



# Low-Carbon Materials and Net-Zero Energy

*An Overview for Public Assistance and Hazard Mitigation  
Assistance.*

September 2024



FEMA

This page intentionally left blank.

---

## Table of Contents

Introduction .....	3
Purpose .....	4
Background.....	4
Low-Carbon Materials.....	6
What Are Low-Carbon Materials?.....	6
How Can FEMA Applicants Use Low-Carbon Materials?.....	8
Net-Zero Energy .....	10
What is Net-Zero Energy? .....	10
How Can FEMA Applicants Implement Projects with Net-Zero Energy? .....	11
Public Assistance – Replacement and Repair Projects .....	11
Hazard Mitigation Assistance – Hazard Mitigation Construction and Existing Building Solutions.....	13
Adoption of Jurisdictional Code Updates Regarding Net-zero Energy Projects.....	14
Net-Zero Energy Examples .....	14
Renewable Energy Examples.....	15
High-Efficiency Appliances, Technology and Materials Examples .....	16
Conclusion .....	19
Acknowledgements.....	19
Appendix A: Acronyms .....	20
Appendix B: Foundations.....	22
FEMA Strategic Documents.....	22
Supporting Legislation and Policies .....	22
FEMA Resources.....	23
Appendix C: Definitions of Key Terms .....	24
Appendix D: Citations List.....	26

# Introduction

On August 16, 2022, the Inflation Reduction Act (IRA) was signed into law, marking a historic commitment to build a new clean energy economy and tackle the climate crisis. This legislation commits \$370 billion towards lowering energy costs and providing cleaner energy solutions. The IRA spurs action to address the impacts of climate change and aligns with other Biden Administration priorities.<sup>1</sup>

This historic act authorizes FEMA to provide financial assistance for costs associated with use of low-carbon materials and to incentivize low-carbon and net-zero energy projects within FEMA’s Hazard Mitigation Grant Program (HMGP), HMGP Post-Fire, Building Resilient Infrastructure and Communities (BRIC), Pre-Disaster Mitigation (PDM) and Public Assistance (PA) Programs.<sup>2</sup> Funding for these costs supports FEMA’s 2022-2026 Strategic Plan goal of leading “whole of community in climate resilience” and encourages State, Local, Tribal and Territorial partners to make strategic investments to build climate-resilient communities.

Section 70006 of the Inflation Reduction Act states as follows:

**Section 70006 FEMA BUILDING MATERIALS PROGRAM**

Through September 20, 2026, the Administrator of the Federal Emergency Management Agency may provide financial assistance under sections 203(h), 404(a), and 406(b) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5133(h), 42 U.S.C. 5170c(a), 42 U.S.C. 5172(b)) for –

- (1) costs associated with low-carbon materials; and
- (2) incentives that encourage low-carbon and net-zero energy projects.

The following sections provide an overview of low-carbon and net-zero energy.

---

<sup>1</sup> [Justice40 Initiative](#), [Bipartisan Infrastructure Law](#), [Executive Order on Tackling the Climate Crisis at Home and Abroad](#), [Executive Order on Catalyzing Clean Energy Industries and Jobs through Federal Sustainability](#) and the [Federal Buy Clean Initiative](#).

<sup>2</sup> Please see [Building Clean, Climate-Resilient Communities through FEMA’s Grant Programs](#)

## Purpose

The purpose of this document is to provide information on the use of low-carbon materials and net-zero energy building practices to FEMA applicants and subapplicants. The document includes additional background, information and examples for the use of low-carbon materials and net-zero energy building practices through FEMA's eligible Hazard Mitigation Assistance (HMA) and PA grant programs.

## Background

The built environment is responsible for almost 40% of the global greenhouse gas emissions (see Figure 1). This includes emissions from building operations, such as electricity usage, heating and cooling, and emissions from the manufacturing, transportation and installation of building and construction materials like concrete, glass, steel and asphalt. The United States government is the single largest purchaser of construction materials in the country and holds significant procurement power in shaping and introducing innovative technologies to the construction materials market. Through its grant programs, FEMA spent more than \$12 billion on repair, replacement and hazard mitigation construction in 2023.<sup>3</sup> Section 70006 of the Inflation Reduction Act (IRA) targets funding available for the use of low-carbon materials and to incentivize low-carbon and net-zero energy projects. These authorities target the reduction of emissions in building materials, construction and building operations.

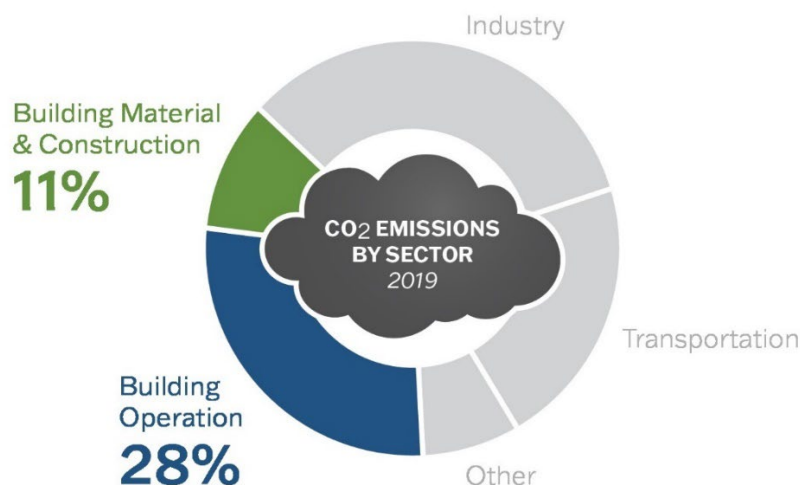


Figure 1: Global CO<sub>2</sub> Emissions by Sector, adapted with permission from [Carbon Leadership Forum](#)

---

<sup>3</sup> [2023 By the Numbers | FEMA.gov](#)

The frequency and cost of weather and climate disasters in the U.S. have been on the rise due to a combination of factors. These factors include increased exposure, vulnerability and the impact of climate change on [extreme weather events](#). Since 2021, the U.S. has experienced an average of 22 \$1 billion disasters each year.<sup>4</sup> That figure is up from an average of just three \$1 billion disasters per year in the 1980s.<sup>5</sup> This impacts FEMA's ability to deliver its mission. In 2023, FEMA responded to over 100 disasters and allocated more than \$12 billion for construction projects.<sup>6</sup>

The growing variability of a changing global climate has led to more frequent and intense weather-related natural disasters, creating an urgency for FEMA to address opportunities for reducing greenhouse gas emissions while enhancing community resilience.

