

A Program Design Combining Community Solar and Weatherization for Manufactured Homes in Michigan

Technical assistance provided to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) under the US Department of Energy's National Community Solar Partnership

Bentham Paulos

March 2024



Disclaimer

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or The Regents of the University of California.

Ernest Orlando Lawrence Berkeley National Laboratory is an equal opportunity employer.

Copyright Notice

This manuscript has been authored by an author at Lawrence Berkeley National Laboratory under Contract No. DE-AC02-05CH11231 with the U.S. Department of Energy. The U.S. Government retains, and the publisher, by accepting the article for publication, acknowledges, that the U.S. Government retains a non-exclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this manuscript, or allow others to do so, for U.S. Government purposes.

A Program Design Combining Community Solar and Weatherization for Manufactured Homes in Michigan

**Technical assistance provided to the
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
under the US Department of Energy's National Community Solar Partnership**

Principal Author

Bentham Paulos

Ernest Orlando Lawrence Berkeley National Laboratory

1 Cyclotron Road, MS 90R4000

Berkeley CA 94720-8136

March 2024

This material is based upon work supported by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under Solar Energy Technologies Office (SETO) Agreement Number 36483 and Contract No. DE-AC02-05CH11231.

Acknowledgements

The author would like to thank Lisa Thomas of EGLE, Karl Hoesch of the University of Michigan, Aimee Bell-Pasht of ACEEE, and Scott Pigg of Slipstream for their contributions to this report.

The author thanks the following experts for reviewing this report (affiliations do not imply that those organizations support or endorse this work):

Greg Leventis

Berkeley Lab

Kimberly Shields

US Department of Energy

Simon Sandler

National Renewable Energy Lab

Table of Contents

Acknowledgements	ii
Table of Contents.....	iii
Table of Figures.....	iv
List of Tables	iv
Executive Summary	v
Introduction	1
Background on CELICA Projects.....	2
Possible Criteria for Program Design	4
Location and Density	4
Demographics	7
Energy Burden and Fuel Types	8
Federal Funding Sources.....	10
Potential Partnerships	13
Cambio Case Study	14
Opportunities for Weatherization	18
Opportunities for Community Solar	21
Strategies for Combining the Weatherization of Manufactured Homes and Community Solar	23
Recommendations.....	25

Table of Figures

Figure 1: Number of manufactured homes by county	5
Figure 2: Share of total homes that are manufactured	5
Figure 3: Manufactured home communities in Michigan	6
Figure 4: Manufactured home sales and prices	7
Figure 5: Overall MiEJScreen Score	8
Figure 6: Low Income Population Score	8
Figure 7: Energy burdens for manufactured homes in Michigan.....	9
Figure 8: The federal Investment Tax Credit with bonuses.....	10
Figure 9: Inflation Reduction Act (IRA) Low-Income Community Bonus Credit Program	11
Figure 10: IRA-designated Energy Communities	12
Figure 11: Number of manufactured homes served	14
Figure 12: Number of low-income MHCs served	14
Figure 13: Cambio MHCs in Michigan.....	15
Figure 14: Mascoma Meadows MHC with solar installation.....	22

List of Tables

Table 1: Cambio MHCs in Michigan.....	16
---------------------------------------	----

Executive Summary

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) is interested in combining community solar with weatherization programs for manufactured homes. To collect program strategies, EGLE made a request for technical assistance from the US Department of Energy's National Community Solar Partnership (NCSP).

Lawrence Berkeley National Lab developed this study in response. It briefly reviews issues relevant to the question, attempts to lay out a methodology for more in-depth analysis, and provides some recommendations for program design and implementation. While the research is specific to Michigan, the recommendations and methodologies could serve as an example for other states and regions.

The paper first provides an overview of manufactured home communities in Michigan, with a discussion of demographics and energy issues they face. It then discusses weatherization opportunities for manufactured homes, opportunities for community solar, and opportunities for combining the two.

The methodology proposed is intended to help EGLE:

- Identify priority locations,
- Set eligibility criteria for communities and households, and
- Make the most of federal and other funding sources

The paper concludes with recommendations for a program that combines community solar with efficient electrification of manufactured homes to reduce the burden of the largest source of energy expenditure in Michigan, winter heating bills. Specifically, it envisions community solar subscriptions for occupants of manufactured homes that have been converted to high-efficiency cold weather heat pumps. The combination can be managed to alleviate seasonal variations in both solar and heating bills, such as through an annualized "budget billing" program.

Introduction

With funding from DOE’s Clean Energy for Low-Income Community Access (CELICA) program, Michigan EGLE worked with utility and community partners to execute three projects that combined community solar and home weatherization to cut bills for up to 135 low-income households.¹

Now EGLE would like to expand that strategy with an emphasis on manufactured homes.

Manufactured housing represents a significant share of affordable housing for LMI households and an even larger share of the affordable housing that does not receive direct public subsidies. It is a pathway to home ownership for those without significant wealth.

Manufactured homes represent a strong opportunity to relieve energy burdens for low-income households. They are subject to federal standards rather than state and local building codes, but because those standards are not often updated, older manufactured homes are especially inefficient. Nearly 20 percent of the national housing stock consists of highly energy-inefficient homes that date from before the initial establishment of HUD standards in 1976, while many more pre-date the 1994 update.²

Moreover, nearly half of manufactured homes are all-electric, and many rely on high-cost propane for heating.³ This means that they have relatively large electric loads that result in high utility bills, creating an opportunity to serve them with solar generation.

Michigan has almost a quarter million manufactured homes, according to research by the Clean Energy States Alliance, representing 5.3 percent of the state’s housing stock.⁴ A high percentage of the homes are located in manufactured home communities (MHCs), especially in over 500 large communities.

To make the case for an expansion of previous CELICA projects, EGLE asked the NCSP to analyze how those programs have served manufactured homes, in comparison with other housing types, and what the potential is for increased focus on this sector. Such an analysis would involve the following steps:

1. Collect program data from the three CELICA projects, including the types and cost of weatherization measures, the projected savings, and any specific barriers or opportunities that were found for manufactured homes.

Collect data on the locations of current manufactured homes in Michigan, to identify those that are older and less efficient, in low-income or disadvantaged communities, and have the greatest potential to benefit.

2. Make recommendations based on the analysis for how to structure a new community solar / weatherization strategy and expand participation in existing pilots for manufactured homes.

¹ EGLE, MI Solar Communities, <https://www.michigan.gov/egle/about/organization/materials-management/energy/renewable-energy/mi-solar-communities>.

² CESA, Solar for Manufactured Homes: An Assessment of the Opportunities and Challenges in 14 States, 2021, <https://www.cesa.org/projects/scaling-up-solar-for-under-resourced-communities/manufactured-homes/>.

³ EIA, 2020 Residential Energy Consumption Survey (RECS), “Fuels used and end uses by housing unit type (HC1.1),” <https://www.eia.gov/consumption/residential/data/2020/index.php?view=characteristics>

⁴ CESA 2021.

Background on CELICA Projects

With funding from the U.S. Department of Energy's (DOE) Clean Energy for Low-Income Communities Accelerator (CELICA) program, EGLE worked with utility and community partners to execute three projects that combined community solar and home weatherization to cut bills for up to 125 low-income households.⁵

The three pilots were in different Michigan communities and featured a partnership between three different types of electric utilities (cooperative, municipal, and investor-owned) and local community action agencies (CAAs), whose community-centered programming includes weatherization services to income-qualified residents.⁶ The projects were intended to serve as blueprints for communities across Michigan with similar characteristics.⁷

Grand Traverse County

- **Cherryland Electric Cooperative and the Northwest Michigan Community Action Agency (NMCAA)**

This pilot started in 2017, to prove the concept of combining a community solar project with weatherization in northwest Michigan.⁸ To save time, NMCAA tapped 60 customers that had previously received weatherization services and used the output from Cherryland's previously built arrays. Each household was assigned the output of nine panels from the solar installation at no cost. The output was valued at 10¢ per kWh, delivering about \$350 in savings per year. In addition to savings for customers, Cherryland saw a 10 percent drop in late payments from enrolled households.

Village of L'Anse

- **L'Anse municipal utility and the Baraga-Houghton-Keweenaw Community Action Agency**

The municipal utility for the small Upper Peninsula town of L'Anse developed a 110 kW solar installation in 2020 to serve LMI and non-LMI households.⁹ LMI subscribers paid nothing upfront for the panels but do pay a low monthly subscription fee for 10 years, while the subscription lasts 20 years, subsidized by a payment from EGLE.

⁵ EGLE, *ibid.*

⁶ The Weatherization Assistance Program (WAP) is funded by the US Department of Energy, administered by the Michigan Department of Health and Human Services, and delivered by community action agencies.

⁷ Anna Adamsson, Clean Energy States Alliance, *Partnering to Reduce Energy Burden: A Michigan Community Solar and Weatherization Pilot*, June 14, 2023, <https://www.cesa.org/resource-library/resource/partnering-to-reduce-energy-burden-michigan/>

⁸ EGLE, "Case Study: Clean Energy for Low Income Communities Accelerator (CELICA)," August 2018, <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/MMD/Energy/renewables/CELICAPhase1.pdf?rev=38199cb90007460391b9fbbfc38444d0&hash=8B2BD031D6A813310672731FAOC2E59A>.

⁹ EGLE, "Case Study: Clean Energy for Low Income Communities Village of L'Anse, Michigan," April 2019, <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/MMD/Energy/renewables/CELICAPhase2.pdf?rev=b128ffc3c75a4e9eb9d0e034b431e327&hash=B79A8C2763B7AE60C9AEEDF31DC8A59>.

The 25 LMI subscribers save about \$275 per year. Like the Cherryland program, participants in the L'Anse program were selected from previously weatherized clients. Weatherization services were provided by the Baraga-Houghton-Keweenaw agency under the Weatherization Assistance Program (WAP).

Lansing

- **Capital Area Community Services and Consumers Energy**

Consumers Energy's community solar program started in 2016, named the Solar Gardens-Sunrise Program. Starting in 2022 they enrolled 50 LMI households in the counties of Ingham, Eaton, Clinton, and Shiawassee that were also receiving weatherization services from Capital Area Community Services (CACS). EGLE paid the solar subscription fees for a three-year rotation term, which were managed by CACS. Unlike the previous two programs, the CACS participants began receiving credits before their weatherization services were complete.

