

Stevenson HS Classroom Addition, 465 kW Array, 58,000 sf



Tyner Center – 17 kW Array, 3,000 sf



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

Net Zero Energy Design as a Practice

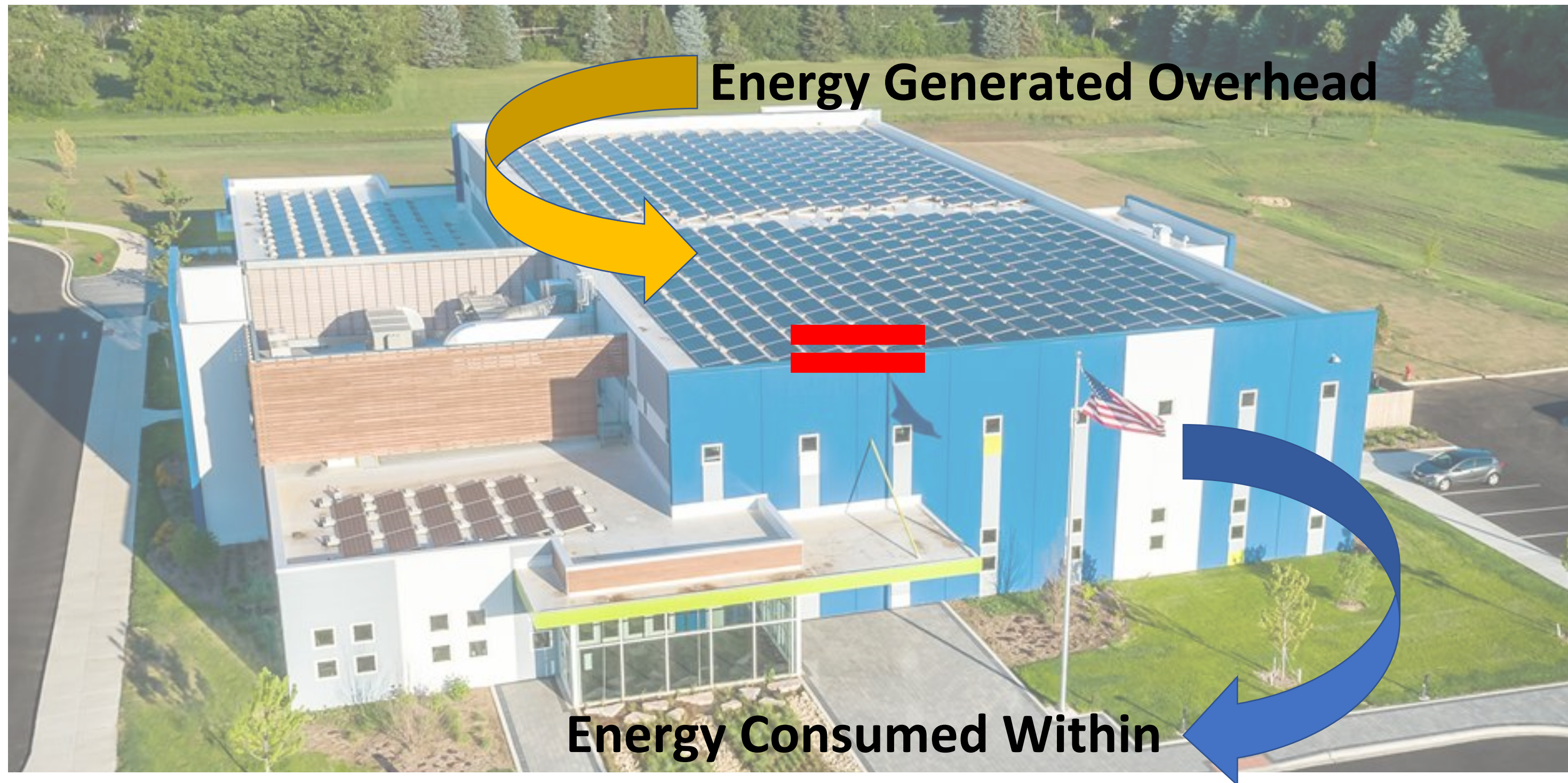


Stevenson HS Fieldhouse 1.1 MW Array, 67,000 sf



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

What is a Net Zero Energy Building?