Additionally, it is important to recognize the added impacts of energy insecurity on disadvantaged and underinvested communities and on people with disabilities. Many people with disabilities or other medical conditions require electric power for mobility devices and medical equipment, making access to alternate power sources critical in times of disasters.

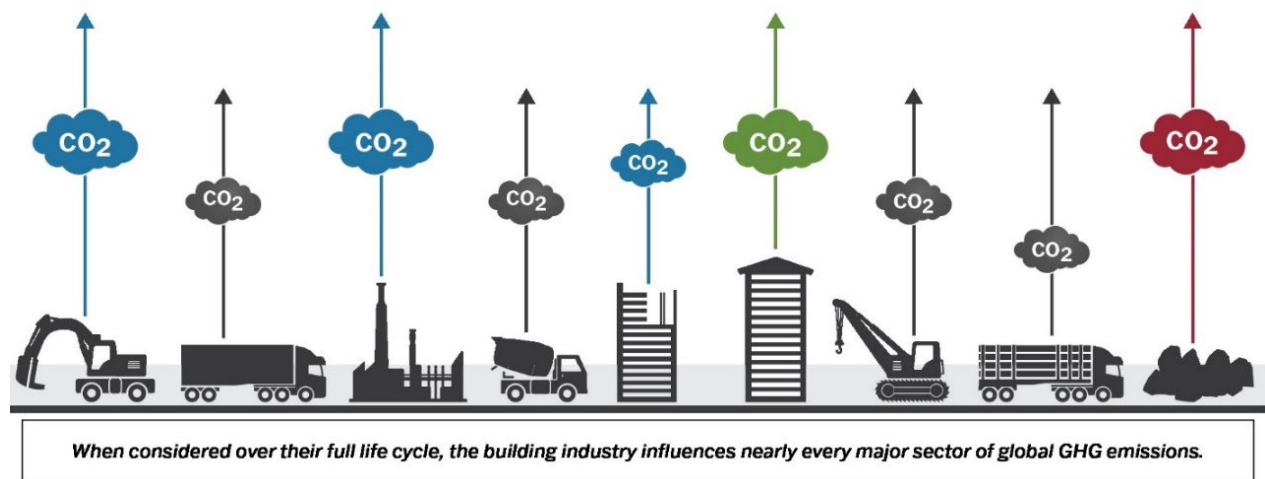


Figure 2: Global greenhouse gas emissions, adapted with permission from: [Carbon Leadership Forum](#)

---

<sup>4</sup> [NOAA National Centers for Environmental Information \(NCEI\) U.S. Billion-Dollar Weather and Climate Disasters \(2024\)](https://www.ncei.noaa.gov/access/billions/).  
<https://www.ncei.noaa.gov/access/billions/>, DOI: 10.25921/stkw-7w73

<sup>5</sup> Consumer Price Index - Adjusted

<sup>6</sup> [2023 By the Numbers | FEMA.gov](#)

# Low-Carbon Materials

Section 70006 of the IRA authorizes FEMA, within the HMGP, HMGP Post-Fire, BRIC, PDM and PA programs, to make funding available for low-carbon materials.

## What Are Low-Carbon Materials?

The U.S. manufacturing sector is responsible for nearly one-third of U.S. greenhouse gas emissions, with the production of steel, concrete, asphalt and glass accounting for nearly half of all U.S. manufacturing greenhouse gas emissions.<sup>7</sup>

The IRA authorizes FEMA to reimburse ‘costs associated with low-carbon materials. This means FEMA may provide such reimbursement *even when the costs are higher than those for conventional materials*. Low-carbon materials are construction materials and products that have substantially lower levels of embodied greenhouse-gas emissions associated with all relevant stages of production, use and disposal, as compared to estimated industry averages of similar materials or products. Low carbon materials include concrete, asphalt, glass and steel which have a global warming potential that is lower than the estimated industry average for similar products as demonstrated by their Environmental Product Declaration (EPD).



### Environmental Product Declaration

An [Environmental Product Declaration \(EPD\)](#) is similar to a “nutrition label” for a product’s environmental footprint. Just like a food nutrition label, it provides information on what is within the product.

EPDs are independently verified documents based on international standards that report the environmental impacts of a product and may include information on raw materials, upstream processing, manufacturing impacts etc. and how each of these contributes to the material’s [global warming potential](#).

---

<sup>7</sup> EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022. U.S. Environmental Protection Agency, EPA 430-R-24-004, [https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text\\_04-18-2024.pdf](https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf).



## FEMA Partnerships and Tools

To support FEMA applicants in their use of low-carbon materials, FEMA has partnered with Building Transparency, a nonprofit dedicated to sustainability in construction. [Building Transparency](#) is the creator of the Embodied Carbon in Construction Calculator (EC3), a free database of EPDs. The tool provides a free and easy way to quickly identify low-carbon materials that qualify for FEMA projects.<sup>8</sup>

The tool includes a filter for FEMA staff and stakeholders pairing available low-carbon materials to applicants based on preferences of distance, reductions in embodied carbon, and upfront supply chain emissions.

## Costs and Standards for Low-Carbon Materials

Costs for low-carbon materials can vary by size and complexity of the project, geographic location and the experience of the project and construction team. Potential savings may come from de-materialization, using less material to achieve the same function, or from reducing the use of higher cost ingredients. In some cases, lower carbon materials are cheaper than their conventional equivalent. Low-carbon materials meet the same performance standards and functional requirements as their competitors.