The CELICA pilot projects combined weatherization of homes under WAP with community solar subscriptions. Only a subset of the homes included in the pilots were manufactured homes.

Possible Criteria for Program Design

In this section we explore a number of criteria that could be used to design a program combining community solar with the weatherization of manufactured housing. A motivation for focusing on manufactured homes is the relatively low income of tenants, the low energy efficiency of older home designs, and the opportunity therefore to reduce energy burdens in a concentrated way. This focus also creates opportunities to specialize in specific aspects of program design and delivery, possibly achieving economies of scope and scale.

The factors we look at for program design include the following.

- **Location and density of manufactured homes:** Focusing on manufactured home communities, especially larger ones, can tap the logistical benefits of treating many homes in the same location. Program eligibility, marketing, and enrollment can all benefit, as can weatherization services and the local siting of community solar projects.
- **Demographics:** While not all MHCs are in disadvantaged communities and not all residents are low-income, many are. We present data that can broadly identify areas of greater need.
- **Energy burdens and fuel types:** Manufactured homes are more reliant on higher cost fuels, such as propane and electric resistance heat, resulting in higher energy burdens.
- **Opportunities for federal funding sources:** Federal funding sources are often aimed at low-income and disadvantaged communities. Recent legislation has created large new funding streams for clean energy programs.
- **Partnerships with utilities and social agencies:** Low-income energy programs are often delivered in partnership with local utilities and social service agencies. We identify some potential partnerships based on location.

A complete analysis is beyond the scope of this technical assistance, but we lay out some preliminary data and present a case study on how EGLE may want to study opportunities in greater detail. We illustrate such research using a case study for one owner of manufactured home communities.

Location and Density

The Census Bureau counts 242,393 manufactured homes in Michigan, representing 5.3 percent of the state's housing stock, according to research by the Clean Energy States Alliance (CESA).¹⁰

A high percentage of the homes are in manufactured home communities (MHCs). The data provider Datacomp has a database of 1,209 MHCs in Michigan with 182,868 identified homesites.¹¹ Over 500 of those communities have more than 100 homesites each, including 64 communities that have more than 500 homesites. As a result, 87 percent of homesites in the CESA analysis are in MHCs with over 100 homesites.

Further, 89 MHCs are restricted to occupants over 55 years of age, and most are in areas with median

¹⁰ CESA, 2021.

¹¹ Datacomp, <https://www.datacompusa.com/manufactured-housing-industry-market-data/>.

household incomes lower than the statewide median of \$68,505.¹²

In 18 Michigan counties, manufactured homes make up more than 10 percent of total housing stock. In Newaygo and Lake Counties, in West-Central Michigan, the share is just over 20 percent. The highest number of manufactured homes is in the Detroit area, in Oakland, Macomb, and Wayne Counties, with over 12,000 in each county.¹³ Figure 1 shows where manufactured homes are in in each county by number of manufactured homes; Figure 2 shows the share of manufactured homes in each county.

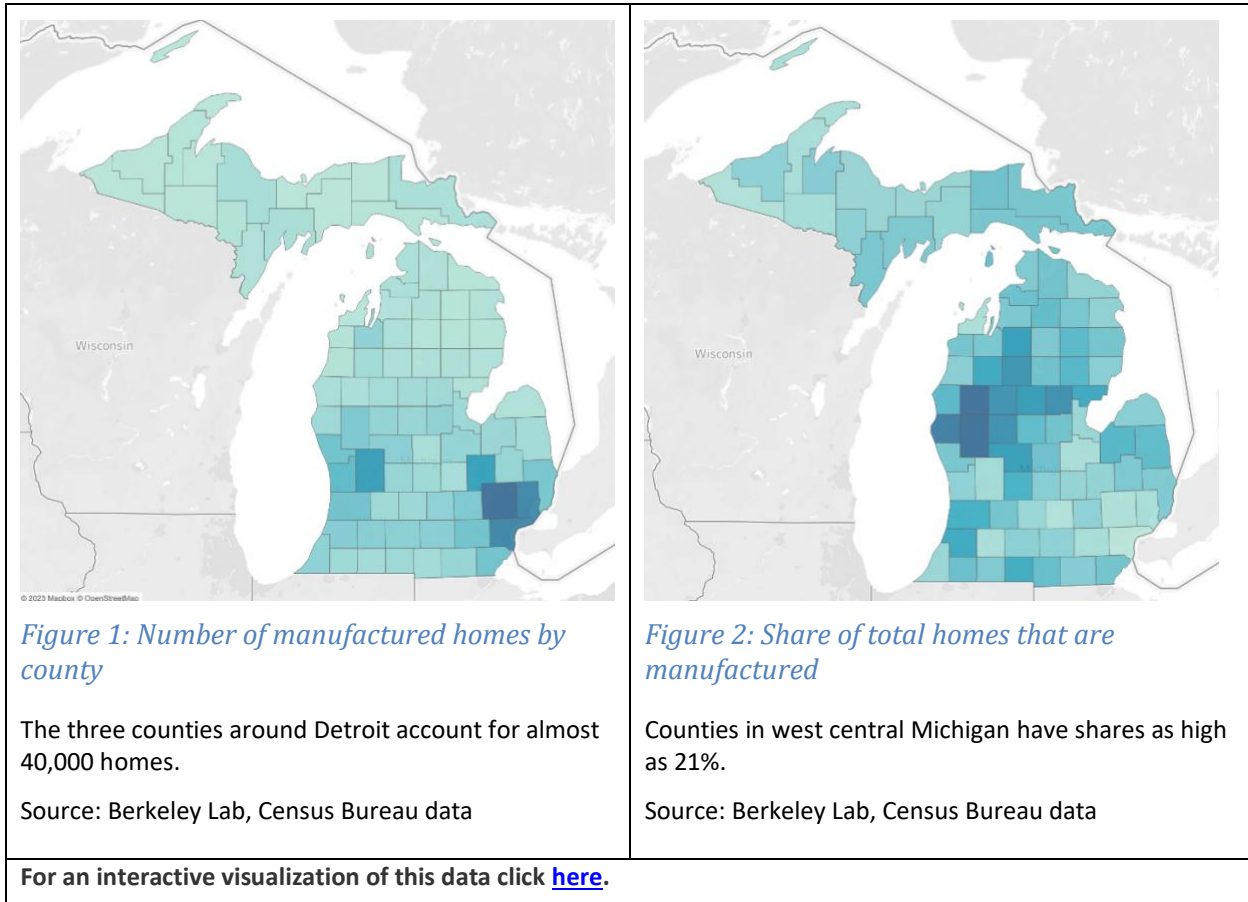


Figure 3 shows the location of 207 large MHCs in Michigan, with over 100 units each. An interactive visualization is available with more details, along with medium and small parks (1075 parks in total), using Homeland Infrastructure Foundation-Level Data.¹⁴

¹² US Census, Michigan Quick Facts, <https://www.census.gov/quickfacts/fact/table/MI/INC110222>.

¹³ An interactive data visualization with this data is available at <https://public.tableau.com/app/profile/berkeley.lab.emp/viz/Michiganmfdhomes/Story1?publish=yes>

¹⁴ Berkeley Lab, Michigan Manufactured Home Communities, using HIFLD data, https://public.tableau.com/app/profile/berkeley.lab.emp/viz/MI/mfdhomesperHIFLD_17032759641210/DBMichmfdhomes?publish=yes

