



U.S. Department of Housing and Urban Development | Office of Community Planning and Development

Climate Resilience Implementation Guide

Single-family Retrofits



HUD Support for Climate Resilience



HUD grantees are in a unique position to increase community resilience to climate change. Community members with low and moderate incomes (LMIs) are disproportionately affected by climate change because they are less able to prepare for, respond to, and recover from the impacts of extreme events and natural hazards.¹² Recognizing these risks, HUD promulgated a rule in 2016 that requires grantees to account for resilience to natural hazard risks in their Consolidated Plans. To support grantees in this work, HUD created a [Supporting Local Climate Action webpage](#), which houses resources on how to use HUD funding to build more resilient communities.

The **Community Resilience Toolkit** provides information on potential impacts from six climate hazards and identifies a broad range of resilience actions that local and state governments can implement to address these risks.

Six **Implementation Guides**, as listed, provide step-by-step instructions on how to implement specific resilience programs.

- Resilience Education and Outreach Activities
- Cool Roofs
- Nature-based Solutions
- Single-family Retrofits
- Resilient Public Facilities
- Community Driven Relocation

About this Resilience Action

This Implementation Guide provides step-by-step instructions on how to implement a single-family retrofit program that improves resilience to hazards associated with climate change. This guide includes community examples of retrofit programs that are not necessarily funded using Community Planning and Development (CPD) resources but could be adapted to allow for CPD program support.

COMMUNITY PLANNING AND DEVELOPMENT (CPD) CONSIDERATIONS

State and local governments may use CPD formula programs – including Community Development Block Grants (CDBG), Section 108 Loan Guarantee Program, and HOME Investment Partnership Program (HOME) – to implement resilience actions. The principal purpose of CPD funding is to benefit low- and moderate-income persons.

Implementation of a single-family home retrofit program may be an eligible activity under the following CPD-eligible activities category:



Housing rehabilitation with CDBG, Section 108, or HOME (as part of an eligible rehabilitation project).

Grantees may consider pursuing a **Neighborhood Revitalization Strategy Area (NRSA)** designation for a specific neighborhood or area at particular risk. This designation encourages more comprehensive, place-based initiatives and therefore allows grantees to aggregate several single-family homes within an NRSA to reach the CDBG 51% LMI household requirement, rather than reaching that requirement by individual household. HUD's [Notice](#) and [webinar](#) about creating NRSA's under CDBG provide additional details.

Examples of Single-family Retrofits



Single-family retrofits reduce risks from natural hazards that are increasing in frequency and intensity due to climate change. They also address climate change by:

- **Improving energy and water efficiency.** Reducing demand for energy through efficiency retrofits, such as installation of [ENERGY STAR](#) appliances, means owners can reduce their greenhouse gas emissions. Improvements like installing low flow sinks and toilets can reduce water demand, which is critical, especially during droughts.
- **Using renewable energy,** which reduces demand for fossil fuels. Renewable energy upgrades, such as installing solar panels, reduce the demand for fossil fuels, which contributes to climate change.
- **Using sustainable building materials,** which reduces demand on critical resources. Retrofits that use sustainable materials reduce demand on raw materials, such as old-growth forests, which are critical to capturing carbon dioxide and helping mitigate climate change.

Some retrofits, including installing more energy-efficient windows or solar panels with battery backup, reduce both greenhouse gases and risks from severe weather and other climate change impacts.

A retrofit program specifically targeted to support LMI communities is critical to community resilience because LMI households face a higher energy burden and are disproportionately affected by climate hazards. An LMI household's energy burden (percentage of the household income spent on energy costs) is, on average, three times higher than it is for other households.³ LMI property owners are at an increased risk from natural hazards in part because their homes are more susceptible to the impact of extreme weather events (e.g., located in areas with high heat or flood risk), they face increased burdens responding to disasters (e.g., not speaking the language of emergency alerts, not being fully insured), and they have a limited ability to adapt (e.g., they cannot afford resilience upgrades to their homes).⁴ Single-family retrofits that decrease resource demand help lower energy and water bills, which in turn reduces the energy burden on these households.⁵ Resilience retrofit programs that target LMI property owners help increase their adaptive capacity and contribute to community-wide resilience.