### Additional Definitions and Descriptions

- **Greenhouse Gas (GHG):** The air pollutants carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons and sulfur hexafluoride.
- **Global Warming Potential:** An index measuring the radiative forcing following an emission of a unit mass of a given substance, accumulated over a chosen time horizon, relative to that of the reference substance, carbon dioxide (CO<sub>2</sub>). The GWP thus represents the combined effect of the differing times these substances remain in the atmosphere and their effectiveness in causing radiative forcing.
- **Substantially Lower:** Having a GWP that is at least less than the estimated North American industry average as demonstrated by their EPD.

By switching to verified low-carbon versions of these materials, FEMA applicants can significantly decrease their carbon footprint. FEMA's IRA authority for low-carbon materials

---

<sup>8</sup> The FEMA PA Grants Portal YouTube channel has step-by-step instructions for how to use the EC3 tool with FEMA filter: [EC3 Demonstration \(youtube.com\)](#)



is just one of several IRA programs across the federal government targeting the reduction of greenhouse gas emissions associated with construction materials.<sup>9</sup>

## How Can FEMA Applicants Use Low-Carbon Materials?

FEMA applicants for HMGP, HMGP Post-Fire, BRIC, PDM and PA are authorized to utilize low-carbon materials (concrete, asphalt, glass or steel) for otherwise eligible recovery and hazard mitigation projects. Any increased costs of these materials will be reimbursed by FEMA at the applicable cost share for the disaster or non-disaster grant program.<sup>10</sup>

Applicants must follow [federal grants procurement regulations](#) when selecting contractors to provide low-carbon materials.



### General Services Administration (GSA) funding for Low-Carbon Construction

The GSA has allocated funding for more than 150 pilot projects utilizing low-carbon construction materials. For example, the [San Luis, AZ, Land Port of Entry](#) (LPOE) utilizes low-carbon asphalt, concrete, glass and steel. The LPOE is the second busiest non-commercial port in Arizona, processing over 3 million vehicles and 2.5 million pedestrians per year.

## Low-Carbon Opportunities

Many of FEMA's commonly funded Public Assistance and Hazard Mitigation Assistance projects include large amounts of concrete, asphalt, glass and steel. Examples of these projects and opportunities to utilize low-carbon materials include:

---

<sup>9</sup> [The General Service Administration's \(GSA\) \\$2 billion investment. Federal Highway Administration \(FHWA\) Low Carbon Transportation Materials Program, Environmental Protection Agency \(EPA\) \\$250 million grant and technical assistance program](#)

<sup>10</sup> For more information see: <https://www.fema.gov/grants/policy-guidance/low-carbon-goals>

Public Assistance	Hazard Mitigation Assistance
<ul style="list-style-type: none"><li>▪ Roadway surface restoration.</li><li>▪ Roadwork with culverts.</li><li>▪ Drainage structures.</li><li>▪ General building and structure components.</li><li>▪ Bridge repair and replacement.</li><li>▪ Pipes and water/wastewater infrastructure.</li><li>▪ Sidewalks and signage.</li></ul>	<ul style="list-style-type: none"><li>▪ Stormwater management projects including culverts, drainage pipes, floodgates, detention and retention basins and other stormwater management facilities.</li><li>▪ Floodproofing such as the installation of impermeable walls.</li><li>▪ Tsunami vertical evacuation refuge, or safe rooms.</li><li>▪ Mitigation reconstruction.</li><li>▪ Structure elevation.</li></ul>

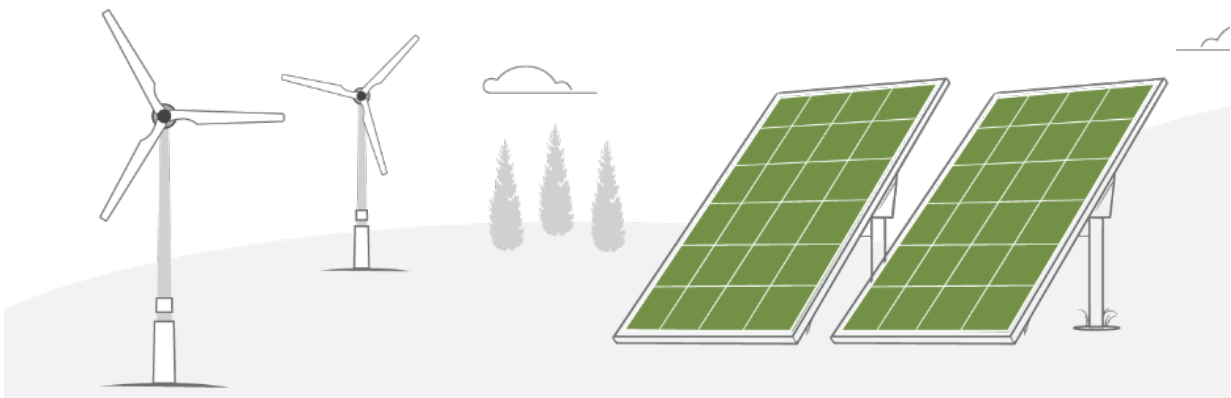
# Net-Zero Energy

Section 70006 of the Inflation Reduction Act authorizes FEMA, within the HMGP, HMGP Post-Fire, BRIC, PDM and PA programs, to make funding available for projects with net-zero energy. This section includes an overview of projects with net-zero energy, their importance and applications for FEMA stakeholders. Projects with net-zero energy eligible under Public Assistance must have a tie to the damages from the declared disaster. Net-zero energy projects eligible under hazard mitigation must have a tie to eligible actions that address risk and reduce suffering from disasters.

## What is Net-Zero Energy?

### There are two parts of a Project with Net-Zero Energy:

1. FEMA projects with net-zero energy **must include renewable energy** (such as solar or wind) in an amount equivalent to or greater than the annual energy consumption of the facility (or applicable portion of the facility).
2. Additionally, applicants **have the option to** include energy efficient appliances and materials (such as heat pumps or energy star lighting) in their project(s) to reduce the amount of energy needed overall to power the facility.



By generating their own [renewable energy](#), net-zero energy buildings lower operating and maintenance costs, help the environment and increase resilience during power outages.

Net-zero energy buildings offer many benefits, including:

- Reduced energy costs.
- Increased comfort for occupants.

- Positive environmental impact.
- Reliable and affordable operations.
- Improved energy security.