Manufactured Home Communities in Michigan

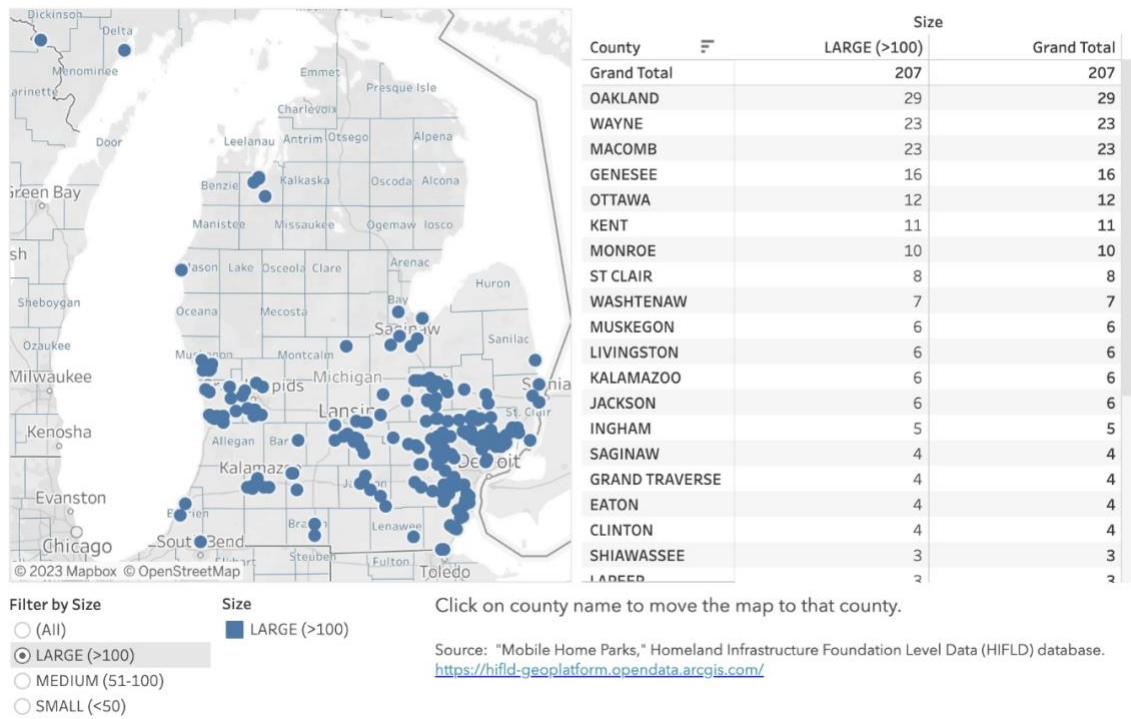


Figure 3: Manufactured home communities in Michigan

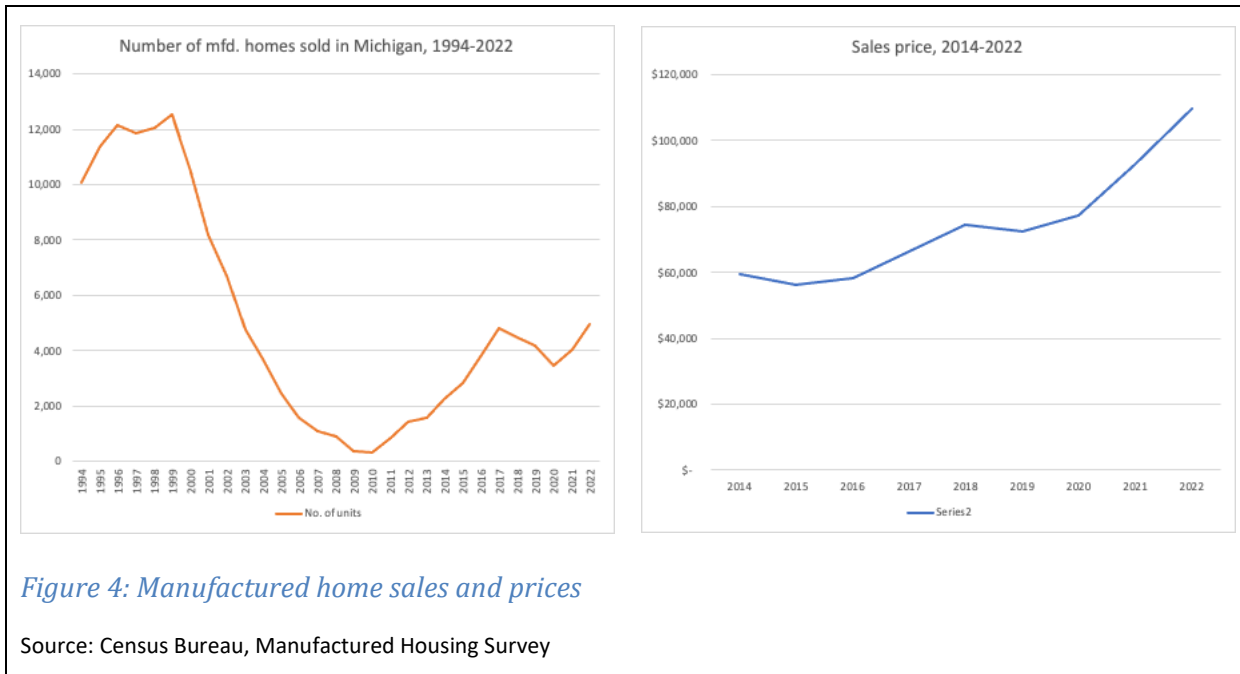
Source: Berkeley Lab, using data from Homeland Infrastructure Foundation-Level Data (HIFLD).

For an interactive visualization of this data click [here](#).

The number of new manufactured homes sold in Michigan fell dramatically between 2000 and 2010, as did new housing starts in general, according to Census Bureau data. Sales have recovered to about 4,000 units per year, which was 24 percent of all new Michigan single-family homes in 2021. Prices for manufactured homes have been rising, and now average over \$100,000.¹⁵ That is still well under half the median price of all home sales.¹⁶

¹⁵ Census Bureau, Manufactured Housing Survey, <https://www.census.gov/programs-surveys/mhs.html>.

¹⁶ Redfin, Michigan Housing Market Overview, <https://www.redfin.com/state/Michigan/housing-market>.



Demographics

The incomes of manufactured home residents are in general much lower than that of conventional housing. The most recent Census data shows household incomes of “mobile home or trailer” residents in Michigan at \$28,115, compared to \$75,760 for residents of single family detached homes.¹⁷

National data indicates that over one-quarter of manufactured home *owners* earn less than \$20,000 annually and two-thirds earn less than \$50,000 annually.¹⁸ Those who *rent* a manufactured home have even lower incomes, with over one-third earning less than \$20,000 per year and over three-quarters earning less than \$50,000 per year.

Michigan’s MiEJScreen mapping tool scores communities on demographic and environmental justice metrics.¹⁹ The map allows users to explore the environmental, health, and socioeconomic conditions within a specific community, region, or across the entire state.²⁰ Communities are scored on a scale of one to one hundred, with higher scores indicating greater environmental, public health, and socioeconomic burdens.

¹⁷ US Census Bureau, ACS 5-Year Estimates Public Use Microdata Sample, https://data.census.gov/mdat/#/search?ds=ACSPUMS5Y2022&vv=*HINCP&cv=BLD&rv=ucgid&wt=WGTP&g=0400000US26.

¹⁸ Fannie Mae, “Manufactured Housing Landscape 2020,” May 21, 2020, <https://multifamily.fanniemae.com/news-insights/multifamily-market-commentary/manufactured-housing-landscape-2020>.

¹⁹ EGLE, MiEJScreen Factsheet, <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Maps-Data/MiEJScreen/MiEJScreen-Factsheet.pdf?rev=626af950b12349e499657e243b93af31>

²⁰ EGLE, MiEJScreen Web Map, <https://gis-egle.hub.arcgis.com/maps/df2334ed1adf47c6b8e57a15fcf85645/explore?location=44.343366%2C-85.187828%2C6.00>.

Unfortunately, MiEJScreen does not distinguish by housing type. Figures 5 and 6 show overall scores and the percentiles of income by Census tract. Overall EJ scores are highest in the cities of southern Michigan, while low-income areas are divided between urban and rural areas across the state.

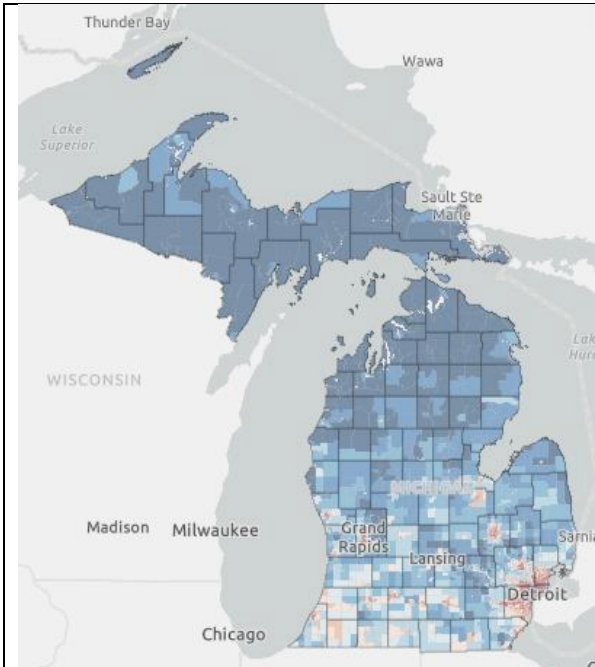


Figure 5: Overall MiEJScreen Score

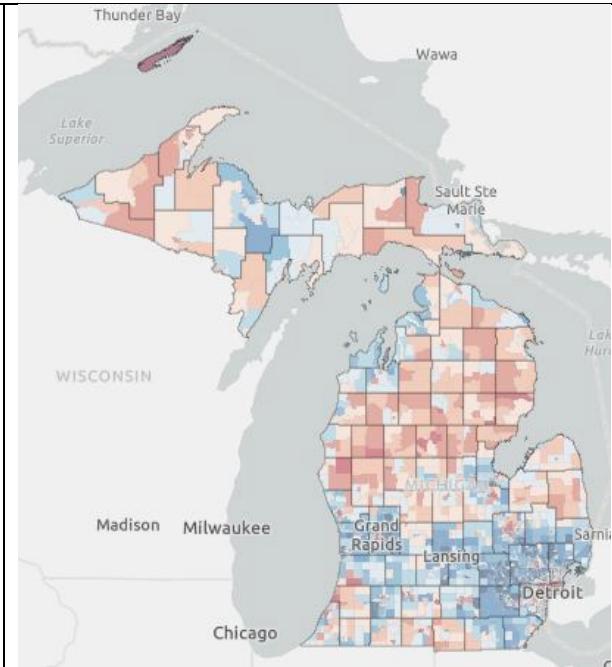


Figure 6: Low Income Population Score

Note: red colors indicate a high score, blue indicate low scores. A high score indicates a low income. The low income map shows percent of population living below double the federal poverty level. Source: MiEJScreen²¹

For an interactive visualization of this data click [here](#).

Energy Burden and Fuel Types

Data is available on the energy expenditures and burdens for Michigan households, from the DOE Low-Income Affordability Energy (LEAD) Tool.²² Michigan data for manufactured homes by county and by Census tract is shown in the figure below, with the right map displaying only tracts with burdens above 10 percent of

²¹ Michigan EGLE, MiEJScreen: Environmental Justice Screening Tool (Draft), <https://www.michigan.gov/egle/maps-data/miejscreen>

²² US DOE, Office of State and Community Energy Programs, LEAD Tool, <https://www.energy.gov/scep/slsc/lead-tool>.