EXAMPLES OF SINGLE-FAMILY RETROFITS

Resilience

- **Sea level rise and coastal storms** – elevate homes, install storm shutters, or fortify roofs
- **Inland floods** – elevate homes, wet or dry floodproof, or nature-based water management measures
- **Wildfire** – use fire-resistant materials and take actions to reduce wildfire risk (i.e., reduce fuels)
- **Drought** – xeriscape or switch to [WaterSense](#) appliances
- **Extreme heat** – install new windows and insulation or switch to a cool roof

Energy and water efficiency

- Install energy-efficient windows and doors
- Improve or add insulation in walls, floors, and roofs
- Upgrade to more efficient light (e.g., LED bulbs)
- Upgrade to more efficient appliances and equipment, such as [ENERGY STAR](#) appliances and solar water heaters
- Replace gas-powered equipment with electric alternatives (e.g., heat pump systems or water heaters)
- Install [WaterSense](#) appliances, showerheads, and toilets
- Install roof overhangs and cool roofs

Renewable energy

- Install solar photovoltaic systems to provide clean energy and send any excess energy back to the grid
- Pair renewable energy with energy storage to provide resilience to energy outages, as well as facilitate participation in peak demand programs and further increase energy savings

Benefits of Single-family Retrofits



Energy and water efficiency retrofits reduce direct and indirect demand on critical resources such as electricity, gas, water, and other natural resources. Renewable energy retrofits reduce demand for fossil fuels. Resilience retrofits reduce risks from natural hazards and climate change.

Improved Indoor Air Quality

Replacing combustion equipment with electric-powered equipment, such as replacing a gas-powered stove with an electric one, [can improve indoor air quality by reducing air pollutants](#), including nitrogen dioxide and particulate matter. [Better indoor air quality has health benefits](#), including fewer respiratory illnesses. Some sustainable building materials improve indoor air quality because they minimize off-gassing from volatile glue and other toxic chemicals.

Cost Savings

Improving efficiency and using renewable energy sources can save money. Retrofits that improve resilience can also avoid losses from natural hazards, including financial damage and non-monetized loss and suffering. Retrofitting a property often results in increased property values.

Improved Thermal Comfort and Health

Home retrofits such as the installation of new windows and insulation or switching to a cool roof can make the building envelope more energy efficient, which can make regulating temperature easier and reduce energy use.

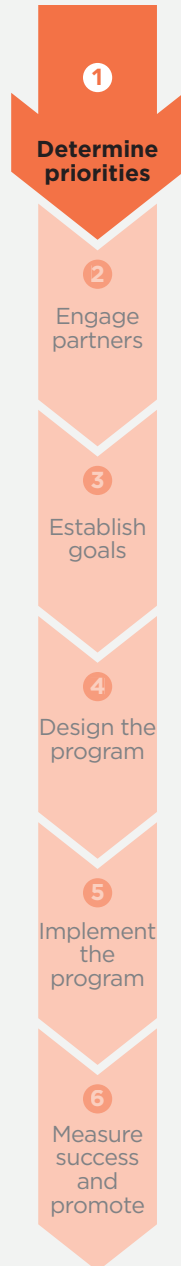
Equity

LMI communities are disproportionately affected by climate change. Improving the resilience of homes often aligns with community equity goals. Energy and water efficiency retrofits can lower utility bills and reduce the energy burden for LMI property owners.



Installing LED retrofit bulb into single-family home

Step 1: Determine Your Community's Priorities



Individual property owners can make retrofits on their own, but a community-wide retrofit program will have a bigger impact by providing owners with information, tools, and resources. For example, a community that supports wildfire mitigation retrofits will have a greater effect on reducing the community's overall wildfire risk than individual property owners taking piecemeal actions.