In addition, many completed projects have demonstrated that net-zero energy buildings can be designed within a standard construction budget using conventional materials, equipment and skilled laborers.<sup>11</sup>



#### Discovery Elementary School, Arlington County, VA

Energy consumption is a major cost for schools, ranking second only to salaries. [Net-zero energy schools](#) typically use 65%–80% less energy than traditional ones, resulting in significant annual savings for districts.

Arlington County, VA, currently experiencing a population boom, wanted to add half a million square feet in educational facilities. [Discovery Elementary pursued a net-zero facility with the Department of Energy](#), which came under budget and saves Discovery more than \$100,000 in utility costs per year.

## How Can FEMA Applicants Implement Projects with Net-Zero Energy?

### PUBLIC ASSISTANCE – REPLACEMENT AND REPAIR PROJECTS

Projects with net-zero energy under PA must have a tie to eligible PA work that addresses damage caused by a declared disaster. In addition, projects must generate renewable energy in an amount equivalent to or greater than the annual energy consumption of the damaged building or applicable damaged portion of the building. Applicants have the option to include high-efficiency appliances and materials to reduce the overall energy consumption of the building.

For example, if a 10,000 SF public school was destroyed during a federally declared disaster, the school could replace the facility using solar arrays to power the building and any damaged appliances or materials could be replaced with high-efficiency appliances, technology and materials to lower the overall amount of energy needed to power the facility (see Figure 2).

---

<sup>11</sup> [About Zero Energy Buildings | Department of Energy](#)

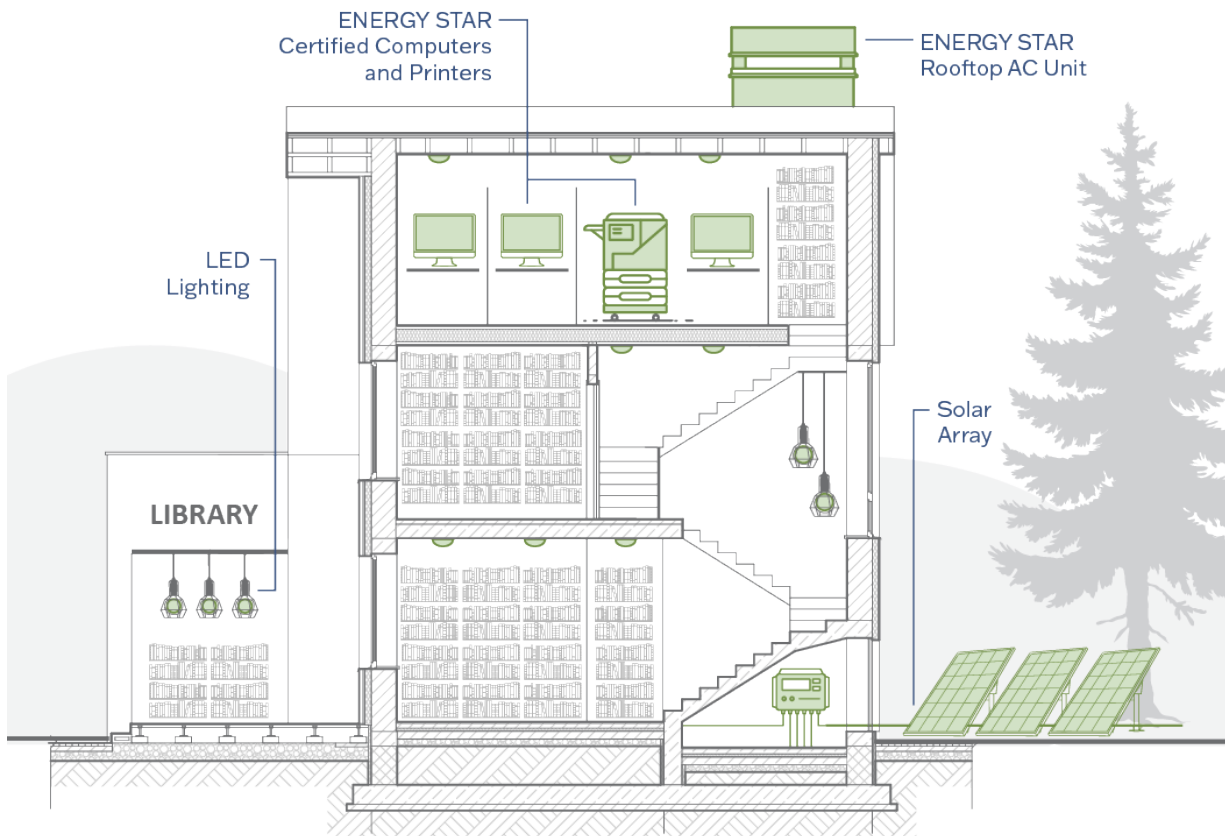


Figure 2: Example of Net-Zero Energy School

Applicants pursuing PA projects with net-zero energy have multiple options to determine the specifications for their project(s). The International Energy Conservation Code (IECC) Appendix CC provides information on each of these options. The prescriptive method uses a simple calculation to determine the specifications for solar. Applicants must provide written documentation substantiating their calculations and proposed solution for anticipated energy consumption. For example:

1. A 10,000 SF public school was destroyed during a federally declared wildfire.
2. The square footage is multiplied by the Energy Utilization Intensity (EUI)<sup>12</sup> for the specific climate zone. A full chart of the EUIs can be found in the IECC Appendix CC. If the destroyed school was in northern California, the EUI would be 36.
3. Therefore,  $10,000 \times 36 = 360,000$  KBtu.

<sup>12</sup> The site energy for either the baseline building, or the proposed building divided by the gross conditioned floor area plus any semi heated floor area of the building. IECC Appendix CC Section CC102.

4. The applicant would need solar that could produce at least 360,000 KBtu to meet the IECC standards for net-zero energy.

It is important to recognize that not every facility will be able to meet the net-zero requirements utilizing the prescriptive method. Some applicants may need to utilize the performance method. Options for each methodology are including in the IECC Appendix CC and should be referenced to determine the appropriate path for the project.