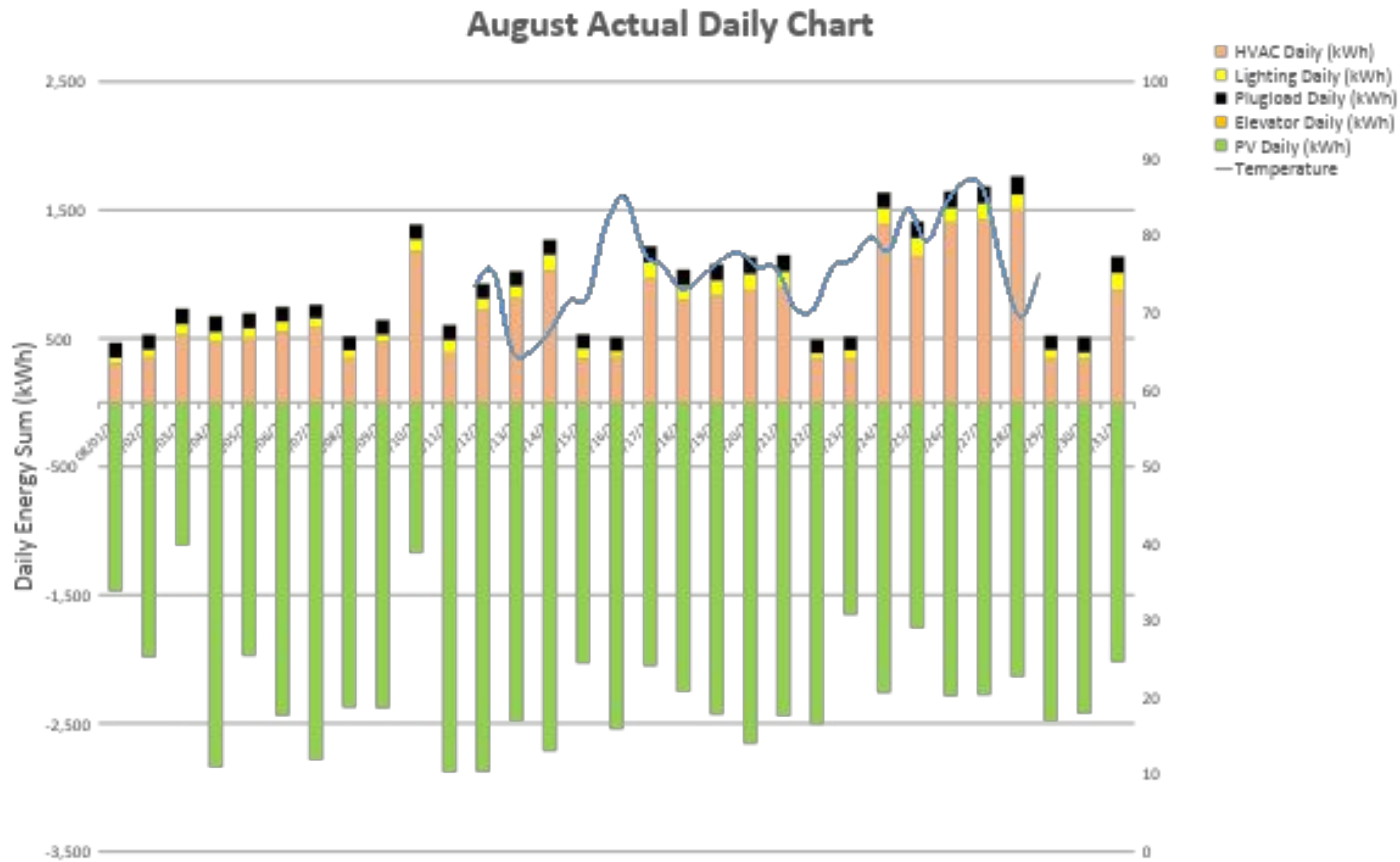


On an *Annual* Basis

Net Zero Energy Buildings *Come Alive* in Performance Period



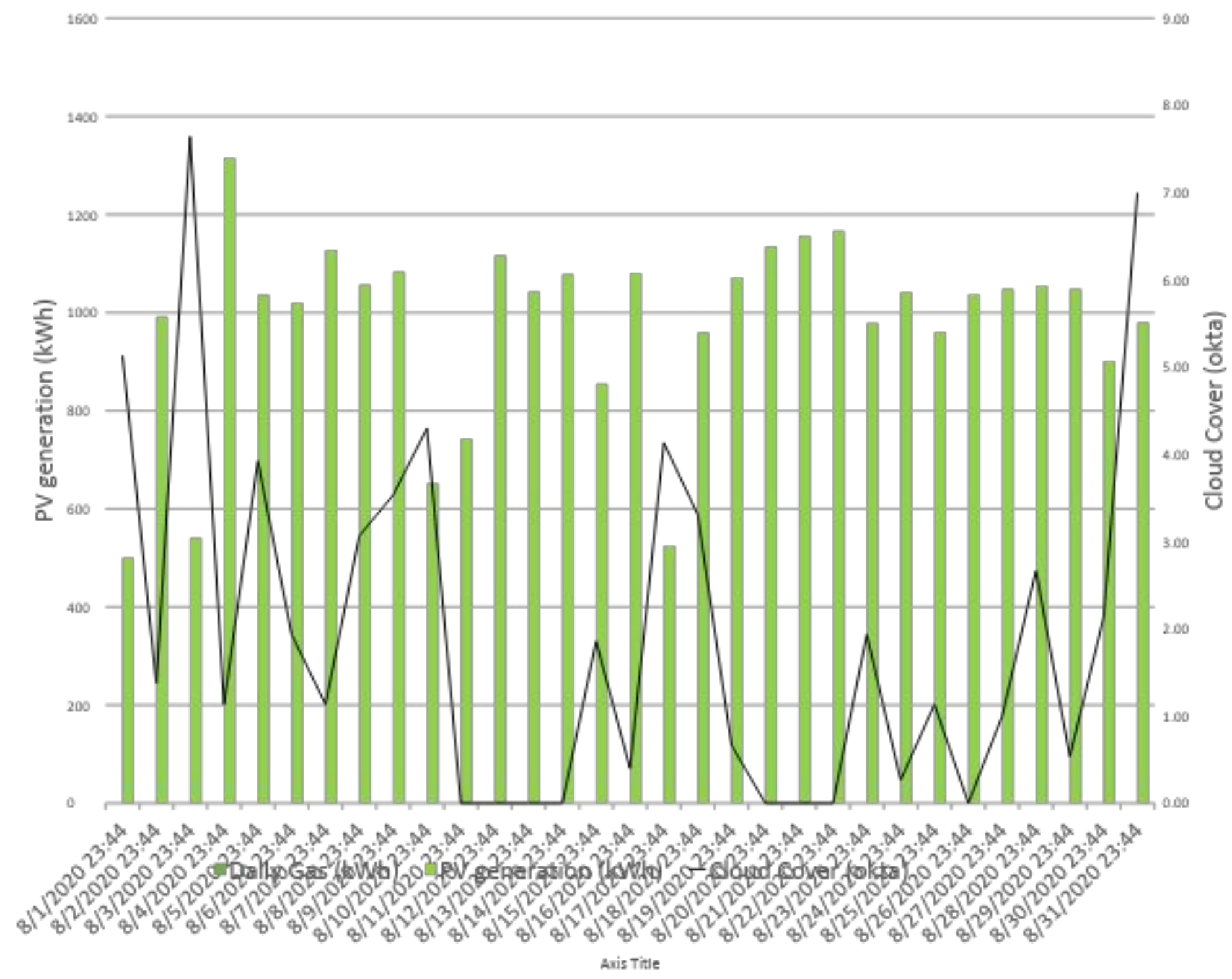
One Month of Performance Data



Solar Production is *Sensitive* to Cloud Cover



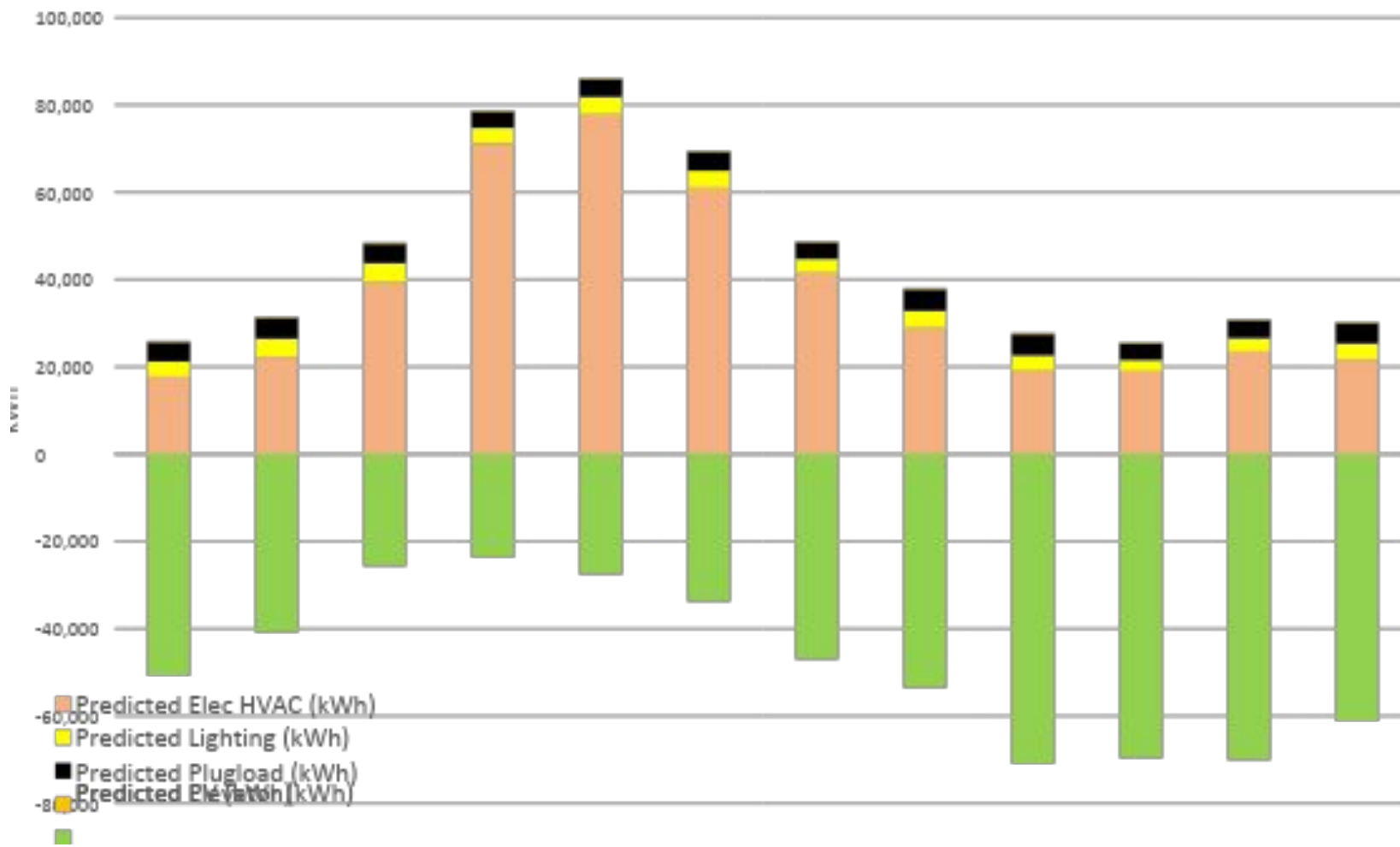
August PV Daily



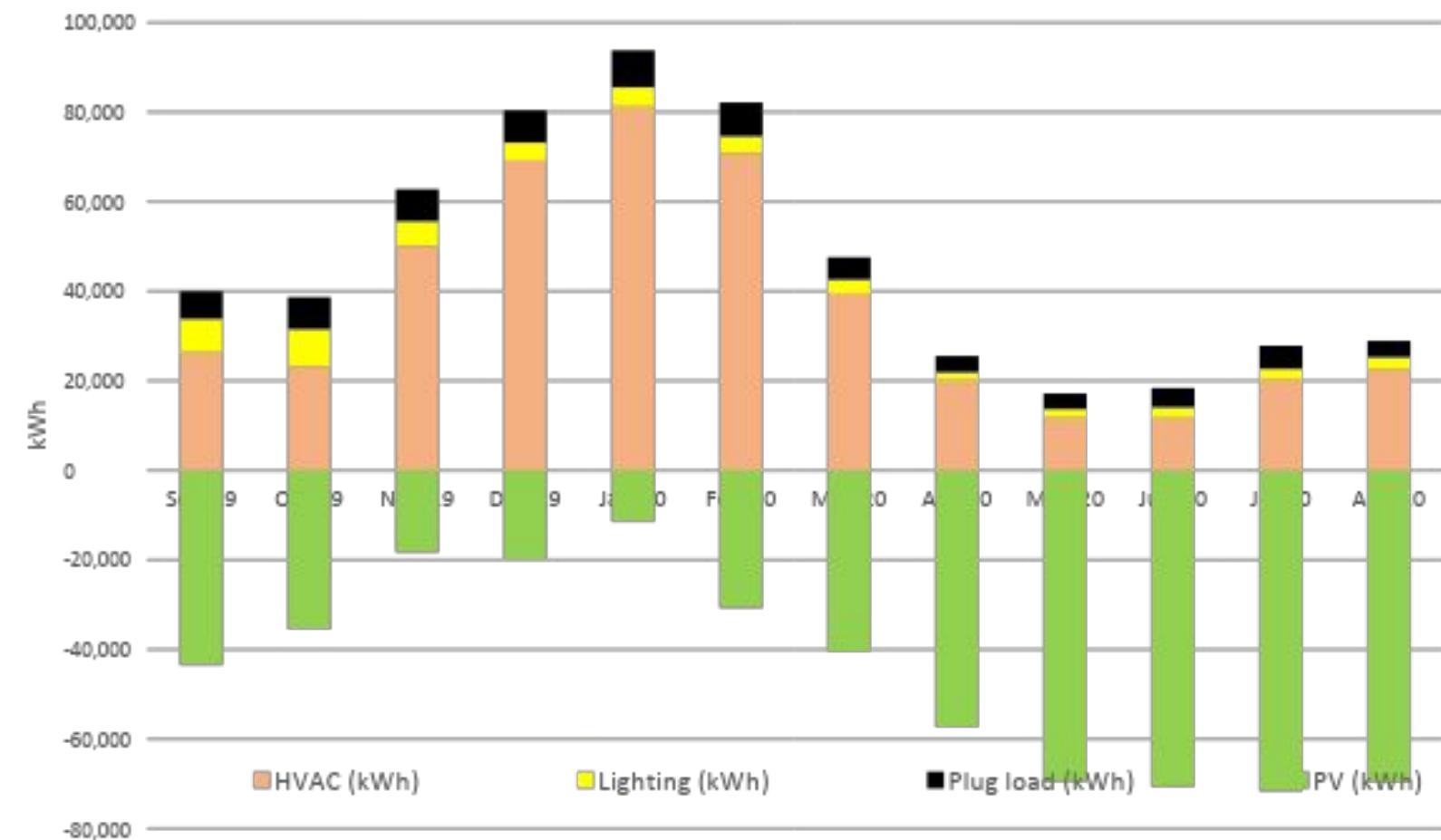
Net Zero Energy Buildings are Built on PREDICTED Models



Annual Predicted Performance



Annual Actual Performance



Lessons Learned on Delivering Net Zero Energy



M & V

- Energy model assumptions and equipment performance parameters don't always sync.
- Commissioning is key. And recommissioning.