First, consider your community's local context, which will determine program priorities and may influence your program design. Many communities have existing resilience retrofit policies such as building and energy codes, ordinances, plans (e.g., comprehensive plan, climate or sustainability plan, energy plan), or incentive programs. Ensure that you are collaborating with other departments that work on relevant plans and programs. Look for synergies where single-family retrofit activities could address both energy-efficiency goals and natural hazard resilience, such as installing new windows that can help reduce energy bills and keep homes cooler, or installing stand-alone renewable energy systems that provide energy during blackouts. Engage partners and community members early in your effort (see Step 2 for details).

Your program might center around a specific natural hazard or a funding opportunity. For example:

- Floodproofing homes that have been repeatedly inundated.
- Providing sustainable household cooling.
- Receiving a grant to install solar power for LMI property owners.
- Meeting community-wide greenhouse gas emissions targets.

Your priorities might include program scale, such as starting with a pilot program and then expanding. Consider:

- Available staff resources to devote to the program.
- Community support for the program.
- Program experience.

To begin, research similar programs. There may be another community or agency with a similar program you can learn from, such as those profiled in the Resilience in Practice boxes in this guide. Also consider funding opportunities, if you do not already have resources set aside; many funding opportunities have requirements that may influence your program priorities.

RESILIENCE IN PRACTICE



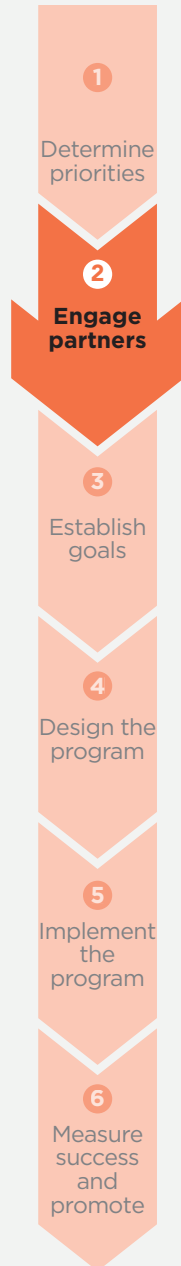
Supporting Property Owners in Building Defensible Space against Wildfires

Following major fires between 2017 and 2020, Sonoma County began supporting single-family homeowners' efforts to retrofit their homes to increase wildfire resilience. [Sonoma County Wildfire Adapts \(SoCoAdapts\)](#) is a pilot program funded by FEMA's Hazard Mitigation Grant Program, administered by the California Governor's Office of Emergency Services. The County identified areas at particular risk from wildfire. In identified project areas, the program provides defensible space and/or structure hardening assessments, followed by incentive cost shares for vegetation management and/or structural fire-resilient upgrades. Staff from across Sonoma County including the Fire Marshal and Buildings Department work together to create streamlined permitting. The County works closely with stakeholders including Fire Safe Sonoma and CAL FIRE to help improve education and outreach and ensure their work is in line with similar work happening across the state. An expanded version of the program, which includes vegetation management in surrounding communities, is under consideration for funding under the Building Resilient Infrastructure and Communities program.



CPD Considerations: This type of wildfire mitigation program may be an eligible activity under CDBG single-family rehabilitation.

Step 2: Identify and Engage Partners, Collaborators, and Community



Community outreach and engagement throughout implementation aligns partnerships, relevant groups, and trusted leaders throughout your community. Start by working with a trusted network of partners if one already exists. It is important to also build staff capacity and obtain leadership buy-in early in the process.