In an alternate example, if the school library was damaged during the federally declared wildfire but the remainder of the school was unaffected, the library could be repaired using net-zero energy building practices while the remainder of the building stayed the same. To be eligible for reimbursement, the school must generate renewable energy in an amount equivalent to or greater than the annual energy consumption of the library. Any damaged appliances or materials could be replaced with eligible high-efficiency materials and appliances. For this example, the library is only 1,000 SF of the school. Therefore, the applicant would do the following prescriptive calculations:

1.  $1,000 \times 36 = 36,000$  KBtu.
2. The applicant would need solar that could produce at least 36,000 KBtu to meet the IECC standards for net-zero energy for the school library.

## **HAZARD MITIGATION ASSISTANCE – HAZARD MITIGATION CONSTRUCTION AND EXISTING BUILDING SOLUTIONS**

Hazard Mitigation Assistance (HMA) projects incorporating net-zero energy must be a part of an already eligible hazard mitigation project. Projects must generate renewable energy in an amount equivalent to or greater than the annual energy consumption of the mitigation project. In addition, applicants have the option to include high-efficiency appliances and materials to reduce the overall energy consumption of the building.

One example where an HMA project may pursue net-zero energy building practices is with hazard mitigation reconstruction. Mitigation reconstruction is the construction of an improved, elevated structure on the same site where an existing structure and/or foundation has been partially or completely demolished or destroyed.<sup>13</sup> Within an already eligible hazard mitigation reconstruction project, the building could utilize solar panels to generate renewable energy and utilize high-efficiency materials and appliances (see Figure 3).

---

<sup>13</sup> [Hazard Mitigation Assistance Program and Policy Guide \(fema.gov\)](https://www.fema.gov/hazard-mitigation-assistance-program-and-policy-guide)

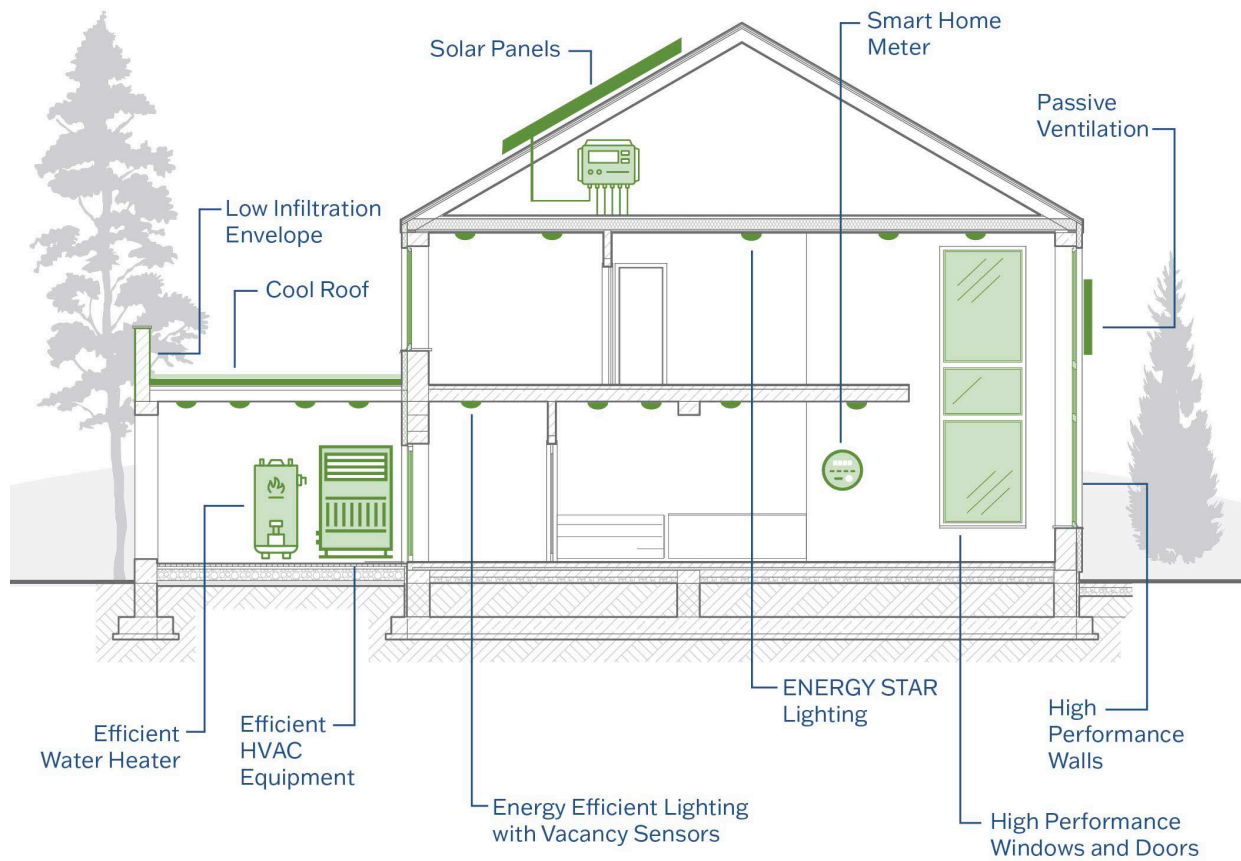


Figure 3: Example of HMA Mitigation Reconstruction

## ADOPTION OF JURISDICTIONAL CODE UPDATES REGARDING NET-ZERO ENERGY PROJECTS

HMA programs may provide funding for the adoption, evaluation, and enforcement of building codes and standards. As part of an otherwise eligible codes and standards project, a jurisdiction may include adoption, evaluation and enforcement of the [2024 IECC Appendix CC and RC or IgCC Chapter 7 and Appendix B](#).

[The Hazard Mitigation Assistance Program and Policy Guide](#) and [FEMA's Building Codes Adoption Playbook for Authorities Having Jurisdiction \(P-2196\)](#), provides general steps to help navigate the code adoption process and includes information about FEMA grants available to support building code adoption and enforcement activities.

## Net-Zero Energy Examples

Projects with net-zero energy eligible under PA must have a tie to the designated damages from the declared disaster. Net-zero projects eligible under HMA must have a tie to eligible hazard mitigation work that addresses risk and reduces suffering from disasters.



