

# An Innovative Solution for Sandy Grove Middle School

Hoke County in southeastern North Carolina is a high-growth, low-wealth county. Its population grew 40% between 2000 and 2010 and continues to grow. The county commissioners knew it would not be long before their schools began to swell with students, especially the two existing middle schools. Their biggest challenge was finding a way to fund the construction and operation of a new school.

The solution for long-term operational costs was to build a new school that would operate as a net zero energy facility. The building would be designed and constructed to be highly energy-efficient, and a rooftop solar energy system would generate the electricity needed to power the building. The solution for shorter-term construction costs came in the form of a public-private partnership with FirstFloor K12 Solutions (FirstFloor).

## Challenge

Sandy Grove Middle School first welcomed its 650 students for the 2013–2014 school year. The 2,358 rooftop solar panels began supplying energy for the building, and the building systems were expected to keep the energy demand low. As the school year unfolded, however, it became clear that the building systems were not performing as designed. The energy use was well above the projected consumption and demand.

The mechanical contractor was unable to pinpoint where the problems were within the system. As Robbie Ferris, Manager at FirstFloor, explains, “We needed high-level insight into the systems to be able to optimize their operations. Because we really weren’t getting good operating data, we were not able to drive energy consumption down to design specs.”

*“We are able to upgrade many of our older schools and provide better learning environments in our buildings.”*

Mr. Ferris knew of Brady’s reputation for innovation and expertise in optimizing system performance. He reached out to Brady and invited them to meet with FirstFloor and school officials. Dr. Freddie Williamson, Superintendent of Schools, describes their criteria for engaging a firm to address the energy issues. “We needed someone with a proven



history of performance and credibility, and someone who could earn our trust. We are a high poverty district, so we can only spend the money once. After the presentation, it was clear Brady met our needs and earned our trust.”

## Solution

Brady connected an advanced analytics platform to the building control system. The platform continuously collects and mines the system data for operating parameters, set points, and performance issues at each piece of equipment.

The data revealed several energy-guzzling problems within the system:

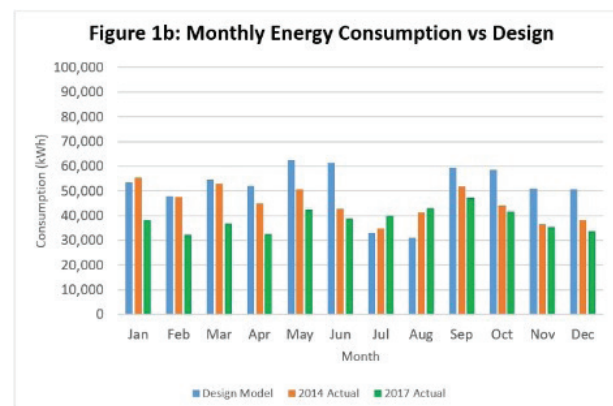
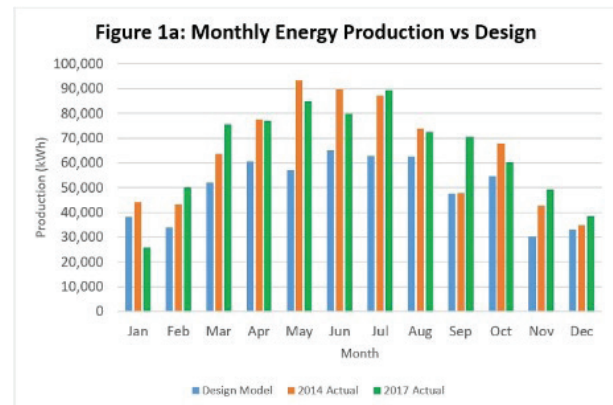
- The outside air systems were running excessively after occupied hours.
- Several water source heat pumps (WSHP) were stuck in “occupied” mode, meaning it was operating even during unoccupied hours.
- The occupied and unoccupied heating/cooling set points for several WSHPs had been improperly adjusted, leading to excess heating/cooling load and unit operation.
- Maintenance teams lacked visibility into operational issues when the building was unoccupied due to lack of access to 24/7 system data.

Brady used the vast amount of detailed data gathered by the platform to identify and correct these and other system problems. They also used the data to identify ways in which the system could be made even more efficient than designed, such as:

- Optimizing morning startup schedules to minimize electrical demand.
- Improving control of the geothermal pumping system.
- Maximizing electricity production by the solar energy system.

These custom modifications resulted in the solar energy system **producing more energy** than originally designed, and the building **using less**

**energy** than designed. Figures 1a and 1b detail the optimized vs. designed monthly energy production and monthly energy consumption.



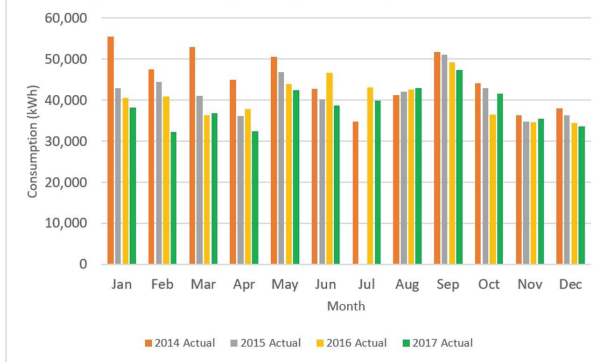
## Results

The improvements achieved by Brady in both energy production and energy demand transformed Sandy Grove Middle School from a **net zero energy facility** to a **net positive energy facility**. In fact, the school has the honor and pride of being the first net positive energy, LEED Gold-certified school in North Carolina.

The improvements were realized within the first few months, and the facility’s energy efficiency and performance have continued to improve since then. Figure 2 shows the monthly energy consumption improvements throughout the years 2014–2017.

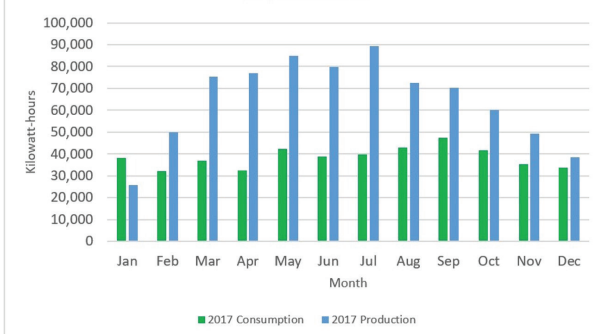


**Figure 2: Monthly Energy Consumption 2014-2017**



Brady's proven process has shown proven results as evidenced by years of continued optimization and sustained performance. As a result, Sandy Grove Middle School now produces 60% more energy than it consumes, as detailed by the data in Figure 3.

**Figure 3: Monthly Energy Consumption vs Production**



All of these achievements mean that Sandy Grove Middle School has almost no electric bill to pay. This alone will provide a savings of \$16 million in energy costs over the next several decades. The Hoke County School District is putting the savings to good use. As Dr. Williamson reports, "We are able to upgrade many of our older schools and provide better learning environments in our buildings."

Sandy Grove Middle School provides their rural county with a world-class learning environment and sustainable energy facility. The improvements at Sandy Grove are also possible for a panorama of facility types.

Brady uses their expertise and innovation to address each facility using a site-specific, data-focused approach. Beginning on day one, they strive to gather all available data to conduct detailed evaluations of the condition, operation, and efficiency of the built environment. From there, Brady develops improvement programs working with facility staff to select and implement the measures and systems that best fit the specific objectives related to your building, your business, and your budget.

Brady—the smart choice for building system health and performance.

