
5 to 49 unit building		84,142 (10%)	58%	93%
50+ unit building		69,390 (8%)	89%	95%
Other building types		14,277 (2%)	35%	22%

Looking Ahead

This research has revealed that low-income families live in every type of housing and every region of Michigan. In fact, almost half (46%) of all Michigan households are low-income, and while in absolute numbers there are fewer low-income households in rural counties than in cities and urban areas, the proportion of income levels is quite similar. All housing types are home to low-income families, and multifamily units are dominated by renters, while single family and other housing types are more likely to be owner-occupied. Housing types are important as different buildings have different energy needs and barriers to programs for energy efficiency and renewable energy. These different building types and ownership

structures require program design tailored to their specific needs. This paper also finds that Michigan is above the national average on energy consumption and energy expenditure even before water costs are included.

The size of the low-income housing market, its breadth and geographic distribution, and above-average residential energy costs all underscore the opportunity and the need to deliver more energy efficiency programming to Michigan households. While low-income households have access to several options for improving the energy efficiency of their home, including utility-provided programs, nonprofit-provided programs, and federal weatherization programs,

holistic programs that address all utility costs for a family in one program generally don't exist. To achieve energy and cost savings across the state, Michigan needs a multipronged strategy that delivers utility cost savings that will reduce water, electric, natural gas, and/or propane costs designed to reach each unique community. There are proven interventions that can accomplish the goal of reducing energy utility costs for a diverse housing sector. These interventions include comprehensive energy and water retrofits and community solar implemented at scale. Successful intervention would make Michigan families more energy secure, resulting in benefits such as reduced poverty, a stronger economy, and more resilient communities.

Appendices

Appendix 1: Household, Income, and Affordable Housing Units by County

County	Total Households	Area Median Income	% below 50% AMI	% below 80% AMI	% below 200% FPL	% Affordable
Alcona County	5,007	\$45,400	30%	45%	45%	100%
Alger County	3,609	\$48,000	29%	43%	43%	100%
Allegan County	41,767	\$59,200	25%	40%	35%	17%
Alpena County	12,860	\$51,000	32%	45%	45%	46%
Antrim County	9,593	\$52,500	24%	38%	38%	43%
Arenac County	6,409	\$45,900	31%	46%	46%	75%
Baraga County	3,055	\$53,000	30%	43%	43%	2%
Barry County	22,700	\$64,100	24%	44%	34%	1%
Bay County	43,712	\$58,000	28%	45%	40%	32%
Benzie County	7,388	\$57,000	22%	42%	37%	1%
Berrien County	60,320	\$54,900	28%	45%	42%	35%
Branch County	15,863	\$53,100	28%	46%	46%	35%
Calhoun County	52,842	\$52,600	28%	43%	43%	46%
Cass County	19,804	\$58,100	28%	48%	42%	27%
Charlevoix County	10,518	\$59,900	28%	45%	39%	8%
Cheboygan County	11,250	\$47,700	30%	45%	45%	51%
Chippewa County	14,382	\$56,500	33%	51%	45%	37%
Clare County	13,208	\$44,100	37%	54%	54%	91%
Clinton County	28,568	\$64,200	22%	40%	30%	9%
Crawford County	5,781	\$49,400	27%	43%	43%	59%
Delta County	15,695	\$54,800	31%	48%	44%	50%
Dickinson County	11,263	\$56,000	26%	45%	40%	47%
Eaton County	43,562	\$64,200	25%	43%	34%	18%
Emmet County	13,612	\$65,500	28%	46%	37%	3%
Genesee County	165,962	\$53,300	30%	45%	45%	47%
Gladwin County	10,827	\$46,500	32%	48%	48%	75%
Gogebic County	6,916	\$49,100	36%	51%	51%	85%
Grand Traverse	34,833	\$59,600	24%	39%	34%	21%
Gratiot County	14,705	\$53,000	30%	46%	46%	38%
Hillsdale County	17,632	\$53,200	29%	45%	45%	37%
Houghton County	13,941	\$50,500	34%	52%	52%	47%
Huron County	13,965	\$52,300	28%	43%	43%	50%
Ingham County	109,806	\$64,200	34%	51%	41%	41%