## RENEWABLE ENERGY EXAMPLES

Eligible net-zero energy projects at FEMA *must* include renewable energy in an amount equivalent to or greater than the annual energy consumption of the facility (or applicable portion of the facility). Applicants should follow the codes, standards and technical specifications found in the [International Energy Conservation Code Appendix CC Zero Energy Commercial Building Provisions](#).

### Renewable Energy Generation Examples<sup>14</sup>

Eligible Projects	Description	Applicable Grant Programs	Applicable Codes and Standards
Solar Panels/Arrays	A solar panel is designed to absorb the sun's rays as a source of energy for generating electricity or heating. A group of solar panels is a solar array.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IECC Appendix CC Section CC103.1-103.2</a>
Microgrids	A Microgrid is a group of interconnected energy-consuming devices and equipment and distributed energy resources. Energy resources generate power in the form of solar panels, wind turbines, or other renewable energy sources. A free standing microgrid is not eligible under Public Assistance unless it is tied to eligible PA work that addresses damage caused by a declared disaster. Microgrids are also eligible under HMA as secondary power sources.	HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IECC Appendix CC Section CC103.1-103.2</a>
Wind Turbines	A wind turbine is a device that converts the kinetic energy of wind into electrical energy.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IECC Appendix CC Section CC103.1-103.2</a>

<sup>14</sup> The IECC defines renewable energy sources as solar, wind, waves, tides, landfill gas, biogas, biomass and geothermal. Renewable energy resources that are not listed in this document may still be eligible and will be evaluated on a case-by-case basis.

Eligible Projects	Description	Applicable Grant Programs	Applicable Codes and Standards
Battery Storage	Battery storage allows for the long-term storage of energy generated by renewable sources like solar panels and wind turbines. Battery storage ensures a facility remains net-zero energy capable during a blackout or when renewable sources are not generating electricity.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">2024 International Green Construction Code (IgCC) Chapter 7 Section 701.3.4</a>

### HIGH-EFFICIENCY APPLIANCES, TECHNOLOGY AND MATERIALS EXAMPLES

High-efficiency appliances and technology must be coupled with renewable energy to be considered a project with net-zero energy. The appliances or materials must be tied to an identified damage for the declared disaster or eligible mitigation grant. Applicants should follow the codes, standards and technical specifications found in the [2024 \(or the most recent version\) International Green Construction Code \(IgCC\) Chapter 7 and Appendix B.](#)

#### High-Efficiency Appliances and Technology Examples

Eligible Projects	Description	Applicable Grant Programs	Applicable Codes and Standards
Heat Pumps	A heat pump uses electricity to transfer heat from a cool space to a warm space offering both cooling and heating solutions for a facility. A heat pump offers an energy-efficient alternative to furnaces and air conditioners.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IgCC Chapter 7 (Section 701.4.3.2)</a> and <a href="#">Appendix B (Tables B101.2, B101.3, B101.4, B101.11)</a>
High-efficiency Appliances (e.g., Energy Star or other certification)	High-efficiency appliances (boiler etc.) reduce overall energy consumption resulting in a smaller amount of renewable energy needed to power a facility.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IgCC Chapter 7 (Sections 701.4.4.1, 701.4.7.3)</a> and <a href="#">Appendix B</a>
High-efficiency Furnace/Air Conditioner	High-efficiency furnaces use less energy to warm a facility, resulting in less emissions and potentially reducing energy costs.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IgCC Chapter 7 (Section 701.4.3.2) [for EnergyStar]</a> and <a href="#">Appendix B (B101.5)</a>

Eligible Projects	Description	Applicable Grant Programs	Applicable Codes and Standards
LED Lighting	LED is a highly energy-efficient lighting technology using at least 75% less energy, and last up to 25 times longer, than incandescent lighting.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IgCC Chapter 7 (Sections 701.3.4.3, 701.4.6, 701.4.7.3.2)</a>
Advanced Metering and Building Controls (Smart Meters)	Advanced metering and building controls can better monitor the most energy-consuming components of a building, like HVAC or lighting, to ensure that all systems are performing at peak energy-efficiency.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">IgCC Chapter 7 (Sections 701.3.3.1 to 701.3.4.2)</a>
Roof Overhangs	Roof overhangs can often compliment upgraded glazing or reduce the immediate need for replacements by eliminating some of the solar radiation that would otherwise enter the home via windows and doors. Overhangs should be positioned on the building to shade from sun during the hottest times of day and seasons.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">International Green Construction Code (IgCC) Chapter 7 (Sections 701.4.2.1, 701.4.2.2, 701.4.2.6, 701.4.2.7, 701.4.2.9, 701.4.2.10)</a>

Eligible Projects	Description	Applicable Grant Programs	Applicable Codes and Standards
High-Performance Glazing	Upgraded glazing (windows, skylights or glass doors) with a low <a href="#">U-Factor</a> can trap internal heat in cooler climates, saving energy costs. Incorporating glazing with a low <a href="#">solar heat gain coefficient (SHGC)</a> can reduce the amount of solar radiation that passes through, helping maintain cooler temperatures in hotter climates. Replacing old windows and sealing can help prevent building energy waste. Heat transfer through poor-efficiency windows can be responsible for 25-30% of heating/cooling energy use. Glazing may be eligible under applicable Hazard Mitigation Assistance grants to reduce the risk of damage from wildfires or wind events.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">International Green Construction Code (IgCC) Chapter 7 (Section 701.4.2.1, 701.4.2.7, 701.4.2.8, and 701.4.2.10)</a>
Weatherization	Weatherization refers to home improvements that reduce the energy we use to make our homes more comfortable, including moisture control, air sealing, ventilation, and upgrades to insulation, doors and windows.	PA, HMGP, HMGP Post-Fire, PDM, BRIC	<a href="#">International Energy Conservation Code (IECC) Chapter 4 (Section 401.2) and Chapter 5 (Section 503.1, 503.2)</a>

# Conclusion

Low-carbon and net-zero energy projects provide new opportunities to increase climate resilience through the funding of greener solutions. By prioritizing renewable energy sources and energy-efficient measures, these projects reduce greenhouse gas emissions and mitigate the impacts of climate change. Investing in sustainability not only addresses immediate energy needs but also builds long-term resilience against climate-related disruptions, fostering healthier and more adaptable communities.

