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Net Zero Buildings and Role of On-site Solar

November 18, 2022

Agenda

1. Housekeeping and introductions
2. Overview on Net Zero Buildings
3. Getting to Zero in Illinois
4. Role of On-site Solar
5. Q&A

IPA Power Hour Webinars

- **Introduction and Scope**
- **Power Hour is a series of educational and informative presentations on a wide range of clean energy topics and emerging issues**
- **Today's Power Hour:**
  - During this webinar, the speakers will discuss the role of net zero buildings to accelerate decarbonization, look at policies and best practices in the landscape of net zero energy buildings nationally, and provide some highlights on how Illinois is moving toward net-zero energy buildings.
  - This presentation is intended for educational purpose only and does not represent a legal interpretation or statement of policy by the IPA or its staff.
  - **Future IPA Power Hour Webinars will cover other topics related to the clean energy economy in Illinois**

IPA Power Hour Webinars

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Upcoming Webinar

IPA Power Hour 11: Navigating the Energy Transition-Growing Pains and Path Forward

Date: December 16, 2022

Time: 12-1pm CST

REGISTER HERE

The Illinois Power Agency

- **Independent State Agency created in 2007**
- **Agency duties include**
  - **Development and implementation of procurement plans for electricity supply for utility customers**
  - **Development and implementation of solar incentive programs**
  - **Implementation of the Renewable Portfolio Standard**
    - Development of Long-Term Renewable Resources Procurement Plan
    - Conduct competitive procurements for utility-scale projects
    - Manage programs for community solar and solar for homes and businesses

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Overview on Net Zero Buildings


Stevenson HS Classroom Addition, 466 kW Array, 58,000 sf


Tyner Center, 17 kW Array, 3,000 sf

Sunset Ridge School, 420 kW Array, 70,000 sf

Designed for Net Zero Energy

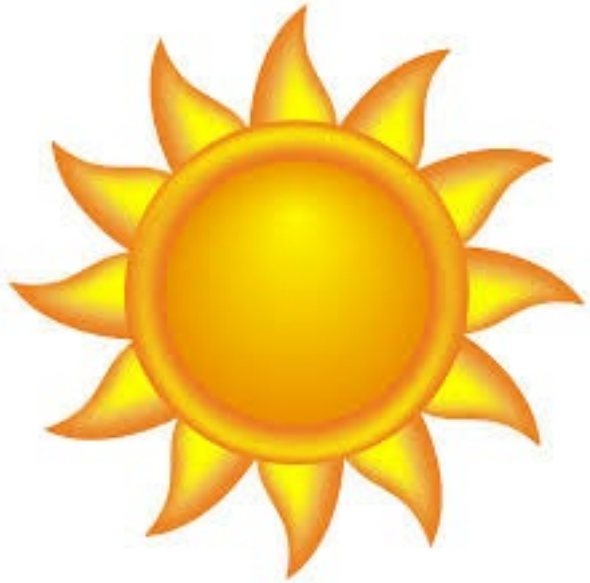
IPA, 18 November, 2022

Lois Vitt Sale, FAIA, LEED Fellow


Prairie Activity & Recreation Center, 213 kW Array, 38,000 sf


Stevenson HS Fieldhouse, 1.1 MW Array, 67,000 sf

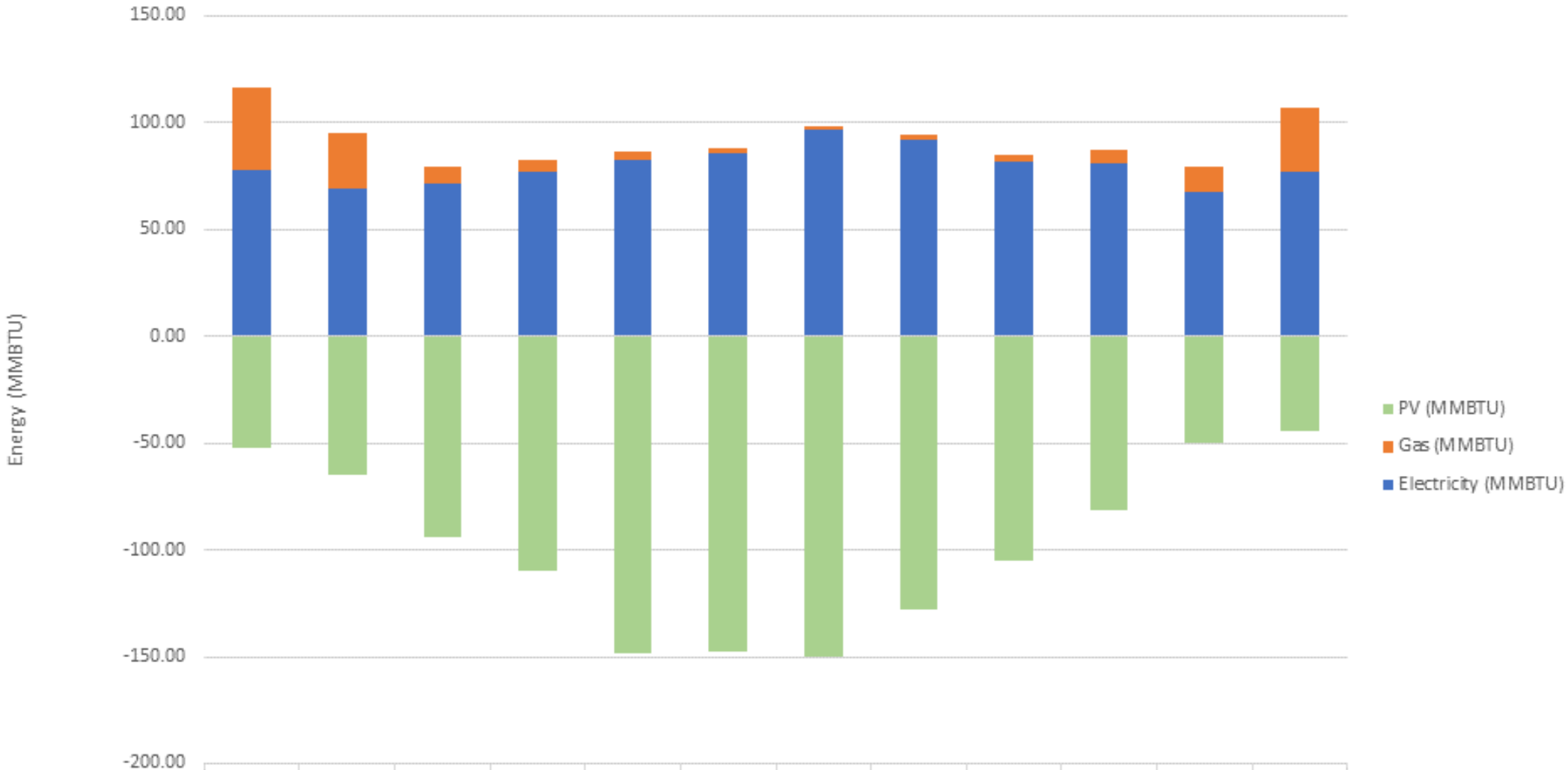
Northbrook Activity Center, 314 kW Array, 44,000 sf