- Net Zero is a **VERB**. In a performance period, you can't afford to adjust and wait for 30 days of results.
- Someone must be tasked with monitoring all the systems frequently.
- Problems are best solved with integrated team approach.

Operation

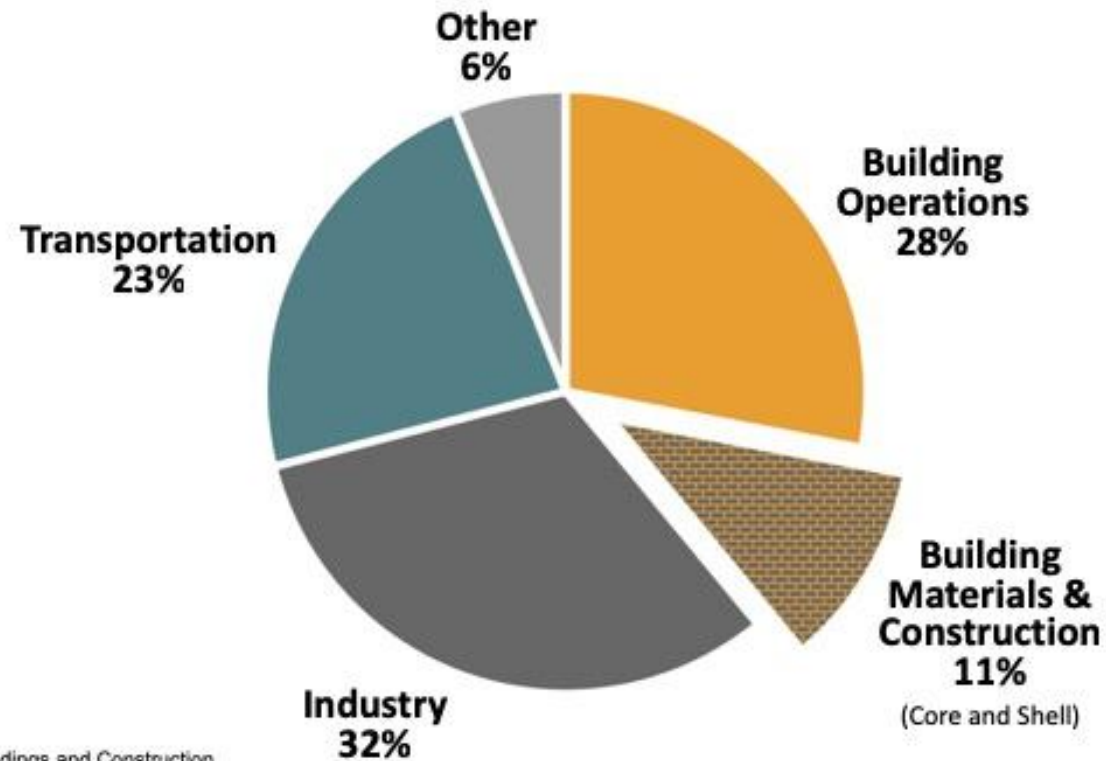
- Use the warranty period to keep trade contractors and equipment manufacturers engaged.
- The weather is going to be different than the weather model files.
- It's not always the weather. But you will become very weather conscious.
- Explore the comfort parameters and see if you can expand the comfort zone.
- If you think it's challenging to be net zero, you're right. So far....because it's a new practice...but shouldn't we apply this scrutiny to all buildings?

