ULI Chicago

# CLIMATE READY CHICAGO

## STRATEGIES FOR ACCELERATING BUILDING DECARBONIZATION


ULI Chicago Climate Initiative Report | MARCH 2024

The Climate Ready Chicago Initiative was conducted over a period of one year starting in February 2023, in Chicago, IL.

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## Net Zero Imperative

Thanks to a generous gift from Owen Thomas, ULI has launched the Net Zero Imperative, a multi-year initiative to accelerate decarbonization in the built environment. Additional gifts from Lynn Thurber, Joe Azrack, Franz Colloredo-Mansfeld, and Dan Cashdan further support and bolster the NZI program's scale and impact. Work to advance the initiative includes technical assistance panels in five global cities each year, designed to help developers, building owners, cities, and other relevant constituents reduce carbon emissions associated with buildings, communities, and cities. The fundamental goal of the effort is to provide concrete ideas and strategies to real estate owners, public sector leaders, and the general public to eliminate carbon emissions from the built environment to reach net zero.Through its work, the initiative will create global resources (research, toolkits, and other tools) to help all ULI members accelerate decarbonization in their real estate operations and in their cities.

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ULI Chicago panelists are land use professionals, selected carefully for their knowledge and skills so that each panel or working group is uniquely positioned to address the challenges at hand and provide in-depth, project-specific, and pragmatic recommendations. The intimate, focused, and collaborative format of ULI panels encourages creative thinking and problem solving.

Learn more at chicago.uli.org.

Green roof at Omni Ecosystems offices in Chicago's Bronzeville neighborhood.

# CONTENTS

# KEY TERMS

**Building Decarbonization** refers to activities and programs that reduce greenhouse gas emissions (GHGs) from buildings, related to operational and embodied carbon.

- **Operational carbon** refers to emissions related to building operations, arising from refrigerant leakage and energy sources such as natural gas used in cooling, heating, lighting, and powering buildings. Operational carbon can be minimized by reducing energy usage in buildings and switching from gas-fired to electrical equipment powered by electricty generated from carbon-free sources such as solar.
- **Embodied carbon** refers to emissions arising from the manufacturing and transportation of building materials and the building construction process. Embodied carbon is locked into the building itself, and the best way to reduce embodied carbon is to reuse existing buildings or when renovating or building new, to select low-carbon materials.

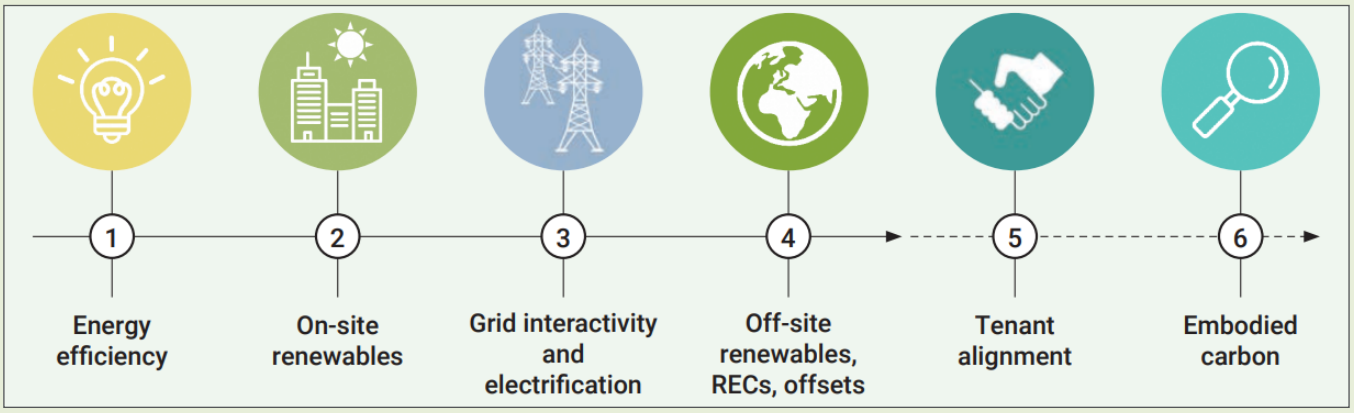
**Carbon Offsets** refer to a reduction in carbon emissions or increase in carbon capture and storage, through activities like planting trees, to compensate for emissions that occur elsewhere. The offsets are based on the concept that because GHGs mix globally in the atmosphere, it does not matter where they are reduced. Therefore, when it's difficult or expensive to reduce their own carbon emissions, organizations or individuals can purchase carbon offset credits and claim the underlying reduction towards their own emissions reduction goals[1]. A carbon offset credit represents an emission reduction of one metric ton of CO2, or an equivalent amount of other GHGs. Carbon offsets can be controversial because they are diffcult to regulate and can be used by entities to avoid implementing carbon reduction measures in their own operations.

**Equitable Development** is a form of planning and community development that can make communities of low- and moderate-income and minority people into places that provide economic opportunities, affordable living, and cultural expression for all residents[2]. Advancing equitable development is a key component of the ULI Chicago Climate Ready Initiative—the environmental, economic, and social benefits of accelerating decarbonization should be realized by residents and building owners across the region, including owners and tenants of smaller buildings, who are often less-resourced.

**Net Zero Carbon** in real estate refers to highly energy efficient buildings that are fully powered by carbon-free energy sources, so their annual and life-cycle carbon

1 Understanding Carbon Offsets, Carbon Offset Guide. https://www.offsetguide.org/understanding-carbon-offsets/

2 Defintion is paraphrased from The Ingredients of Equitable Development Planning, Joint Center for Housing Studies of Harvard University (2019). The discussion appears on Page 38.




ULI's Real Estate Journey to Net Zero
*Source: ULI*

emissions are either zero or negative. As illustrated in "ULI's Real Estate Journey to Net Zero," building owners need to take several steps to achieve net zero carbon. Two key components of the journey include energy-efficiency and building electrification. Energy-efficiency measures, such as insulating the building exterior to minimize heat gain/loss and matching the heating/cooling schedule to the building's occupancy, cut down the amount of energy used to operate the building. Building electrification or replacing gas-fired equipment when it reaches the end of its useful life with electric equipment, can further reduce, or eliminate carbon emissions. Additional details on achieving net zero carbon buildings are presented in the recommendations section of the report.

**Renewable Energy** is generated from sources that can be replenished—wind, water, solar, and geothermal energy. Electricity generated from these renewable sources does not create direct greenhouse gas emissions.

**Renewable Energy Certificates (RECs)**, also known as renewable energy credits, allow consumers to ensure that the electricity supplied to their home or business is coming from a renewable source. A REC is issued when one megawatt-hour (MWH) of electricity is generated from a renewable energy source and delivered to the grid.

Because electricity supplied by the grid typically does not include any information on where and how it was generated, it is difficult, if not impossible, for an entity to estimate carbon emissions associated with their electricity consumption. While Illinois has committed to transitioning to a 100% carbon-free electric grid by 2050, in 2022, 34% of its electricity came from natural gas and coal-fired plants[3]. Until the grid is carbon-free, purchasing RECs allows entities to eliminate carbon emissions associated with the production of electricity consumed for their operations.

**Scope 1, 2 & 3 Emissions.** Greenhouse gas (GHG) emissions inventory for an organization is a list of different emissions sources and the quantity of emissions associated with each source. Based on key characteristics of emissions sources, such as the level of control by the organization, the Greenhouse Gas (GHG) Protocol organizes sources into three categories, or scopes[4]. This categorization is intended to make it easier for organizations to identify emissions reduction opportunities throughout their operations.

- **Scope 1:** Also called direct emissions, these are emissions from sources that the organization owns or controls. This includes emissions from natural gas-fired heating and hot water systems in buildings.
- **Scope 2:** Emissions that are a consequence of the operations of the organization but occur at sources owned or controlled by someone else are called Scope 2 or indirect emissions. This includes GHG emissions from the generation of electricity purchased by the company to run its building operations.
- **Scope 3:** Scope 3 emissions include all other indirect emissions not covered in Scope 1 or 2. These can be the most difficult emissions to measure and reduce. In the context of real estate, Scope 3 emissions can arise from the manufacturing and transporting of building materials during a construction/renovation project. Emissions from tenant spaces that are not controlled by the building owner would also be considered Scope 3 emissions.

**Whole Life Carbon** is the combined total of embodied and operational emissions over the life cycle of a building, from material sourcing, manufacture, construction, use over a given period, to demolition and disposal, including transport emissions and waste disposal[5].

3 Illinois State Energy Profile, U.S. Energy Information Administration, August 2013. https://www.eia.gov/state/print.php?sid=IL

4 Defintions are based on The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition, World Resources Institute and World Business Council for Sustainable Development.

5 Whole Life Carbon Explainer Guide, UK Green Building Council. https://ukgbc.org/wp-content/uploads/2023/02/Whole-life-carbon.pdf

# EXECUTIVE SUMMARY

Climate Change is one of the biggest challenges of our times and the Chicago region is not immune. As the earth's surface temperature is rising, our weather patterns are changing resulting in extreme temperatures and intense storms. Lower-income communities and communities of color, suffering from decades of infrastructure disinvestment, are facing the harshest impacts. While the challenge is immense, solutions to slow climate change already exist. We need the leadership and the vision to implement it.

Because buildings account for nearly 70% of carbon emissions in Chicago, the real estate industry has the responsibility and the opportunity to play a key role in reducing carbon emissions. This ULI Chicago Initiative brought together approximately 50 area stakeholders, including industry experts, civic and community leaders, and public sector officials, to develop recommendations for accelerating building decarbonization and creating a "Climate Ready Chicago." Our recommendations are organized into three broad categories with more detailed strategies and actions within each category.

While leadership from the public sector is key, close partnerships with the non-profit and private sectors will be necessary to effectively implement the report recommendations. Additionally, although the report focuses on the City of Chicago, most recommendations are applicable to communities throughout the Chicago region and elsewhere.

## SUMMARY RECOMMENDATIONS

### A. Strengthen the Policy Ecosystem to Encourage a Net-Zero Carbon Built Environment

We need a stronger, streamlined policy environment to accelerate building decarbonization and create a net zero carbon built environment. Our recommendations to achieve that include:

#### Building Level

**A1.** Strengthen the Energy Benchmarking Ordinance

**A2.** Adopt Building Performance Standards (BPS)

**A3.** Encourage Focus on Whole Life Carbon

**A4.** Track and Manage Use of Refrigerants

**A5.** Conduct Regular Review and Update of Regulatory Codes

#### Neighborhood/ City Level

**A6.** Allow Accessory Dwelling Units (ADUs) Citywide

**A7.** Activate City-Owned Vacant Lots

**A8.** Encourage Equitable Transit-Oriented Development (ETOD)

## B. Align Resources with Decarbonization Goals

Building owners, big and small, need access to greater technical and financial resources to implement decarbonization retrofits and construct net zero carbon buildings. Increased collaboration between government agencies, and with non-profit and industry partners, will facilitate the most effective use of resources and amplify impact. We recommend the following actions:

**B1.** Build an Effective Governance Structure: Create a Well-Resourced Department of Environment

**B2.** Streamline Approvals for "Green" Development Proposals

**B3.** Create a Network of Technical Support

**B4.** Improve Access to Existing Funding Sources, Explore New Funding Sources

**B5.** Create a Trained Workforce

**B6.** Support Creation of a Clean and Smart Electric Grid

## C. Engage and Educate All Stakeholders

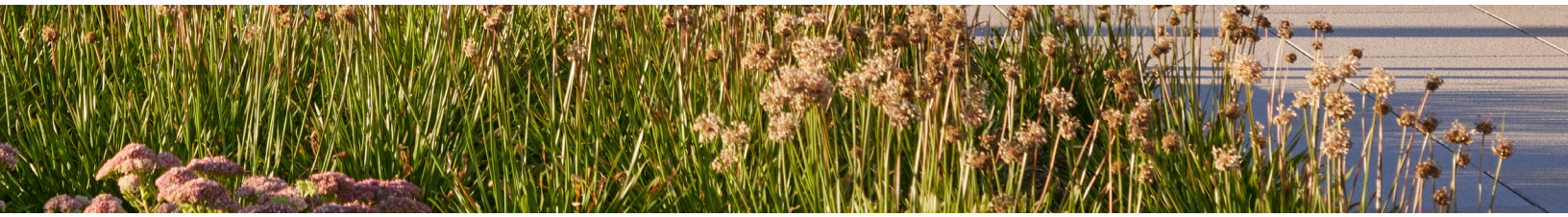
To achieve widespread, equitable decarbonization, we need to engage a diverse group of stakeholders including residents, building owners, and construction industry workers. Our recommendations for effective outreach and education include:

**C1.** Target Messaging to Audience

**C2.** Leverage the Power of Partnerships to Reach Different Audiences

**C3.** Provide Guidance on Roadmap for Building Decarbonization

**C4.** Sequence Improvements to Maximize Impact



# INTRODUCTION

Climate change, or the change in weather patterns and ecosystems due to earth's rising surface temperature, is one of the most significant challenges of our times. It is causing extreme weather events resulting in devastating losses of life and property in many communities across the world. Melting polar ice caps and rising sea levels are threatening the very existence of coastal communities, warmer ocean waters are making catastrophic storms more frequent than ever before, and scorching summers coupled with droughts are sparking intense wildfires. Changing weather is altering agricultural growing seasons, which, in turn, is impacting food production.