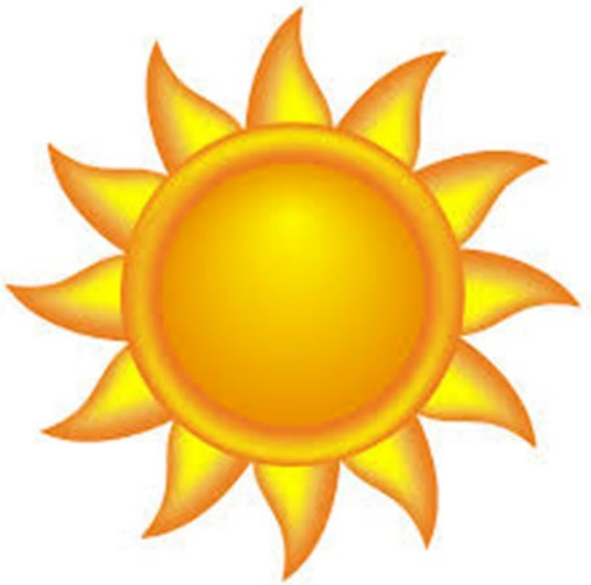
Powered by the Sun –

A ***net zero energy building*** generates at least as much power on site annually as it uses in the underlying building. The most common energy generation is through on-site photovoltaics

Northbrook Predicted Annual Energy Consumption & Generation



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PV (MMBTU)	-52.26	-65.18	-93.84	-109.62	-148.08	-147.85	-149.73	-127.62	-104.85	-81.29	-49.88	-44.51
Gas (MMBTU)	38.58	25.35	7.28	5.77	4.04	2.32	1.74	2.05	3.11	6.57	11.93	29.54
Electricity (MMBTU)	78.15	69.48	71.77	76.93	82.83	85.85	96.83	92.23	81.56	80.61	67.84	77.30

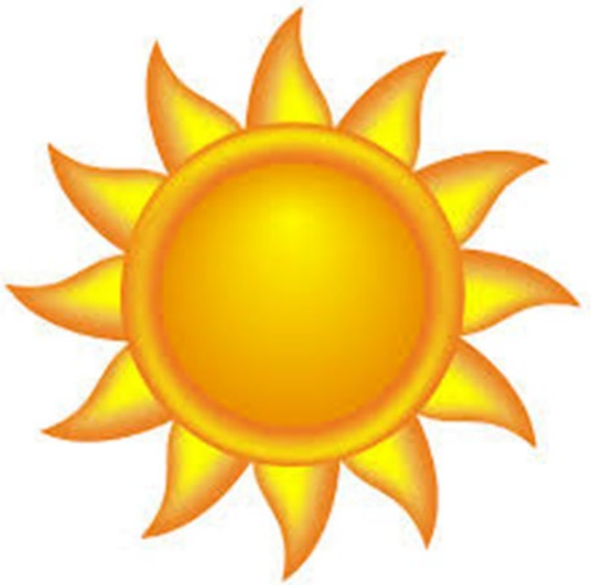


A ***net zero energy building*** is classified as emerging or verified….

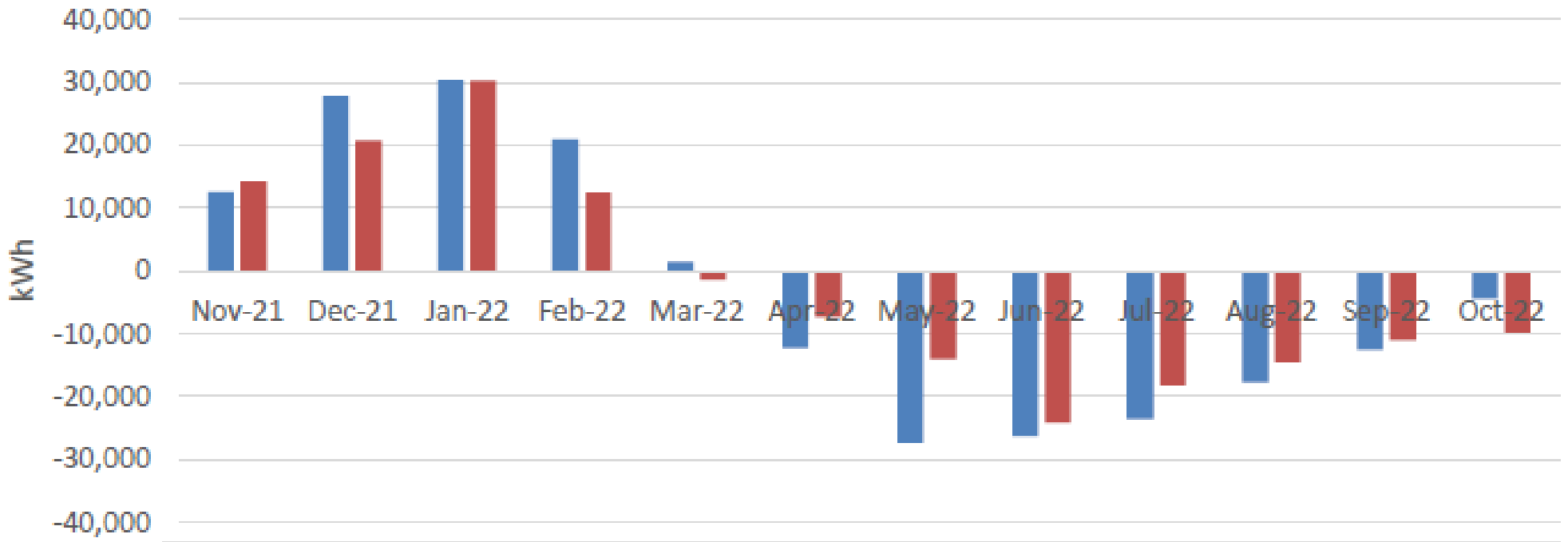
To get from ***Emerging*** to ***Verified*** – A building must prove that in 12 consecutive months, it has produced as much energy as it consumed.