Thank You.
Lois Vitt Sale, FAIA, LEED Fellow
lvittsale@wightco.com

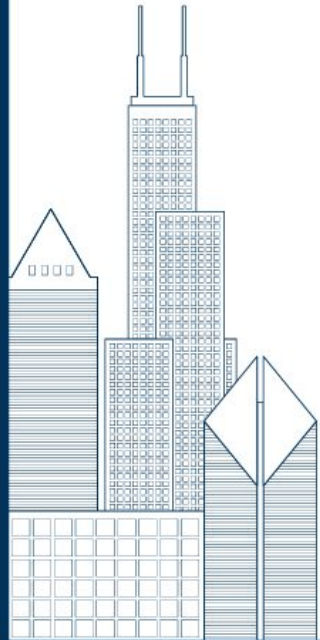


Buildings are the largest source of carbon pollution

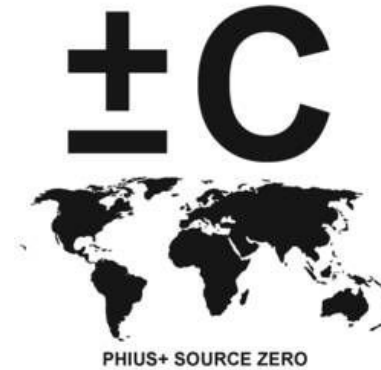
Global CO₂ Emissions by Sector



Source:
Global Alliance for Buildings and Construction.
2018 GLOBAL STATUS REPORT.



Zero Energy or Carbon Ratings / Verifications



- [LEED Zero](#)

[Carbon](#)

- [LEED Zero](#)

[Energy](#)

- [LEED Zero](#)

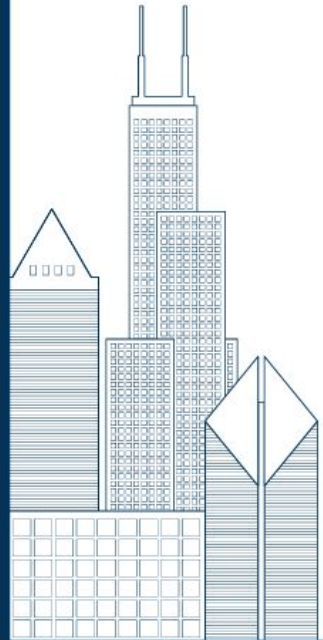
[Water](#)

- [ILFI Zero Energy](#)

- [PHIUS+ Source Zero](#)

- [PHIUS+ Getting to Zero](#)

- [DOE Net Zero Energy Ready Homes](#)



New Buildings Institute Code & Policy Resources

NBI Getting to Zero Buildings Database

Use the filters on the left to filter projects in the map, and/or select a bubble on the map to filter the table below. Click on the **Analysis** tab above to see the big picture and create customized charts.

Reset Filters ↻

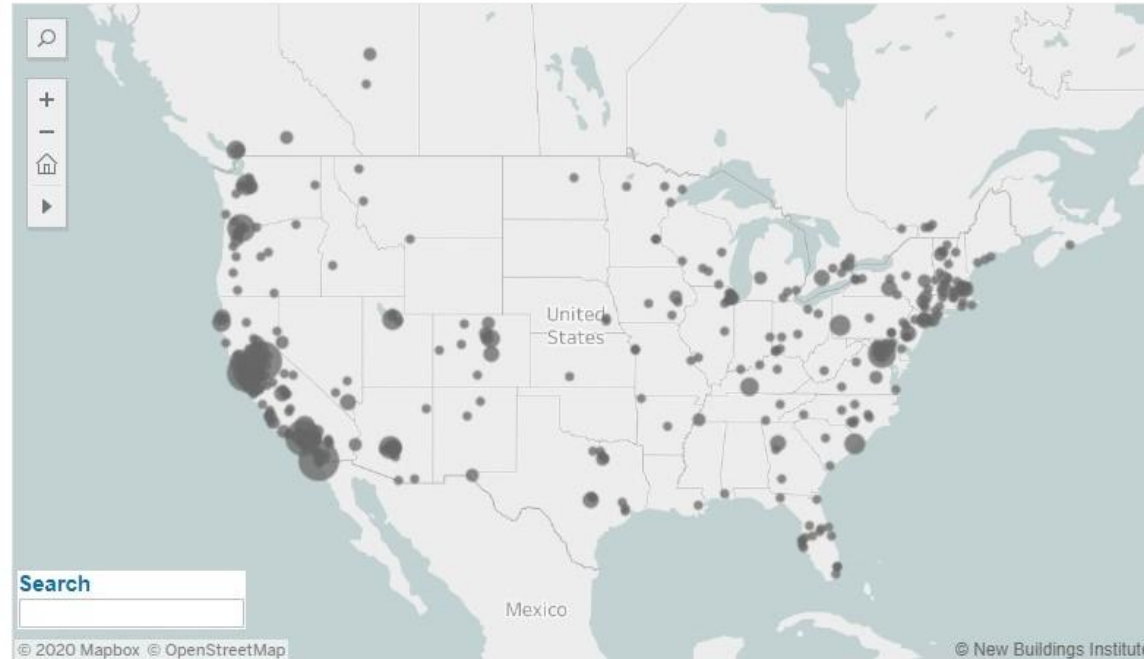
ZE Status	Count
<input checked="" type="checkbox"/> Emerging	523
<input checked="" type="checkbox"/> Verified	126

State or Province

- (All)
- Alabama
- Alberta
- Arizona
- Arkansas
- British Columbia
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

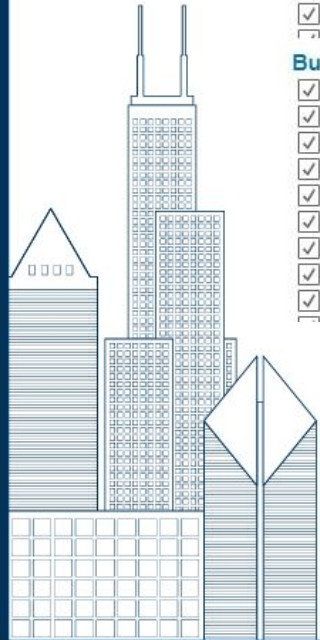
Building Type

- (All)
- Education
- Food Sales
- Food Service
- Health Care (Inpatient)
- Health Care (Outpatient)
- Lodging
- Mercantile (Enclosed a...)
- Mercantile (Retail Other...)



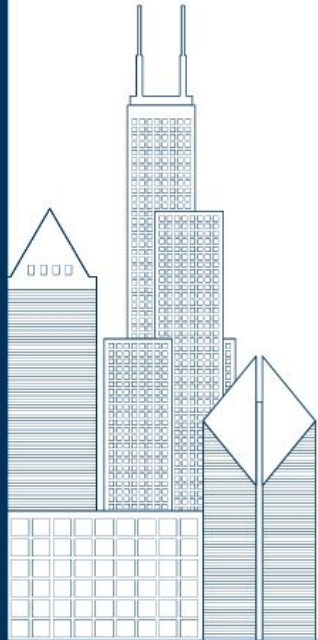
Add to the list:

- Do you know about a low or zero energy building not listed here? Submit the building to the registry.