Locational advantages have shielded the Chicago region from the worst impacts. But as evidenced by the growing frequency of deluging storms, polar vortex jet streams, intense heat waves, and unhealthy air quality from wildfires, we are not immune. Additionally, as communities become increasingly uninhabitable because of eroding coastlines, extreme heat, or another climate-related challenge, displaced residents will have to seek refuge in regions that are more resilient to the changing climate.

The magnitude and urgency of the climate crisis facing us can feel overwhelming and beyond the scope of an individual, or even an entire city and region. **However, many solutions to stem climate change already exist; we need the leadership and the vision to implement them.**

Climate change is being driven by increased emissions of greenhouse gases (GHG) that trap heat in the earth's atmosphere, raising its average annual surface temperature. The primary greenhouse gas is carbon dioxide ($CO_2$), a byproduct of many daily activities such as driving a car, and heating/cooling our homes and workplaces, which are often powered by burning coal

Chicago, with its history of innovation in architecture and engineering, bold city planning, and commitment to building an equitable and resilient city for all, is well-positioned to be a climate leader and a destination of choice for those seeking to live and invest in vibrant and climate resilient communities.

Chicago, a global city with a thriving economy, extensive transit network, abundant access to fresh water, vibrant neighborhoods, and a commitment to building an equitable and resilient city, is well-positioned to be a climate leader.

or natural gas. Reducing carbon emissions today, is essential for slowing climate change and minimizing its worst impacts in the coming years.

Globally, buildings account for 37% of carbon emissions (Figure 1a). In denser urban areas that percentage can be far higher. Buildings account for 69% of Chicago's carbon emissions (Figure 1b). Additionally, it is estimated that in 2050, nearly 80% of the global building stock will be buildings that exist today[1]. Without upgrades, they will still be emitting greenhouse gases. Therefore, in addition to constructing buildings with low or net zero carbon emissions, retrofitting existing buildings to lower carbon emissions by reducing energy consumption and switching to cleaner energy sources, is critical for a sustainable future.

Given the significant carbon emissions generated by buildings, the real estate industry has a heightened responsibility as well as the opportunity to take action to slow climate change. Urban Land Institute (ULI) has made it a mission priority to promote building decarbonization. It launched the Net Zero Imperative (NZI) in 2021 to help building owners, cities, and other relevant constituents reduce carbon emissions associated with buildings, communities, and cities. ULI Chicago's Climate Ready Chicago Initiative is part of ULI's NZI program.

1 Accelerating green growth in the built environment, McKinsey & Company, November 2022. https://www.mckinsey.com/capabilities/operations/our-insights/accelerating-green-growth-in-the-built-environment#/

## PARIS CLIMATE ACCORD

Recognizing climate change as a global emergency that goes beyond city and country borders, world leaders at the United Nations' Climate Conference in 2015 (COP21) reached a historic climate agreement known as the Paris Agreement. The Paris Agreement calls for reducing global greenhouse emissions to hold earth's surface temperature increase to below 2ºC (3.6ºF) over pre-industrial levels while pursuing efforts to limit the increase to 1.5ºC (2.7ºF). An increase in global temperature over 2ºC is likely to alter conditions on earth beyond what we've experienced before; limiting it to 1.5ºC could reduce the risk of the worst impacts of climate change. 1.5ºC and 2ºC are therefore commonly used as reference points to set goals for reducing greenhouse gas emissions.

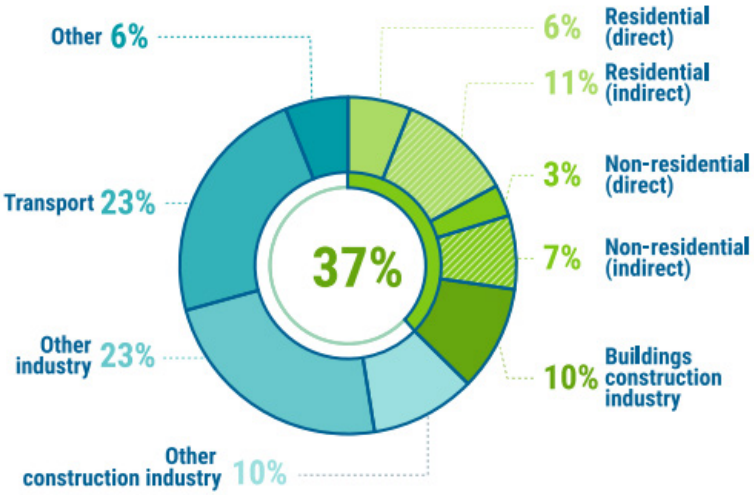



**Figure 1a.** Building and Construction's Share of Global Energy-Related CO2 Emissions, 2020

*Source: 2021 Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient & Resilient Buildings and Construction Sector, United Nations Environment Programme*

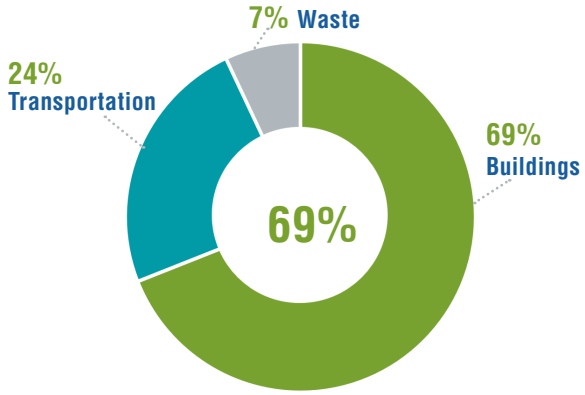



**Figure 1b.** Buildings' Share of Greenhouse Gas Emissions in Chicago, 2017

*Source: Based on data presented in the 2022 Climate Action Report, City of Chicago*

# THE ULI CHICAGO INITIATIVE
# CLIMATE READY CHICAGO

Chicago's buildings account for nearly 70% of the city's carbon emissions, making building decarbonization an essential aspect of the city's plan for climate readiness. Chicago has an extensive stock of older buildings—according to an analysis by the National Trust, in 2015, Chicago had more than 500,000 buildings (with age data available) and more than half of them were nearly 100 years old[2]. These older buildings are an integral part of Chicago neighborhoods, contributing to their distinctive character and economic vibrancy. According to the analysis, in Chicago neighborhoods with a greater concentration of older and smaller buildings, 45% of all jobs were in small businesses compared to 33% in other parts of the city. While there is a significant push for reducing carbon emissions in new construction by using low-carbon materials and installing highly efficient, electric building equipment, retrofitting older existing buildings continues to be challenging. Yet, given Chicago's large number of existing buildings, making them more energy efficient and transitioning from fossil-fuels to clean, renewable energy sources, is key to reducing citywide greenhouse gas emissions. Additionally, because of their embodied carbon, reusing older buildings is inherently more sustainable than tearing down and building new. Therefore, the ULI Chicago initiative is focused on decarbonizing existing buildings.

In Chicago, like elsewhere, most vulnerable populations—lower income and communities of color—have historically faced the harshest consequences of climate change. The heat wave of July 1995, one of the deadliest in the country, killed 739 Chicagoans, most of them Black and living in the city's poorest neighborhoods on the south and west sides[3].

2 Building on Chicago's Strengths: The Partnership for Building Re-use: Executive Summary, National Trust for Historic Preservation and ULI Chicago, May 2016.
3 Cooked: Survival by Zipcode, Judith Helfand, Kartemquin Films, 2019.

As illustrated in Figure 2, west and southwest side neighborhoods in the city continue to be the hottest. According to an analysis by the Center for Neighborhood Technology, between 2007 and 2016,

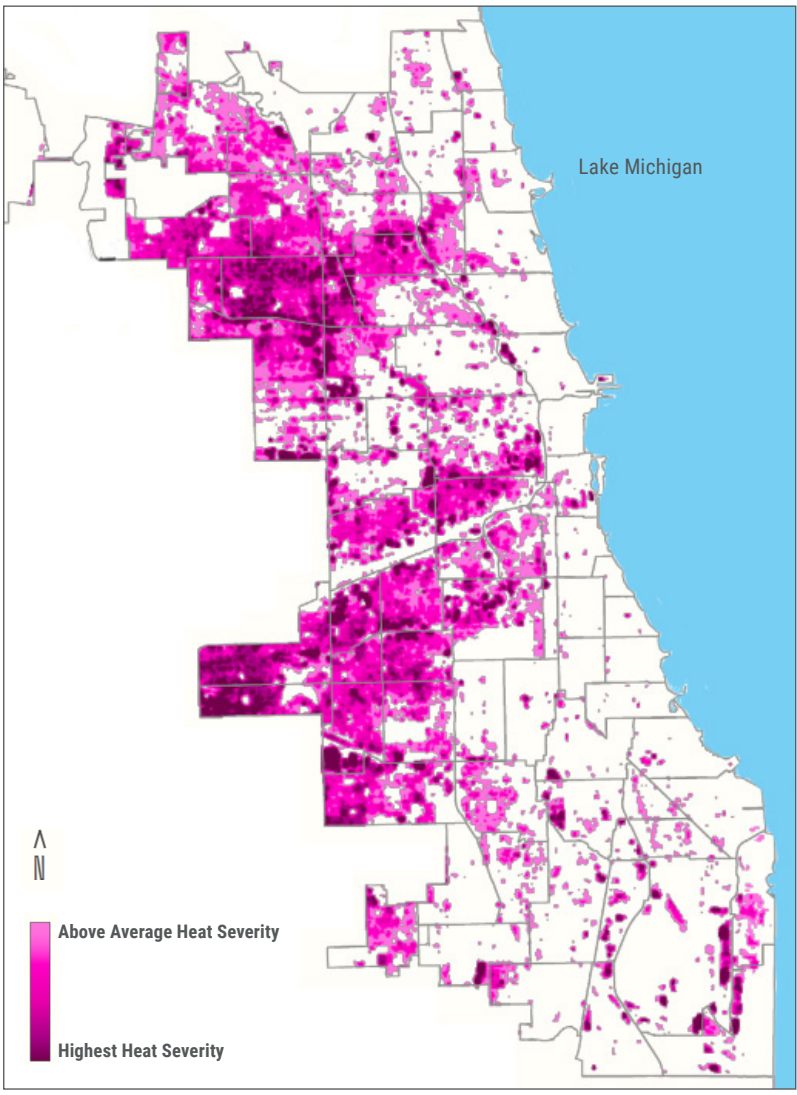



**Figure 2.** Urban Heat Severity in Chicago
*Source: 2022 Chicago Climate Action Plan, City of Chicago*

Notes.
1. Credit: Dr. Christian Braneon, Data Scientist at d3i Systems.
2. This map was created as a result of activities associated with the NASA-Microsoft partnership through collaboration between NASA, Microsoft, ESRI, City of Chicago Department of Planning and Development and City Tech Collaborative.

87% of flood insurance claims in Chicago were paid in communities of color, once again, on the city's south and west sides[4]. To build a truly resilient city, where all residents and neighborhoods are shielded from the harshest impacts of climate change and can participate in the green economy to lead healthier, more-productive lives, ensuring equitable impacts must be an integral part of decarbonization efforts.

Recognizing this, ULI Chicago launched the *Climate Ready Chicago* Initiative in February 2023 to develop recommendations for accelerating carbon emissions reductions from buildings and creating a more healthy, equitable, and climate-resilient Chicago. As part of the Initiative, we convened nearly fifty industry and public sector representatives in a series of six workshops through 2023. Participants identified the most significant challenges for retrofitting existing buildings and developed recommendations for overcoming them by strengthening existing/proposed programs and establishing new decarbonization tools and programs.

Its important to note that while our recommendations are focused on the City of Chicago, many of them apply to communities in the larger Chicago region and beyond.

4 Assessing disparities of urban flood risk for households of color in Chicago, Center for Neighborhood Technology, 2018.

## Initiative Goals

Climate Ready Chicago was launched with the following goals:

**1. Accelerate Decarbonization in Existing Buildings to achieve Net Zero Carbon.** Identify the most significant regulatory, technical, cultural, and financial barriers limiting decarbonization in existing buildings. Develop recommendations to build upon effective policies and programs to overcome these barriers and scale-up decarbonization retrofits.

**2. Promote Equitable Outcomes.** Develop recommendations to ensure that decarbonization benefits, such as healthier and more-comfortable living/working spaces, utility cost savings, and green job opportunities, are available to residents and business owners across the city. Provide additional support for south and west side neighborhoods that have endured greatest environmental harms.

**3. Build Greater Awareness and Support.** Develop recommendations for engaging diverse stakeholder groups, including smaller and larger building owners, tenants, tradespeople, and contractors, to build greater awareness of the benefits of decarbonization and available implementation resources.



Participants in ULI Chicago's Climate Ready Initiative brainstorm ideas for making it easier for building owners to invest in improvements to reduce carbon emissions and create healthier living/working environments.