household income. Full data can be accessed with an interactive tool.²³

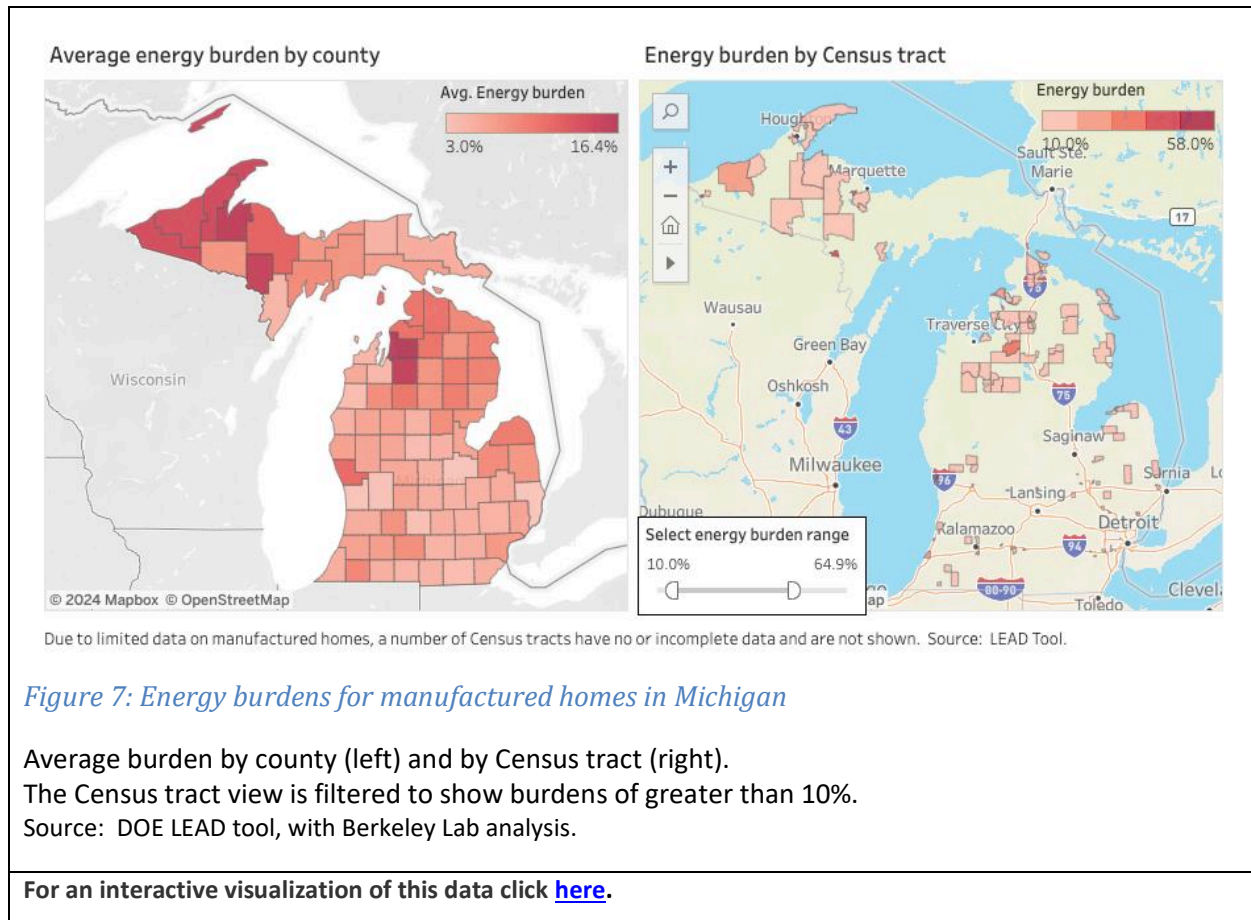


Figure 7: Energy burdens for manufactured homes in Michigan

Average burden by county (left) and by Census tract (right).
The Census tract view is filtered to show burdens of greater than 10%.
Source: DOE LEAD tool, with Berkeley Lab analysis.

Figure 7 shows that energy burdens tend to be higher for manufactured homes in the Upper Peninsula – where propane heating is more common but where fewer homes are in manufactured home communities.

To provide a fuller view of the opportunities with MHCs in Michigan, especially with LMI households that are also eligible for weatherization and energy assistance programs, a more complete analysis should be undertaken, such as by using the Datacomp data set. Such an analysis could identify the location, size, and demographics of MHCs; their local utilities and community action agencies that could serve as program administrators; and the potential for federal incentives to reduce costs and maximize benefits.

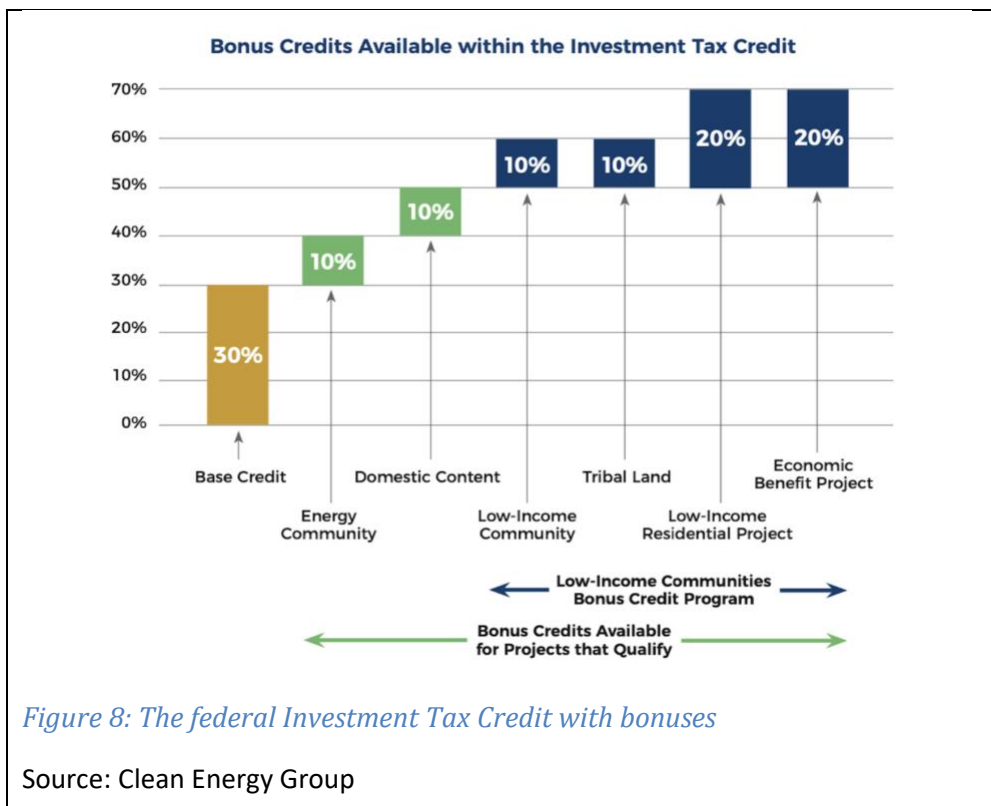
While such an analysis of all 1,200 MHCs in the Datacomp database is beyond the scope of this technical assistance, an illustration of such an analytical approach is presented below as a case study, using data from one MHC owner, Cambio MHC.

²³ Berkeley Lab, “Energy Burden for Manufactured Homes in Michigan” data tool, <https://public.tableau.com/app/profile/berkeley.lab.emp/viz/MlImfdhomesenergyburdenbycountyandtract/Dashboard1?publish=yes>.

Federal Funding Sources

Another factor in identifying opportunities for LMI solar for manufactured homes is the applicability of federal incentives for clean energy. The Inflation Reduction Act (IRA) created new incentives and programs that can benefit solar development in Michigan, especially for projects that benefit low-income households and communities.

The main incentive is the Investment Tax Credit (ITC), which has a number of new bonuses to encourage development with greater benefits to certain communities. The base credit of the ITC is now 6 percent, rising to 30 percent if prevailing wage and apprenticeship requirements are met. This portion applies to projects anywhere in the United States. A 10 percent bonus is available for projects located in “energy communities,” which are defined as brownfields, communities with a significant share of workers in the fossil fuel sector plus high unemployment rates, or a community where a coal plant or mine has closed.²⁴ An additional 10 percent bonus is available for projects that use domestic content, such as American-made solar panels and mounting hardware. The base ITC plus the energy communities and domestic content bonuses are not limited by appropriations.



A final bonus, for low-income communities, is limited to 1,800 MW per year nationally and to projects smaller

²⁴ DOE, Energy Community Tax Credit Bonus, <https://energycommunities.gov/energy-community-tax-credit-bonus/>

than 5 MW. This bonus offers 10 percent to solar and wind facilities installed in low-income communities or on Indian land, and 20 percent to solar and wind facilities that are part of a qualified low-income residential building or a qualified low-income economic benefit project.²⁵ This program is expected to be extremely competitive. For the first year of awards, during the initial 30-day application window the program received more than 46,000 applications for new wind and solar projects, representing more than 8,000 megawatts of proposed capacity.²⁶

These bonus tax credits are “stackable,” meaning projects that meet all criteria could receive a credit of up to 70 percent of the total investment cost of the project. Maps of the eligible areas in Michigan are shown in Figures 10 and 11 below, with links to the official mapping tools in the footnotes.

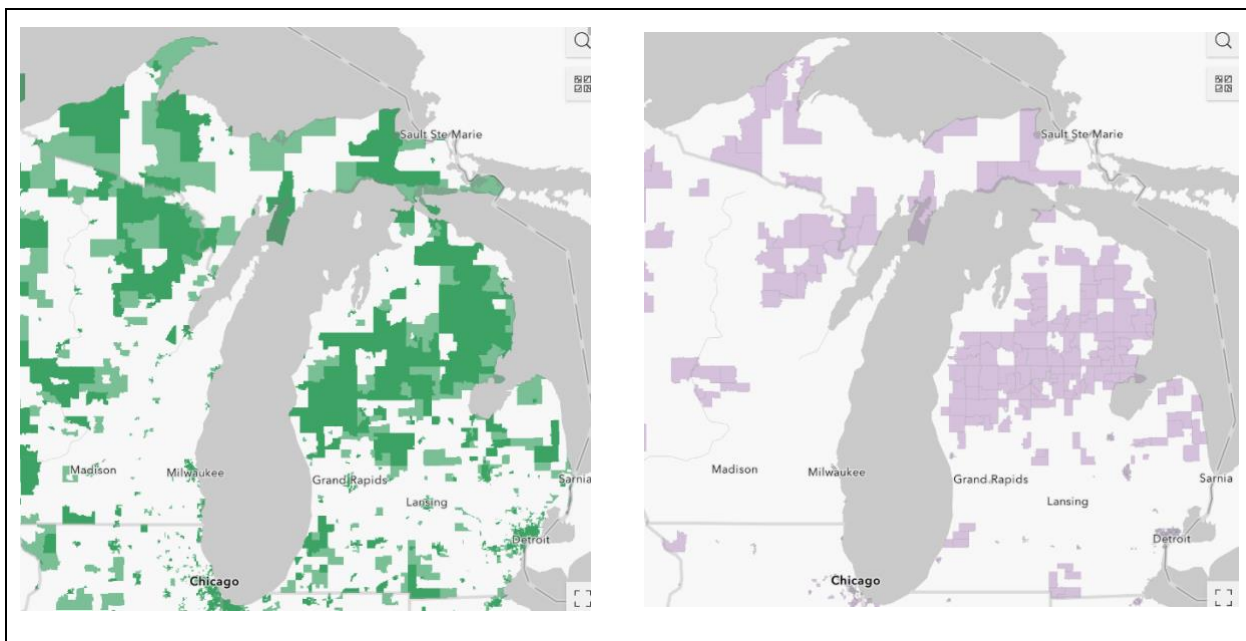


Figure 9: Inflation Reduction Act (IRA) Low-Income Community Bonus Credit Program