Illinois Clean Energy Community Foundation

Grantee	Project	Program Areas	Granted	Awarded
Adlai E. Stevenson HSD 125 Lincolnshire, IL Lake County	East Building Addition	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	08/1/2017	\$1,000,000
City of Countryside Elgin Cook County	City of Countryside Site Net Zero Energy Municipal Complex	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	01/22/2018	\$1,000,000
Downers Grove Sanitary District Downers Grove, IL DuPage County	Combined Heat And Power Facilities Phase 2	<ul style="list-style-type: none"> Net Zero Projects Net Zero Waste Water Treatment Plants 	11/1/2016	\$500,000
Granite City Housing Authority Granite City, IL Madison County	Net Zero Energy PHIUS Certified Affordable Housing Residence	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	01/1/2017	\$261,480
Northbrook Park District Northbrook, IL Cook County	Site Net Zero Energy Activities Center at Techny Prairie Park	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	07/22/2019	\$1,776,770
Park District of Oak Park Oak Park, IL Cook County	Site Net Zero Energy Carroll Center Addition and Renovation	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	05/13/2019	\$577,800
Plainfield Park District Plainfield, IL Will County	Bott Park Indoor Recreation Center	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	11/1/2017	\$1,000,000
River Trails School District 26 Mount Prospect, IL Cook County	Park View School Net Zero Energy Renovation	<ul style="list-style-type: none"> Net Zero Projects Net Zero Energy Buildings Net Zero Energy Buildings 	01/27/2020	\$2,000,000





City of Countryside Municipal Complex

First Municipal Net Zero Energy Building in the State of Illinois

Gail Paul, City Administrator

Countryside's Process

Space Needs Analysis

- 32,000 Sq. ft. for joint facility
- 52 staff parking spaces
- 45 public parking spaces
- Minimum lot size 2.9 acres
- Deficiencies in working spaces
 - Police evidence storage inadequate
 - No evidence processing area
 - Holding cells did not meet IL Department of Corrections Standards
 - Cramped work spaces
 - Lack of storage
 - Inefficient customer flow



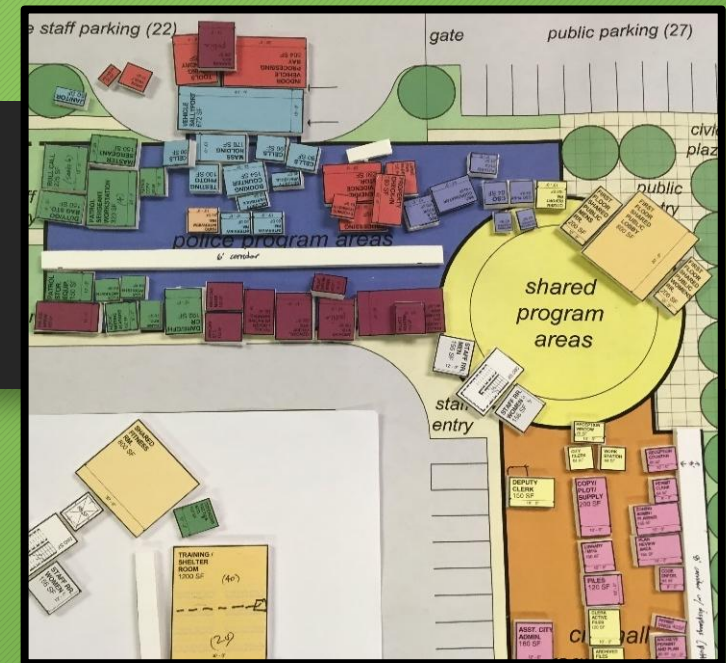
Process Cont.

City Council Sets Goals for Staff

- Purchase property which meets requirements
- Hire an architect with LEED experience
- Design a facility which meets LEED Silver requirements at a minimum
- Appoint a Design Committee
- Determine a financing plan which doesn't raise taxes
- Stay on budget

Process Cont.

- Prepare a RFQ for architectural services
- Selection Committee recommends architect
- City Council approves architect's service agreement
- Decide on construction method (Design-Bid-Build, Design-Build, or Construction Manager)
- Prepare a RFQ for a construction manager "CM" at risk
- City Administrator, City Engineer and Architect recommend CM finalists
- City Council approves CM's contract
- City staff, architect and CM work together through design and construction



Hire Architect

Schematic
Design Phase

Design
Development
Phase

Construction
Documents
Phase

Bidding Phase

Construction
Administration

Major Decisions



HVAC

1. Packaged Variable Air Volume (VAV) Rooftop Units (RTU) with Hot Water Reheat
2. Geothermal Heat Pump VAV Rooftop Units with Hot Water Reheat
3. Distributed Geothermal Heat Pumps with Rooftop Dedicated Outdoor Air System Units



Monitoring & Maintenance

1. There are customized systems which need to be monitored and maintained
2. HVAC system is very complicated with equipment coming from different vendors so no one vendor understands the entire system.
3. A new position was created for a Building Maintenance Technician to start before the equipment was installed.



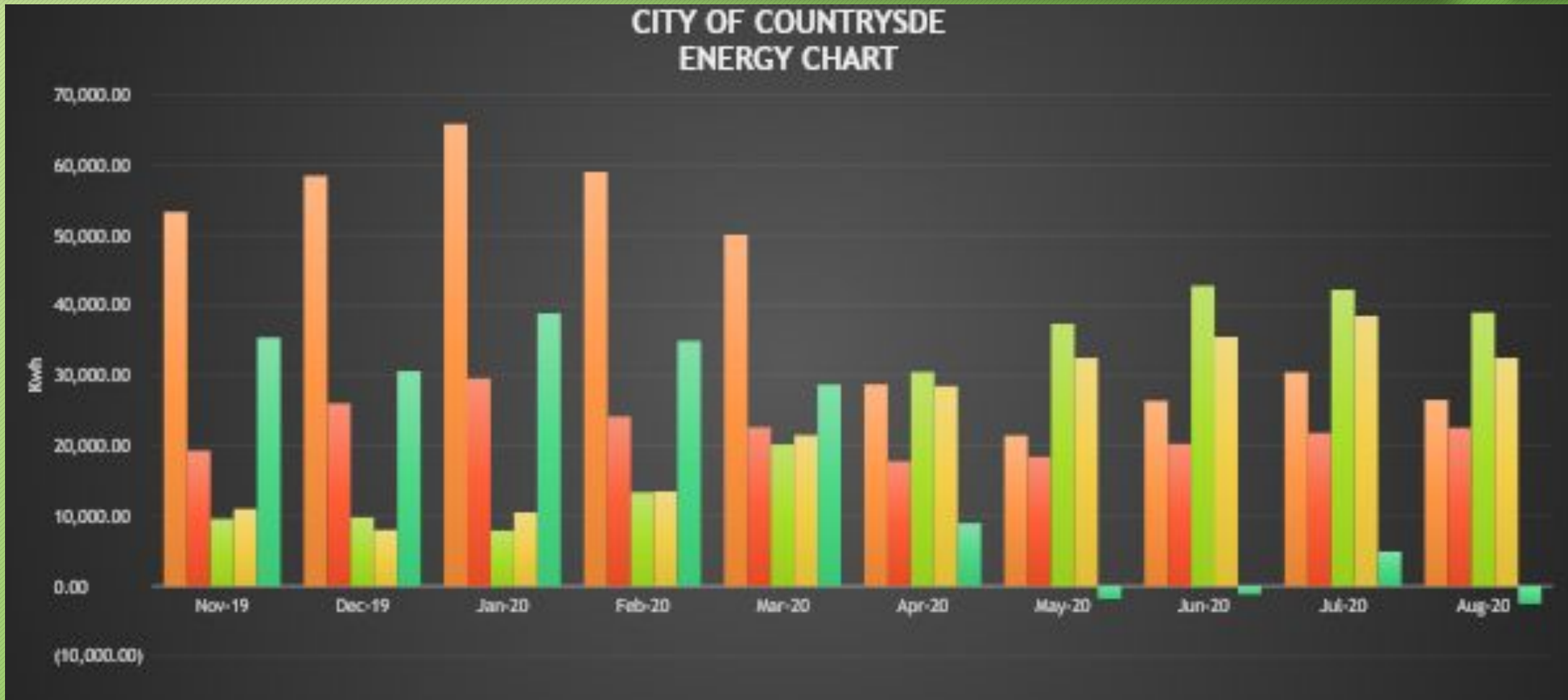
Solar Panels

1. Architect informed the City the models were indicating if we added solar panels we could achieve net zero energy
2. Recommended photovoltaic panels on the roof and car ports
3. City Council gave the go-ahead if grant money could be secured

Net Zero?