# CHICAGO'S CLIMATE COMMITMENT

Chicago has been at the forefront of sustainable development. Chicago's City Hall was the first municipal building in the country with a green roof and when it adopted its first climate action plan in 2008, Chicago was one of the first cities in the country to do so. Since then, Chicago has continued to advance sustainable development; key recent initiatives and policies are described below.

### Climate Resilience Investments in the Chicago Recovery Plan

The City of Chicago, like cities across the country, received federal funds under the American Rescue Plan Act of 2021 (ARP) for expenses incurred between March 2021 and December 2024 to aid recovery from COVID-19. To use these funds effectively, Chicago prepared the 2021 Recovery Plan outlining investments for urgent assistance as well as longer-term equitable growth. $188 million is budgeted for climate resilience related improvements, including $31 million for decarbonizing low- and moderate-income residential and community anchor buildings in underserved areas. Other investments include solar panel installations, expanding tree canopy coverage, and low-carbon transportation alternatives such as bike and pedestrian infrastructure.

### Climate Action Plan

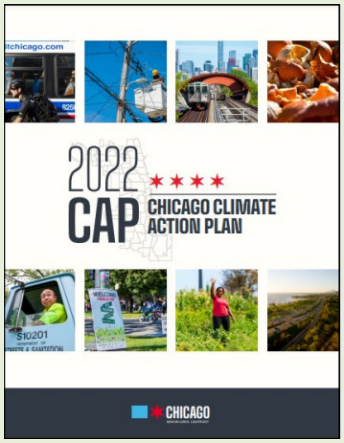
Released on Earth Day 2022, the City of Chicago's updated Climate Action Plan (2022 CAP), set a minimum target of 62% reduction in citywide greenhouse emissions by 2040 (from a 2017 baseline). The plan identifies strategic actions under five pillars, which include retrofitting buildings, reducing waste, and improving access to renewable energy and clean transportation options while enhancing economic inclusion, community health, and equitable access.

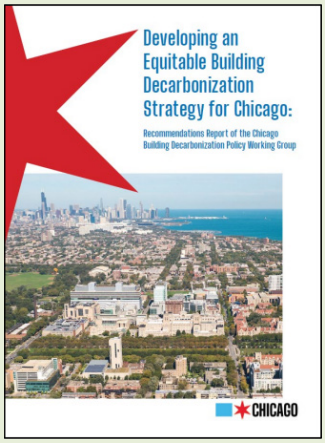
### Developing an Equitable Building Decarbonization Strategy for Chicago | Recommendations Report of the Chicago Building Decarbonization Policy Working Group ("CBDWG Report")

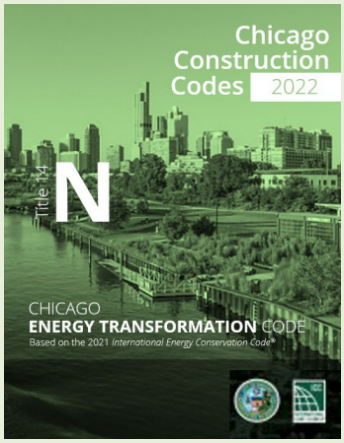
Decarbonizing buildings, which account for nearly 70% of GHG emissions in Chicago, is key to achieving the city's climate goals outlined in the 2022 CAP. Recognizing this, the city convened a diverse working group across different sectors, including technical experts as well as community leaders, to develop equitable and implementable decarbonization strategies. The group developed a series of recommendations for decarbonizing both new and existing buildings, such as adopting building performance standards and funding pilot projects and identified technical and financial resources necessary to implement them. Many of these recommendations, presented in the CBDWG Report released in October 2022, are synergistic with the findings and recommendations presented in this ULI Chicago report.

### Energy Transformation Code

Chicago updated its building code to meet new energy requirements, effective November 2022, becoming one of the first cities in the country to adopt and exceed the latest edition of the International Energy Conservation Code (IECC). Unlike previous energy codes, which focused exclusively on reducing energy usage, the 2022 Energy Transformation Code incentivizes the use of equipment and energy sources that reduce greenhouse gas emissions. The code applies to both new construction and building renovations. Key provisions


include requiring residences to be built with electrical capacity and wiring necessary to support the switch to full electrification without disallowing gas appliances, placing windows to minimize solar heat gain in the summer, and incentivizing the use of smart heating, cooling, and hot water equipment that is integrated with the electric grid to reduce demand during peak usage.

### Sustainable Development Policy

Chicago's Sustainable Development Policy (SDP) requires projects receiving city assistance (financial assistance or regulatory relief), to include sustainable design elements that help meet the City's climate goals by reducing energy usage and carbon emissions. First implemented in 2004 as a green roof requirement and later modified to require Leadership in Energy and Environmental Design (LEED) or similar green certifications, Chicago's Sustainable Development Policy (SDP) was last updated in 2017. The current SDP includes a point-based menu of sustainable features that, in addition to energy, address a variety of issues including public health, stormwater management, transportation, waste diversion, bird and bat protections, and workforce development.

### Energy Benchmarking Ordinance

Instituted in 2013, the Chicago Energy Benchmarking Ordinance requires commercial, institutional, and residential buildings over 50,000 square feet to report their energy consumption annually and verify their data every three years. The ordinance is based on the idea that creating awareness through data gathering and reporting can incentivize property owners to invest in energy-efficiency improvements while providing prospective tenants with the ability to compare the energy profile of various buildings. Even though the ordinance doesn't require implementing any energy improvements, according to the 2020 Chicago Energy Benchmarking Report, the energy used per square foot in reporting buildings declined by 9% between 2017 and 2020 and the median carbon emissions per square foot dropped by 25% between 2016 and 2020.

### *Proposed* Clean and Affordable Buildings Ordinance (CABO)

Introduced in January 2024 in the Chicago City Council, the CABO is the most significant step to-date in reducing building carbon emissions in Chicago. With a few exceptions, the ordinance bans the combustion of fuels that emit more than 25 kg/btu, effectively requiring all new construction and building renovations over a specific size to switch to clean energy sources like electricity . Therefore, if passed, CABO would effectively ban new natural gas connections in Chicago buildings.

# KEY CHALLENGES FOR DECARBONIZATION

Initiative participants identified the following as key challenges for implementing decarbonization retrofits in existing buildings.

## High Cost of Decarbonization

Many decarbonization retrofits, such as replacing single-pane windows with energy-efficient windows or natural gas furnaces with electric heat pumps, can be expensive and disruptive, posing a challenge for both smaller and larger property owners. Smaller building owners, especially those who operate older buildings with rents affordable to lower-and middle-income communities, might not have cash reserves or the borrowing capacity to finance such improvements. Deferred maintenance and health and safety issues in these buildings can also make building upgrades more expensive.

For owners of older office buildings who are facing sharply higher vacancies and plunging revenues, investing in decarbonization improvements may not be a priority. As one building owner put it, "There is a lot of competition for capital, and many office building owners are simply not earning enough rent right now to cover costs and re-invest into the building."

## Tenants' Willingness to Pay for Green Features

While there is increasing awareness of the benefits of green buildings and it may provide a competitive edge in a difficult leasing environment, many Initiative participants contend that average tenants are not likely to pay higher rents for green features such as electric heat pumps instead of gas-fired boilers. Companies with environmental commitments looking to attract a highly specialized workforce that values environmental responsibility, are typically the ones willing to pay higher rents, but they constitute a relatively small portion of the overall demand for office/commercial space. This makes it more challenging for building owners, both residential and commercial, to invest limited dollars in decarbonization retrofits.

## Knowledge and Resource Gaps

Lack of clarity on best practices and available resources has limited the adoption of decarbonization improvements, even when they are relatively inexpensive or have quick payback periods. For example, regular maintenance and ongoing monitoring of building systems to ensure efficient operations can result in significant energy and cost savings with little capital investment. The Chicago Mercantile Exchange (CME), a two-tower, 40 floor complex in Chicago's Loop was able to save over $680,000 or approximately 18% of its annual energy costs through a project undertaken with the ComEd Energy Efficiency Program. These savings enabled the property manager to recoup their initial project investment in under a year[5]. Most building

5 Chicago Mercantile Exchange Case Study by ComEd. https://www.comed.com/ways-to-save/for-your-business/resource-center/case-studies/chicago-mercantile-exchange

CREDIT: ERIC ALLIX ROGERS VIA FLICKR CC

Century old buildings, like this apartment building in Chicago's South Shore neighborhood, are usually more affordable to rent but challenging to retrofit, especially if they are owned by smaller property owners with limited resources.

owners can complete free energy audits every three to five years through ComEd to identify low-cost energy saving improvements. Yet many don't take advantage of this program; lack of awareness of potential benefits or personnel to implement audit recommendations are common barriers.

Additionally, because many building decarbonization technologies, such as heat pumps, are relatively new, it can be difficult to find technicians trained in installation and maintenance. Supply chain issues can add to the challenge; several participants reported delays of several months in getting heat pumps installed in their buildings.

## Technological Readiness

Technological advancements, such as heat pumps that work more reliably in cold climates like Chicago, and smart building equipment that communicates with the electric grid to reduce peak loads, are making it increasingly possible to transition older buildings into new electric systems with significantly reduced carbon emissions. However, many of these technologies and products are relatively new and are undergoing iterations to align more closely with market needs. For example, the electric equipment currently available for heating/cooling larger buildings can be significantly bulkier than existing high-efficiency natural gas systems, making it difficult to fit them in some existing spaces. Continued investment in research and design with a focus on overcoming challenges encountered in decarbonization pilot projects, can help advance technology more rapidly, making it easier and cheaper to decarbonize buildings.

## Regulatory Environment

Current regulations can have the unintended impact of impeding green retrofits in buildings. For example, regulations in the zoning code can make it difficult to add solar panels on rooftops or external insulation in existing structures that have been built to the maximum allowed height and setback line respectively. Increasing code flexibility to allow exceptions when warranted can help.

Additionally, Chicago's legislation on carbon emissions has been focused on measuring and reporting, with no requirements for reducing emissions, especially for existing buildings. The 2023 Energy Transformation Code, which applies to both new construction and building renovations, is starting to change that. In addition to incentivizing the use of grid interactive, smart equipment for heating/cooling, it requires electrical capacity and wiring capable of supporting full building electrification. The Clean and Affordable Buildings Ordinance (CABO), introduced in Chicago City Council in January 2024, builds on this by proposing an effective ban on natural gas equipment in new construction and building renovation projects.

Our workshop participants recognized that emissions standards will be needed to spur widespread retrofits of older buildings. At the same time, they emphasized that additional regulations will be counter-productive in the current environment when many commercial building owners are struggling to stay afloat. Therefore, any emission-reduction targets for existing buildings should be introduced with realistic compliance timelines and supported with robust technical and financial assistance programs, especially for smaller-scale owners and developers, and those who support vulnerable communities.

**Decarbonizing existing buildings is a significant undertaking with many barriers. However, technological advancements and innovations and stakeholder education programs are steadily breaking down these barriers. Additionally, historic investments by the federal government have opened new financial resources, making achieving a net-zero carbon future more realistic than ever before. Our recommendations for building a net-zero carbon Chicago are presented in the following section.**

At over three acres, *The Meadow,* the rooftop garden on the rehabilitated Old Post Office Building in downtown Chicago, serves as an urban oasis, giving the building's tenants a place to relax, exercise, and reconnect with nature. The rooftop includes many sustainability and energy efficiency features. The urban meadows and trees prevent more than a quarter-million gallons of stormwater from becoming polluted runoff. More than 50 species comprise the rooftop's 41,000 plants, which capture over one million pounds of $CO_2$ and decrease energy consumption as well as the emission of air pollutants and greenhouse gasses. Three colonies of bees call The Meadow home, protecting and maintaining its ecosystem.

*Photo Credit: Dave Burk; Landscape Design and Project Description: Hoerr Schaudt*

# RECOMMENDATIONS

Decarbonizing existing buildings is challenging, yet essential for slowing the devastating impacts of climate change, especially in urban environments like Chicago, where buildings account for over 70% of carbon emissions. To accelerate our city and region towards a net-zero carbon future, in addition to incentivizing building owners to decarbonize their buildings, we must take a holistic approach towards transforming our city and region to support carbon-neutral living. To help achieve this, ULI Chicago's Climate Ready Initiative participants have developed a series of recommendations within three key priority areas outlined below.

## A. Strengthen the Policy Ecosystem to Encourage a Net-Zero Carbon Built Environment

The City of Chicago has many policies to encourage sustainability, aimed at individual buildings and at the neighborhood and city level. However, accelerating the current pace of decarbonization will require a trajectory change; a stronger, streamlined policy environment can help make that happen.

## B. Align Resources with Decarbonization Goals

The City should work collaboratively with Federal, State, County, and other government agencies in the region, and leverage partnerships with private and non-profit groups to make it easier to use financial and technical resources available for decarbonization improvements.

## C. Engage and Educate All Stakeholders

Engaging and educating stakeholders—developers, property owners, residential and commercial tenants, general contractors, and tradespeople—so they understand the benefits and implementation steps, will be key to achieving widespread decarbonization. Industry leaders including professional organizations, trade unions, nonprofits, community organizations, and individual advocates, should all be part of this effort.