Key Characteristics of a net zero energy building

- Underlying aggressive energy efficiency
  - High Performance Envelope
  - Low Window to Wall Ratio
  - Low Rate of Infiltration
  - High efficiency lighting + HVAC Systems
- On-site renewable energy resource
  - Solar
  - Wind
  - Other source i.e. Thermal Energy
- Active Building Performance Monitoring
  - Dedicated Personnel to record and monitor building systems including: HVAC, Lighting, Plug Loads, Elevator, Hot Water, Renewable Energy Generation
  - Systems level monitoring to record performance
  - Willingness to actively manage building performance to meet consumption + generation expectations



Techny Prairie Activity Center: Net Energy Consumption



	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22
Predicted	12,560	27,774	30,326	20,891	1,386	-12,232	-27,304	-26,253	-23,557	-17,670	-12,458	-4,492
Actual	14,261	20,744	30,207	12,499	-1,378	-7,328	-14,023	-24,078	-18,132	-14,451	-11,007	-9,780

East Building Addition

Lincolnshire, IL

Net Zero Certified – ILFI 2021

LEED Platinum NC 2009 Certified

First Verified NZE Building in Illinois

Occupied August 2019

56,000 SF

Classroom Addition including Science Labs

Exceptions:

- Use of existing diesel emergency power system
- Scale Jumping for PVs on adjacent building due to Rooftop Urban Agriculture