Developing effective partnerships that leverage each partner's strengths can enhance your program, ensure timely program implementation, and help your community respond to climate change on a broader scale. Establish clear goals for the partnership, build trust, highlight common benefits, and create structured timelines and processes for communication. Partners, collaborators, and other stakeholders might include:

- Nonprofit, faith-based, or other organizations
- Energy auditors
- Renewable energy companies, such as solar installers
- Energy utilities
- Professional associations for builders and others
- Homeowner associations
- Affordable housing providers and developers
- Home builders, home contractors, home improvement professionals, and remodelers
- Government departments such as building, environment, general services, health, public works, and transportation
- Academic institutions

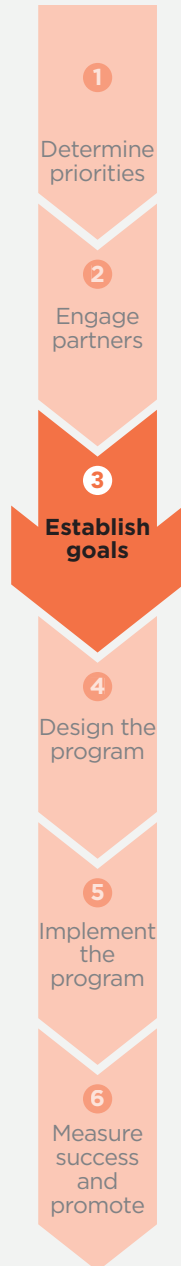
You may be able to align your single-family retrofit program with existing incentives offered through utilities, depending on state requirements. In many utility service areas, a resident can obtain a free energy audit and have a portion of energy upgrade costs covered by utility rebates. The [Database of State Incentives for Renewables & Efficiency](#) provides information about utility incentives across states, regions, and cities.

Education and outreach are particularly critical for LMI communities, which may have fewer resources to cope with climate risks and increase their resilience. Keep in mind that LMI community members or organizations may have higher priority concerns, such as meeting basic needs for housing, food, employment, childcare, or transportation. The [Developing a Resilience Education and Outreach Activity Implementation Guide](#) provides information about engaging stakeholders.

CPD CONSIDERATIONS

If your community is considering using CDBG resources to fund a single-family retrofit program, ensure that it meets a [National Objective](#) by documenting eligibility of individual homeowners or residents. Each activity should be eligible either as single-unit residential rehabilitation (matrix code 14A) or as rehabilitation/energy efficiency (matrix code 14H). Consult with local experts to obtain data on local need and potential impact, and with other public agencies, such as code enforcement and permitting, to identify opportunities and barriers to implementation of a retrofit program. Contacting your local HUD field staff early in activity design will help ensure compliance with requirements.

Step 3: Establish Goals for a Single-family Retrofit Program



Informed by earlier steps, define the goals of your single-family retrofit program with your partners and collaborators, including how you will measure the success of those activities.

Define the Goals. Consider holding goals-setting workshops with key partners so that all voices are at the table and heard. Consider what short- and long-term success would look like for your program and set goals accordingly. Using the “SMART” goal approach can ensure your goals are Specific, Measurable, Attainable, Relevant, and Time-based. Resilience goals do not need to be constrained to natural hazards alone; consider where resilience solutions can address multiple objectives. For example, a retrofit program could be a job training opportunity, as well.

Identify Metrics. To determine what metrics to track, consider your program’s goals and how you can measure its success. Identify what you will measure, how you will measure it, and what equipment or processes you need to collect and record the data. Consider whether you can draw on existing metrics rather than create new ones. Where appropriate and possible, track metrics by income, neighborhood, or race/ethnicity, which will allow you to identify the impact of your program on different communities. Identifying a team or point person in charge of metrics will help ensure consistency and success. Step 6 and the Measuring Success box later in this guide include information about measuring and evaluating outcomes.

Establish Baselines. Gathering data on your metrics at the start of your program establishes a baseline against which you can measure the program impact. For single-family retrofits, baseline metrics may include energy and water bills, number of homes retrofitted, demographic data of program participants, or number of community volunteers.