## Acknowledgements

This document represents the culmination of extensive collaboration, dedication, and expertise from various individuals and organizations. We are deeply thankful for the contributions of our federal agency partners including the General Services Administration, the Federal Highway Administration, the Environmental Protection Agency, the Department of Energy, the White House Council on Environmental Quality and other members of the Biden-Harris Administration's Buy Clean Taskforce.

Additionally, we would like to give special thanks to Building Transparency and Carbon Leadership Forum for the endless support, technical assistance and subject matter expertise provided throughout the policy development and implementation of this report.

## Appendix A: Acronyms

BRIC	Building Resilient Infrastructure and Communities
BT	Building Transparency
CLF	Carbon Leadership Forum
CRC	Consolidated Resource Center
DOE	Department of Energy
DOT	Department of Transportation
EAG	External Affairs Guidance
EC3	Embodied Carbon in Construction Calculator
EPA	Environmental Protection Agency
EPD	Environmental Product Declaration
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
GSA	General Services Administration
GWP	Global Warming Potential
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
ICC	International Codes Council
IECC	International Energy Conservation Code
IgCC	International Green Construction Code
IRA	Inflation Reduction Act
MOA	Memorandum of Agreement

NGO	Non-Governmental Organization
OCC	Office of Chief Counsel
OEA	Office of External Affairs
ORR	Office of Response and Recovery
PA	Public Assistance
PDM	Pre-Disaster Mitigation
RSM	Recovery Scoping Meeting
SLTT	State, Local, Tribal, Territorial



# Appendix B: Foundations

## FEMA Strategic Documents

This overview resource has been developed in line with the FEMA vision of a prepared and resilient nation, as well as its mission to help people before, during and after disasters. Additionally, these authorities contribute to achieving Goal 2 of the *2022-2026 FEMA Strategic Plan*, “*Lead Whole of Community in Climate Resilience.*”

FEMA’s core values of *compassion, fairness, integrity and respect* are represented throughout these initiatives and their implementation. These values represent what the agency stands for and impact how FEMA implements programs and interacts with communities nationwide.

## Supporting Legislation and Policies

### Inflation Reduction Act of 2022

[On August 16, 2022, the Inflation Reduction Act \(IRA\) of 2022](#) was signed into law, marking a historic commitment to build a new clean energy economy and tackle the climate crisis. The act authorizes FEMA to fund costs associated with low-carbon materials and net-zero energy projects to help cut carbon pollution and build back cleaner and more resilient.

The Inflation Reduction Act (IRA) is the most significant piece of clean energy and climate legislation in U.S. history. It will get us on a path to achieve the President’s ambitious climate goals:

- A 50-52% reduction in emissions below 2005 levels by 2030.
- A 100% clean electricity sector by 2035.
- Net-zero emissions by no later than 2050.

The IRA and the Bipartisan Infrastructure Law are expected to reduce emissions by one gigaton in 2030, ten times more reductions than from any other piece of legislation.

### EPA Interim Determination for Low-Carbon Materials

The Environmental Protection Agency’s [Interim Determination on Low Carbon Materials under IRA](#), provides agencies with actionable determinations on the selection of materials and products that meet the standards of IRA Sections 60503 and 60506. Furthermore, the Interim Determination helped inform FEMA’s definition of low-carbon materials by sharing the EPA’s interpretation of “substantially lower” to mean that materials/products qualify if

their product-specific GWP is in the best performing 20% (top 20% or lowest 20% in embodied GHG emissions), when compared to similar materials/products.

### **Federal Buy Clean Initiative**

In December 2021, Executive Order 14057 launched the Buy Clean Task Force and Initiative to promote the use of low-carbon and domestic construction materials. The [Federal Buy Clean Initiative](#) prioritizes the consumption of American-made, low-carbon construction materials in federal procurement and federally funded projects.

### **Bipartisan Infrastructure Law**

On November 6, 2021, Congress passed the [Infrastructure Investment and Jobs Act](#), commonly referred to as the Bipartisan Infrastructure Deal, a commitment to invest in the nation's infrastructure. The Bipartisan Infrastructure Law will rebuild roads, bridges, and train rails, expand access to clean drinking water and internet connection, and advance environmental justice by investing in disadvantaged communities.

Like the Bipartisan Infrastructure Law, the IRA catalyzes investment in the nation's infrastructure, particularly pursuing projects that will enhance renewable energy use and reduce the sector's carbon output. FEMA's implementation projects will share the same goals of upgrading and reinforcing infrastructure, specifically in areas that have experienced and/or are prone to disasters.

## **FEMA Resources**

### **FEMA Website**

<https://www.fema.gov/grants/policy-guidance/low-carbon-goals>

### **FEMA Training and Tools**

[Public Assistance Low-Carbon Implementation Presentation](#)

[Public Assistance Webinar for State, Local, Territorial and Tribal Partners](#)

[Asphalt Demonstration – EC3 Database for Locating Low-Carbon Materials](#)

[Glass Demonstration – EC3 Database for Locating Low-Carbon Materials](#)

[Concrete Demonstration – EC3 Database for Locating Low-Carbon Materials](#)

[Steel Demonstration – EC3 Database for Locating Low-Carbon Materials](#)

## Appendix C: Definitions of Key Terms

**Built Environment:** Human-made structures, features and facilities in the environment in which people live and work.

**Carbon Dioxide:** A naturally occurring gas, as well as a by-product of burning fossil fuels from fossil carbon deposits, burning biomass, land-use changes and industrial processes (e.g., cement production).

**Decarbonization:** Human actions to reduce carbon dioxide emissions from human activities.<sup>15</sup>

**Environmental Product Declaration:** A transparent, verified report used to communicate the environmental impact associated with the manufacture or production of construction materials.

**Fossil Fuels:** Carbon-based fuels from fossil hydrocarbon deposits, including coal, oil and natural gas.

**Global Warming Potential:** An index measuring the radiative forcing following an emission of a unit mass of a given substance, accumulated over a chosen time horizon, relative to that of the reference substance, carbon dioxide (CO<sub>2</sub>). The GWP thus represented the combined effect of the differing times these substances remain in the atmosphere and their effectiveness in causing radiative forcing.

