GRACELAND & HOLABIRD SCHOOLS

Net Zero Energy Schools Case Study

OVERVIEW

Baltimore City Public Schools is home to two Net Zero Energy (NZE) schools: Graceland Park/O'Donnell Heights Elementary/Middle School and Holabird Academy. These identical 94,000 square foot schools were designed to serve 604 students each in pre-kindergarten through 8th grade. Funding was provided in part by $5 million in grants from the Maryland Energy Administration's Maryland Net Zero Energy Schools Program.

The main entry of each school features a solar canopy and unique daylighting design.

TIMELINE

The planning and grant application process for the schools started in 2013, nearly a decade before their scheduled opening. Baltimore City Public Schools wanted to replace the two aging schools with state of the art sustainable prototypes for 21st century learning. With the approval of a $35 million construction budget, building commenced in 2018 and the schools were ready to greet students, staff, and faculty for the start of the school year in Fall 2020. The schools reached their full capacity in Fall 2021 filling with 604 exuberant students per school, ready to enliven the long-planned halls and spaces. From initial concept to realized vision, the completion of the schools marked the culmination of years of preparation to serve area families.

HIGHLIGHTS

As among the first urban net zero energy schools in the U.S., these schools provide a national model for equitable access to sustainability.

- *Construction cost in line with "traditional" new construction costs*
- *Site Energy Use Intensity less than 25 kBtu/gsf*
- *523 kW of Solar Energy generates more power than consumed*
- *Hands-on sustainability integrated in the curriculum through interactive features and living lab approach*

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DESIGN FEATURES

- Optimal building orientation for solar exposure
- 1,000 + Solar PV panels on each roof (523 kW system)
- Closed Loop geothermal well system for HVAC
- High efficiency LEDs (0.5w per gsf)
- Low flow plumbing
- Insulating concrete form (ICF) exterior envelope walls
- Low Leakage, high performance windows
- CO2 monitoring and demand control ventilation
- High indoor air quality through material selection
- Weather station, green roof, and gardens for curriculum
- Window cutaways allowing students to view insulation and systems

WHAT NZE SCHOOLS LOOK LIKE

The schools' sustainable designs are prominently displayed so that the community can learn about features like the geothermal system visible through the window, the cut-away wall exposing the different insulation materials, and the exterior rainwater collection system pictured from left to right below.

Educational signage around the school grounds gives community members a brief overview of various sustainable features, explaining what they are, why they promote sustainability, and providing QR codes to learn more. Pictured left to right above are: solar panels mounted on a green roof to generate renewable energy, the inverters that convert the solar power to usable AC electricity, and an example of the informative signage itself.

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KEY PERFORMANCE INDICATORS

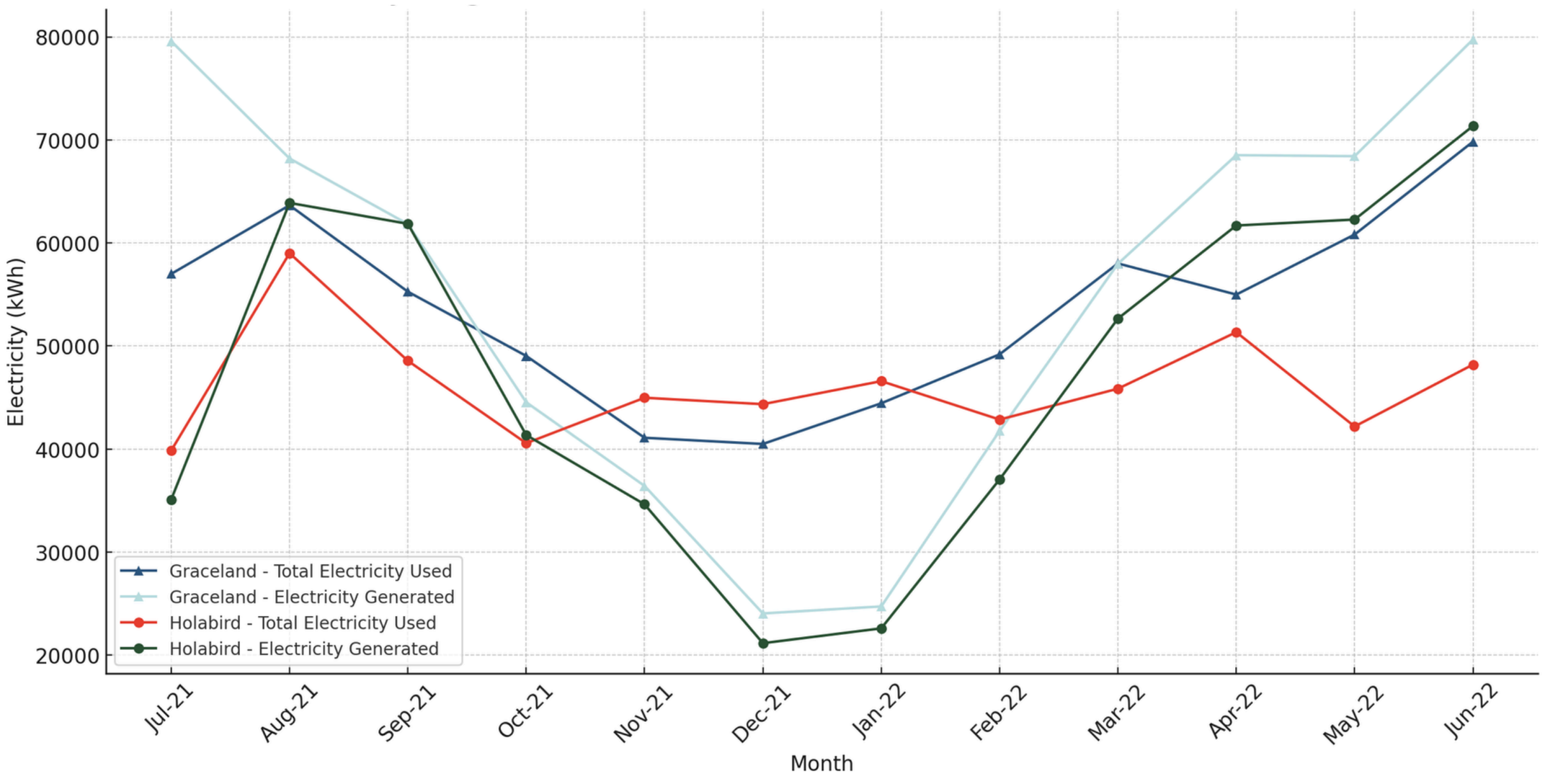
- LEED Platinum Certified
- Zero Energy Certified
- Reduced Energy Use
- Reduced GHG Emissions
- Cost effective design and construction

300% less energy used per square foot (EUI) than the average school

195 metric tons of CO2 equivalent avoided each year

Construction costs of approximately $360 per square foot compared to the average Maryland school cost of $405 per square foot (for 2021)

523 kW Solar Photovoltaic Systems of renewable energy



Monthly Comparison of Electricity Usage and Generation: This chart presents a side-by-side comparison of electricity usage and generation for Graceland (marked with triangles) and Holabird (marked with dots) from July 2021 to June 2022.The chart illustrates the variations in electricity dynamics, highlighting the balance between consumption and sustainable energy production in both buildings across different months.