Stevenson High School

Plainfield, IL

PHIUS+ & Source Zero Certified

37,000 SF

Occupied January 2019

Received $1m Grant from Illinois Clean Energy Community Foundation

Designed and built by Wight & Company

Precast Construction

14% window to wall ratio

R 55/60 rooftops

R 34/40 walls

Prairie Activity & Recreation Center

Northbrook, IL

PHIUS+ & Source Zero Certified

44,000 SF

Occupied January 2021

Verfied NZE 12 months after occupancy

Received $1.78m Grant from Illinois Clean Energy Community Foundation

Designed by Wight & Company

Precast Construction

16% window to wall ratio

R 55/60 rooftops

R 34/40 walls

Techny Prairie Activity Center

PV

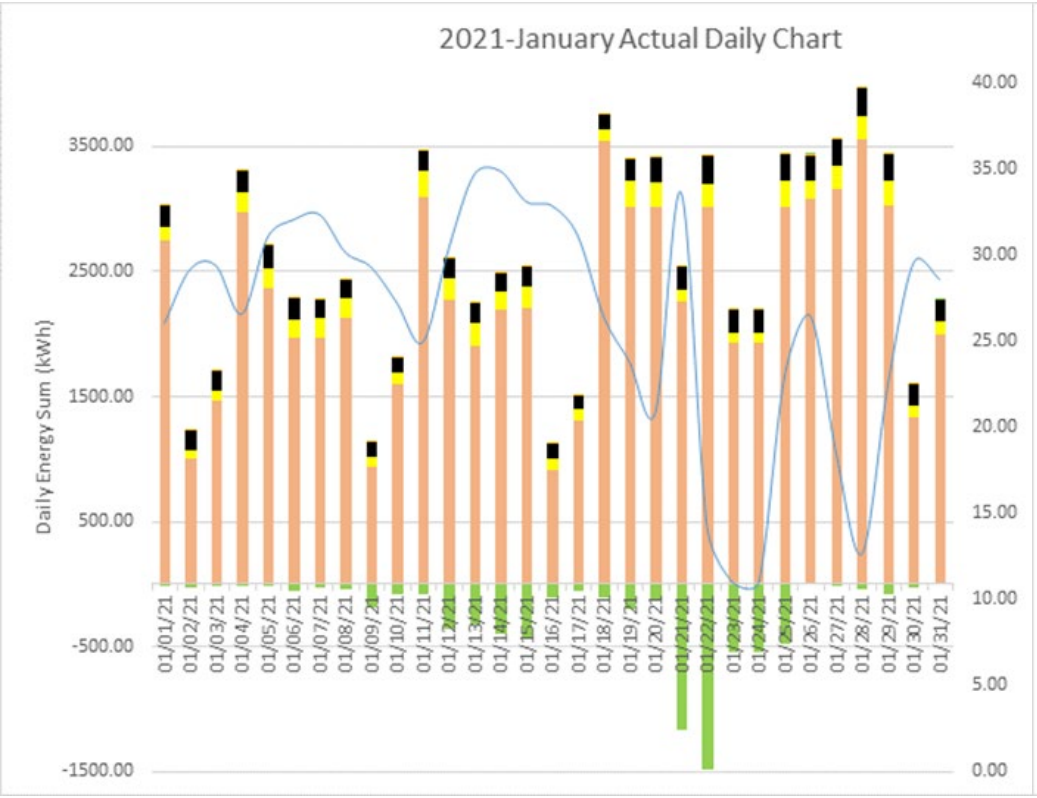
Nameplate DC Capacity: 312.4 kW

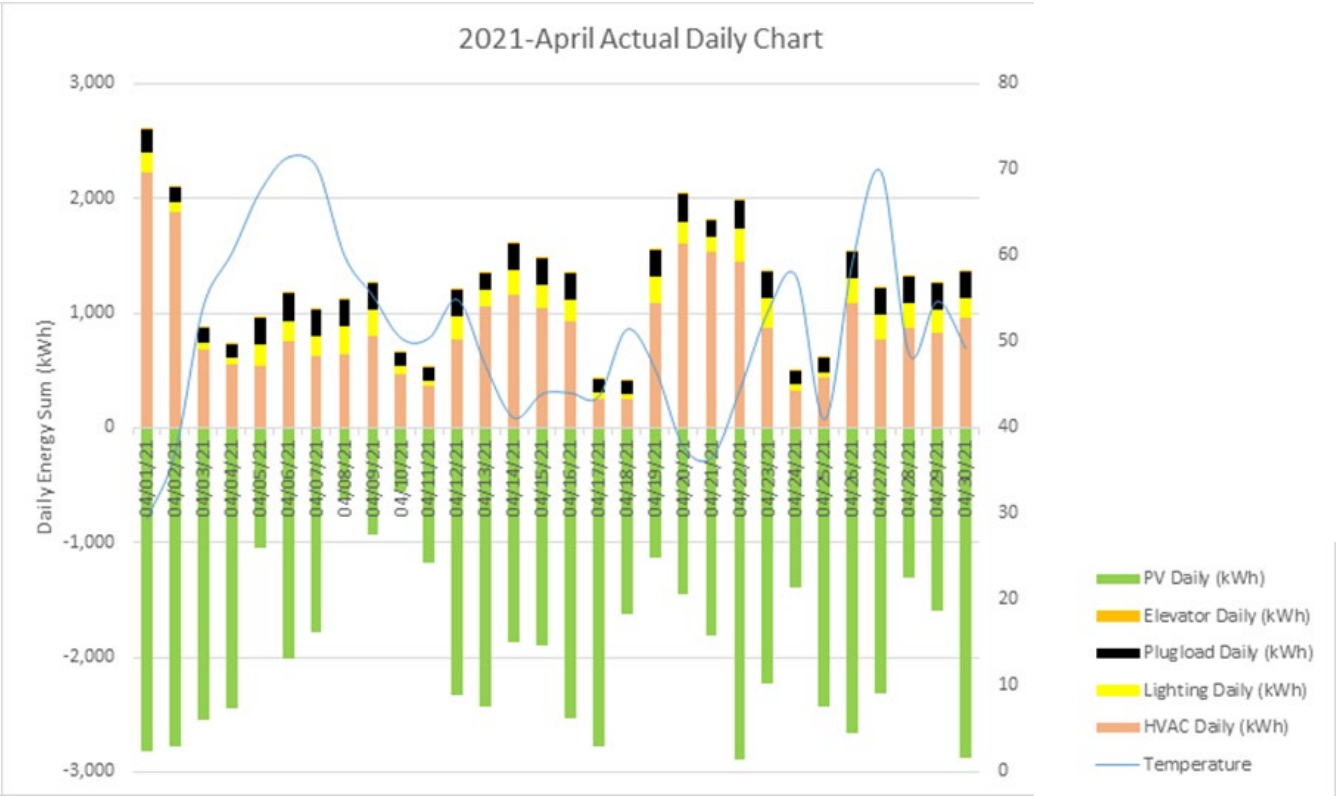
Fixed Tilt 375W panels

Tilt: 10°

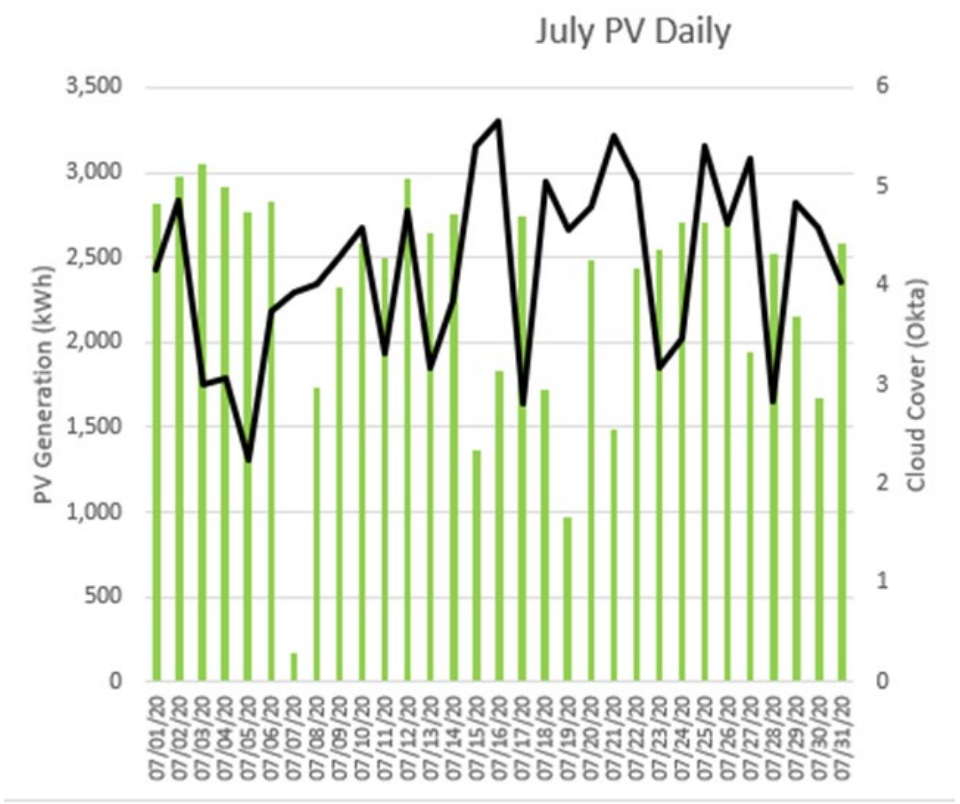
Predicted Annual Production: 368.83 mWh

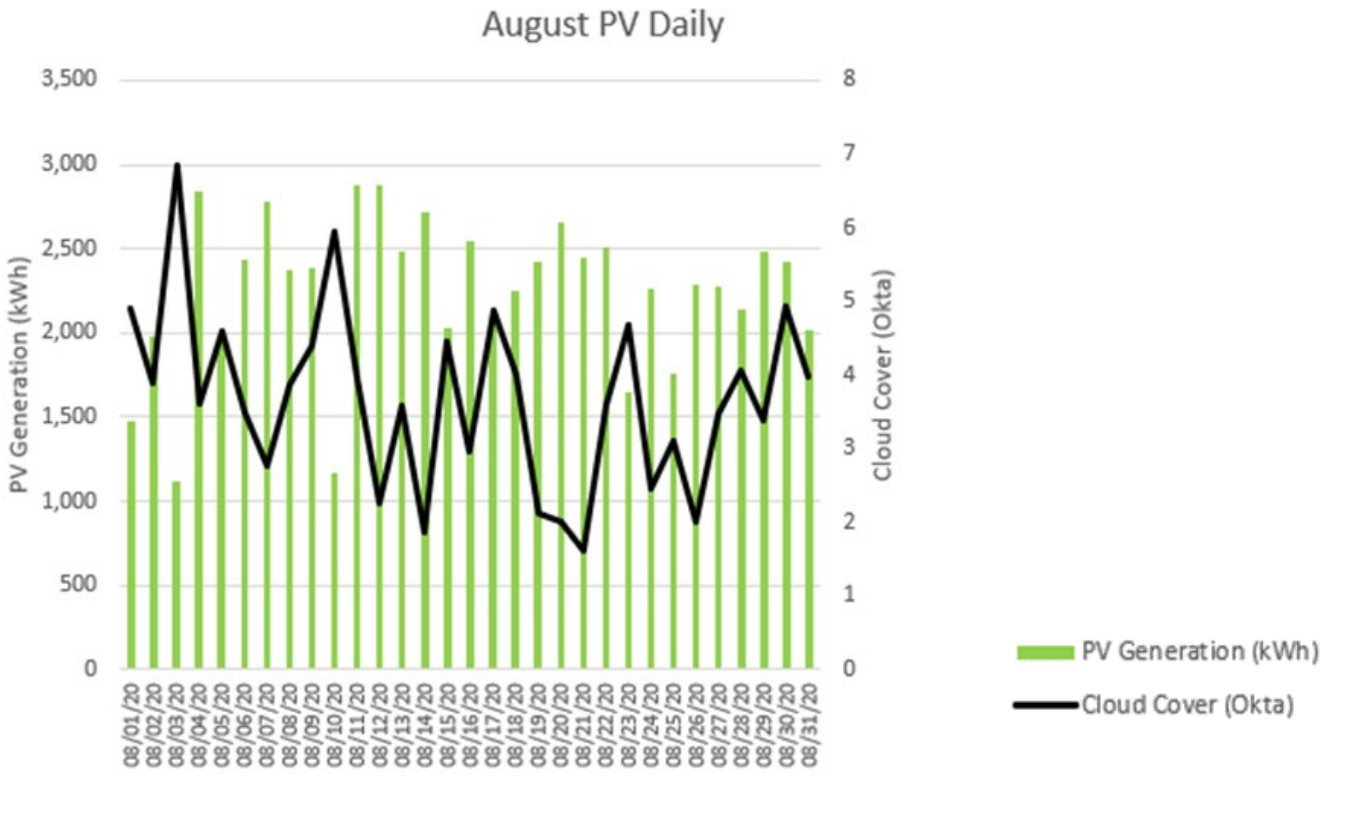
833 Panels



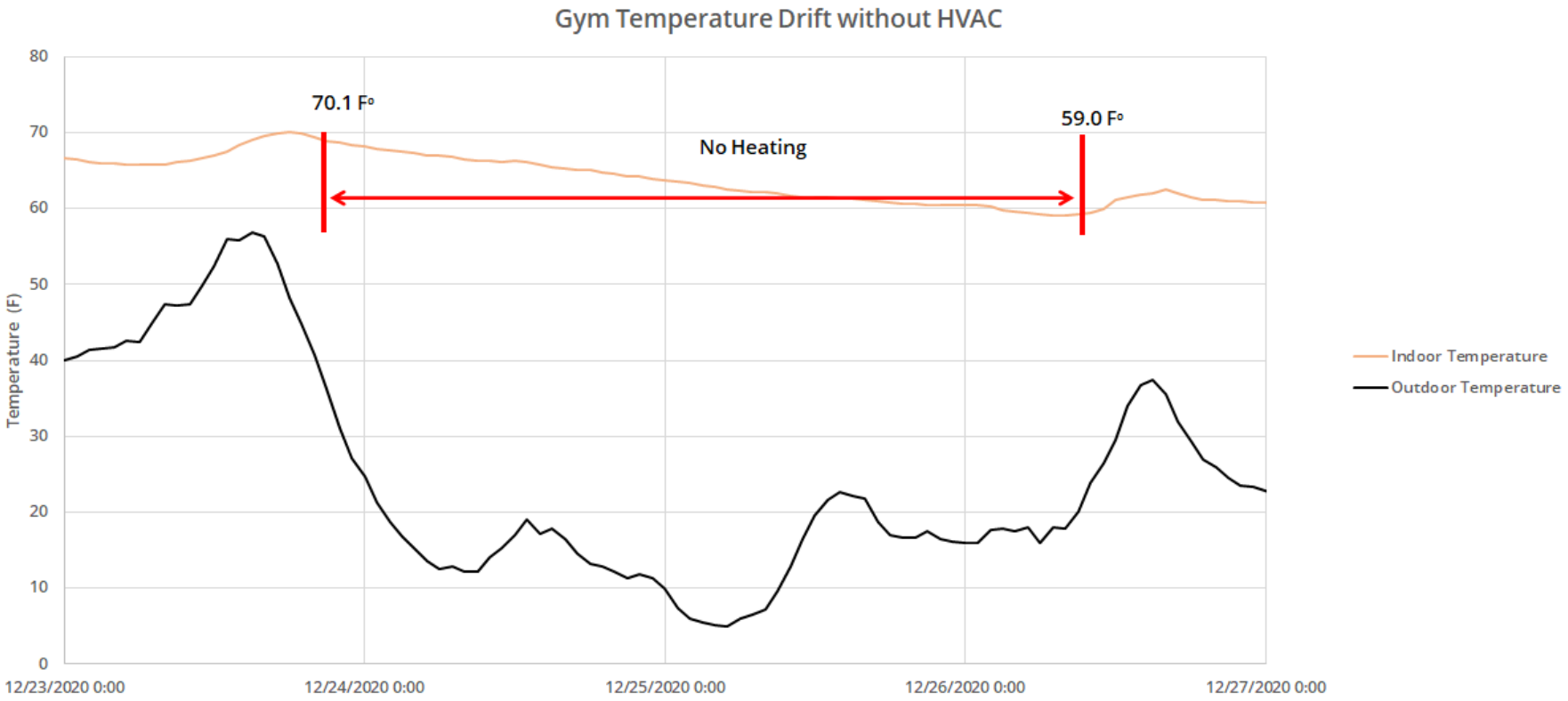


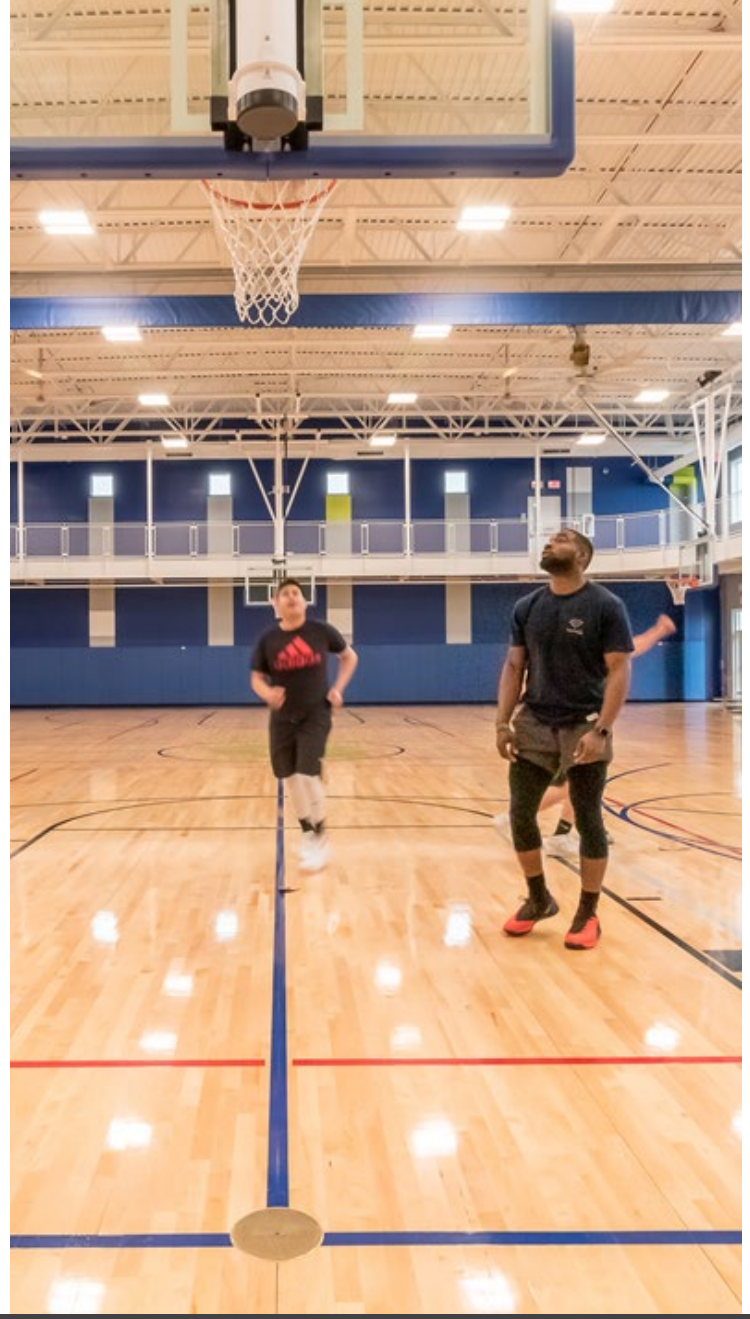
One Month’s Daily Performance Data