CPD CONSIDERATIONS

As you establish goals, keep in mind that single-family retrofit measures can be incorporated into broader goals included in the Strategic Plan portion of the Consolidated Plan, such as “Rehabilitate existing housing stock (homeownership or multifamily).” Such goals can include outcomes from an owner-occupied (single-family) rehabilitation and reconstruction program, a CDBG-funded minor repair program, or a program focused on energy efficiency.

HUD strongly encourages grantees to consider environmental review requirements early in their planning, as this will allow for the broadest range of options to streamline the process and avoid delays. HUD [Field and Regional Environmental Officers](#) are available to help design a procedure to document efficient and effective environmental reviews.

Note that allowable rehab costs greater than \$5,000 may trigger [lead-based paint requirements](#).

Many resources exist to help in process planning and goal setting.

- [Develop SMART Objectives \(U.S. Centers for Disease Control and Prevention\)](#)
- [Health and Household-Related Benefits Attributable to the Weatherization Assistance Program \(Oak Ridge National Laboratory\)](#)
- [Making Health Count: Monetizing the Health Benefits of In-Home Services Delivered by Energy Efficiency Programs \(American Council for an Energy-Efficient Economy\)](#)
- [AVoided Emissions and geneRation Tool \(AVERT\) and CO-Benefits Risk Assessment Health Impacts Screening Tool \(COBRA\)](#)

Step 4: Design the Single-family Retrofit Program



1

Determine priorities

2

Engage partners

3

Establish goals

4

Design the program

5

Implement the program

6

Measure success and promote

In line with your goals, determine what type of single-family retrofit program you can implement in your community, including program design elements, program parameters, and the operational requirements of the program.

The single-family retrofit program may be designed as voluntary, mandatory, or a combination of these approaches. Voluntary programs, such as green building certification or rebates with your local energy utility, can attract willing participants and be a good approach when piloting a program, but their reach may be limited. Mandatory programs, such as building codes, will have stronger impacts from broader participation, but they can be expensive, take longer to implement, and meet resistance.

Consider the parameters of your program:

- The types of retrofits eligible for your program (e.g., floodproofing, solar panel installation)
- The minimum and maximum allowed funding per housing unit
- The aspects of the retrofit that your program will cover (e.g., roof replacements on older roofs, electric panel upgrades in older homes before installing solar panels, solar panel installation)

Consider the operational requirements of the program:

- Registration/application process; specifically, ensuring everyone has an equal opportunity to apply for the program
- Program engagement (e.g., who and how often program staff will be in contact with qualified property owners)
- How to support upkeep and maintenance over time. Consider how you will monitor the long-term health of retrofit projects.

If you have limited staff resources, are unsure about which solution will be the most effective, or have limited experience with the type of solution you would like to try, consider starting with a pilot project or program and then expanding. A pilot can achieve quick wins, demonstrate success, and build support for your program. A pilot also allows you to adjust your program more easily.

The following resources may be helpful as you design your program.

- [Green Building Retrofit Checklist \(HUD CPD\)](#)
- [Directory of State LMI Clean Energy Programs \(The Clean Energy States Alliance\)](#)

CPD CONSIDERATIONS

Note that CDBG-eligible rehabilitation activities include “improvements to increase the efficient use of energy in structures” including replacement of heating and cooling equipment, the use of solar energy equipment, and improvements to increase the efficient use of water.

RESILIENCE IN PRACTICE California



Equitable Access to Renewable Energy Options

GRID Alternatives' [Energy for All: Single-Family](#) program provides no-cost solar energy systems for income-qualified homeowners, as well as job training on renewable energy systems. The program began in California in 2008 with funding from the state, and their partners have used HUD CDBG to cover funding gaps (e.g., the City of Richmond paid for roofs while Energy for All installed the photovoltaic systems). The program set intentional metrics updated regularly based on trend data. For example, GRID Alternatives noted that the program was not serving the desired population, so it modified the application requirements and process to make the program more equitable. GRID Alternatives works closely with trusted community groups to reach target neighborhoods, and requires all staff to participate in its equity, inclusion, and diversity efforts to understand the significance of their work.