It is important to note that although focused on the City of Chicago, many of these recommendations are applicable to communities throughout the Chicago region and beyond. Additionally, while the City should play a lead role, scaling up decarbonization efforts across all building types will require active participation from industry and non-profit partners.

## A. Strengthen the Policy Ecosystem to Encourage a Net-Zero Carbon Built Environment

### Policies at the Building Level

Recommendations for strengthening Chicago's policies for reducing greenhouse gas emissions from individual buildings are presented below.

### A1. Strengthen the Energy Benchmarking Ordinance

Instituted in 2013, the Chicago Energy Benchmarking Ordinance requires commercial, institutional, and residential buildings over 50,000 square feet to report their energy consumption annually and verify their data every three years. The ordinance is based on the idea that creating awareness through data gathering and reporting can incentivize property owners to invest in energy-efficiency improvements while providing prospective tenants with the ability to compare the energy profile of various buildings. According to the 2020 Chicago Energy Benchmarking Report, between 2017 and 2020, the energy used per square foot in reporting buildings declined by 9%, and between 2016 and 2020, the median carbon emissions per square foot dropped by 25%. Additionally, there is a high rate of compliance—in 2020, 85% of all buildings required to report had done so, down from 91% in 2019 (likely due to pandemic related challenges). There are several opportunities to enhance this program to achieve greater levels of energy efficiency and reduction in carbon emissions:

**Increase data transparency.** In 2019, Chicago adopted a unique energy rating system, which translates a building's score on the Environmental Protection Agency's (EPA) ENERGY STAR rating scale of 1-100, into a simplified four-star rating system. Chicago's energy ratings are required to be posted at buildings covered by the ordinance energy so efficiency levels can be more easily understood. However, as we look to achieve more ambitious carbon-reduction goals, listing and analyzing the actual energy performance score and Energy Use Intensity (EUI) or energy used per square foot, will be helpful in identifying areas for improvement. We also recommend publishing annually updated data on the City's website.

**Update benchmarking to correspond with new ENERGY STAR NextGen Certification.** Recognizing that achieving net zero emissions requires not just increasing energy efficiency but also shifting from fossil fuels to clean electricity, the EPA has introduced the ENERGY STAR NextGen certification to recognize energy-efficient, low-carbon buildings. The NextGen certification for residential includes detached homes and multi-family buildings; the certification for commercial buildings is expected to be introduced in 2024. Updating Chicago's benchmarking ordinance to measure carbon emissions in addition to energy usage, modeled on ENERGY STAR NextGen, will help move Chicago buildings towards efficient electrification and use of renewable energy.

**Expand benchmarking to include smaller buildings.** The current ordinance is focused on the city's largest buildings. It covers less than 1% of Chicago buildings, even though because of their larger size, they account for approximately 20% of energy used by all buildings[6]. ULI Chicago supports the Chicago Building Decarbonization Working Group (CBDWG)'s recommendation to expand the ordinance to include most buildings by lowering the building size threshold required for reporting, and adding industrial buildings. This can be rolled out in a tiered approach to ensure that smaller building owners, and those serving lower-income communities, have the necessary technical and financial support. For example, integrating automated energy usage reports with utility accounts of smaller buildings could make it much easier for them to meet benchmarking requirements.

6 Developing an Equitable Building Decarbonization Strategy for Chicago: Recommendations Report of the Chicago Building Decarbonization Policy Working Group, City of Chicago, 2021

## A2. Adopt Building Performance Standards (BPS)

Chicago's energy benchmarking program is limited to reporting energy usage in buildings, there is no requirement to reduce energy usage. Therefore, not surprisingly, gains in energy efficiency and carbon reduction have not kept pace with the city's target of reducing its carbon footprint by 62% by 2040[7]. To accelerate the pace of decarbonization, consistent with CBDWG, we recommend building on benchmarking requirements to implement a building performance standards (BPS) policy for the city. A BPS policy will establish decarbonization standards that buildings must meet by reducing their energy usage and switching to clean, renewable energy sources over defined periods of time, ultimately reaching net zero. Setting realistic timelines and building a robust network of technical and financial support will help minimize "stranded assets" or buildings that lose significant value because they are unable to meet new performance standards.

The City of Chicago is part of the National BPS Coalition, a consortium of state and local governments across the country, who have committed to implementing equity-centered BPS policies in their communities (Figure 3).

7 2022 Climate Action Plan, City of Chicago, 2022.

## BPS Policies are Gaining Traction

### New York City (NYC)'s Local Law 97 (LL97)

NYC enacted LL97 in 2019 requiring buildings over 25,000 sq.ft. to meet increasingly stringent limits on GHG emissions or face penalties. Approximately 50,000 buildings covered under the law will have to cut emissions by 40% by 2030 and 100% by 2050. The first compliance reports, which include 2024 emissions, are due in May 2025. NYC recently issued new guidance allowing buildings to avoid penalties if they can demonstrate "good faith efforts" such as approved building permits for retrofits or a plan for meeting 2024 targets by 2026 and net-zero by 2050.

### Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO)

Boston passed the BERDO in 2021 requiring residential buildings with 15 or more units and non-residential buildings of 20,000 sq. ft. or more, to progressively reduce their GHG emissions and reach net zero by 2050. Compliance starts in 2025 or 2030 based on building size; buildings that exceed emissions targets will have to pay into a fund to support decarbonization projects in Environmental Justice communities in Boston.

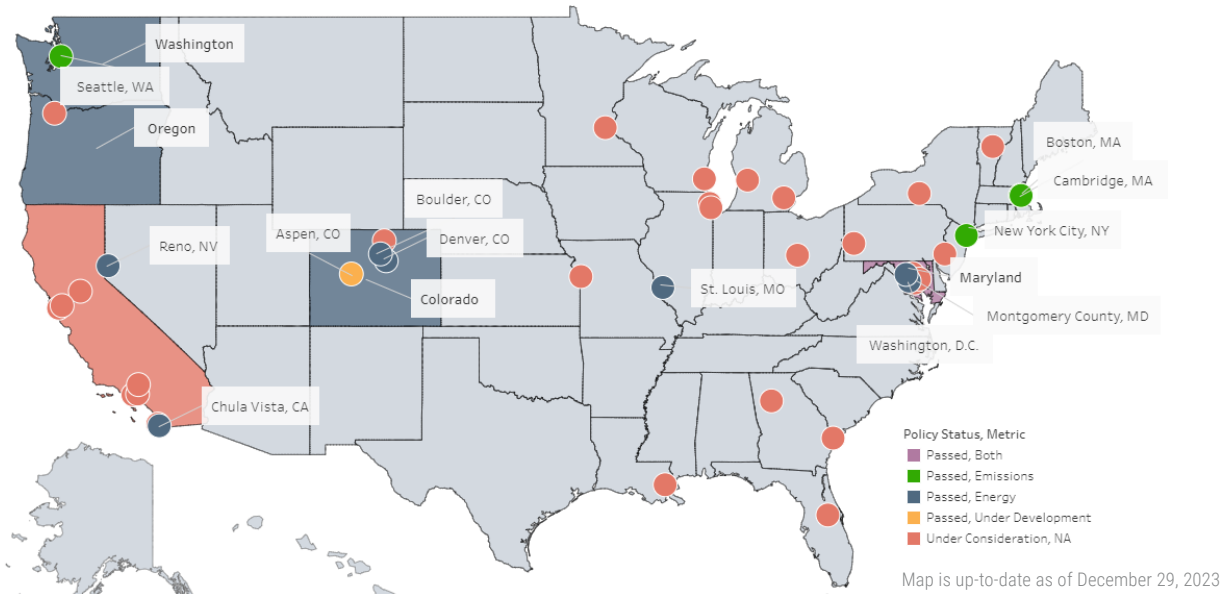



**Figure 3.** Adoption Status of Building Performance Standards Across U.S.
*Source: Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy*

## A3. Encourage Focus on Whole Life Carbon

Chicago's performance standards for building decarbonization should be based on a holistic approach that minimizes whole-life carbon. As per the World Green Building Council (WGBC), a net zero whole life carbon approach focuses on carbon emissions across the building lifecycle by:

- Using low carbon materials and construction processes during renovations or new construction
- Reducing carbon emissions from building operations such as heating and cooling, and,
- Choosing materials and design strategies that extend the useful life of buildings and equipment.

Within the whole-life carbon paradigm, recognition is given to the idea that maintaining an existing fossil-fuel-based furnace so it operates as efficiently as possible until the end of its useful life may result in lower total emissions than sending it to the landfill.

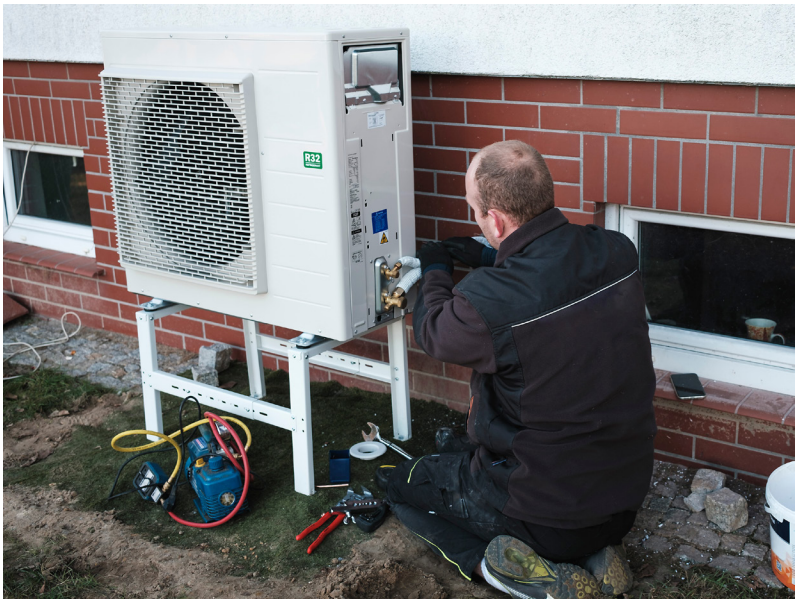
## A4. Track and Manage Use of Refrigerants

Refrigerants, the working fluids in home and commercial air-conditioning systems, refrigerators, and heat pumps, typically have very high global warming potential (GWP), often several thousand times higher than an equivalent mass of carbon dioxide ($CO_2$). For example, R410A, a hydrofluorocarbon (HFC) refrigerant in use across the country, has a GWP of 2088. This means that 1kg of R401A emissions will have the same impact on global warming as 2088 kg of $CO_2$. Refrigerants can escape into the atmosphere via leaks in equipment or pipes and if the refrigerant is not properly recovered at the end of the useful life of the equipment or during maintenance. Even though refrigerants pose a potent climate threat, their use and disposal are not adequately regulated. As we move towards building electrification and the use of technologies such as heat pumps and Variable Refrigerant Flow (VRF) systems for HVAC needs, refrigerant use will increase significantly making their effective management a climate imperative. To do so, we recommend :

- Creating a program to help building owners track refrigerant use so they can identify and eliminate leaks and ensure proper reuse or disposal when decommissioning equipment.
- Encouraging the use of refrigerants with lower GWP and phasing out HFCs by providing financial incentives. The US EPA will be awarding $15 million in grants for reclamation and innovative destruction of HFCs to local governments and non-profit entities in Summer 2024[8]. The City should take advantage of opportunities like this to secure federal grants for incentivizing local improvements.

In 2022, by signing the Kigali amendment to the Montreal Protocol, the US made a commitment to phase out HFCs. By encouraging innovation in the manufacturing of alternative refrigerants and

8 Protecting Our Climate by Reducing use of HFCs, US Environmental Protection Agency. https://www.epa.gov/climate-hfcs-reduction




Refrigerant use will increase as we move towards all-electric buildings making safe refrigerant management and disposal a climate imperative.

establishing protocols for safely repurposing or disposing of high GWP refrigerants, Chicago could take a leadership role in the transition from HFCs.

## A5. Conduct Regular Review and Update of Regulatory Codes

As new technologies and practices to support building decarbonization continue to emerge, it is important to ensure that our zoning and building codes make it easy to incorporate them. To help achieve that, we recommend that relevant City departments collaborate with industry groups and non-profit and community partners to identify any regulatory obstacles and develop potential solutions. In its 2022 report, the CBDWG recommended that an advisory group composed of City staff, technical experts, and other stakeholders meet regularly to review and recommend any needed updates to the City's codes and climate policies. For example, the Chicago building code is more restrictive than latest national model codes on the use of mass timber, a low-carbon material, and prefabricated/modular wall components. Height and setback limitations in the zoning code can make it challenging to add rooftop solar panels, install heat pumps on the side of buildings, or add external insulation. The current formula for calculating a building's floor area ratio (FAR) also disincentivizes building thicker outer walls, which are needed for adding insulation.

Building code updates will also be necessary to allow the use of newer generations of refrigerants, which, while having lower GWP, in some cases, pose safety risks due to higher flammability.

Additionally, Chicago should consider adopting stretch codes or codes that set higher standards for energy efficiency and decarbonization than the current base code. Stretch codes can be an effective way for the City to "test drive" regulations it intends to introduce—the development and construction industry can benefit from the extra time to get ready for future regulations, and the City can get valuable feedback on whether updated codes are likely to have the intended impact.