Daily Cloud Cover & PV Generation





Occupant Experience

- When the Utility only has one person working on Interconnection Agreements
- Utility wants systems not sized for any usage beyond building needs. No Net Positive!
- Testing Grid to make sure electrons can travel in two directions!
- Construction Schedule Anyone?

Evolving Relationship between grid and buildings

- Reducing or Eliminating on site combustion has positive health impacts
- Can be a source for resilience in tandem with battery storage in cases of extreme weather events
- Can be used to interact with the grid to shave peak loads or power buildings when grid is operating in high carbon mode

Benefits of NZE now and in the future

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Getting to Zero in Illinois

ILLINOIS GREEN ALLIANCE

We advance high performance buildings in Illinois.

Educating building professionals

Advancing policy to remove barriers

Supporting existing buildings on the path to net zero.

Green Building Path to Zero

The First Ten Years

The formation was catalyzed around the potential USGBC's Leadership in Energy and Environmental Design (LEED) could play in making an impact.

The Center for Green Technology in Chicago, the first LEED Platinum municipal building in the world, became a signature project and living laboratory.

Supported the passage of the Illinois Green Buildings Act, which requires all new state buildings to meet LEED Silver.

2021

A new strategic plan was launched, focused on bringing net zero building practices to all building types.

The Second Ten Years

2012: Illinois was recognized as the state with more LEED square footage per capita than any other state.

2013: Supported the passage and implementation of the Chicago energy benchmarking ordinance.

2016: The 2016-2020 strategic plan, called the Epic Challenge, built on our experience with LEED to bring green building experience to more buildings and neighborhoods.

2020: The Neighborhood Power Project launched to assist community oriented buildings with sustainability operations.

2020: The Illinois Green Schools Project launched to engage students and classrooms around green building.