**Greenhouse Gas:** The air pollutants carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride.

**Low-Carbon Materials:** Construction materials and products that “have substantially lower levels of embodied greenhouse-gas emissions associated with all relevant stages of production, use, and disposal, as compared to estimated industry averages of similar materials or products.”

**Low-Carbon Projects:** Projects where 30% or more of materials (concrete, glass, asphalt and steel) by cost of the total value of permanently installed building products, in the project are either low-carbon materials, salvaged or a combination of the two.

---

<sup>15</sup> USGCRP, 2023: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://nca2023.globalchange.gov/>

**Low Embodied Carbon:** Carbon generated from the materials that buildings are built from and from the transportation and distribution of materials.

**Net-Zero Energy:**

- New construction, major renovation projects, and existing building overhauls will meet or exceed energy performance thresholds set by the IECC, appendices CC and RC, as a result of renewable energy or energy-saving updates. These projects must procure renewable energy generation in an amount equivalent to or greater than the annual energy consumption of the entire facility (or applicable portion of the facility).
- In addition to the required renewable energy generation, applicants have the option to pursue high performance equipment and materials to further reduce the facility's overall energy consumption. To be eligible for expenses of high-performance equipment and materials in the facility, equipment and materials must meet or exceed the requirements outlined in Chapter 7 and Normative Appendix B (if applicable) in the 2024 or most recent version of the IgCC.

**Operational Carbon:** Carbon generated from the heating, lighting, and/or cooling of existing buildings.

**Salvaged Materials:** FEMA considers salvaged materials to be the deliberate reclamation of reusable materials from the disassembly, deconstruction or demolition of buildings or structures. Minimally processed salvaged and reused materials/products and associated services: Any construction materials/products salvaged and reused onsite or in other regional projects. Salvaged and reused materials/products from external vendors. Note: This category of materials is not referring to recycled content in manufactured materials/products.

**Substantially Lower:** Having a Global-Warming Potential (GWP) that is at least less than the estimated North American industry average as demonstrated by their Environmental Product Declaration (EPD).

- Under the authorities of the Inflation Reduction Act Sections 60503 and 60506, the U.S. Environmental Protection Agency (EPA) is directed to determine materials and products “that have substantially lower levels of embodied greenhouse-gas emissions associated with all relevant stages of production, use and disposal as compared to estimated industry averages of similar materials or products.”

## Appendix D: Citations List

Building Transparency. Retrieved from: <https://www.buildingtransparency.org>.

The Carbon Leadership Forum. Climate, Carbon and the Built Environment. Retrieved from: <https://carbonleadershipforum.org/the-carbon-challenge/>.

Congress.gov. (2021). H.R.3684 - 117<sup>th</sup> Congress (2021-2022): Infrastructure Investment and Jobs Act. Retrieved from: <https://www.congress.gov/bill/117th-congress/house-bill/3684>.

Congress.gov. (2022). S.1303 - 117th Congress (2021-2022): Build America, Buy America Act. Retrieved from: <https://www.congress.gov/bill/117th-congress/senate-bill/1303>.

Congress.gov. (2022). H.R.5376 - 117th Congress (2021-2022): Inflation Reduction Act of 2022. Retrieved from: <https://www.congress.gov/bill/117th-congress/house-bill/5376>.

Council on Environmental Quality. (2023). Federal Buy Clean Initiative. Retrieved from: <https://www.sustainability.gov/buyclean/>.

Crimmins, Allison R., Avery, Christopher W., Jay, Avery K., Dahl, Travis A., Dodder, Rebecca S., Hamlington, Benjamin D., Lustig, Allyza R., Marvel, Kate, Méndez-Lazaro, Pablo A., Osler, Mark S., Terando, Adam, Weeks, Emily and Ariela Zycherman. (2023). The Fifth National Climate Assessment. USGCRP. U.S. Global Research Program. Retrieved from: <https://nca2023.globalchange.gov>.

Energy.gov. Zero Energy Building Project Profiles: Schools. Retrieved from: [www.energy.gov/eere/buildings/zero-energy-building-project-profiles-schools](http://www.energy.gov/eere/buildings/zero-energy-building-project-profiles-schools).

Environmental Protection Agency. (2023). Understanding Global Warming Potentials. Retrieved from: <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.

FEMA.gov. (2023). Blue Lake Rancheria Case Study. Retrieved from: [www.fema.gov/sites/default/files/documents/fema\\_gpd-blr-cs-final-report-v14.pdf](http://www.fema.gov/sites/default/files/documents/fema_gpd-blr-cs-final-report-v14.pdf).

New Buildings Institute. (2020). Zero Energy Appendix for the 2021 IECC. Retrieved from: [https://newbuildings.org/wp-content/uploads/2020/05/2021\\_IECC\\_ZEAppendix\\_202006.pdf](https://newbuildings.org/wp-content/uploads/2020/05/2021_IECC_ZEAppendix_202006.pdf).

The White House. (2022). Justice40. Retrieved from: <https://www.whitehouse.gov/environmentaljustice/justice40/>.

The White House. (2022). What They Are Saying: Biden-Harris Administration's Federal Buy Clean Initiative Receives Praise from Labor Leaders, Industry, and Environmental Organizations. Retrieved from: <https://www.whitehouse.gov/ceq/news-updates/2022/09/19/what-they-are-saying-biden-harris-administrations-federal-buy-clean-initiative-receives-praise-from-labor-leaders-industry-and-environmental-organizations>.

FEMA.gov. (2024). Building Clean, Climate-Resilient Communities through FEMA's Grant Programs. Retrieved from: <https://www.fema.gov/grants/policy-guidance/low-carbon-goals>.

Winters-Downey, Erika S.E., LEED AP. (2010). Reclaimed Structural Steel and LEED Credit MR 3 – Materials Reuse. Retrieved from: [https://www.aisc.org/globalassets/modern-steel/steelwise/052010\\_steelwise\\_may.pdf](https://www.aisc.org/globalassets/modern-steel/steelwise/052010_steelwise_may.pdf).