Left: Census tracts that meet the New Market Tax Credit Program’s threshold for Low Income

Right: Census tracts that meet the Climate and Economic Justice Screening Tool’s threshold for disadvantage in the Energy Burden category

Source: DOE²⁷

²⁵ DOE, Low-Income Communities Bonus Credit Program, <https://www.energy.gov/justice/low-income-communities-bonus-credit-program>

²⁶ David Lawder, Reuters, “US Treasury swamped by demand for bonus wind, solar tax credits in low-income areas,” December 4, 2023, <https://www.reuters.com/sustainability/climate-energy/us-treasury-swamped-by-demand-bonus-wind-solar-tax-credits-low-income-areas-2023-12-04/>

²⁷ DOE, Low-Income Communities Bonus Credit Program, <https://experience.arcgis.com/experience/12227d891a4d471497ac13f60fffd822/page/Page/>

For an interactive map, click [here](#).

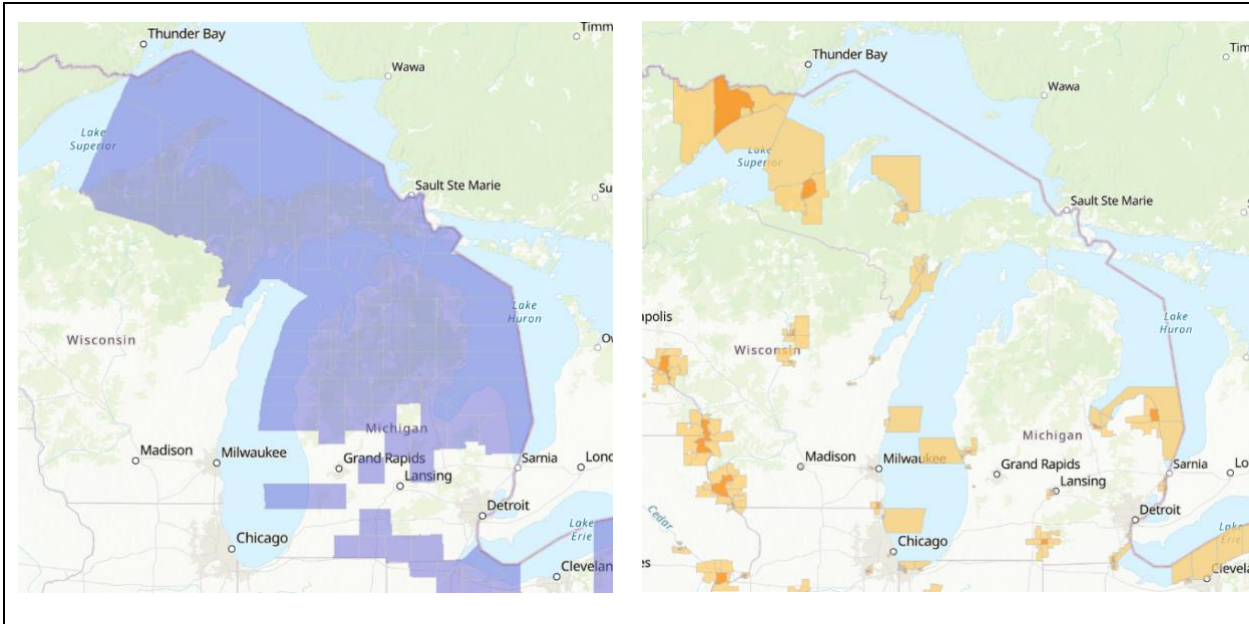


Figure 10: IRA-designated Energy Communities

Left: Areas that meet both the Fossil Fuel Employment (FEE) threshold and the unemployment rate requirement.

Right: Coal Closure Energy Communities

Source: DOE²⁸

For an interactive map click [here](#).

To identify priority MHCs, EGLE should research which ones are in areas that are eligible for these ITC bonuses. Many areas of Michigan are defined as “energy communities,” for example, while several are “low-income communities.”

Additional federal funding programs created or expanded by the Inflation Reduction Act (IRA) may also be applicable. A few of these are:

- Greenhouse Gas Reduction Fund: EPA is granting \$27 billion to states, nonprofit financial institutions, and Tribes to provide low-cost financing for zero emissions technologies.²⁹ This includes the Solar for All

²⁸ DOE, Energy Community Tax Credit Bonus mapping tool, <https://arcgis.netl.doe.gov/portal/apps/experiencebuilder/experience/?id=a2ce47d4721a477a8701bd0e08495e1d>

²⁹ EPA, Greenhouse Gas Reduction Fund, <https://www.epa.gov/greenhouse-gas-reduction-fund>.

grant fund of \$7 billion, specifically for low-income solar programs.³⁰ Michigan is eligible for a Solar for All grant of between \$100 million and \$250 million.

- Rural Energy for America Program (REAP): USDA provides grants or loans for rural clean energy projects, with a budget of \$2 billion.³¹
- New Empowering Rural America (ERA) Program: Rural electric co-ops can apply for loans, refinancing, or grants for up to 25 percent of project costs (limited to \$970 million per utility). The program has a \$9.7 billion budget.³²
- Powering Affordable Clean Energy PACE Program: USDA's Rural Utilities Service (RUS) will forgive up to 60 percent of loans for renewable energy generation and storage projects. \$1 billion budget.³³
- Environmental and Climate Justice Block Grants: \$3 billion in grants and technical assistance to community-based organizations to execute climate and environmental justice projects.³⁴

Additional funding opportunities may come from state government policies and programs, from county and local governments, and from corporate and philanthropic donations.

Potential Partnerships

Local utilities and social service agencies are typically the frontline partners for delivery of low-income energy programs, and were the partners for EGLE's CELICA programs. This would make an obvious template for future program delivery.

In Michigan, community action agencies (CAAs) manage the delivery of the federally-funded Weatherization Assistance Program (WAP), and help manage enrollment in the Low Income Home Energy Assistance Program (LIHEAP). CAAs cover every county in the state, as well as most areas of the United States.

The largest investor-owned utilities, Consumers Energy and DTE Electric, serve 76 percent of homes in MHCs, which is proportional to their share of total electricity sales in the state. They also serve the majority of low-income MHCs.

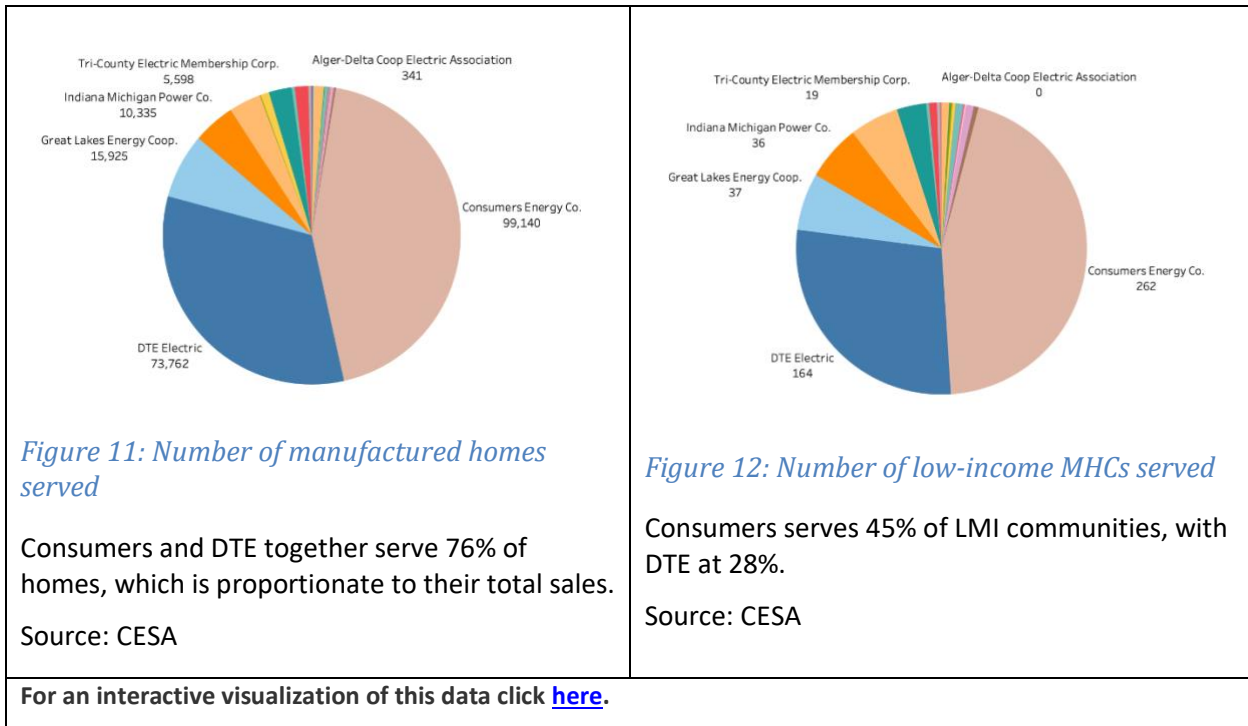
³⁰ EPA, Solar for All, <https://www.epa.gov/greenhouse-gas-reduction-fund/solar-all>.

³¹ USDA, Rural Energy for America Program, <https://www.rd.usda.gov/programs-services/energy-programs/rural-energy-america-program-renewable-energy-systems-energy-efficiency-improvement-guaranteed-loans>.

³² USDA, Empowering Rural America, New ERA Program, <https://www.rd.usda.gov/programs-services/electric-programs/empowering-rural-america-new-era-program>.