Description of Net Zero Work	Initial Estimate	Revised Budget
NET ZERO ALLOWANCE	200,000	-
A&E DESIGN FEES	100,000	61,700
PHOTOVOTAIC PV SYSTEM	700,000	842,615
COMMISSIONING/NET ZERO CONSULTING	IN ABOVE ALLOW	15,400
COMMISSIONING/BUILDING ENCLOSURE	IN ABOVE ALLOW	29,770
TESTING	IN ABOVE ALLOW	-
CM FEES ON NET ZERO CONSTRUCTION	IN ABOVE ALLOW	61,976
HEAT PUMPS/ENERGY RECOVERY/GEOTHERMAL SYSTEMS	495,000	-
GEOTHERMAL WELLS	-	242,111
HVAC (HYBRID GEOTHERMAL VS. CONVENTIONAL)	-	252,889
NET ZERO - D.V. & S. (CM at Risk)	-	100,000
WATERPROOFING/AIR BARRIER	-	280,350
SLIP SHEET/MOCK UP	-	35,000
MASONRY/STONE ON MOCKUPS	-	40,000
GENERAL TRADES ON MOCK UPS	-	5,500
ELECTRICAL TRACTION PREMIUM	-	37,000
INSULATION/FRAMING ON MOCKUPS	-	20,500
TOTAL NET ZERO COSTS	1,495,000	2,024,811

Monitoring & Reporting





“I am extremely proud that our new municipal complex has been designed as a Net Zero Energy building and has been awarded LEED Gold Certification. This clearly demonstrates the commitment the City of Countryside has made to protecting our environment and mitigating the impact of climate change.”
~ Mayor Sean R. McDermott

Gail Paul, City Administrator
gpaul@countryside-il.org
708-485-2462

Net Zero Energy Building Program

**GreenTown
Webinar**

9/30/2020

Illinois Clean Energy Community Foundation

- Independent, private charitable organization
- Created in 1999 with an endowment of \$225 million from the Commonwealth Edison Company
- Grants available to local governments and 501c3 charitable organizations within Illinois
- Mission to invest in clean energy development and land preservation through grant programs that:
 - Improve energy efficiency
 - Develop renewable energy resources
 - Protect natural areas & wildlife habitats

Net Zero Energy Building Program

- **Show that NZE buildings are realistic and achievable**
- **Encourage exemplary buildings that bring together beautiful design and careful construction to maximize energy efficiency**
- **Grow the knowledge base on net zero building design, construction, and operation**
- **Educate the public and professionals to help pave the way for shift in the building sector**

Net Zero Energy Building Program

- **Buildings that combine high energy efficiency with on-site renewable energy generation**
- **Achieve net zero energy by generating enough renewable energy to offset total annual energy consumption**
- **Grants are paid incrementally, with full payment contingent on actual net zero building performance**

Net Zero Energy Building Program

Eligibility

- Building located in Illinois
- 501 (c)(3) non-profit organizations
- Local government agencies
- Colleges and universities
- Public schools
- Not yet under construction

Criteria

- Maintain site net-zero performance
- Load-specific building performance monitoring
- Have a strong educational component
- Provide public access to building
- New construction or retrofit
- Obtain PHIUS+ or ILFI LBC certification