Appendix 1: Household, Income, and Affordable Housing Units by County, Continued

County	Total Households	Area Median Income	% below 50% AMI	% below 80% AMI	% below 200% FPL	% Affordable
Ionia County	22,140	\$56,500	30%	47%	41%	26%
Iosco County	11,361	\$46,800	31%	48%	48%	74%
Iron County	5,415	\$48,200	35%	49%	49%	100%
Isabella County	24,773	\$50,800	36%	50%	50%	43%
Jackson County	60,485	\$56,400	30%	47%	42%	29%
Kalamazoo County	100,042	\$58,000	30%	46%	41%	29%
Kalkaska County	7,123	\$48,900	32%	46%	46%	100%
Kent County	230,895	\$62,800	27%	46%	36%	32%
Keweenaw County	1,021	\$50,500	28%	45%	45%	96%
Lake County	4,308	\$40,600	44%	62%	62%	100%
Lapeer County	32,510	\$64,600	24%	45%	34%	20%
Leelanau County	9,136	\$67,500	24%	38%	29%	0%
Lenawee County	37,859	\$57,400	27%	45%	39%	15%
Livingston County	68,279	\$79,300	23%	40%	23%	6%
Luce County	2,345	\$52,000	32%	50%	50%	47%
Mackinac County	5,066	\$53,000	27%	45%	45%	39%
Macomb County	334,508	\$64,600	26%	44%	34%	23%
Manistee County	10,452	\$52,200	29%	45%	45%	48%
Marquette County	26,693	\$58,600	35%	52%	42%	22%
Mason County	12,133	\$52,100	29%	44%	44%	41%
Mecosta County	15,529	\$52,200	30%	48%	48%	42%
Menominee County	10,668	\$52,000	30%	43%	43%	50%
Midland County	33,709	\$66,100	27%	45%	35%	17%
Missaukee County	5,925	\$48,300	27%	45%	45%	52%
Monroe County	58,328	\$63,800	25%	44%	34%	16%
Montcalm County	23,219	\$48,400	29%	47%	47%	66%
Montmorency County	3,985	\$44,000	32%	48%	48%	100%
Muskegon County	64,889	\$49,400	30%	46%	46%	45%
Newaygo County	18,157	\$52,500	29%	45%	45%	35%
Oakland County	489,797	\$64,600	22%	36%	28%	17%
Oceana County	9,668	\$50,100	29%	47%	47%	63%
Ogemaw County	9,398	\$44,300	35%	49%	49%	100%
Ontonagon County	3,201	\$48,700	34%	49%	49%	68%
Osceola County	8,847	\$48,400	32%	51%	51%	67%
Oscoda County	3,743	\$41,000	36%	53%	53%	100%
Otsego County	9,811	\$56,400	25%	43%	37%	36%

Appendix 1: Household, Income, and Affordable Housing Units by County, Continued

County	Total Households	Area Median Income	% below 50% AMI	% below 200% FPL	% below 200% FPL	% Affordable
Ottawa County	95,304	\$68,600	26%	41%	31%	17%
Presque Isle County	6,091	\$47,700	28%	42%	42%	84%
Roscommon County	11,796	\$42,100	37%	52%	52%	87%
Saginaw County	77,589	\$53,600	28%	43%	43%	38%
Sanilac County	16,177	\$64,600	29%	46%	46%	28%
Schoolcraft County	3,495	\$55,000	36%	49%	49%	25%
Shiawassee County	27,435	\$51,300	27%	45%	39%	57%
St. Clair County	64,182	\$51,600	30%	49%	39%	29%
St. Joseph County	22,856	\$58,000	26%	45%	43%	22%
Tuscola County	21,318	\$53,700	25%	42%	42%	39%
Van Buren County	28,178	\$58,000	31%	48%	43%	32%
Washtenaw County	136,471	\$87,400	34%	49%	31%	34%
Wayne County	667,553	\$64,600	38%	56%	47%	58%
Wexford County	12,662	\$51,500	29%	47%	47%	69%