³³ USDA, Powering Affordable Clean Energy PACE Program, <https://www.rd.usda.gov/programs-services/electric-programs/powering-affordable-clean-energy-pace-program>.

³⁴ EPA, Environmental and Climate Justice Block Grants, <https://www.epa.gov/environmentaljustice/environmental-justice-grants-funding-and-technical-assistance>.



Other utilities serving a significant number of manufactured homes include the Indiana-Michigan Power Company (IOU); the Great Lakes, Midwest, and Tri-County rural electric cooperatives; and the Village of Clinton, which is southwest of Detroit.

Cambio Case Study

A number of manufactured home communities in Michigan are owned by corporations that own multiple sites. One such company, Cambio MHC, has 31 manufactured home communities in Michigan with about 7,200 homes in total.³⁵

Notably, 14 of these communities, with about 2,225 homes, are in areas designated as “disadvantaged” by the federal Climate and Economic Justice Screening Tool (CEJST). CEJST uses a combination of data on demographic factors and environmental burdens to designate communities as eligible for certain programs.³⁶ Scores are also shown from Michigan’s similar screening tool, called MiEJscreen

A map of Cambio MHCs is shown in Figure 13. Circle sizes reflect the number of homes in the MHC, while color tones reflect their MiEJScreen score (dark colors have higher scores). For example, large Cambio MHCs are located in Belleville and Canton, east of Ann Arbor, while the MHCs with the highest Michigan EJ scores are in Warren, just north of Detroit.

³⁵ Cambio Communities, Michigan communities page, <https://cambiohmc.com/our-communities/?category=44>

³⁶ Office of the President, Council on Environmental Quality, Climate and Economic Justice Screening Tool (CEJST), <https://screeningtool.geoplatform.gov/en/>

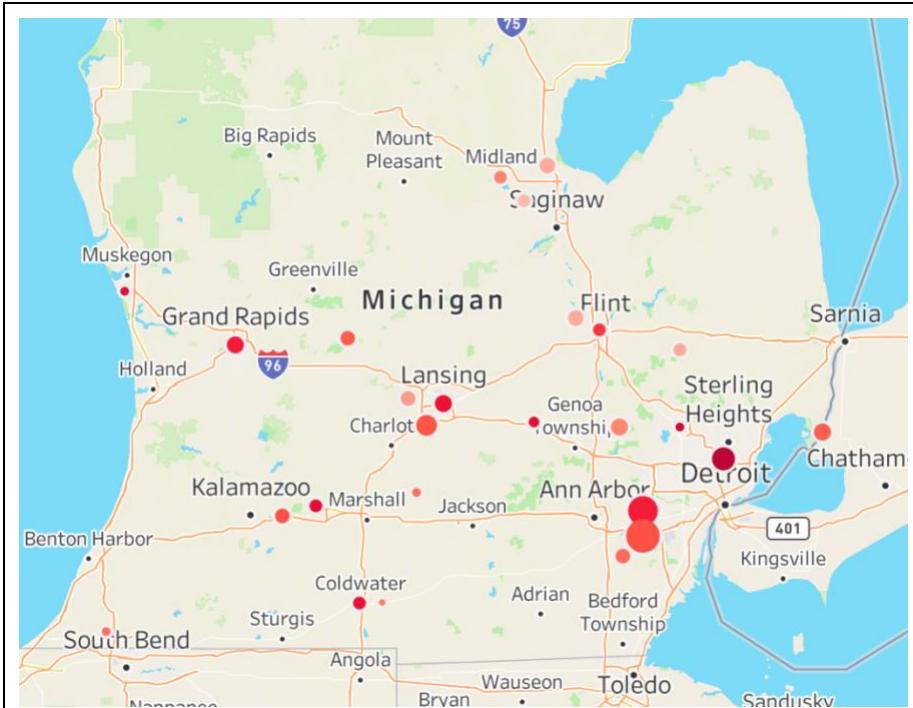


Figure 13: Cambio MHCs in Michigan

By size of community and MiEJScreen score

Source: Berkeley Lab, with Cambio data

For an interactive visualization of this data click [here](#).

While CEJST and MiEJScreen ratings are similar, they are not always the same. Still, both can be used to identify priority communities. An analysis of the Cambio MHCs, as shown in Table 1, finds that Cambio’s two MHCs in Warren (Shadylane and Warren Estates) have 549 homes in CEJST disadvantaged communities, with Michigan EJ scores of 92 and 93 out of 100. Nine Cambio MHCs with 1,752 homes have Michigan scores over 70.³⁷

Since the three CELICA pilots featured collaborations between EGLE, local community action agencies (CAAs), and local utilities, we present also on this table the corresponding utilities and CAAs for each Cambio MHC. Utilities were matched using data from the Public Service Commission, while CAA information came from Michigan Community Action.³⁸

³⁷ An interactive data visualization based on this data is at <https://public.tableau.com/app/profile/berkeley.lab.emp/viz/Michiganmfdhomes/Story1?publish=yes>

³⁸ Michigan Public Service Commission, <https://utilitysearch.apps.lara.state.mi.us/search>. Michigan Community Action, agency locator map, <https://micommunityaction.org/agency-map>.

Table 1: Cambio MHCs in Michigan

(Sorted by MI EJscreen score)

Name	City	Utility	CAA	CEJST DAC	MI EJ Screen score	Number of homes
Shadylane	Warren	DTE Energy	Macomb Community Action	Yes	93	249
Warren Estates	Warren	DTE Energy	Macomb Community Action	Yes	92	300
Sylvan Lake	Pontiac	DTE Energy	Oakland Livingston Human Service Agency	Yes	84	80
Royal Holiday	Canton	DTE Energy	Wayne Metropolitan CAA	No	77	436
Avenue A	Springfield	Consumers Energy	Community Action	Yes	74	169
Cedar River	Fowlerville	DTE Energy	Oakland Livingston Human Service Agency	Yes	74	119
Nomad	Norton Shores	Consumers Energy	Mid-Michigan CAA	Yes	73	104
Park Terrace	Lansing	City of Lansing	Capital Area Community Services, Inc.	Yes	72	152
Trail Tree Village	Coldwater	Coldwater Board of Public Utilities	Community Action	Yes	71	143
Valley Estates	Lansing	City of Lansing	Capital Area Community Services, Inc.	Yes	69	148
Green Meadows	Grand Rapids	DTE Energy	Kent County Community Action	Yes	68	149
Kentwood	Grand Rapids	DTE Energy	Kent County Community Action	Yes	68	180
Linden Place	Flint Twp	Consumers Energy	Genesee County CARD	Yes	61	162
Holiday Estates	Canton	DTE Energy	Wayne Metropolitan CAA	No	58	481
Gale Valley	Galesburg	Consumers Energy	Community Action	No	53	226
Holiday West	Belleville	DTE Energy	Wayne Metropolitan CAA	No	53	851
Holiday Woods	Belleville	DTE Energy	Wayne Metropolitan CAA	No	53	313
Windsor Estates	Dimondale	Consumers Energy	Capital Area Community Services, Inc.	No	52	446
Channel View	Clay Township	Consumers Energy	EightCAP, Inc.	No	49	323

Sherwood Forest	Ionia	DTE Energy	Blue Water Community Action	Yes	49	228
Whittaker Oaks	Whittaker	DTE Energy	Washtenaw County OCED	No	43	220
Riverside Estates	Buchanan	Consumers Energy	Southwest Michigan CAA	No	42	87
Spring Harbor	Springport	Indiana-Michigan Power	Community Action Agency	No	42	81
North Trail Village	Quincy	Consumers Energy	Community Action	Yes	39	42
Oakside	Midland	Consumers Energy	Mid Michigan CAA	No	34	156
Highland Hills	Highland	DTE Energy	Oakland Livingston Human Service Agency	No	33	306
Grand Ledge Ravines	Grand Ledge	Consumers Energy	Capital Area Community Services, Inc.	No	25	205
Flushing Estates	Flushing	Consumers Energy	Genesee County CARD	No	19	280
Ideal Villa	Metamora	DTE Energy	Human Development Commission	No	19	168
White Birch	Kawkawlin	Consumers Energy	Mid Michigan CAA	No	18	249
Freeland	Freeland	Consumers Energy	Mid Michigan CAA	No	11	143

Source: Cambio MHC, LBL analysis using CEJST tool and MIEJScreen tool. Utility service indicated using <https://utilitysearch.apps.lara.state.mi.us/search>.

Opportunities for Weatherization

In a recent report, the American Council for an Energy Efficient Economy (ACEEE) surveyed the opportunities for improving efficiency in manufactured homes.³⁹ They point out that energy costs per square foot are roughly 50 percent higher in manufactured homes than those in site-built, single-family homes and 20 percent higher than in apartments in large buildings.

While much of the guidance in the report will be familiar to WAP practitioners, one suggestion relevant to the combination of WAP and community solar is to deploy efficient heat pumps for heating and cooling as a replacement for higher cost heating fuels like electric resistance heaters, propane and heating oil, which at the same time replaces less efficient air conditioners. This electrification measure can be combined with community solar to cut overall energy expenditures.

Additionally, the report points out that older manufactured homes, especially those dating from before 1994 energy standards took effect, may be good candidates for replacement rather than efficiency improvements and repairs. It cites several states with home replacement financing programs. Replacement is also an opportunity to incorporate solar and electrification technologies in the new homes. Further research by Slipstream explores replacement strategies specific to Michigan.⁴⁰

Lastly, the ACEEE report catalogues an extensive list of federal funding opportunities that can be applied to manufactured homes, especially those occupied by low-income tenants or sited in disadvantaged communities. Programs offered by USDA, HUD, EPA, DOE, the Center for Disease Control (CDC), and the Centers for Medicare & Medicaid Services (CMS) offer billions of dollars in potential aid, in aggregate. IRA created the \$4.3 billion Home Efficiency Rebates program and the \$4.5 billion Home Electrification and Appliance Rebates program, both to be administered by states, that can be applied to manufactured homes.⁴¹ The WAP program itself received \$3.5 billion from the Infrastructure Investment and Jobs Act (IIJA), beginning in fiscal year 2022, available until expended, in comparison to \$326 million in regular appropriations for fiscal year 2023.⁴²

One specific funding opportunity is the Preservation and Reinvestment Initiative for Community Enhancement (PRICE) program to preserve and revitalize manufactured housing.⁴³ The HUD program will receive \$225 million over five years, distributed as competitive grants to states, local governments, resident-owned manufactured

³⁹ ACEEE, Topic Briefs: Upgrading Manufactured Homes, August 2023, https://www.aceee.org/sites/default/files/pdfs/topic_briefs_-_upgrading_manufactured_homes_-_encrypt.pdf

⁴⁰ Shannon Stendel and Rachel Krogman, Slipstream, *Great Lakes Energy Manufactured Home Replacement Research*, January 2023, <https://slipstreaminc.org/sites/default/files/documents/publications/great-lakes-manufactured-home-replacement-final-report1.pdf>.

