

Northbrook Park District

Program Area:

Net Zero Program

County:

Cook

Grantee:

Northbrook Park District

Grant Date:

2019

Grant Amount:

\$1,776,770

Location:

Northbrook, IL 60062

Project: Net Zero Energy New Construction

Gross Square Footage: 44,200 sq ft

Delivery Method: Design-Build

Total Cost: \$15,276,608.78

Funding: Northbrook Park District, Illinois Clean Energy Community Foundation

Incremental Net Zero Energy Cost: \$2,018,738

Incremental Net Zero Energy Cost (% of total): 13%

PV Array: 312.4 kW DC

Predicted Annual Energy Consumption: 341,172 kWh

Predicted Annual Energy Generation: 372,185 kWh

Certifications: PHIUS+ Source Zero

Contact: Jake Vest, Trades Manager, jvest@nbparks.org

The Northbrook Park District serves over 34,000 residents and maintains 543 acres of open space. It operates numerous recreational facilities, including the Techny Prairie Activity Center, a newly constructed net zero energy fitness facility.

Techny Prairie Activity Center was specifically engineered to achieve net zero energy. On the consumption side, the building was designed for maximum efficiency. Airtight construction along with high values of Polyisocyanurate insulation and highly efficient heating and cooling equipment maintain building

temperatures. The windows, covering just 16% of the exterior walls, are strategically placed to maximize light as well as sweeping views of the surrounding park. They are high-performance, low-emissivity (low-E) coated windows with triple-pane, argon gas-filled insulated glass. Light-emitting diode (LED) lighting throughout the facility and in the parking lot utilizes light and motion sensors for additional energy savings.

The project uses VRF and DOAS in the offices and administration area, and Air Source Heat Pump RTU in high-volume spaces like the gym. Air Source Heat Pump technology has proven very efficient even when the temperature drops to 0 degrees Fahrenheit. Because there are two big high-volume spaces that use single space RTUs in this project, the utilization of the Air Source Heat Pump is maximized, resulting in increased HVAC energy savings, especially heating.

The building relies on 833 fixed tilt (10 degree) south facing 375 W photovoltaic panels to offset its annual energy consumption. The system has performed as anticipated and the Park District only encountered a few issues with inverters not properly coming up and needing to be reset. This eventually led to the manufacturer writing a patch for the program to solve the issue.

A critical aspect of getting to and maintaining net zero energy performance is careful ongoing monitoring of the facility which is being accomplished through monthly utility analysis, equipment sub-metering, and real-time data analytics. The building controls system is complemented by data analytics software that captures data in real time, analyzes it against past and expected performance, and relays the results to the building operations groups at the District. Staff members are able to make any necessary adjustments and trouble shoot equipment. The BAS is used to check everything from set points to pressures and is also linked to the PV system as well as lighting controls. The BAS has allowed the District to quickly catch issues with units and save a significant amount of energy.

Staff worked very closely with the HVAC contractor, the architect, and the commissioning agent to ensure that all equipment is performing as designed. Through this collaboration, many programming changes were made to the equipment to ensure units are running at maximum efficiency. Some of the programming changes included lowering fan speeds, utilizing demand control ventilation, introducing building optimization for morning warm up and evening shut down as well heating sequencing changes. The robust envelope of the

building results in significantly less heat lost or gained depending on the season than in a traditional facility. This allowed the District to implement overnight shutdown of the facility. Overall, these adjustments resulted in a significant reduction in electrical and gas consumption from their initial settings. The building saw a 92% decrease in natural gas usage in December 2021 compared to gas usage in December 2020 during the early stages of commissioning.

In working with the lighting systems contractor many adjustments were made, including the scheduling of the lighting to completely shut down at night other than the necessary safety lighting. The Park District has increased the use of daylighting. As fixtures sense natural light in a specific area they automatically adjust and lower the fixture lighting. All areas and zones are monitored down to each fixture of the building using the Trellix lighting system allowing for scheduling changes, adjusted occupancy time outs, and lower overall lighting levels to reduce energy consumption both inside and outside the facility. Several sensor issues throughout the commissioning process resulted in the manufacturer needing to reprogram a portion of the lighting system for all data to display properly. Park District staff's constant monitoring and use of the systems highlighted multiple issues that needed to be addressed by manufacturers. Manufacturers were responsive and interested in collaborating to improve systems. Finding these issues and having manufacturers address them helped not only the performance of the Techny Park Activity Center but will be of benefit to many other building owners now and in the future.

Suggestion from Jake Vest: “If you are working towards net zero energy, you need to include your trades and maintenance staff from the very beginning of the mechanical system design. They need to understand from early on that these are different from what you see in a traditional building. Bring them in early so they can learn, ask questions, and train. Also, working with the BAS designer from design, installation, to today has been very important. This is the only way to make sure the BAS best meets our needs and for us to fully understand all the functions of the system and take advantage of the benefits.”