Appendix 2: Low-Income Population and Affordable Housing by Utility Territory

	Total Households	% below 50% AMI	% below 80% AMI	% below 200% FPL	% Affordable Housing Units
Electric IOUs					
Consumers Energy Co.	1,624,072	28%	45%	40%	37%
No Electric Utility	149,682	38%	55%	47%	55%
Upper Peninsula Power Co.	50,073	32%	48%	43%	41%
Alpena Power Co.	14,641	31%	44%	44%	48%
Wisconsin Electric Power Co.	22,195	28%	44%	41%	61%
Indiana Michigan Power Co. (AEP)	132,299	27%	44%	40%	31%
Edison Sault Electric Co.	15,724	31%	48%	45%	38%
Northern States Power Co.	6,279	38%	53%	53%	82%
Detroit Edison Co. (DTE)	1,805,314	30%	47%	37%	36%
Wisconsin Public Service Corp.	7,601	29%	42%	42%	24%
Gas IOUs					
Michigan Consolidated Gas Co. (DTE)	1,273,728	35%	52%	44%	51%
No Gas Utility	112,331	31%	51%	43%	47%
SEMCO Energy Gas Co.	364,287	27%	44%	38%	29%
Michigan Gas Utilities Corp.	195,391	27%	44%	38%	23%
Consumers Energy Co.	1,833,909	26%	42%	35%	28%
Presque Isle Electric & Gas Coop, Inc.	8,082	28%	43%	43%	100%
Aurora Gas Co.	4,769	28%	46%	46%	75%
Northern States Power Co. (Xcel)	5,140	39%	53%	53%	78%
Peninsular Gas Co.	4,339	34%	52%	52%	73%
Citizens Gas Fuel Co.	21,551	29%	48%	42%	26%
Superior Energy Co.	4,353	28%	43%	43%	54%

Appendix 3: Pricing and Fuel Use by Utility Territory

	2017 Residential Rate*	2014 Residential Rate*	% Renters Paying Nothing Extra for Utilities^	% Heating with Electricity^	% Heating with Utility Gas^
Electric IOUs	cents per kWh	cents per kWh			
Consumers Energy Co.	15.78	15	11%	69%	9%
No Electric Utility			16%	84%	10%
Upper Peninsula Power Co.	24.01	22.76	23%	58%	8%
Alpena Power Co.	13.29	13.93	8%	58%	6%
Wisconsin Electric Power Co.	16.35	15.06	17%	50%	5%
Indiana Michigan Power Co. (AEP)	12.36	10.85	10%	64%	14%
Edison Sault Electric Co.			18%	31%	16%
Northern States Power Co.	13.39	12.78	24%	63%	6%
Detroit Edison Co. (DTE)	16.38	14.61	9%	86%	8%
Wisconsin Public Service Corp.	12.89	10.43	35%	63%	7%
Gas IOUs	\$/ccf	\$/ccf			
Michigan Consolidated Gas Co. (DTE)	0.72	0.79	11%	77%	8%
No Gas Utility			12%	80%	7%
SEMCO Energy Gas Co.	0.54	0.81	14%	69%	9%
Michigan Gas Utilities Corp.	0.53	0.74	11%	69%	9%
Consumers Energy Co.	0.61	0.80	9%	80%	8%
Presque Isle Electric & Gas Coop, Inc.	0.87	1.00	10%	44%	4%
Aurora Gas Co.	set locally	set locally	5%	51%	4%
Northern States Power Co. (Xcel)	0.57	0.82	25%	65%	5%
Peninsular Gas Co.	0.49	0.69	24%	48%	5%
Citizens Gas Fuel Co.	set locally	set locally	12%	79%	6%
Superior Energy Co.	set locally	set locally	6%	25%	7%