CPD Considerations: This type of program may be an eligible activity under CDBG single-family rehabilitation.

Step 5: Implement the Single-family Retrofit Program



1
Determine
priorities

2
Engage
partners

3
Establish
goals

4
Design the
program

5
Implement
the
program

6
Measure
success
and
promote

Implement your retrofit program. First, consider what needs to happen before you can begin the program; for example, conducting beta testing of a website, training staff, securing volunteers, procuring materials or vendors, changing a policy, or adjusting other operational protocols, as needed. The examples in the Resilience in Practice boxes in this guide depict how several communities have structured and implemented similar programs.

Once you feel secure about the foundation for your program launch, continue community education and outreach to raise awareness, continuing the work done during Step 2. Community engagement can increase awareness of and participation in the program. Keep in mind, targeted messaging may be important for outreach to organizations representing or comprising LMI community members, as they may have higher priority concerns than retrofit, such as meeting basic needs for housing, nourishment, employment, childcare, or transportation. Consider working with partner organizations to distribute shared messaging and amplify the promotion of the single-family retrofit program to key populations. Find details in the [Developing a Resilience Education and Outreach Activity Implementation Guide](#).

You may want to consider an incremental rollout or a pilot program, which will allow you to gain experience and refine or adjust your approach over time. For example, your community might implement the program in just one area and then expand to other areas. As mentioned above, this may be an opportunity to designate a HUD NRSA.

Create an implementation plan where you document all program design choices in one, easily accessible location and keep a record of any program changes you make along the way.

RESILIENCE IN PRACTICE



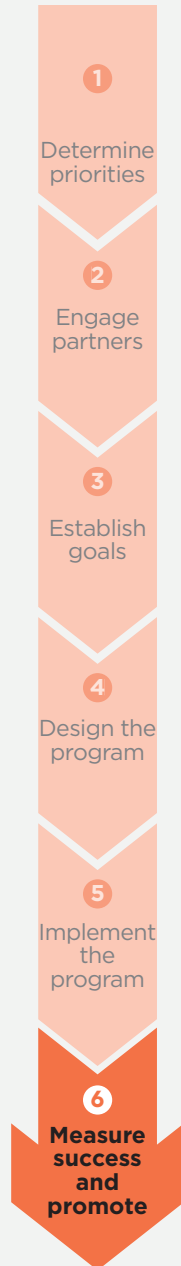
Natural Hazard and Renewable Energy Efficiency

In November 2021, Puerto Rico launched a pilot program, [Community Energy and Water Resilience Installations \(CEWRI\)](#), using [CDBG Disaster Recovery Funds](#) awarded following Hurricanes Irma and Maria in 2017. The CEWRI program will provide energy and water efficiency improvements to structures damaged by the hurricanes, including installing photovoltaic systems with battery backups that will operate during power outages. The program provides training for managers and installers who carry out the retrofits throughout the island. The program also provides training webinars for the end-users about how to use and maintain the systems. For structures that can be connected to the internet, the program will be able to collect and track usage data. The CEWRI program works closely with partners throughout Puerto Rico, including other agencies such as the U.S. Department of Energy.



CPD Considerations: This type of program may be an eligible activity under CDBG single-family rehabilitation.

Step 6: Measure Success and Promote



Tracking and evaluating the metrics identified in Step 3 will help you measure the success of the program and identify areas for improvement. Tracking program metrics can also help you report progress and outcomes to funders and the public, especially as they relate to your original program goals.

Capture Data. Measure and record the data. Determine how the point person or team will collect data, how they will convey it, and to whom. For example, if data is collected on paper forms, establish a plan to collect the forms and enter them into a digital format. Where possible, turn qualitative issues into quantitative data so you can track progress consistently over time. See the Measuring Success box for specific examples of metrics to track.