Project Team

Design-Build Firm: Wight & Company

Commissioning and Ongoing Performance Monitoring: Aero Building Solutions

Contractor: Corporate Construction Services

Green Rater: EcoAchievers

Link to building data

<https://www.nbfitness.org/net-zero/#annualusagegeneration>

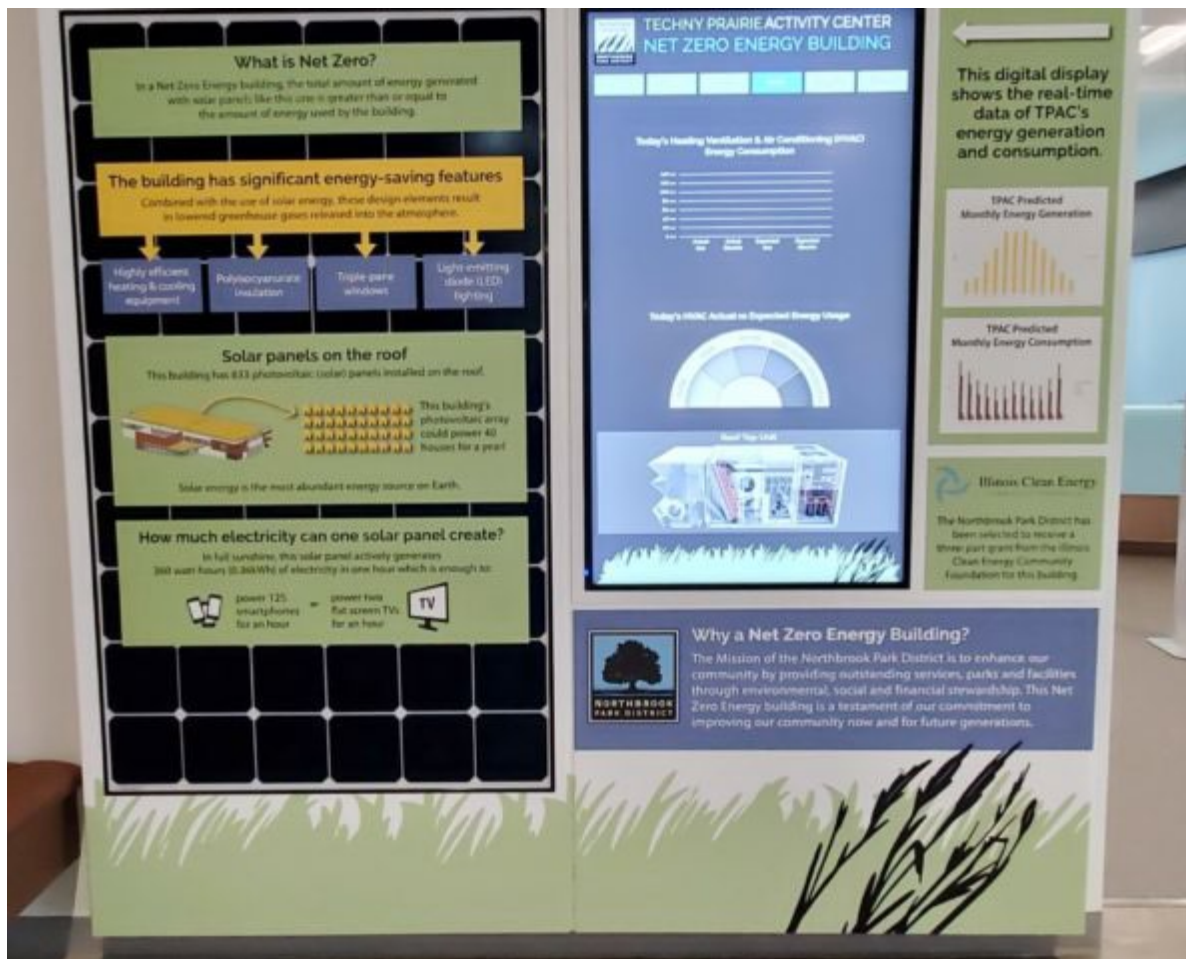


Photo: Northbrook Park District



Photo: Northbrook Park District

ENERGY SAVING FEATURES

Insulation

An insulating material that slows the transfer of heat flow is measured or rated in terms of its thermal resistance or R-value. The higher the R-value, the greater the insulating effectiveness.

Highly Efficient HVAC
R-60 Roof insulation
R-34 Exterior wall insulation
R-40 Interior wall and ceiling insulation

Airtight Construction

Highly airtight construction prevents hot fresh air from escaping and through the highly efficient heating system and the conditioning system. Airtightness allows a system to operate more efficiently.

Windows

Windows are the weakest link in a building's energy envelope. Windows on this building are highly energy efficient. They have a low U-factor and low solar heat gain coefficient (SHGC). They also have a low air leakage rate, which helps reduce energy consumption.

SAMPLE WINDOW

This is a high-performance, low-emissivity (low-E) coated window with triple-pane, argon gas-filled insulated glass and a thermally-resistant frame of fiberglass.

The low-E coating reflects heat in the summer and retains heat in the winter.

Invisible to the human eye and thinner than a strand of hair, the coating minimizes heat transfer and blocks UV rays while allowing light to pass through.

These coated windows act like sunglasses, protecting the building from excessive sunlight.

SAMPLE INSULATION

Polystyrene (PAH-lee-EE-so-SIGH-ahm-ur-ate), often referred to as Styrofoam, is a rigid plastic foam used for thermal insulation.

Insulation like the five inch sample shown here helps the building stay warm in the winter and cool in the summer.

All the TRAC...
 walls...

Photo: Northbrook Park District



Photo: Wight & Company



Photo: Northbrook Park District



Photo: Wight & Company



Photo: Wight & Company