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Green Building Path to Zero

- LEED Zero Carbon
- LEED Zero Energy
- ILFI Zero Carbon
- ILFI Zero Energy

- PHIUS+ Source Zero
- PHIUS+ Getting to Zero
- DOE Net Zero Energy Ready Homes

White House releases net-zero road map

By David Iaconangelo | 11/04/2022 06:50 AM EDT

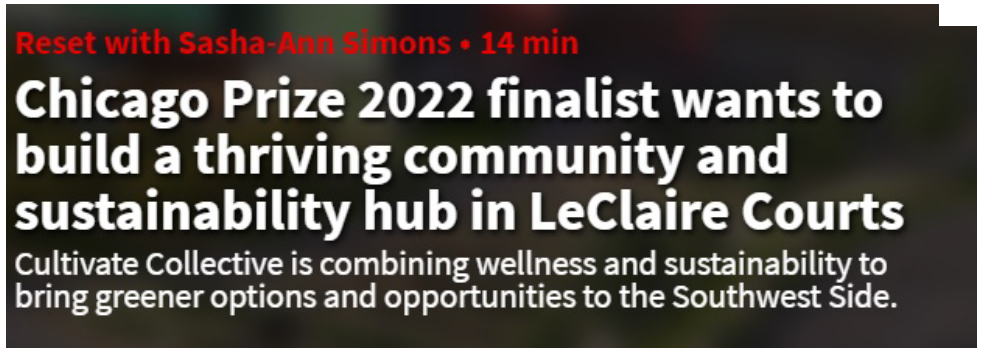
With Buildings Accounting for More than a Third of New York's Climate Pollution, Governor Launches Unprecedented Commitment to Accelerating Green, Electrified or Electrification-Ready Buildings

Denver's Net Zero Energy (NZE) New Buildings & Homes Implementation Plan

Washington state moves to electrify new buildings by requiring heat pumps

New commercial buildings in Washington will have to conforr
are now the country's strongest electrification standards for

CEJA Grows Renewables and Social Equality in Illinois



RMI
47,051 followers
1mo •

Leaders in Pembroke, IL decided their community would not be left behind when it came to renewable energy and electrification of their homes. They kicked off the Pembroke Energy Efficiency Pilot project for four homes to show that electrification is a viable, sustainable solution for bringing reliable energy to rural, poor communities.

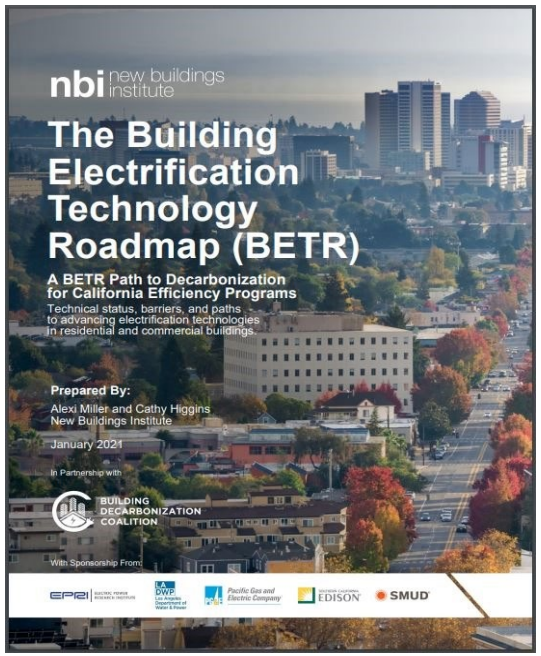
Zero Carbon and Zero Energy Codes: Key Policy Tools to Meet Climate Goals

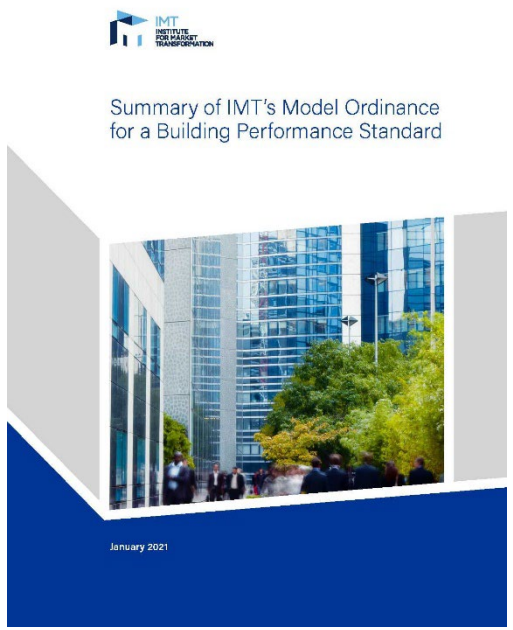
Chicago's new weapon against climate change: A requirement that new homes be ready for easy installation of electric appliances

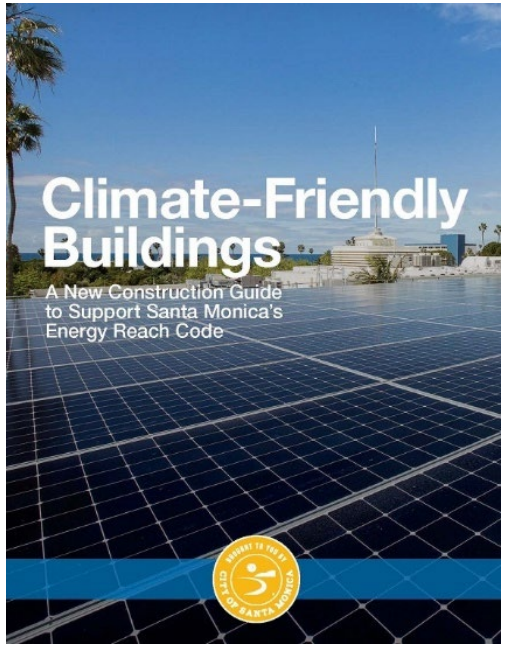
Boston zoning change would require net-zero emissions from new buildings

Gains made in this code cycle will put the IECC on track to achieving an increase in all-electric homes that can save up to **$16,200 over 30 years**.