⁴¹ DOE, State and Community Energy Programs, Home Energy Rebates Programs, Guidance for Program Administrators, <https://www.energy.gov/scep/home-energy-rebates-programs>.

⁴² Carlos Martin, Joint Center for Housing Studies of Harvard University, "Harnessing the IIJA's Weatherization Assistance Program to Leave No Household in the Cold," January 31, 2023, <https://www.jchs.harvard.edu/blog/harnessing-iijas-weatherization-assistance-program-leave-no-household-cold>.

⁴³ HUD FY-24 appropriations, (page 15) https://www.whitehouse.gov/wp-content/uploads/2023/03/hud_fy2024.pdf

housing communities, cooperatives, nonprofits, community development financial institutions, Tribes, and others. Grantees must provide a 50 percent match for the federal funds.

These grants from the Office of Community Planning and Development can be used for infrastructure, planning, resident and community services, resiliency activities (defined as reconstruction, repair, or replacement to protect the health and safety of manufactured housing residents and to address weatherization and energy efficiency needs), and assistance for land and site acquisition. Priority is given to applications that primarily benefit low- or moderately low-income residents and preserve long-term housing affordability. Legislation introduced in late 2023 would make the program permanent.⁴⁴

A report from the National Consumer Law Center (NCLC) adds further insight about how land ownership can pose a barrier to or opportunity for weatherization efforts in MHCs.⁴⁵ Homes in MHCs may be rented or may sit on rented land, creating a barrier to home improvement, or to the financing of energy efficiency measures. Alternatively, MHCs can be a Resident Owned Community (ROC), cooperatively owned by the residents, which can alleviate those barriers. While the support group ROC USA counts over 300 ROCs in the US, they don't identify any located in Michigan.⁴⁶

The physical structure of manufactured homes can also pose barriers to weatherization programs. Older homes especially can have thin 2x2 walls that don't allow for insulation, limited space for ductwork, and roof structures that don't support rooftop solar installations.⁴⁷ While cost-effective energy efficiency measures are possible, they can vary from home to home. As discussed below, new electrification strategies may offer a way around physical barriers.

Lastly, identifying the heating source can be a way to prioritize manufactured homes for inclusion in a program. Space heating accounts for 55 percent of household energy use in Michigan. In the 2020 Residential Energy Consumption Survey (RECS) DOE found that 71 percent of "mobile" homes in the US (4.85 million out of 6.83 million) relied on electricity for space heating, and 76 percent relied on electric water heaters.⁴⁸ Indeed, almost half of US manufactured homes are all-electric. Another 13 percent used propane for space heating.

In Michigan, however, full electrification is uncommon. Two-thirds of manufactured homes rely on natural gas for heat, with 19 percent using propane, 7 percent electric, 4 percent wood, and 3 percent none or other.⁴⁹

⁴⁴ HousingWire, "Lawmakers introduce affordable manufactured housing community bill in House, Senate," November 9, 2023, <https://www.housingwire.com/articles/lawmakers-introduce-affordable-manufactured-housing-community-bill-in-house-senate/>

⁴⁵ NCLC, *Manufactured Housing Resource Guide: Weatherization and Replacement of Homes*, February 2010, https://prosperitynow.org/sites/default/files/resources/weatherization_replacement_of_homes.pdf

⁴⁶ ROC USA, "What's a ROC?", <https://rocusa.org/whats-a-roc/>

⁴⁷ ACEEE, 2023.

⁴⁸ EIA, 2020 Residential Energy Consumption Survey (RECS), "Fuels used and end uses by housing unit type (HC1.1)," <https://www.eia.gov/consumption/residential/data/2020/index.php?view=characteristics>

⁴⁹ American Community Survey, Public Use Microdata Sample (PUMS), <https://www.census.gov/programs-surveys/acs/microdata.html>.

Rural manufactured homes and homes not in MHCs are more likely to rely on fuels other than natural gas, such as inefficient electric resistance heaters or propane for space heating and water heating. The relatively high cost of these fuels, combined with the relative inefficiency of manufactured homes, can result in very high winter heating bills. Emissions from propane tanks and heaters, in addition, can cause indoor and localized outdoor air pollution.⁵⁰

According to the Michigan PSC, Michigan has a higher portion of homes (of all kinds) relying on propane for heating than any other state, at 8 percent of the total.⁵¹ Areas of the Upper Peninsula and the northern Lower Peninsula have some of the highest proportions, with some counties topping 50 percent. Only 6 percent of all Michigan homes rely on electricity for heating.

Heating bills for homes heated with propane average \$1,294 per year in the Midwest region, slightly higher than the \$1,213 for electric-heated homes. Both are more than double the \$581 spent to heat natural gas homes.⁵²

Research by ACEEE in 2012 found that energy costs per square foot in manufactured homes in the US are nearly twice that of site-built homes at \$1.38/square foot, compared to \$0.74/square foot.⁵³ This, combined with the lower income of manufactured home residents, results in exceptionally high energy burdens.

These disparate data sets suggest that manufactured homes in northern counties are especially likely to rely on propane for heating, and thus have higher energy burdens.

⁵⁰ American Lung Association, “The Health Impact of Combustion in Homes,” January 2023, <https://www.lung.org/getmedia/da394c1a-200e-4c89-9947-7ecb1a26571a/The-Health-Impact-of-Combustion-in-Homes.pdf>

⁵¹ Michigan Public Service Commission, “Winter Energy Appraisal, Winter Outlook 2023-2024,” November 8, 2023, https://www.michigan.gov/mpsc/-/media/Project/Websites/mpsc/regulatory/reports/energy-appraisal/2023-2024_Winter_Energy_Appraisal.pdf

⁵² EIA, Short Term Energy Outlook, Winter Fuels Outlook 2023–24, <https://www.eia.gov/outlooks/steo/report/WinterFuels.php#tab1>

⁵³ Jacob Talbot, ACEEE, “Mobilizing Energy Efficiency in the Manufactured Housing Sector, July 2012, <https://www.aceee.org/sites/default/files/publications/researchreports/a124.pdf>

Opportunities for Community Solar

The opportunities to use community solar to provide benefits to residents of manufactured homes are in some ways more straightforward than the opportunities for weatherization. While community solar comes in many forms, the most common is that an offsite solar plant generates electricity, and the benefits are conveyed to subscribers in the form of a bill credit. This conveyance is done through accounting, either on the utility bill or on a separate bill, so it is the same for all residential customers with utility bills regardless of building type or metering configuration.

There are many variations, however. The customer can buy and own panels in a centrally located solar system, with the system maintained by the developer or utility. Or the customer can lease the panels, making a monthly payment that is typically lower than the retail price of the energy. Or the customer can sign a power purchase agreement (PPA) to buy the electricity.

Community solar can also take the form of systems owned or leased by community organizations, who either use the savings from the system to fund their community services or convey the savings to their clients in the form of cash or bill credits. Sometimes the solar system is installed on the premises of the community organization, letting them capture the self-generation value of the energy through net metering.

How to serve a manufactured home community may depend on how the homes are metered and where they are located. If a community is master-metered, a single solar project in or adjacent to the community could be connected behind the meter and create benefits for the customers as a whole, with or without submetering for individual homes. If homes are individually metered, the solar project could provide a bill credit or virtual net metering (VNEM) credits. In that case the project needn't be in or near the community but could be anywhere in the utility's service territory, depending on program rules.

The Michigan legislature passed a slew of clean energy legislation in 2023, which will likely foster a larger and more mature solar industry.⁵⁴ But they have not directly addressed community solar.⁵⁵ Without clear statutory guidance on community solar, utilities have been able to create their own programs, as in the three CELICA pilot projects. Those community solar projects were located in the service territory of each utility and their customers.

There are numerous examples of community solar projects dedicated to low-income subscribers and community organizations, sometimes in manufactured home communities.

In one example, the Community Loan Fund, a New Hampshire lending CDFI, has been developing community

⁵⁴ Michigan Public Service Commission, 2023 Energy Legislation, <https://www.michigan.gov/mpsc/commission/workgroups/2023-energy-legislation>

⁵⁵ Brian Allnut, *Planet Detroit*, "Republicans and Democrats want community solar. Why won't Michigan legislators enable it?" December 7, 2023, <https://energynews.us/2023/12/07/republicans-and-democrats-want-community-solar-why-wont-michigan-legislators-enable-it>.

solar for manufactured home communities.⁵⁶ They financed the Mascoma Meadows project, where a 50-unit resident-owned manufactured-home cooperative in Lebanon, NH, partnered with ReVision Energy to install a 132 kW ground-mounted solar array. The project saves each of the co-op's participating low- and moderate-income households an estimated \$270 annually. The state's application to the EPA Solar for All program includes additional funding for the Loan Fund for similar projects.



Figure 14: Mascoma Meadows MHC with solar installation

Source: ReVision Energy

For more examples of community solar development, visit the DOE's National Community Solar Partnership website.⁵⁷

⁵⁶ Sarah Shemkus, "New Hampshire seeks IRA grant to help low-income residents tap the benefits of solar," *Energy News Network*, November 30, 2023, <https://energynews.us/2023/11/30/new-hampshire-seeks-ira-grant-to-help-low-income-residents-tap-the-benefits-of-solar/>.

⁵⁷ DOE, National Community Solar Partnership, <https://www.energy.gov/communitysolar/community-solar>

Strategies for Combining the Weatherization of Manufactured Homes and Community Solar

Community solar and weatherization strategies for manufactured homes intersect in the form of efficient electrification. Switching to high-efficiency electrical appliances enables the home to tap low-cost community solar to replace higher-cost energy sources.