Funding

Up to \$2,000,000

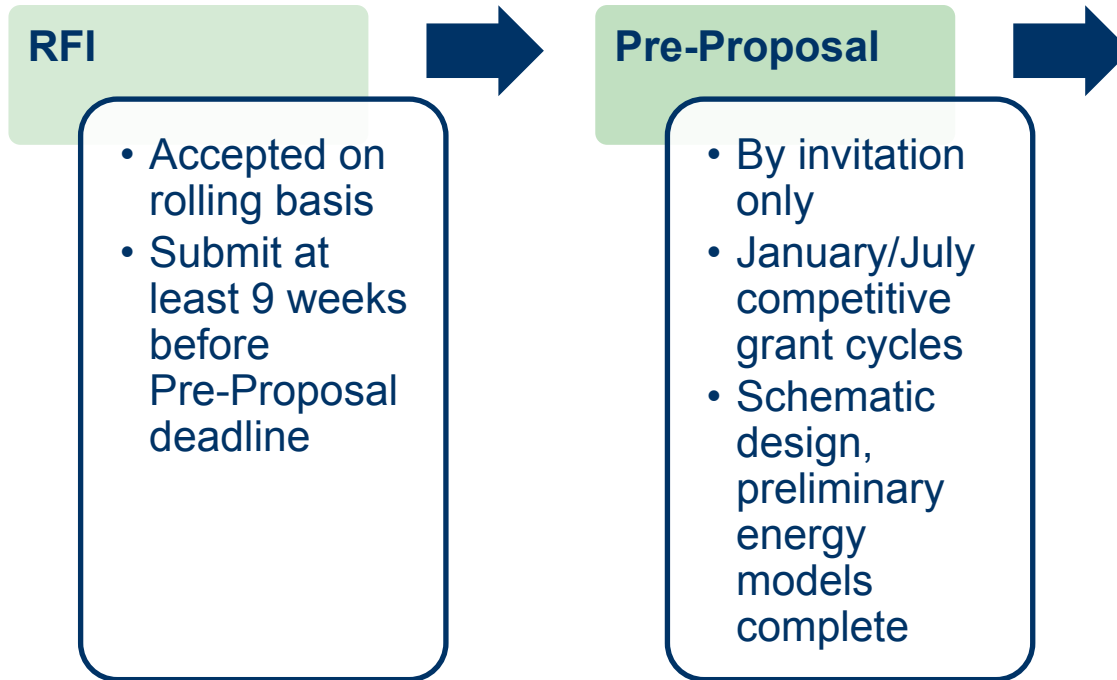
Grant Application Process

RFI

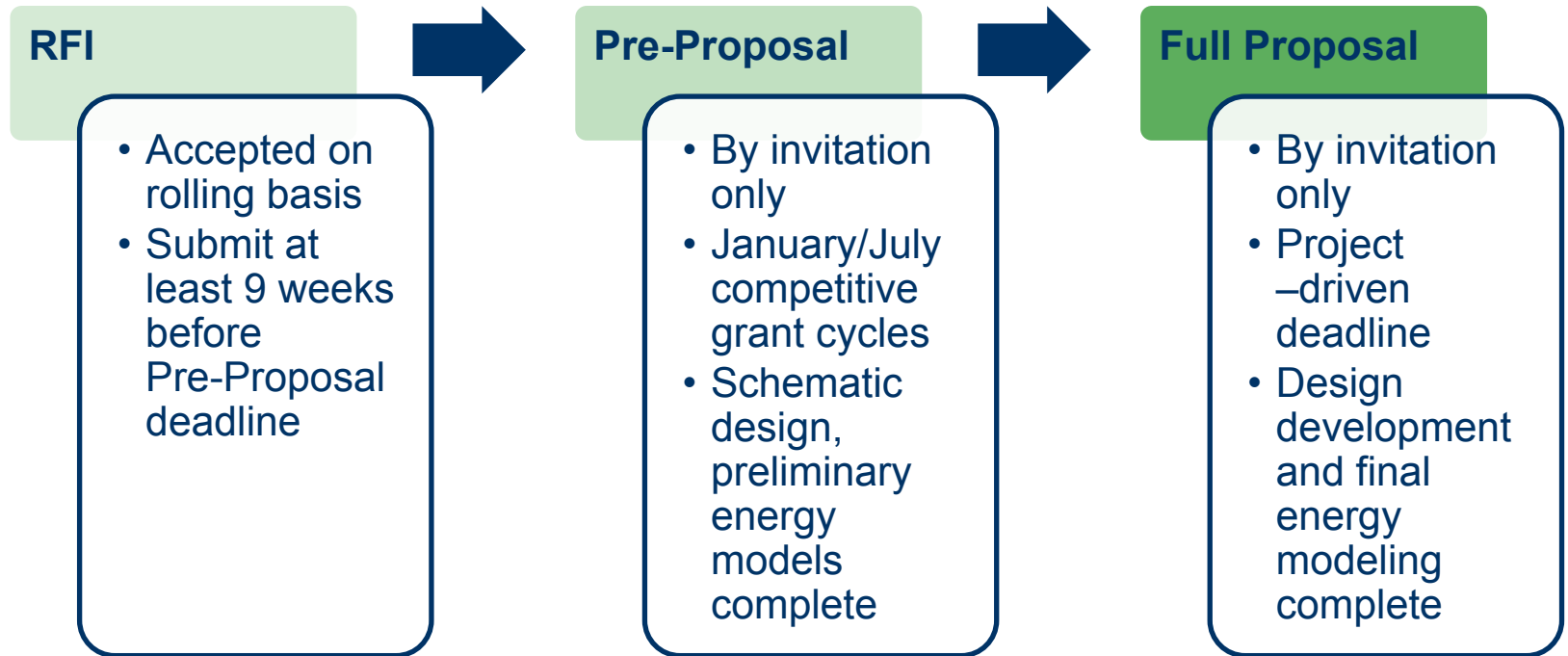


- Accepted on rolling basis
- Submit at least 9 weeks before Pre-Proposal deadline

Grant Application Process



Grant Application Process



Grant Payment and Reporting

Construction



- Interim Report and Payment Request #1
- 30% of grant

Grant Payment and Reporting

Construction

- Interim Report and Payment Request #1
- 30% of grant



Occupancy & Data Monitoring

- Interim Report and Payment Request #2
- 30% of grant



Grant Payment and Reporting

Construction

- Interim Report and Payment Request #1
- 30% of grant



Occupancy & Data Monitoring

- Interim Report and Payment Request #2
- 30% of grant



12 Months Net Zero Performance

- Payment Request #3 and Project Completion Report
- 40% of grant

Net Zero Energy Building Program

- **45 Net Zero Energy Requests for Ideas received**
- **6 Projects completed**
- **2 Under construction**
- **10 NZE Projects in the pipeline**

Net Zero Energy Building Program

For program details, please visit:

www.IllinoisCleanEnergy.org

Contact Information

Gabriela Martin

Program Director

Illinois Clean Energy Community Foundation

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Chicago, Illinois 60602

gmartin@illinoiscleanenergy.org

Cook County's Clean Energy Plan

Feasible. Responsible. A model for others.

A Plan for 100% Renewable Electricity
and a Carbon Neutral Footprint for Cook County Buildings
Jamie Meyers, Energy Manager, Cook County

Cook County's Goals

A reduction in carbon emissions by **45%** by **2030**



Achieving carbon neutrality by **2050**



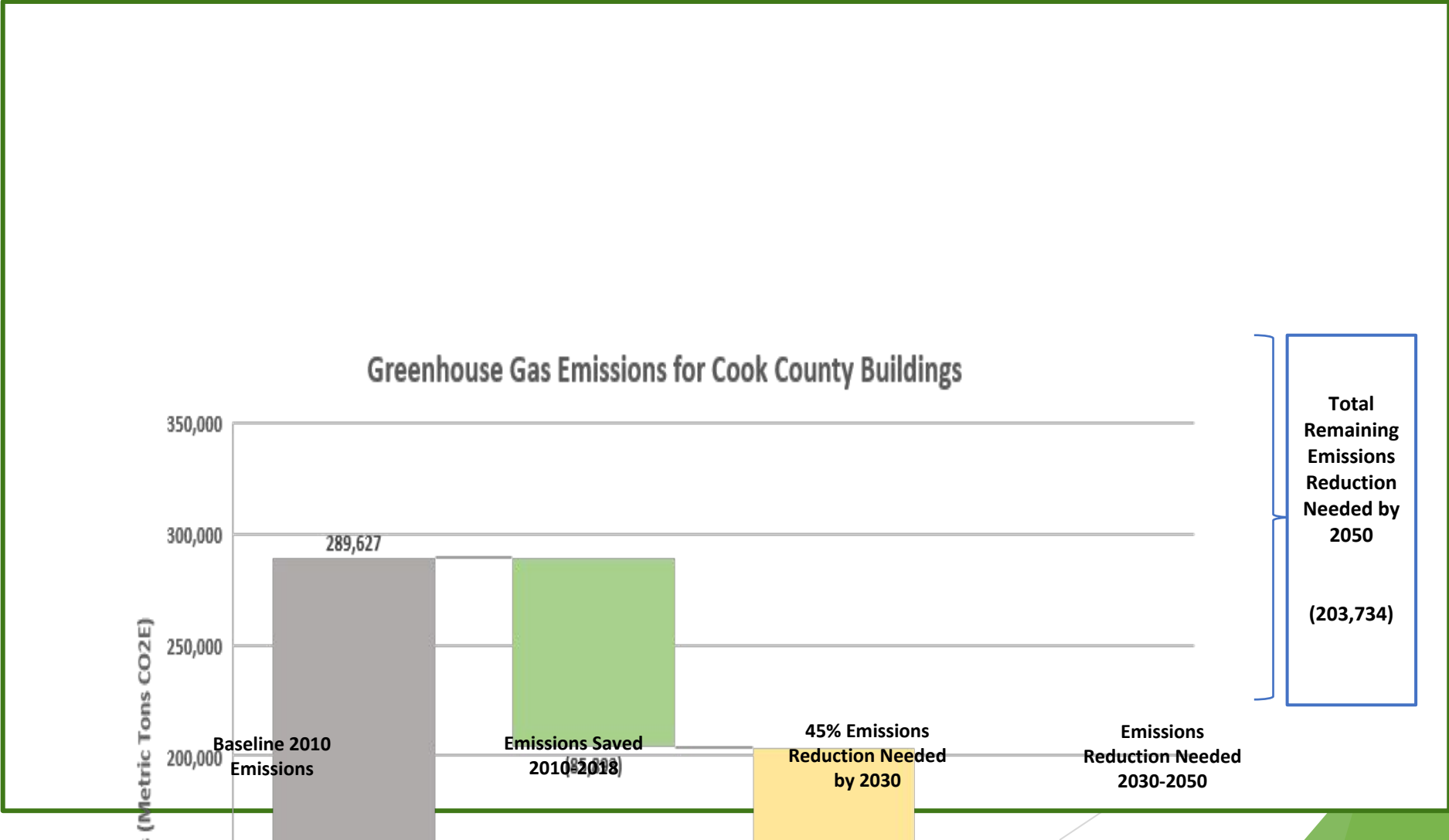
100% renewable electricity by **2030**



- ▶ Goals are based on recommendations from Intergovernmental Panel on Climate Change to avoid the worst impacts of climate change. Baseline is 2010.
- ▶ **Carbon neutral:** The amount of human-produced carbon dioxide equivalent emissions is balanced by clean energy sources.
- ▶ **100% renewable electricity:** Using low- or no-carbon resources including wind, solar, and geothermal for all electricity used in building operations.

Equity: Climate change impacts will affect under-resourced communities and communities of color disproportionately. Solutions that prioritize the needs of under-resourced communities and communities of color are essential.