Zoning and building codes can sometimes create roadblocks for decarbonization improvements. For example, Chicago's building code limits the use of mass timber, a low-carbon material, in renovation or new construction projects (left). It can be difficult to add external insulation if it encroches into the minimum setback required by the zoning code (right).

## A. Strengthen the Policy Ecosystem to Encourage a Net-Zero Carbon Built Environment (continued)

### Policies at the Neighborhood/City Level

ULI Chicago recommends taking a holistic approach to decarbonization that doesn't focus on buildings in isolation, but the entire built environment. For example, constructing a net-zero carbon building in a location not currently connected to existing roadway and other infrastructure, likely has greater environmental costs than thoughtful rehabilitation of an existing building or new construction on an underused lot in an existing neighborhood. To create neighborhoods and communities with lower carbon footprints, we recommend strengthening policies that encourage:

#### Infill development

Building on underused sites, adding greater density in areas with existing infrastructure, instead of building in greenfield areas is inherently more sustainable because of the embodied carbon savings. Additionally, higher density, mixed-use neighborhoods where homes, workplaces and other amenities of daily living are located close-by, make it easier for people to walk and bike to places, reducing carbon emissions from cars.

#### Reusing existing buildings

Embodied carbon savings also make it more sustainable to reuse vacant or underused buildings instead of tearing down and building new. Yet zoning and building codes can inadvertently create roadblocks to adaptive reuse. For example, it can be time consuming and expensive to obtain a zoning change for the proposed new use if it is not allowed under the existing zoning classification of the building/site. Off-street parking requirements pose an additional challenge if the site is not large enough to fit the number of parking spaces required for the new use. Industry and nonprofit partners should collaborate with public officials through focus groups or other means to identify and remove regulatory barriers.

#### Increasing transit usage

Permitting higher development density in areas with strong transit access can reduce use of personal cars and associated emissions. Additionally, enhancing transit in neighborhoods with limited connectivity so that it can be a reliable alternative to driving, can reduce carbon emissions.

The City of Chicago has made strides in adopting policies that encourage transit-oriented infill development to create neighborhoods that are not only more sustainable but also more equitable and livable.

CREDIT: MERCY HOUSING LAKEFRONT

The Lofts on Arthington is an adaptive reuse of the former catalogue printing building for the Sears, Roebuck & Company in Chicago's North Lawndale neighborhood. The building now includes 181 apartments at rents affordable to lower-and middle-income families. This project by Mercy Housing Lakefront, is a 2018 ULI Chicago Vision Awards winner.

CREDIT: PRESERVATION OF AFFORDABLE HOUSING (POAH) CHICAGO


Located at the entrance to the CTA's Green Line station at 63rd Street and Cottage Grove Avenue, Woodlawn Station by POAH Chicago features 55 mixed-income units. The four-story building has many sustainable features including a solar thermal system, enhanced insulation, and a tight building envelope.

Opportunities to strengthen these policies and expand implementation are presented here.

## A6. Allow Accessory Dwelling Units (ADUs) Citywide

In May 2021, the City of Chicago legalized ADUs or backyard homes and basement and attic units in existing residential buildings in five pilot zones across the city. ADUs are a great way of adding homes that use existing infrastructure. Further, because of their non-primary locations, they are often more affordable than other units in the area. ADUs should be legalized throughout the city.

## A7. Activate City-Owned Vacant Lots

The City of Chicago owns thousands of vacant parcels, mostly on the south and west sides. Initiatives to activate them have had limited success, leaving large holes in the fabric of many neighborhoods. The ChiBlockBuilder portal, launched in November 2022, includes an interactive map of City-owned land with details such as environmental clearances and market value, making it easier for potential buyers to identify sites. It's a step in the right direction; continuing to market the sites and providing additional supports, such as financial assistance to make the sites development ready, can help create sustainable and equitable development opportunities.

## A8. Encourage Equitable Transit-Oriented Development (ETOD)

Chicago's TOD policy, which includes density bonuses and reduced parking requirements for developments near transit stations, has resulted in several mixed-use developments in northside neighborhoods in recent years. To encourage similar developments in historically disinvested south and west side neighborhoods, Chicago passed the Connected Communities ordinance in 2022. It extends TOD benefits to areas served by bus lines, which are concentrated on the south and west sides, and ties density bonuses more closely to the percentage of affordable homes included in a development. We recommend continuing to encourage ETOD through resources such as pre-development and development grants.

The Red Line Extension (RLE) project, expected to break ground soon, will extend the Red Line L from 95th Street to 130th Street, presenting a great opportunity to develop transit-oriented mixed-use nodes on Chicago's south side.

## B. Align Resources with Decarbonization Goals

To successfully implement policies and scale-up building decarbonization such that benefits are accrued equitably across all neighborhoods, it is critical to allocate existing resources efficiently and to identify opportunities to fill resource gaps. Our recommendations to help accomplish this are presented below.

### B1. Build an Effective Governance Structure: Create a Well-Resourced Department of Environment

In the past, Chicago's many climate policies fell within the purview of different City departments. When layered with various State and County policies and programs, the result was a confusing web of regulatory requirements and support programs that was often challenging to navigate, especially for smaller property owners and developers. Additionally, it can be difficult to leverage synergies between programs housed in different departments. To improve coordination and support for equitable green retrofits/developments Chicago needs a Department of Environment (DOE). Mayor Johnson's 2024 budget included funding to expand the Mayor's Office of Sustainability into a new Department of Environment. This is an important step towards accelerating implementation of Chicago's climate priorities. The newly created Chicago DOE should help:

- Resolve potential conflicts for "green" improvements with other regulatory requirements. For example, as noted above, adding exterior insulation to an existing building might not be permitted when it encroaches into the minimum setback requirements prescribed by the zoning code. Working collaboratively with relevant departments, DOE can help develop solutions for such conflicts without compromising health and safety standards.
- Advance climate priorities by improving coordination across City departments and other government agencies. For example, Chicago DOE would be ideally positioned to use findings from decarbonization pilots in Chicago and elsewhere to coordinate improvements to the City's sustainable development policy and building and zoning codes.
- Position Chicago to successfully access climate-related federal funds, many of which will be disbursed via State and regional governments, by maintaining consistent communication with relevant federal, state, and regional agencies and aligning priorities.
- Connect with cold climate cities across the world that are already meeting tighter carbon emissions standards, including Chicago's "sister cities," to learn best decarbonization practices.

### B2. Streamline Approvals for "Green" Development Proposals

Well-defined, predictable, and speedy permitting processes carry tremendous value for developers and property owners, allowing them to plan and budget construction projects with greater certainty. Therefore, fast-track permitting can help incentivize decarbonization retrofits, which can be expensive and more difficult to execute than projects without "green" or environment-friendly features. Additionally, providing technical guidance and support during the permit application process, especially for projects proposed by smaller-scale owners/developers or in neighborhoods with greater environmental challenges, can help ensure benefits of green developments reach neighborhoods across the city. We recommend establishing criteria, perhaps based on updated energy benchmarking or building performance standards, for ascertaining which projects qualify for fast-tracking.

To help achieve expedited permitting and enhanced support for permit applicants, Chicago should ensure that relevant departments have the funding to hire and train adequate staff. According to the 2022 CBDWG

CREDIT: DAVE BURK

report, Chicago's zoning, building permits, and building inspection teams are understaffed compared to other jurisdictions of the same size.

## B3. Create a Network of Technical Support

The regulatory environment at the local, state, and national level is constantly shifting with newer, tighter mandates governing carbon emissions from buildings becoming the norm. At the same time, decarbonization technology is rapidly evolving, and it can be difficult to stay up-to-date. Not surprisingly, many property owners and managers as well as designers, contractors, and tradespeople, are unsure of where to start. Smaller-scale owners and developers are further challenged because they typically have limited time and resources to spend learning about new regulations and technologies.

To help break down these technical barriers, Chicago should work with private and non-profit industry organizations, foundations, and neighborhood groups to develop a network of technical support designed to reach building owners across the entire spectrum, from the two- to four flat residential buildings that dot Chicago neighborhoods, to downtown high-rises.

## U.S. Securities and Exchange Commission (SEC) Climate Discolure Requirements

In 2022, the SEC proposed a rule change that would require companies registered with the SEC to disclose their greenhouse gas emissions and climate related risks to their long-term business operations. These disclosures are meant to make it easier for potential investors to make informed decisions by providing access to reliable data regarding climate risks facing different companies.

While the SEC's final climate disclosure rule is not yet publicly available (expected Spring 2024), it is likely to push companies to create or strengthen plans to decarbonize and mitigate climate impacts on their buildings and operations. More information on proposed SEC requirements and other climate-related regulations impacting the real estate industry is available in the 2023 ULI-Heitman report, "Change is Coming: Climate-Risk Disclosures and the Future of Real Estate Investment Decision-Making."

**Centralized Resource Hub.** Chicago has already taken a big step in this direction with the launch of the Building Energy Resource Hub, or the "Hub" in August 2023. Created by the Illinois Green Alliance in partnership with the City of Chicago, ComEd, professional organizations including the American Institute of Architects (AIA) and Building Owners and Managers Association (BOMA), and non-profit leaders like Elevate and Slipstream, the Hub promises to be a great resource on building decarbonization in northeastern Illinois. The Hub's online platform includes step-by-step guidance for building owners, contractors, and designers, information on emerging technologies, and case studies.

Future plans include opening a central location to facilitate deeper interactions and knowledge-sharing. We support continuing to expand the Hub's capacity to meet industry needs and encourage collaboration with similar resource centers across the country to maximize their collective impact.

**Neighborhood-focused Resource Hubs.** To complement the Hub and make it easier to reach smaller owners/developers, we recommend that the City partner with community organizations to establish neighborhood-scale energy resource hubs across the city. As trusted community members with an understanding of unique local barriers, these organizations are likely to be more effective in increasing adoption of decarbonization retrofits.

The Illinois Green Alliance partnered with Elevate from 2021-2022, to empower community-centered organizations to become climate action resources for their communities through the Neighborhood Power Project pilot. We encourage the City to support programs like this to build-up capacity for clean energy retrofits in Chicago neighborhoods.

**Personalized Technical Guidance.** Additionally, some building owners, especially smaller-scale owners with fewer resources or unique building features, might need one-on-one expert guidance to create an implementable decarbonization plan. To support that, we recommend that, like the NYC Accelerator (described on the following page), Chicago establish a dedicated team of experts who can offer free or discounted personalized technical guidance to building owners and developers.


The Bullitt Center in Seattle is a six-story, 44,700 square foot office building designed to meet the stringent requirements of the Living Building Challenge (LBC). Visitors to the center are learning about the building's geothermal heating and cooling system that operates on electricity generated by solar panels on the building rooftop. More information on Bullitt Center's green features is included in the ULI Case Study.

## Decarbonization Resource Hubs in other Regions

### Building Energy Exchange (BE-Ex)

Established with the support of public and private sector partners, including New York City and State governments, the Building Energy Exchange (BE-Ex) connects New York's real estate community to the latest in energy efficiency solutions through seminars, exhibitions, and research. In partnership with the Institute for Market Transformation (IMT), BE-Ex has supported the creation of energy-efficiency resource hubs in Kansas City, St. Louis and Washington DC. This growing network can leverage national resources while providing region-specific solutions for decarbonization challenges.

### Building Innovation Hub

Like New York's BE-Ex, the Building Innovation Hub in Washington, DC provides resources and connections to help building owners, operators, designers, contractors, and tenants create and operate high-performing buildings. The Hub also provides guidance on regulatory requirements including the Building Energy Performance Standards (BEPS) and other updates to local building codes. Its enhanced assistance programs for owners of qualifying buildings, including affordable residential and senior-care communities, is helping break down barriers to building decarbonization in the DC region.

### NYC Accelerator

NYC Accelerator was established by the New York City (NYC) Mayor's Office of Climate and Environmental Justice to help the city achieve carbon neutrality by 2050 by decarbonizing its building stock in accordance with Local Law 97. The Accelerator provides resources, training, and one-on-one guidance to building owners and industry professionals and is key to equitable implementation of LL 97. Building owners can use the Accelerator to get information about their building's energy use and free help with energy efficiency and renewable energy upgrades to achieve LL 97 compliance and avoid annual fines. Since 2015, the Accelerator has provided free assistance to over 9,000 buildings.