*MPSC Average Rates Filings, Feb 1,2017 and Dec 1,2014 Data <http://www.dleg.state.mi.us/mpsc/electric/download/rates1.pdf> and <http://www.michigan.gov/mpsc/0,1607,7-159-16385-41446--,00.html>

^ACS 2014 5-Year Estimates

Appendix 4: Population Change Since 2010 for All Counties (ACS 5-Year Estimates)

Geography	2016 Population Estimate	% Change since 2010	% Change 2015- 2016
Alcona County	10,352	-5%	0%
Alger County	9,219	-4%	-1%
Allegan County	115,548	4%	1%
Alpena County	28,704	-3%	0%
Antrim County	23,144	-2%	0%
Arenac County	15,122	-5%	-1%
Baraga County	8,503	-4%	-1%
Barry County	59,702	1%	1%
Bay County	104,747	-3%	-1%
Benzie County	17,572	0%	1%
Berrien County	154,010	-2%	0%
Branch County	43,427	-4%	0%
Calhoun County	134,386	-1%	0%
Cass County	51,599	-1%	0%
Charlevoix County	26,174	1%	0%
Cheboygan County	25,401	-3%	0%
Chippewa County	37,724	-2%	-1%
Clare County	30,358	-2%	-1%
Clinton County	77,888	3%	1%
Crawford County	13,744	-2%	0%
Delta County	36,202	-2%	-1%
Dickinson County	25,535	-2%	-1%
Eaton County	109,160	1%	0%
Emmet County	33,182	1%	0%
Genesee County	408,615	-4%	0%
Gladwin County	25,122	-2%	0%
Gogebic County	15,243	-7%	-1%
Grand Traverse	92,084	6%	1%
Gratiot County	41,202	-3%	-1%
Hillsdale County	45,774	-2%	0%
Houghton County	36,555	0%	0%
Huron County	31,481	-5%	-1%
Ingham County	288,051	3%	1%
Ionia County	64,232	1%	0%
Iosco County	25,327	-2%	0%

Geography	2016 Population Estimate	% Change since 2010	% Change 2015- 2016
Iron County	11,195	-5%	-1%
Isabella County	71,282	1%	1%
Jackson County	158,460	-1%	-1%
Kalamazoo County	261,654	5%	1%
Kalkaska County	17,263	1%	0%
Kent County	642,173	7%	1%
Keweenaw County	2,199	2%	1%
Lake County	11,496	0%	1%
Lapeer County	88,340	0%	0%
Leelanau County	21,765	0%	-1%
Lenawee County	98,504	-1%	0%
Livingston County	188,624	4%	1%
Luce County	6,358	-4%	-1%
Mackinac County	10,820	-3%	-1%
Macomb County	867,730	3%	0%
Manistee County	24,373	-1%	0%
Marquette County	66,435	-1%	-1%
Mason County	28,876	1%	0%
Mecosta County	43,221	1%	0%
Menominee County	23,281	-3%	-1%
Midland County	83,462	0%	0%
Missaukee County	15,102	2%	1%
Monroe County	149,208	-2%	0%
Montcalm County	62,974	-1%	0%
Montmorency County	9,173	-6%	-1%
Muskegon County	173,408	1%	0%
Newaygo County	47,938	-1%	0%
Oakland County	1,243,970	3%	0%
Oceana County	26,027	-2%	0%
Ogemaw County	20,904	-4%	0%
Ontonagon County	5,911	-13%	-2%
Osceola County	23,110	-2%	0%
Oscoda County	8,264	-4%	0%
Otsego County	24,470	1%	1%
Ottawa County	282,250	7%	1%

Appendix 4: Population Change Since 2010 for All Counties (ACS 5-Year Estimates), continued

Geography	2016 Population Estimate	% Change since 2010	% Change 2015- 2016
Presque Isle County	12,762	-5%	-1%
Roscommon County	23,700	-3%	0%
Saginaw County	192,326	-4%	0%
Sanilac County	41,409	-4%	0%
Schoolcraft County	8,001	-6%	-2%
Shiawassee County	68,554	-3%	0%
St. Clair County	159,587	-2%	0%