While this can be accomplished in a number of ways, one key focus for Michigan could be on using cold weather air-source heat pumps for space conditioning, replacing electric resistance heaters and propane furnaces in the winter, and inefficient air conditioners in the summer.

States are trying out heat pumps in manufactured home retrofits. A new WAP program, created in the IJJA, funds the Sustainable Energy for Consumers (SERC) Awards, to “drive innovative strategies and technologies in weatherization and maximize energy burden reduction for low-income households.”⁵⁸ In December 2023 DOE awarded a total of \$15.2 million to ten WAP Grantees for program year (PY) 2023.⁵⁹ SERC-funded measures are not subject to cost effectiveness or savings to investment ratio (SIR) requirements.

Two awards from this round of funding included manufactured homes. The Massachusetts Department of Housing and Community Development got \$1 million to replace existing heating systems with cold climate air-source heat pump technology in mobile homes in a 41-unit mobile home park. The measures will include upgraded electrical panels capable of supporting the heat pumps plus future installation of solar and/or electric vehicle charging stations. New Hampshire’s Department of Energy will fund the Tri-County Community Action Program, Inc. (\$232,175) to install heat pump space heating systems in kerosene-fueled manufactured homes in low-income clients’ homes.⁶⁰

Heat pumps can then be married with solar to cut bills. The Florida Solar Energy Center (FSEC) at the University of Central Florida developed the PV-GEMS system to cut energy bills at single-family homes.⁶¹ PV-GEMS (Grid Enhanced Mechanical Solution) is a package featuring an on-site PV system, a battery, a high efficiency heat pump water heater, and a high efficiency mini-split heat pump that can enhance or replace a home’s existing central space conditioning system. It can be configured to not export any power to the grid and to function during grid outages.

FSEC argues that older manufactured homes are good candidates for PV-GEMS since “achieving significant energy savings through enclosure-based load reduction measures such as wall, window, and roof retrofits are

⁵⁸ US DOE, Weatherization Assistance Program, “SERC Quick Guide,” November 16, 2023, <https://www.energy.gov/scep/wap/articles/serc-quick-guide>

⁵⁹ US DOE, Weatherization Assistance Program, “Weatherization Memorandum 121: Announce the Recipients of Program Year (PY) 2023 Sustainable Energy for Consumers (SERC) Awards,” December 21, 2023, <https://www.energy.gov/scep/wap/articles/weatherization-memorandum-121-announce-recipients-program-year-py-2023>

⁶⁰ US DOE, “Attachment 1: Program Year 2023 SERC Projects,” <https://www.energy.gov/sites/default/files/2023-12/attachment-1-program-year-2023-serc-projects.pdf>.

⁶¹ FSEC, PV-GEMS, <https://energyresearch.ucf.edu/research-projects/pv-gems/>

considered not economical, too invasive, or otherwise problematic.”

They are demonstrating the concept in eight manufactured homes and four single-family homes in six states representing different climate zones, including Massachusetts.

McKnight Lane, a defunct MHC in Vermont, was redeveloped with 14 single-family modular homes available for rent to low-income residents.⁶² All the homes are zero net energy, with rooftop solar production, as well as battery systems. The project gets additional value by operating as a ‘virtual power plant’ with remote dispatch by the local utility. Similar projects combining manufactured homes with on-site solar have been deployed in Delaware and California.⁶³

In Minnesota, a ground-mounted community solar project is being used to test a new strategy for energy assistance for residents of manufactured homes.⁶⁴ In that community, winter heating bills can be very large, exceeding \$300 per month for residents of manufactured homes, creating severe seasonal bill payment problems. To maximize the value of the solar generation, the local utility, Detroit Lakes Public Utilities, is “banking” solar credits from the summer and applying them against large winter heating bills.

A similar effect could be achieved through a kind of “budget billing” approach, where utility charges and community solar credits are allocated evenly throughout the year. This would smooth seasonal variations for both consumption and solar production, as well as reduce the normalized monthly bill. While this may reduce arrearages, care should be taken to ensure the best result for these vulnerable households. In either case, allowing any excess community solar credits from the summer to rollover to subsequent bills is a best practice that can be promoted.

⁶² Samantha Donalds, Sarah Galbraith, and Todd Olinsky-Paul, Clean Energy Group and the Meridian Institute, “Resilient Power Project Case Study: McKnight Lane Redevelopment Project,” June 2018, <https://www.cleaneenergy.org/wp-content/uploads/McKnight-Lane-Case-Study-June-2018.pdf>.

⁶³ Dylan Tucker, NASEO, *Manufactured Housing in Rural America: How States are Supporting Energy Efficient Homes and Reducing Energy Costs for Residents*, April 2021, <https://www.naseo.org/data/sites/1/documents/publications/Manufactured%20Housing%20in%20Rural%20America.pdf>

⁶⁴ Clean Energy States Alliance, Webinar: An Equitable Solar Access Pilot Project in Minnesota benefitting Manufactured (Mobile) Home Residents, August 31, 2023, <https://www.cesa.org/event/equitable-solar-access-project-benefitting-minnesota-manufactured-home-residents>

Recommendations

This paper was written in response to a technical assistance request from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), who are interested in combining community solar with weatherization programs for manufactured homes. While it is not an exhaustive review of the issues, it does briefly review some of the relevant facts and attempts to lay out a methodology for more in-depth analysis.

Because it is a relatively cursory analysis, it makes a number of recommendations for further research. But it focuses on a single overarching strategy that seeks to tie the three elements together:

EGLE should consider combining community solar subscriptions with the deployment of cold weather heat pumps in manufactured home retrofits, to replace electric resistance and propane heat as well as inefficient air conditioners. Home heating is the largest portion of residential energy expenditures in Michigan, especially for homes heated with propane and electric resistance heaters, and manufactured homes tend to rely on those higher-cost fuels. To better manage the seasonal variation of heating bills and solar output, utilities may wish to implement a “solar banking” option or a seasonalized “budget billing” plan.

This strategy recommendation is made because:

1. It could provide a workaround to some of the difficulties of weatherizing manufactured homes, like narrow walls, roof joists, and limited duct space;
2. It could be done as a standard measure replicated in many homes, potentially tapping economies of scale in procurement, permitting, and labor; and
3. It would enable low-cost community solar power to displace heating and cooling expenditures, shrink large winter heating bills, and reduce arrearages.

If EGLE were interested in pursuing this strategy, it would be prudent to do further research and preparatory actions, such as the following:

Better characterize MHCs in Michigan:

- To identify priority MHCs, an analysis like the one done for Cambio properties could be conducted for additional communities, including their location, demographics, DAC status, land ownership status, utility service territory, CAA service territory, and other factors.
- The Michigan EJ Screen tool could be used to identify disadvantaged areas.
- Further consultation with stakeholders could identify places with willing CAAs and utility partners, and a robust contractor community that can provide service.

Characterize manufactured housing stock:

- Collect data on the location, structure, and heating fuels of manufactured homes in Michigan. Focus on identifying homes reliant on electric resistance or propane heaters for winter heating, or that were built before energy efficiency codes were updated (pre-1994).
- Research technical issues around making efficient electrification retrofits for a variety of existing manufactured homes, such as the relative feasibility and cost/benefit of installing ducted or ductless mini-split heat pumps.

- A model for this analysis could be research done for the Minnesota Department of Commerce in 2016.⁶⁵

Develop eligibility criteria for selection of MHCs and individual households:

- Based on the research described above, EGLE can set criteria for eligibility for programs, either for MHCs or for individual households.
- For ease of administration the program may wish to select income limits in line with other programs like LIHEAP and WAP, or the forthcoming programs under the EPA Solar for All and IRA Home Energy Rebates programs. Participation in these programs and other income-verified programs can serve as an automatic (categorical) verification of eligibility. However, income levels vary for each program, so additional analysis should go into selecting an appropriate level.

Identify locations that attract extra funding support:

- Community solar can be sited in areas that are eligible for bonus adders for the federal Investment Tax Credit, such as “energy communities” and low-income communities. Additional federal funds will make the projects more economical for participants and could stretch program dollars.
- Both community solar and weatherization programs may be eligible for support from other federal programs, such as from HUD, HHS, USDA, and others.
- Local governments and community foundations may be willing to offer support, such as financial support, services, or use of land.

Develop a finance strategy that delivers maximum benefits to eligible MHCs and households:

- Incorporate WAP / community solar strategies into Michigan’s EPA Solar for All program, Home Energy Rebates,⁶⁶ and other IRA and IJA funded programs.
- Consider partnering with the Michigan Housing and Community Development Fund (HCDF). Include this strategy in any state green bank plans that tap the federal Greenhouse Gas Reduction Fund.
- Apply for grants from the WAP program under the Sustainable Energy for Consumers (SERC) Awards and HUD’s Preservation and Reinvestment Initiative for Community Enhancement (PRICE) program.
- Consider outreach to local governments, corporate donors, and community and place-based foundations in Michigan.⁶⁷

Join the NASEO Manufactured Housing Energy Efficiency and Affordability Initiative:

⁶⁵ Slipstream, Inc. (formerly Seventhwave), *Minnesota Manufactured Homes Characterization and Performance Baseline Survey*, October 20, 2016, <https://slipstreaminc.org/sites/default/files/documents/publications/manufactured-homes-study-2016.pdf>

⁶⁶ EGLE, Home Energy Rebate Programs, <https://www.michigan.gov/egle/about/organization/materials-management/energy/rfps-loans/home-energy-rebate-programs>

⁶⁷ Berkeley Lab, *Are You Philanthropy-Ready? How to Work with Foundations on Mission-Aligned Community Solar*, January 18, 2023, <https://emp.lbl.gov/news/are-you-philanthropy-ready-how-work>

- In January 2023, NASEO launched the Manufactured Housing Energy Efficiency and Affordability Initiative to improve energy efficiency in manufactured homes.⁶⁸ The initiative has 11 partner states, including Minnesota and New York. It will be meeting through 2024 and welcomes new members.

⁶⁸ NASEO, <https://www.naseo.org/issues/buildings/manufactured>