## Community Partners

The city should partner with neighborhood-based environmental justice organizations to develop green resource hubs across the city, especially in south and west side neighborhoods that have faced greatest environmental harm over the years. Examples of potential partner organizations include:

### Blacks in Green (BIG)

Blacks in Green (BIG) is focused on closing racial health and wealth gaps in Black communities by building a green economy based on energy, horticulture, housing, tourism, and waste management in a walkable "Sustainable Square Mile." BIG has pioneered the concept of the Sustainable Square Mile to create communities with green economies where Black families can walk to work, shops, schools, and recreational amenities, and land and businesses are locally owned. To learn more about BIG's work, including the newly launched Thriving Communities Technical Assistance Center (TCTAC) to support climate resiliency and environmental justice initiatives by leveraging federal funds, visit https://www.blacksingreen.org/

### Little Village Environmental Justice Organization (LVEJO)

Located in the Little Village community area of Chicago, LVEJO's mission is to organize with the community to achieve environmental justice and self-determination of residents who tend to be immigrant, lower income, working families. Founded in 2005, LVEJO has successfully advocated for the closure of polluting land uses near residential areas, creation of green spaces, and consistent transit service in areas with poor access. For more information on LVEJO and its current work, visit http://www.lvejo.org/

## B4. Improve Access to Existing Funding Sources, Explore New Funding Sources

Funding decarbonization retrofits remains a challenge, whether for smaller residential buildings or larger office/mixed-use buildings. However, new financing tools and funding opportunities becoming available through the federal government's investment in clean energy and climate resilience, are helping shift the equation. To help ensure that building owners and their designers/ contractors are aware of all available funding sources, guidance on funding pathways should be an essential component of technical support provided by the City, resource hubs, and other partner organizations. A brief overview of potential funding sources is provided below.

### Grants and Rebates

Grants and rebates help reduce upfront costs, incentivizing building owners to choose energy efficient, low carbon alternatives when replacing equipment/appliances, and to invest in other eligible decarbonization retrofits such as improvements to the building envelope. Grants and rebates programs include:

#### ComEd Energy Efficiency Program

This program provides free facility assessments with energy optimization strategy, point-of-sale discounts on equipment including HVAC and lighting fixtures, and reimbursement for eligible expenses in eligible properties. Often the level of financial incentives available is tied to the amount of energy saved. For example, building owners can access more incentives and savings by installing lighting controls such as occupancy sensors and zone controls in addition to energy-efficient light fixtures. Additionally, ComEd is partnering with Elevate and Resource Innovations on a pilot project to electrify 100 affordable residential units, including single-family homes and multi-family apartments. Pilot projects like this are helping create a better understanding of typical electrification challenges and potential solutions, paving the way for more-widespread electrification.

#### Illinois Home Weatherization Assistance Program (IHWAP)

IHWAP uses a combination of State and Federal funds to help low-income households make energy efficiency and health and safety improvements in their homes. Attic and wall insulation, air sealing, repair or

New grants and rebates, tax credits, and financing opportunities are becoming available through the Inflation Reduction Act (IRA), the federal government's historic investment in clean energy and climate resilience. These programs are making it easier for property owners, of both smaller and larger buildings, to invest in decarbonization retrofits such as insulating the building envelope (left) and adding rooftop solar panels (right) to generate on-site renewable energy. For more information on federal funding visit ULI's website: uli.org/federalfunding.

replacement of HVAC systems and water heaters, and ventilation and moisture control measures to improve air quality are some of the eligible improvements. Higher cost improvements, such as window replacements, cannot typically be funded by IHWAP. More information is available here.

### Inflation Reduction Act (IRA)

The 2022 Inflation Reduction Act provides unprecedented federal funding of $370 billion over the next ten years to stem climate change and create an equitable green economy. While detailed information is still becoming available, IRA programs aimed at accelerating building decarbonization are described below. Additional information is available on ULI's website at uli.org/federal funding.

- **Department of Energy Home Efficiency Rebates.** $4.3 billion in funding for energy saving projects is available to all households with higher rebates for greater energy savings and households making below 80% of Area Median Income (AMI).
- **Department of Energy Home Electrification and Appliance Rebates.** $4.5 billion in funding is available for households below 150% of AMI, including owners of multi-family buildings. This program includes point-of-sale rebates for ENERGY STAR rated appliances and heat pumps, and reimbursement of 50% of expenses for improvements like electric wiring, with a maximum rebate of $14,000/household or home.
- **Section 25C, Tax Credit for Energy Efficiency Home Improvements.** The IRA extended this tax credit through 2032 and removed the lifetime cap of $500 allowing taxpayers to access credits for different improvements such as insulation and heat pumps in successive years.
- **Section 25D Tax Credit for Residential Clean Energy.** Extends 30% credit for on-site renewables such as solar panels and geo-thermal heat pumps, and battery storage through 2032.
- **Section 179D Tax Deduction for Energy-Efficient Commercial Buildings**. Also available to owners of multi-family buildings, this program provides a tax deduction of $2.5-$5 per square foot for a 25%-50% improvement in Energy Use Intensity (EUI) over one year.
- **Section 48 Clean Electricity Investment Tax Credit.** This provision provides up to 30% tax credit for clean electricity investments such as rooftop solar, geothermal, and battery storage. Additional credits are available for projects serving low-income communities, or in designated "energy communities" that have brownfield sites or shuttered coal plants.

Additionally, the IRA includes a $27-billion Greenhouse Gas Reduction Fund to significantly enhance the capacity of local green banks, CDFIs, credit unions, and other private capital providers to finance decarbonization retrofits in existing buildings and zero emissions new buildings.

### Financing Tools

**Property Assessed Clean Energy Program (PACE).** PACE allows private property owners and developers to take out low-cost, long-term loans to finance energy-efficiency improvements and repay them through an extra charge on their property tax bill. In the Chicago area, PACE programs for commercial properties, including multi-family residential, are available through the City of Chicago, Cook County, and the State of Illinois.

**On-Bill Financing and On-Bill Recovery Programs.** On-Bill programs allow customers to pay for improvements via their utility bills. On-Bill Recovery Programs allow energy savings to cover loan payments.

**Low-cost loans.** Green banks, such as NYC Green Bank and DC Green Bank, are developing low-cost loan products to make it easier to finance decarbonization projects. The newly established Illinois Climate Bank (described on the following page) can serve a similar role, bridging a significant funding gap.

### Funding Gaps and Potential Solutions

While new grants and tax incentives, as they are rolled out, are expected to reduce the financial burden of decarbonization improvements on building owners, many projects will need additional funding sources.

Establishing a Green Bank at the state or local level focused on financing projects with an environmental benefit with loans at below-market interest rates would be a significant benefit. The Illinois Finance Authority (IFA), designated as Illinois Climate Bank in 2022, is working to establish clean energy finance tools within an equitable framework, including a revolving loan fund for energy efficiency retrofits, using federal resources and private capital. For instance, projects in communities that have historically seen the greatest environmental challenges and/or those led by developers/contractors from minority groups, could be awarded loans with more generous terms, such as very low, or no-interest and reduced fees.

Additionally, entities such as pension funds and real estate investment trusts (REITs), which do not pay federal income taxes, were previously not able to benefit from tax credits or deductions offered by the federal government. The IRA has changed that— REITs and other companies with little or no tax liability can transfer or sell benefits of their IRA tax credits to third parties who pay taxes[9]. This provides an incentive for these companies to decarbonize their real estate portfolios; streamlining the tax credit transfer could enhance its appeal. Alternative tax credits, such as a reduction in property taxes, could be another significant incentive.

Public sector leaders at the city, county, and state level, and industry leaders should work collaboratively to develop a robust green finance ecosystem for the Chicago region. Making it easier to access applicable incentives and low-cost financing options to bridge funding gaps should significantly boost uptake of decarbonization retrofits.

9 Inflation Reduction Act of 2022 Fact Sheet: Clean Energy Tax Incentives Relevant to U.S. Real Estate, Real Estate Roundtable, July 2023. https://www.rer.org/wp-content/uploads/7-31-23_IRA-Energy-Fact-Sheet.pdf

## The Cost of Doing Nothing

**As regulations on building emissions become tighter and municipalities start imposing fines for non-compliance, the cost of doing nothing could be significant for building owners.**

For example, as per New York's LL97, owners of buildings that exceed their carbon emissions cap will have to pay an annual fine of $268 for every metric ton of carbon emissions over the established limit, which could add up to hundreds of thousands of dollars. In addition, a non-compliant building might be less attractive to tenants, reducing its market value. Creating greater awareness among building owners and managers so they can incorporate decarbonization in their capital improvement plans, can keep their buildings from losing vale or becoming "stranded assets" in a rapidly changing green economy.

## B5. Create a Trained Workforce

Successful implementation of decarbonization retrofits, whether its installing rooftop solar panels, upgrading electrical systems, or adding a heat pump, is dependent on access to skilled workers. The Climate and Equitable Jobs Act (CEJA) passed by the State of Illinois in 2021, includes provisions for job training in clean energy technologies with a focus on creating opportunities for residents in communities that have historically experienced greatest environmental harms and/or economic barriers. Its job-training programs will be implemented through local governments and community-based, non-profit organizations such as HIRE360. Launched in 2020 by a group of developers, general contractors, and labor unions, HIRE360 is helping diversify the construction industry by making it easier for young people to join the trades, and by supporting small minority- and women-owned businesses as they launch and scale up.

ULI Chicago recommends extending training programs to include contractors, and teaching them business development in addition to technical skills. Helping build industry connections that can lead to jobs, through mentorship and internship opportunities, should be integral part of the program.

## B6. Support Creation of a Clean and Smart Electric Grid

As buildings move away from gas-fired equipment, the demand for clean electricity will continue to rise. Clean electricity, or electricity generated from sources that do not generate $CO_2$ emissions, is essential for buildings to achieve their net-zero carbon goals.

Through the Climate and Equitable Jobs Act (CEJA) passed in 2021, Illinois has committed to transition to 100% clean energy by 2050 by phasing out coal and gas fired plants and ramping up investment in renewable energy generation. Currently, Illinois' electricity includes a mix of traditional coal and gas, nuclear, wind, and, increasingly, solar energy. Additionally, Illinois continues to modernize its electric grid by installing devices such as automated switches and sensors that can isolate outages faster, minimizing disruptions across the system. GridWise Alliance ranks Illinois' grid second in the nation based on performance, policies, and customer programs[10].

However, high rates of electrification combined with greater use of air-conditioning as our summers become hotter and more humid, will have a significant impact on Illinois' electric grid. According to a 2022 study[11] prepared for ComEd, annual and peak loads on the electric grid are expected to almost double by 2050.

10 Stable Electric Grid, Electrify Illinois. https://ev.illinois.gov/grow-your-business/stable-electric-grid.html

11 Illinois Decarbonization Study: Climate and Equitable Jobs Act and Net Zero by 2050, Energy + Environmental Economics, December 2022.

The study also found that because of the transition to electric heating, the grid could transition to a winter peak load, from summer daytime peaks, as early as 2030. Infrastructure and systems updates will be needed to meet these increased and changing loads. Continuing to invest in renewable energy sources and modernizing the electric grid to ensure highest levels of reliability and efficiency will allow communities across Illinois, including Chicago, to meet their decarbonization goals.

## Grid-Interactive, Energy Efficient Buildings (GEBs)[1]

Grid-Interactive, Energy Efficient Buildings (GEBs), are both energy efficient and capable of a two-way dialog with the grid to reduce peak demand, resulting in cost savings and reduced emissions for both buildings and the electric grid. Grid-interactive buildings are based on a new paradigm for energy management that focuses not only on how much energy we use, but when we use it.

GEBs include a blend of strategies, including energy efficiency, distributed energy generation (such as on-site or community solar), energy storage, and load flexible technologies (such as running dishwashers or charging electric vehicles overnight when there is reduced demand for electricity) to lower demand peaks. This can improve grid performance, make more efficient use of renewable energy, and potentially reduce the number of power plants required to meet electrical demand.

1 Matt Jungclaus. The Opportunity to Save Money, Energy, and Carbon With Grid-Interactive Efficient Buildings, Rocky Mountain Institute, 2019.

## C. Engage and Educate All Stakeholders

Engaging all stakeholders to create a deeper understanding of the environmental and health benefits of decarbonizing buildings—the spaces where we live, work, and play—and connecting them to resources is essential to achieve widespread decarbonization. To be most effective, ULI Chicago recommends developing a broad-based yet focused outreach and education strategy designed to meet the needs of different stakeholder groups, including:

- Residential and commercial tenants or building occupants
- Designers, contractors, and tradespeople
- Developers, building owners, building managers, and engineers

### C1. Target Messaging to Audience

Moving towards net-zero carbon buildings has benefits that will appeal to different audiences. Highlighting these benefits can help generate enthusiasm for retrofit projects, making it easier to implement them. When tenants, whether residential or commercial, are amenable to construction-related disruptions and contractors willing to troubleshoot complications arising from new technologies, it can be much easier for a building owner to embark on an expensive and complex decarbonization retrofit. Examples of potential benefits to different stakeholders include:

- For residents of an apartment building undergoing energy-efficiency improvements and electrification can mean more comfortable temperatures within their homes and lower utility bills because of more efficient HVAC systems, and better indoor air quality when gas stoves are replaced with electric or induction cooktops.
- For contractors and tradespeople, learning about green building and retrofitting means upgraded skills and access to growing opportunities in clean jobs.
- For building owners and developers, moving towards net-zero carbon emissions means saving on utility costs and the potential for higher rents and occupancy. The cost of improvements will not always be recouped, however. In some instances, the need to meet regulatory demands will be a primary incentive.

Additional stratification within each group can help develop more-targeted messaging. For example, neighborhood-focused building owners and developers with small portfolios will likely have different needs than larger, well-resourced development companies.

### C2. Leverage the Power of Partnerships to Reach Different Audiences

Creating support for building decarbonization should involve a public education campaign led by a collaboration of public, private, and non-profit partners. Different organizations/entities are uniquely positioned to reach different stakeholder groups. We recommend that the City of Chicago leverage these partnerships to maximize impact.