Geography	2016 Population Estimate	% Change since 2010	% Change 2015- 2016
St. Joseph County	60,853	-1%	0%
Tuscola County	53,338	-4%	-1%
Van Buren County	75,223	-1%	0%
Washtenaw County	364,709	6%	1%
Wayne County	1,749,366	-4%	0%
Wexford County	33,163	1%	1%

Appendix 5: Unemployment Rates and Ranking (ACS 2014 and 2015 5-Year Estimates)

*Rank of 1 is the highest unemployment rate in that year.

Geography	Unemployment Rate, 2014	Rank, 2014	Rank, 2015
Alcona County	13%	19	14
Alger County	12%	33	28
Allegan County	8%	79	81
Alpena County	11%	50	46
Antrim County	12%	30	40
Arenac County	14%	11	17
Baraga County	8%	77	65
Barry County	9%	63	67
Bay County	11%	51	41
Benzie County	9%	64	60
Berrien County	11%	49	45
Branch County	9%	66	76
Calhoun County	12%	36	39
Cass County	11%	52	42
Charlevoix County	10%	60	68
Cheboygan County	16%	5	5
Chippewa County	13%	20	20
Clare County	16%	3	7
Clinton County	7%	82	80
Crawford County	14%	17	18
Delta County	11%	43	48

Geography	Unemployment Rate, 2014	Rank, 2014	Rank, 2015
Dickinson County	9%	72	77
Eaton County	9%	65	69
Emmet County	9%	71	61
Genesee County	16%	6	8
Gladwin County	13%	22	26
Gogebic County	11%	45	43
Grand Traverse	8%	78	79
Gratiot County	11%	53	57
Hillsdale County	11%	47	50
Houghton County	9%	68	74
Huron County	10%	59	70
Ingham County	10%	57	51
Ionia County	11%	41	32
Iosco County	14%	14	16
Iron County	8%	75	52
Isabella County	12%	31	23
Jackson County	12%	34	35
Kalamazoo County	10%	54	49
Kalkaska County	13%	25	33
Kent County	9%	69	71
Keweenaw County	5%	83	78

Appendix 5: Unemployment Rates and Ranking (ACS 2014 and 2015 5-Year Estimates), continued

*Rank of 1 is the highest unemployment rate in that year.

Geography	Unemployment Rate, 2014	Rank, 2014	Rank, 2015
Lake County	14%	12	9
Lapeer County	12%	28	31
Leelanau County	8%	76	75
Lenawee County	10%	55	55
Livingston County	8%	80	83
Luce County	14%	15	21
Mackinac County	13%	26	12
Macomb County	11%	44	53
Manistee County	12%	29	22
Marquette County	9%	73	66
Mason County	11%	39	29
Mecosta County	15%	8	15
Menominee County	10%	56	58
Midland County	9%	70	59
Missaukee County	11%	40	27
Monroe County	10%	58	63
Montcalm County	13%	21	24
Montmorency County	20%	1	1
Muskegon County	14%	16	19
Newaygo County	13%	23	38
Oakland County	9%	67	72

Geography	Unemployment Rate, 2014	Rank, 2014	Rank, 2015
Oceana County	10%	61	54
Ogemaw County	13%	18	13
Ontonagon County	15%	7	6
Osceola County	11%	42	36
Oscoda County	15%	10	10
Otsego County	11%	46	64
Ottawa County	7%	81	82
Presque Isle County	14%	13	11
Roscommon County	15%	9	4
Saginaw County	12%	32	25
Sanilac County	13%	27	30
Schoolcraft County	16%	4	2
Shiawassee County	12%	37	37
St. Clair County	13%	24	34
St. Joseph County	11%	48	56
Tuscola County	12%	35	47
Van Buren County	10%	62	62
Washtenaw County	8%	74	73
Wayne County	17%	2	3
Wexford County	12%	38	44