Policy & Code Trends







Illinois Policy Landscape & Trends

Illinois Climate and Equitable Jobs Act

Enables creation of a Green Bank and development of net zero stretch code for adoption by municipalities

Energy Benchmarking Policies & Building Performance Standards

Requires buildings over a determined square footage to track and report energy use annually and/or meet a minimum energy performance

Building Decarbonization and Electrification

Policy and utility incentives to reduce energy use and switch appliances, fleets and HVAC from fossil fuels

Health, Wellness & ESG Reporting

Increased demand for healthy building materials, air quality improvements and reporting to investors on sustainability practices and metrics

Illinois Green **Net Zero Honor Roll**

Photo courtesy of Connor Steinkamp

Adlai E. Stevenson High School Science Addition (EBA I)
ILFI Zero Energy
Verified Energy

Photo courtesy of Tom Bassett-Dilley

Carroll Community Center
PHIUS+ Source Zero
Verified Energy

Photo courtesy of Kendall McCaughtery

Techny Prairie Activity Center
PHIUS+ Source Zero
Verified Energy

Illinois **Net Zero Watch List**

Lake County Forest Preserves rendering

University of Illinois Instructional Facility

7 Van Buren | Oak Park Residence Corporation | **Phius ZERO**

Academy for Global Citizenship | Academy for Global Citizenship Charter School | **ILFI Zero Energy**

Adlai E. Stevenson High School Fieldhouse Addition (EBA II) | High School District 125 | **LEED Zero**

Countryside Municipal Complex | City of Countryside | **ILFI Zero Energy**

Granite City Passive House | Granite City Housing Authority | **Phius ZERO**

Heartland Community College Agricultural Complex | Heartland Community College

Lake County Forest Preserves Environmental Education Center | Lake County Forest Preserves

Oak Park Community Recreation Center | Park District of Oak Park | **ILFI Zero Energy**

Plainfield Activity & Recreation Center | Plainfield Park District | **Phius ZERO**

Prairie Trails School | River Trails School District 26 | **Phius ZERO**

Saint Joseph's School Addition | Saint Joseph School | **Phius ZERO**

University of Illinois Instructional Facility | University of Illinois | **LEED Zero**

Willowbrook Wildlife Center | Forest Preserve District of DuPage County | **ILFI Zero Energy**

Funding & Financing

Illinois Clean Energy
community foundation

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Net Zero Energy Building Program

The Foundation's Net Zero Energy Building Program will award grants to new construction or retrofit projects that achieve site net zero energy performance or better, over the course of a year. Buildings must, at a minimum, offset all of their energy consumption with on-site generation from renewable resources. Grants will be paid incrementally, with full payment contingent on actual building performance.

The program goal is to encourage exemplary buildings that bring together beautiful design and careful construction to maximize energy efficiency, showcase renewable energy and, by educating the public and professionals, help pave the way for a larger shift in the building sector. The Foundation aims to fund projects that demonstrate that net zero energy buildings are realistic and achievable. These flagship projects will add to the knowledge base on net zero building design, construction and operation.

Kmiecik Imagery

Illinois Net Zero Trend Survey (June 2022)

- 20% of respondents are currently or have previously worked on a building project that is pursuing net zero energy or carbon in Illinois
- 33% of respondents say their firm has worked on a net zero project
- 45% of respondents said that they are confident they will be working on a net zero project in Illinois in the next 18 months

Persistent Barriers to Net Zero Energy

- Owner/Developer/Finance community issues with first costs vs. operational savings
- Building envelope and window to wall ratio preferences
- Availability of equipment during construction timeline; supply chain issues
- Workforce experience and training for high performance design and construction
- Voluntary adoption vs. regulation and policy

Opportunities to Advance Net Zero in Illinois

- Flagship projects adding to the knowledge base on net zero building design, construction and operation in IL
- Maximizing energy efficiency and envelope requirements for new construction through code and policy adoption
- Requirements for new buildings to offset all energy consumption with on-site generation from renewable resources when feasible
- Capital Development Board's stretch code adoption by municipalities throughout the state
- Utility incentives to offset incremental costs of high performance equipment and training
- Trained workforce ready and able to build high performance buildings
- State, municipal and institutional buildings leading by example

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Role of On-site Solar

Renewable Energy Options in Illinois

- **Green Supply Offers**
  - **As a retail choice state, most customers in Illinois can choose their supplier. Some Alternative Retail Electric Suppliers offer rates that includes a renewable energy component**
    - Typically, Renewable Energy Credits ("RECs") to offset usage. May be sourced from a wide range of resources and locations.
    - Priced at a premium
- **Community Solar**
  - **Subscriptions to larger off-site solar projects in the same service territory**
  - **Customer value seen through net metering credits on electric bill**
- **On-site Solar**
  - **Customers can install solar at their location to offset their usage and can receive net metering credits for excess generation (subject to certain limitations)**

Only On-site Solar meets the requirements for Net Zero Buildings

On-Site Solar Growing

- Prior to 2019 less than 80 MW of solar in Illinois
- Adjustable Block and Illinois Solar for All on-site installations

MW	Government and Non-Profit	Non-Residential	Residential	Grand Total
2019	0.78	19.94	24.07	44.79
2020	28.17	78.59	82.25	189.01
2021	25.46	86.31	70.34	182.11
2022 (Through June 30)	5.11	21.62	57.11	83.83

Number of Projects	Government and Non-Profit	Non-Residential	Residential	Grand Total
2019	16	252	2,664	2,932
2020	79	718	10,380	11,177
2021	94	619	9,760	10,473
2022 (Through June 30)	29	279	8,175	8,483

- Climate and Equitable Jobs Act will support increasing numbers of projects with a focus on new categories including public schools, projects developed by Equity Eligible Contractors, and projects featuring energy sovereignty

Ownership of Environmental Attributes

- Illinois Renewable Portfolio Standard ("RPS") is based upon the sale of Renewable Energy Credits generated by participating projects to Illinois utilities
  - Utility-scale projects through competitive procurements
  - On-site solar and community solar through the Adjustable Block and Illinois Solar for All Programs
  - 15 or 20-year REC delivery contracts
- The sale of RECs transfers the ownership of the environmental attributes of renewable energy from the seller to the buyer
  - Projects that participate in IPA-administered programs and procurements thus transfer the environmental attributes of the energy they produce to the utility that buys the RECs. The utilities then retire the RECs as part of their compliance with the Illinois RPS

Policy Issues

- On-site solar is a critical tool for achieving the goals of net zero buildings
  - However, there is a policy tension between maintaining control of environmental attributes, and the Illinois RPS which includes incentive opportunities that require the transfer of those attributes
- Other funding sources outside the RPS
  - Illinois Clean Energy Community Foundation
  - Enhanced value of Federal tax credits from the Inflation Reduction Act
  - Smart inverter rebates
- Illinois policies on battery storage still developing
  - Can incentives for storage align with the policy goals of net zero buildings?

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Q&A

Contact Us!

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