**Community-based Organizations.** Trusted community-based organizations focused on issues such as environmental justice, public health, housing, and workforce training could be more effective in reaching residents and small businesses in neighborhoods than a purely City-driven program. Similarly, schools and faith-based institutions could be an effective conduit for sharing information on the benefits of decarbonization.

**Mission-Driven Non-profit Organizations.** Non-profit organizations such as Elevate and Community Investment Corporation (CIC), both leaders in promoting energy-efficient, affordable housing, have training programs for contractors and smaller property owners. These programs can be expanded to include training on the latest decarbonization technologies such as heat pumps and best practices in weatherization improvements for older buildings.

**Professional Organizations.** The member education and engagement efforts of organizations such as the Illinois Green Alliance, and the Chicago chapters of the American Institute of Architects (AIA Chicago), Building Owners and Managers Association (BOMA Chicago), and American Society of Heating, Air-conditioning, and Refrigeration Engineers (ASHRAE) can be a powerful mechanism for generating greater awareness and understanding of building decarbonization among developers, building owners, designers, and engineers.

Additionally, ULI Chicago, with nearly 1500 members representing all aspects of real estate, is committed to advancing net-zero carbon buildings in our region through this initiative, and continued engagement to help implement recommendations.

**Higher Education and Research Institutions and Universities.** Higher education and research institutions, such as the University of Illinois through its Smart Energy Design Assistance Center (SEDAC) program, are actively engaged in research and outreach activities to accelerate decarbonization. Partnering with these institutions can expedite the adoption of new technologies in real-world settings and help make their research more responsive to market challenges.

## Climate Action Museum

The Climate Action Museum, located along the Chicago River in downtown Chicago, is free and open to the public. It was founded in 2023 with the idea of instilling optimism in everyday people regarding our ability to mitigate climate change, and to inspire and facilitate direct action.

A series of exhibits educate visitors about the climate impact of the way we live, work, eat, and play, how that has evolved over time, and offer solutions for changing harmful practices and slowing climate change. Additionally, museum programming includes educational seminars and social gatherings, designed to build community and awareness of technological innovations and best practices for decarbonization.

The Climate Action Museum can be a great resource for engaging and educating a wide range of stakeholders on the critical importance of, and the tools for, decarbonizing our built environment.


CREDIT: CLIMATE ACTION MUSEUM

## C3. Provide Guidance on Roadmap for Building Decarbonization

Pathways to building decarbonization will vary depending on characteristics such as building use, size, age, and type of construction. Yet, there are key steps that can help building owners get started and chart out the most suitable pathway for minimizing their carbon emissions:

### Understand the Regulatory Environment

The City of Chicago requires buildings over 50,000 square feet to report their energy usage annually, and the 2022 Energy Transformation Code enhanced energy efficiency/clean energy requirements for new construction and buildings undergoing renovation. The regulatory environment for carbon emissions is likely to continue to tighten to align with the City's climate-resilience goals. By staying engaged, building owners can make sure that their properties are compliant with modern code standards and better positioned to meet future requirements. The newly launched Building Energy Resource Hub can serve as a reliable, accessible source of information.

### Measure Baseline Building Performance

Measuring the baseline energy performance of a building is a great first step towards identifying potential areas for improvement. An energy audit or a more comprehensive greenhouse gas emissions reduction audit can help accomplish that. An energy audit includes an assessment of a building's energy usage through evaluation of past energy bills, current physical condition, and tests to detect air leakages, with the goal of reducing energy consumption without compromising normal operations. Utility companies often provide free energy audits; Chicago area consumers can access free audits from ComEd. The free audits, however, are usually limited in scope because they tend to focus on energy efficiency programs being offered by the utility. For a more complete picture, building owners should consider getting a full energy audit, and in the case of larger buildings with complex building systems, a GHG audit. As shown in Figure 4, in addition to reducing energy usage, GHG audits can identify opportunities for moving towards cleaner energy sources and reducing use of harmful refrigerants.

### Set Goals, Develop Implementation Roadmap with Buy-In from All Stakeholders

Decarbonization retrofits of existing buildings can be expensive, disruptive, and technically challenging. Therefore, to maximize the chances of staying on-course, it is important to set achievable goals and develop an implementation roadmap with buy-in from all stakeholders.

**Smaller-scale buildings.** In a small, neighborhood apartment building, where the building owner might be the sole decision-maker, it will still be critical to

| | ENERGY Conservation Measures (ECMs) Typical Energy Audit Scope | EMISSIONS Reduction Measures (ERMs) GHG Emissions Reduction Audit Scope |
|---|---|---|
| Energy Efficiency & Load Reduction | ✓ | ✓ |
| Electrification / EV Charging | | ✓ |
| Low / No GWP Refrigerants | | ✓ |
| On-site Renewable Energy | | ✓ |

**Figure 4.** Building-Level GHG Emissions Reduction Audit

*Source: GHG Emissions Reduction Audits: Taking Energy Audits To The Next Level, Webinar hosted by Better Buildings Challenge, U.S. Department of Energy, July 2023. https://betterbuildingssolutioncenter.energy.gov/webinars/ghg-emissions-reduction-audits-taking-energy-audits-next-level*

engage the building's engineering and maintenance staff and residents early in the retrofit process. The maintenance staff will be responsible for keeping the building systems running smoothly during and after construction, and residents will have to live through disruptions such as temporary water and power shutoffs. Additionally, if new equipment, such as electric or induction stovetops and heat pumps is being installed, residents and maintenance staff will have to learn the new technology. They are more likely to embrace these changes if they know what to expect during construction and the improved living environment on project completion.

**Large commercial buildings.** Most multi-story commercial buildings in downtown Chicago are owned and/or managed by large companies with multiple buildings in their real estate portfolio and many layers of decision-makers. These buildings can have multiple commercial tenants with different space and occupancy needs, and their massive square footage typically requires complex mechanical systems. Decarbonizing large commercial buildings can be a significant undertaking, making it imperative to engage key decision-makers from the start and setting realistic targets aligned with the company's sustainability goals and resources. Leaders from a building's engineering and maintenance, leasing, and operations teams, as well as the organization's leaders for sustainability, finance, and capital investments, should all be engaged in developing its decarbonization roadmap. A coordinated, planned approach can help right-time deep retrofits with major building life-cycle events such as equipment replacement and potentially help the organization realize greater efficiencies by coordinating decarbonization retrofits in many buildings across their portfolio. Engaging tenants and getting their buy-in before extensive retrofits is also key for commercial buildings. Transitioning to "green leases" or incorporating energy performance standards within leases with provisions for sharing costs and savings due to energy retrofits, can help incentivize both owners and tenants.

## Split Incentives & Role of Green Leases

Traditional commercial leasing agreements often create a condition known as "split incentives" between owner and tenant, in which capital improvements that yield energy savings result in one party, usually the building owner, paying for improvements while the other party, usually the tenant, receives the benefits of reduced utility costs. On the other hand, when utility costs are paid by the owner, the tenant has little incentive to modify their behavior to reduce energy use, potentially diminishing cost savings and emissions reduction. This mis-aligned incentive system can be a major barrier keeping building owners from investing in expensive energy retrofits such as better insulation or new HVAC equipment.

Transitioning to green leases, which include provisions to distribute both costs and benefits in a more proportionate manner between owners and tenants, can help accelerate decarbonization retrofits. Key aspects of green leases include:

- Greater transparency in energy use via sub-metering of both tenant and common spaces
- Cost recovery clauses allowing building owners to recoup their investment from tenants by capturing the cost savings from reduced energy usage and/or amortizing the cost of improvement over time.
- Establishing standards for tenant fit-outs to minimize carbon emissions through measures such as efficient lighting, annual budgets for plug loads, and water conserving fixtures.

Additional Resources:

- Taking Green Leases to Net Zero: Best Practices and Examples to Engage Tenants in Sustainability, ULI, 2023.
- Green Lease Leaders, Institute for Market Transformation and U.S. Department of Energy.

## C4. Sequence Improvements to Maximize Impact

In most buildings, many low-cost or no-cost improvements can be made to reduce energy use and its resultant carbon emissions before taking on costly or time-consuming building retrofit or equipment replacement projects. Additionally, reducing energy usage means that when it is time to replace a building's HVAC system, it might be possible to buy a smaller system than before, further reducing cost and energy consumption. Sequencing certain improvements can be very impactful but many steps can and should be taken parallel to each other. For example, setting thermostat levels to avoid unnecessary heating/cooling when a space is not in use, need not be contingent on a tune-up of the HVAC system. And if a building furnace suddenly fails, obvious air gaps/ leaks in the building can be sealed in conjunction with the installation of the new electricity-based heating system. Key decarbonizing steps include:

### Performance Optimization through Retro-Commissioning and Monitoring-Based Commissioning

Commissioning is the process of ensuring that building systems are designed, installed, operated, and maintained according to the building's current needs. Commissioning should be done for every new building, but that isn't always the case, especially for buildings constructed many years ago. Retro-commissioning applies the same process to buildings that were never commissioned, often enhancing occupant comfort while reducing energy usage and costs by simply optimizing settings for existing equipment. Buildings should be recommissioned every three to five years, or sooner if there has been a significant change such as an equipment upgrade or a gain/reduction in occupancy. If the building's maintenance staff has the capacity to analyze data on an ongoing basis, monitoring equipment can be left in place so issues can be resolved as soon as they come up.

### Energy Conservation

Matching lighting and HVAC schedules with building occupancy is an easy step to reduce energy waste. For example, in office buildings, most lights should be set to turn off and heating/cooling should be reduced during nights and weekends because they are rarely used during those times. Also, using operable window coverings like blinds to protect from solar heat gain in summer or, conversely, to warm up interior spaces during winter naturally, can help conserve energy.

However, these relatively easy interventions are rarely used – according to a study by U.S. Department of Energy, even though most window coverings are operable, 75% of residential window coverings stay in the same position every day[12].

### Load Reduction

**Energy efficient lighting.** LED lights are at least 75% more energy efficient than incandescent lights and last up to 25 times longer, therefore switching to LED lights can result in considerable energy savings.

**Reduced plug loads.** Plug loads refer to energy used by appliances or equipment that is plugged into an outlet. Using Energy Star rated computers and monitors, and appliances such as washing machines and dishwashers, can further reduce energy consumption.

**Energy-efficient heating.** Instead of gas-fired furnaces, several Chicago-area buildings use electric resistance heating systems such as electric furnaces and electric baseboards. Electricity use in these buildings can be reduced by 50% or more by switching to energy-efficient heat pumps[13].

**Sealed and insulated building envelope.** According to estimates by the EPA, air leakage accounts for between 25%-40% of the energy used for heating or cooling a typical residence[14]. Sealing air gaps to prevent air leakage by caulking and/or weatherstripping can significantly reduce energy use and costs, while creating a more comfortable environment. Combined with air sealing, insulating external walls, attics, and basements can further enhance a building's energy efficiency; the EPA estimates that sealing and insulating can reduce total energy costs by 11% in a typical residence[15]. However, adding insulation in existing buildings can be expensive and technically challenging based on the type of construction and condition of existing exterior surfaces.

**Upgraded Windows.** Windows, especially if they are single-paned, can be a significant source of heat gain and loss in a building. However, upgrading to more energy-efficient double-paned windows can be expensive and disruptive for tenants. Alternative solutions, such as window coatings or window inserts that can be installed within existing window frames at a fraction of the cost of new windows, should be considered.

## Innovative Window Solutions

### Indow

Indow has developed storm window inserts that are installed in existing window frames, significantly improving the energy efficiency of older, drafty windows at a fraction of the cost of window replacement. These inserts, designed to be inconspicuous and custom-fit for each window, are ideal for historic buildings. Indow's product line includes options suitable for residential and commercial buildings. More information is available here.

### 3ENano

3E Nano has developed a nano-thin, nearly invisible low-emissivity, solar control coating for windows in both residential and commercial settings. These coatings are made of earth abundant materials and designed to allow light transmission while minimizing heat gain/loss, resulting in energy savings and improved thermal comfort. 3E Nano coatings can be used on large glazed surfaces that are widely used in contemporary buildings, making it easier to maintain aesthetics without compromising energy efficiency. More information is available here.

12 Energy Efficient Window Coverings, Energy Saver, U.S. Department of Energy. https://www.energy.gov/energysaver/energy-efficient-window-coverings

13 Electric Resistance Heating, Energy Saver, U.S. Department of Energy. https://www.energy.gov/energysaver/electric-resistance-heating

14 Air Sealing: Building Envelope Improvements, ENERGY STAR, U.S. Environmental Protection Agency. https://www.energystar.gov/ia/home_improvement/home_sealing/AirSealingFS_2005.pdf

15 Why Seal and Insulate, ENERGY STAR, U.S. Environmental Protection Agency. https://www.energystar.gov/saveathome/seal_insulate/why_seal_and_insulate

## C4. Sequence Improvements to Maximize Impact (continued)

### Electrification

Building electrification involves the replacement of fossil-fuel based systems such boilers and furnaces, when they reach the end of their useful life, with systems such as heat pumps that run on electricity. Ideally the above steps—performance optimization, energy conservation, and load reduction—which reduce energy usage within buildings, should be completed in advance of equipment replacement. This will allow the new equipment to be right sized to match the new lower load. In residential buildings, phasing out natural gas systems will also require switching from gas stoves to electric or induction cooking ranges, which is difficult for many people as it can require adjusting cooking styles and cherished recipes. However, creating opportunities for people to see how these appliances work through cooking demonstrations and testimonials, and highlighting the improvement in indoor air quality, can encourage people to switch.