Evaluate the Data. Determine how often you will analyze and evaluate the data. Some data may be reviewed annually (e.g., number of homes enrolled in the program), whereas you may review other data more frequently (e.g., number of website views or information session attendance). Where possible, compare the data collected over time to the baseline data.

Share the Data. Reporting success can solidify public, political, and financial support. Determine how you will share results. Think about your audience, delivery method, format, content, language, timing, and messengers.

Reassess Your Program. Use the data from your metrics to assess strengths and weaknesses in your program and identify opportunities to improve. This may include going back to Step 4 and redesigning program elements. You may discover, for example, that you are not reaching your target population. Continue your community engagement and outreach through this process to provide community members the opportunity to weigh in on program modifications. Strong engagement at every step will help increase transparency and build trust.

CPD CONSIDERATIONS

For CPD-funded retrofit activities, whether incorporated into another rehabilitation activity or funded independently, the activities can be set up during the creation of the Annual Action Plan, along with all other proposed activities. The appropriate matrix code depends on the specific activity and associated plan goal, (e.g., 14A for single-family rehabilitation or 14H for energy-efficiency improvements). In addition, if your community is considering CDBG or other CPD formula programs to fund a retrofit program, remember that all key reporting elements of the CPD formula grant programs should be integrated into HUD's [Integrated Disbursement and Information System \(IDIS\)](#). Grantees typically create new IDIS activities through the AP-35 Projects screens while setting up their Annual Action Plan. This is also the best way to ensure that any activities funded through CPD sources are properly tied to the Action Plan. Grantees using CDBG funding may be able to report back via the IDIS.

MEASURING SUCCESS

Single-family retrofit metrics track the performance of your program. If equity is a program goal, consider tracking metrics by demographic data such as income, neighborhood, or race/ethnicity where appropriate and possible. This will allow you to identify the impact of your program on different communities and subgroups.

- Number of LMI community members who express interest in the program (e.g., number of applications by people meeting program criteria)
- Number of targeted individuals reached during a retrofit program (e.g., receive a flyer, click on a social media post, or attend information session)
- Growth of program in target areas (e.g., number of retrofits completed)
- Value of electricity, gas, or water bill savings by month
- Amount of power generated by renewable energy sources (e.g., solar arrays)
- Amount of greenhouse gas emissions avoided each year
- Changes in outdoor and indoor air quality measures of [criteria pollutants](#) measured at regular intervals
- Measure of energy burden, or the percentage of energy bills to household income, by month each year



Additional Resources

HUD Program Resources

- [Green Building Retrofit Checklist and Draft Guidance \(HUD\)](#)
- [HUD Programs that Support Energy Efficiency](#)

Non-HUD Resources

- [Building Resilient Infrastructure and Communities \(BRIC\) \(FEMA\)](#)
- [Energy Efficiency Potential in the U.S. Single-Family Housing Stock \(NREL\)](#)
- [FireWise guide \(National Fire Protection Association\)](#)
- [Home Energy Rating System \(HERS\) \(Residential Energy Services Network\)](#)
- [Home Energy Score \(DOE\)](#)
- [Indoor Air Quality Guidelines for Single-Family Renovations \(EPA\)](#)
- [Local Residential Energy Efficiency \(EPA\)](#)
- [Natural Hazard Retrofit Program Toolkit \(FEMA\)](#)
- [Risk Assessment \(Ready.gov\)](#)
- [Upgrade the Efficiency of Affordable Housing in Your Portfolio \(DOE\)](#)
- [U.S. Climate Resilience Toolkit](#)

Additional Funding Opportunities

HUD CPD funding can be combined with other funding opportunities to create more comprehensive resilience programs in communities.

- [Grants.gov](#)
- Partner with your local AmeriCorps service members or sponsor members of your own through your State Service Commission ([Corporation for National and Community Service](#))
- [Smart Growth Technical Assistance Programs \(EPA\)](#)
- [State Energy Program \(DOE\)](#)
- [Weatherization Assistance Program \(DOE\)](#)

Notes

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