Greenhouse Gas Emissions: Progress to Date, and Future Action Needed



The Plan Relies Heavily on Familiar Actions



REDUCE: Energy efficient lighting, heating, cooling, plug loads, building envelope etc. The least expensive unit of energy is one you don't use.



MAINTAIN: Monitor energy use through Building Automation Systems, educate employees and building operators and ensure proper maintenance.

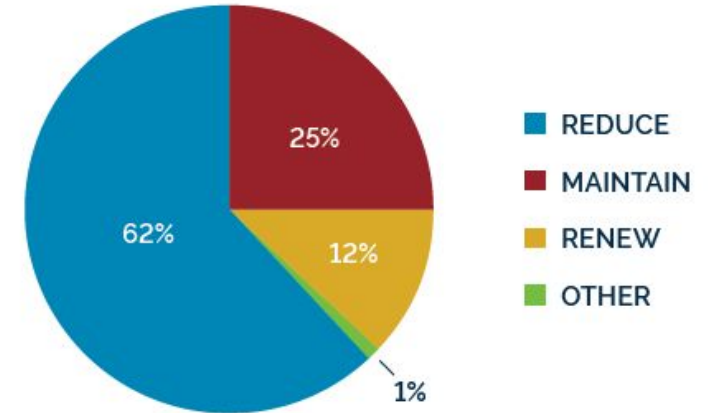


RENEW: Mix of on-site solar, power purchase agreements for offsite solar or wind, or if needed, Renewable Energy Credits. Priority given to local projects that create jobs or help communities.

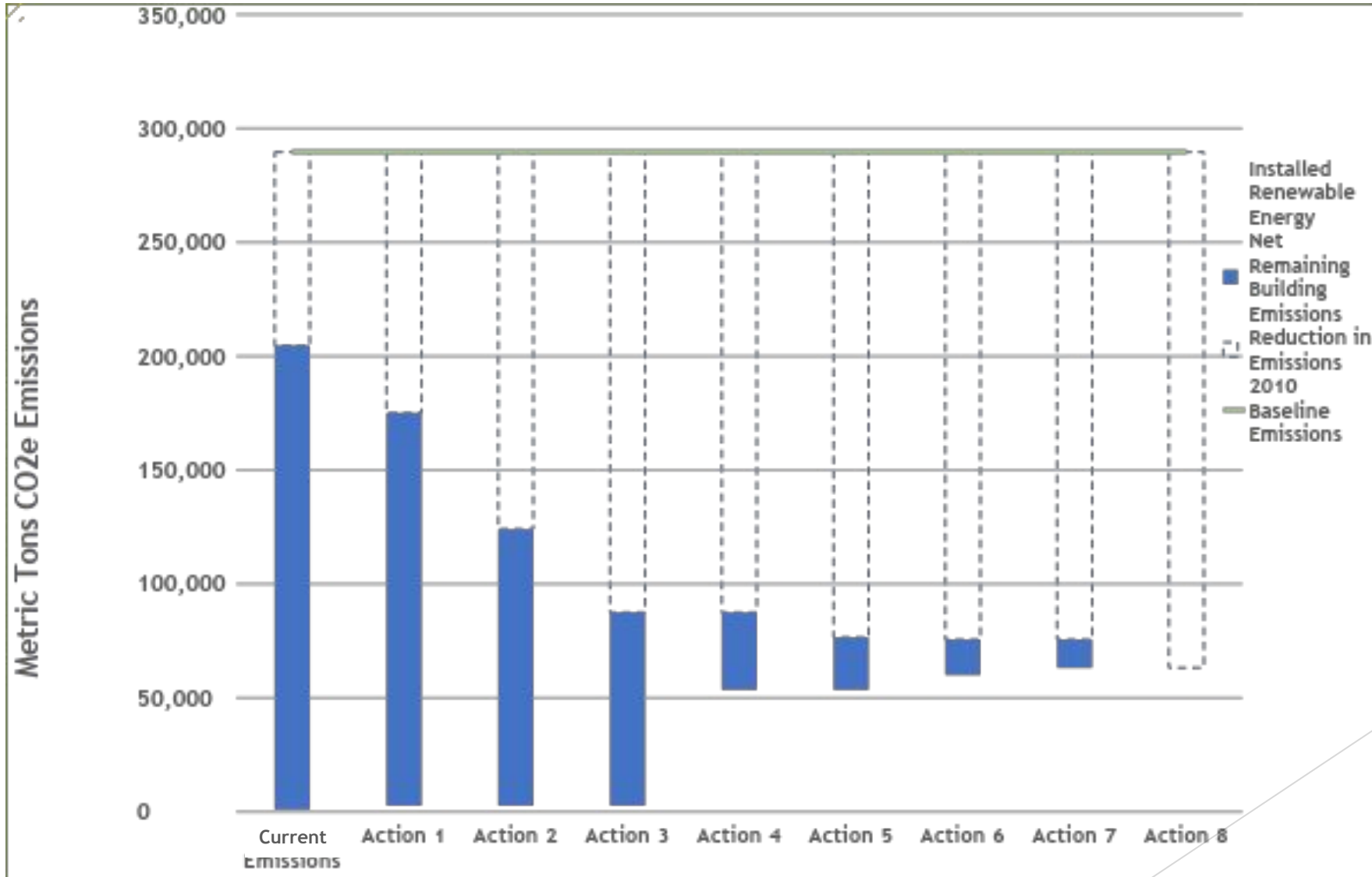


SUPPORT: Policies and procedures to execute the other tracks, such as new building standards, thinking about solar energy potential when buildings are designed, and giving departments incentives to save energy

ESTIMATED IMPACT TOWARD CARBON NEUTRAL



Progress Toward Carbon Neutrality



Action	Specifics
Action 1	Major Building Energy Retrofits, Skokie Solar, Cicero Records Solar
Action 2	Building Automation Systems and Fault Detection Upgrades
Action 3	Next Generation Energy Efficiency Upgrade, Rooftop Solar at Markham, Rolling Meadows, and Bridgeview Courthouses, Employee Behavior Change
Action 4	DOC Redesign
Action 5	Switch mechanical equipment away from natural gas (fossil fuel) to electric when time to replace
Action 6	Portfolio On-site Solar Potential
Action 7	Microgrid
Action 8	Other factors that may reduce emissions

How Action Steps Implement the 4 Tracks

<i>Actions</i>	Reduce	Maintain	Renew	Support
<i>Action 1</i>				
Major Building Retrofits	X	X		
Skokie and Cicero Solar			X	
<i>Action 2</i>				
BAS Upgrades	X	X		
FDD Upgrades	X	X		
<i>Action 3</i>				
Next Generation Energy Efficiency	X	X		
Rolling Meadows, Bridgeview, Markham Solar			X	
Behavior Change	X	X		X
<i>Action 4</i>				
DOC Redesign	X	X	X	
<i>Action 5</i>				
Switch from Natural Gas	X			
Storage	X		X	
<i>Action 6</i>				
Portfolio Rooftop Solar Estimate			X	
<i>Action 7</i>				
Microgrid	X	X	X	
<i>Action 8: Other</i>				
Green Buildings Standards for Capital Projects	X	X	X	X
Performance Based Design for New Construction	X	X		X
Electricity Billed by Department through Submetering for Accountability	X	X		X
Land Acquisition Policy to encourage solar viability for new leased/purchased real estate				X
Greening the Procurement Process				X
Cleaner Grid				X
Property Disposition/Replacement	X			
Offsite Solar Partnerships			X	

Currently Happening

- ▶ Trained Cook County Department of Facilities Management employees on solar installation and upkeep
- ▶ Will issue an RFP for the design and procurement of photovoltaic systems for the Skokie Courthouse, Markham Courthouse and Cicero Warehouse.
- ▶ Published Green Buildings Standards for performance-based design, solar ready buildings and sustainability measures
- ▶ Began in-depth building audits and energy modeling of County facilities