Electrification can result in additional costs, which should be considered during planning:

- Switching to all electric equipment can require upgrading of the building's electrical system and capacity.
- If natural gas is available at a lower cost, electrification can lead to higher utility bills. However, an analysis of Chicago area energy prices from 2018 to 2022 shows electricity rates as holding steady while natural gas prices have been rising (Figure 5).

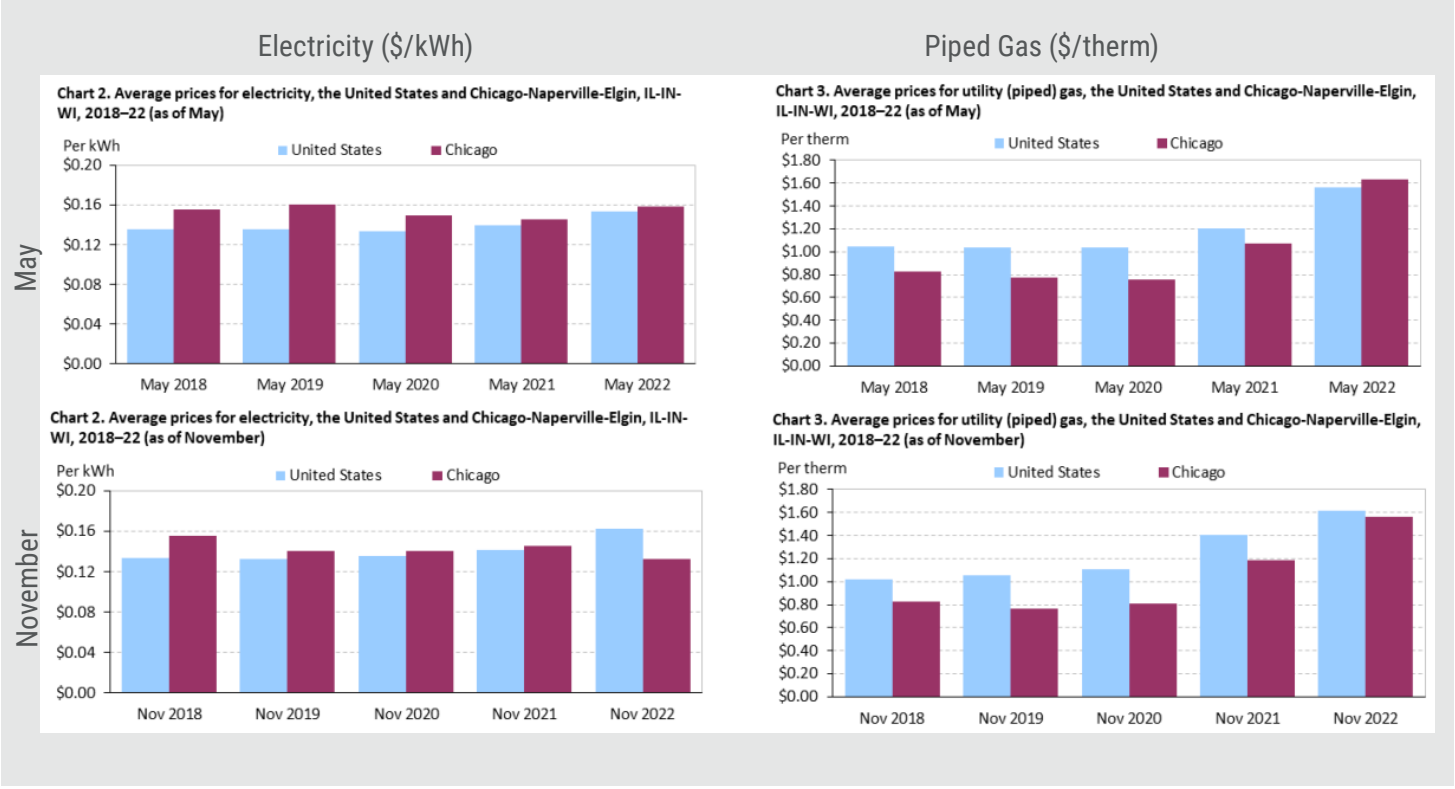



**Figure 5.** Chicago Area Energy Prices

*Source: City of Chicago, Department of Buildings' Analysis of U.S. Bureau of Labor Statistics data.*

Opportunities to experience new technologies, such as induction cooktops through cooking demonstrations, can help build familiarity and encourage more people to make the switch.

### Renewable Energy

To further reduce the carbon footprint of a building in the journey towards net zero emissions, renewable energy sources, off-site or on-site, should be used to meet the optimized demand for energy.

**Solar Panels.** Rooftop solar panels can generate electricity to meet at least part of the demand for a building, while reducing utility costs. Financial incentives such as grants, and tax credits that offset even a portion of installation costs, can shorten payback periods encouraging more building owners to consider solar. The Illinois Solar for All program gives income eligible households access to residential solar installations at no upfront cost to them and guarantees savings in utility costs.

**Power Purchase Agreement.** Power Purchase Agreements (PPAs) can be a great tool for

## **La Paz Place** | Building Electrification Case Study

La Paz Place is a three-building, 44-unit affordable housing development in Chicago's Humboldt Park/ Logan Square neighborhood, owned and managed by Bickerdike Redevelopment Corporation (BRC), a non-profit, affordable-housing provider. La Paz Place was selected to participate in Elevate's* Building Electrification Program (BEP), which offers grant support and a turnkey service-delivery model for implementing electrification retrofits in affordable housing. BRC had completed building envelope improvements in 2013, including air sealing and insulation, and, by 2020, mechanical systems in the buildings were due for replacement, making La Paz Place a good candidate for an electrification pilot project.

The project scope included converting the natural gas equipment for heating, cooking, hot water, and laundry to all-electric heat pumps, smart thermostats, electric stoves, and electric dryers, and adding rooftop solar panels. The turnkey cost for the project was approximately $1.24 million. In addition to creating healthier, more comfortable spaces and reducing utility costs for residents, this electrification retrofit is estimated to have reduced the building's carbon emissions by 44%. For more details, review the complete case study on Elevate's website.

* Elevate is a non-profit dedicated to making the benefits and services of a clean energy economy available to everyone—no matter who they are or where they live.

CREDIT: ELEVATE

Low-rise masonry construction apartment buildings with flat roofs, like La Paz Place, are common in Chicago neighborhoods.

organizations looking to access renewable energy for their electricity needs without having to pay to install and maintain any power generation equipment. As described by the Better Buildings Initiative[16], a PPA is an arrangement in which a third-party developer installs, owns, and operates an energy system on a customer's property. The customer then purchases the system's electric output for a predetermined period. A PPA allows the customer to receive stable and often low-cost electricity with no upfront cost, while also enabling the owner of the system to take advantage of tax credits and receive income from the sale of electricity. Though most commonly used for renewable energy systems like solar, PPAs can also be applied to other energy technologies.

16 Power Purchase Agreement, Financing Navigator, Better Buiildings Solutions Center, U.S. Department of Energy. https://betterbuildings-solutioncenter.energy.gov/financing-navigator/option/power-purchase-agreement

## **Encourage Innovations in Sustainability** | CenTrio's District Cooling System

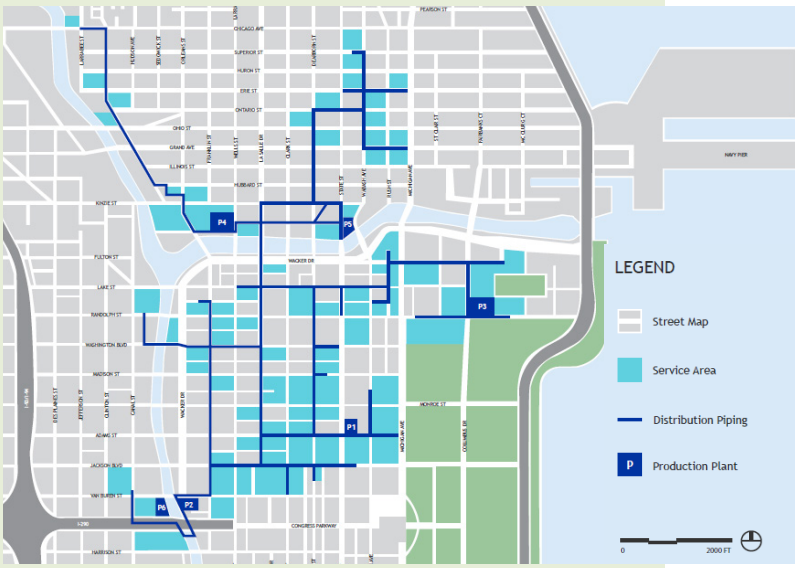
District cooling is an efficient way to air-condition a network of buildings. Instead of individual chillers and cooling towers, buildings in a district cooling network are served by central cooling plants that supply chilled water through an underground piping system. The chilled water flows through the building's heat exchanger, absorbing heat from the building space. It is then recirculated to the central plant through a closed loop return line. Aggregating cooling loads of multiple buildings creates economies of scale, driving greater efficiency and making it easier to balance peak electrical loads reducing stress on the electrical grid[1]. Besides decarbonization retrofits within individual buildings, access to clean energy infrastructure such as district cooling systems, can play a significant role in achieving net zero carbon emissions.

CenTrio, a company focused on sustainable energy solutions, provides district cooling to 53 million square feet of building space in 115 buildings across downtown Chicago. The largest downtown district cooling network in North America, CenTrio's downtown Chicago system features an ice thermal storage system or "ice battery," which produces ice at night (when electricity costs are lowest) to cool buildings during the day reducing cost, carbon emissions, and electric grid strain. CenTrio's district also leverages the Chicago River for aqua-thermal heat rejection and other proprietary technologies to reduce freshwater consumption further enhancing resilience[2].

The City should coordinate with CenTrio to promote an equitable and sustainable expansion of their district network and explore partnership opportunities with companies innovating solutions for a sustainable, resilient built environment.

1 District Cooling, International District Energy Association. https://www.districtenergy.org/topics/district-cooling

2 CenTrio Chicago District Energy System Project, Global District Energy Climate Awards. https://www.districtenergyaward.org/wp-content/uploads/2023/09/chicago-write-up-2022.pdf




CenTrio Chicago District Cooling System Distribution Map

*Source: CenTrio Chicago District Energy System Project, Global District Energy Climate Awards.*

# MOVING FORWARD

Chicago is well-positioned to seize the moment and establish itself as a climate leader. Chicago's public, civic, and industry leaders should work collaboratively to build on our city and region's locational advantages, extensive infrastructure, talented workforce, and history of bold innovations in the built environment, to create an equitable, sustainable, and climate-ready future.

Retrofitting Chicago's extensive stock of older buildings to minimize their greenhouse gas emissions is essential for the future of our city and region, and a critical step towards slowing down global climate change. The path to net zero has many challenges, however, as discussed earlier in the report, technological advancements have resulted in increasingly effective and implementable solutions. Additionally, the federal government's largest ever investment to support decarbonization at the local level, is opening new funding opportunities making it easier than ever before to finance decarbonization improvements.

This report outlines three priority action areas for accelerating decarbonization with recommendations for different stakeholders, including the City of Chicago, the real estate industry, sustainability-focused non-profits, and community organizations. For its part, ULI Chicago is committed to convening its members and partners to continue to build awareness and momentum for building decarbonization. Additionally, ULI Chicago will draw upon its global network to bring the latest in best decarbonization practices and technical advancements to Chicago.


CREDIT: LBBA

"City Gardens," an affordable housing development on the site of the former Maplewood Courts public housing on Chicago's near west side, includes environmentally focused amenities such as community gardens, a recycling center, and community cooking and gathering spaces, designed to promote healthy lifestyles and foster environmental stewardship. City Gardens is a 2019 ULI Chicago Vision Awards winner.

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## BUILDING DECARBONIZATION | **KEY ULI PUBLICATIONS**

Net Zero for All: A Just Transition for Real Estate (2023)

Working Towards Net Zero: Tenant Engagement Best Practices and Examples (2023)

Off-Site Renewable Energy Buyers Guide for Real Estate (2022)

Renewable Energy Strategies for Real Estate (2022)

Electrify: The Movement to All-Electric Real Estate (2021)

The ULI Blueprint for Green Real Estate (2020)

Decarbonizing the Built Environment: 10 Principles for Climate Mitigation Policies (2020)

Embodied Carbon in Building Materials for Real Estate (2019)

Science Based Targets: The Next Level of Carbon Reduction and Sustainability Goals in Real Estate Retrofits Over Time (2019)

Best Practices for Achieving Zero Over Time For Building Portfolios (2018)

Tierra Linda Passive House
*Credit: LBBA*

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