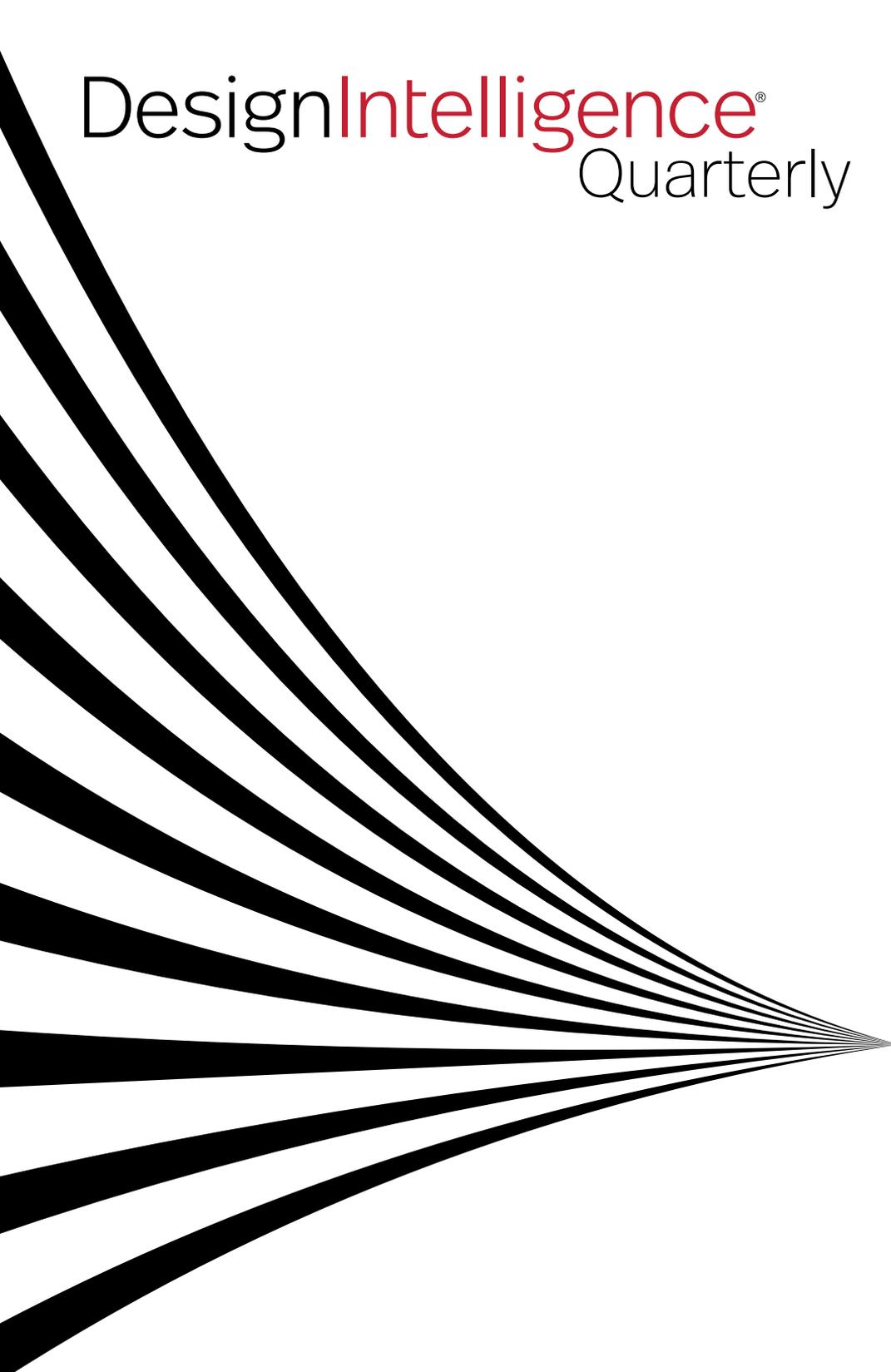


# DesignIntelligence® Quarterly



Q3 2017

## Is Zero Energy Achievable within Budget?

The cost to achieve Zero Energy has declined dramatically over the last decade. With the advancement of energy reduction strategies and the reduction of solar PV costs, the Zero Energy goal has finally become obtainable within a standard budget. The first point to understand is that reaching a goal of Zero Energy is a process—not an add-on to the budget. Second, setting a Zero Energy goal as a priority from the beginning of the design process is key to achieving a Zero Energy building within the budget parameters.

TONY HANS

In 2007, CMTA designed the first Zero Energy educational building in the U.S. and has since designed over 1,300,000 sf of Zero Energy buildings. However, in three recent projects Zero Energy was achieved without added costs to the budget *including the renewables*. All three projects had the following similarities:

- First, the owner created project budgets from similar previous project costs and set a sustainability goal (LEED Silver). The projects appeared to have standard budgets and goals.
- Second, the project Request for Proposal (RFP) showed that energy efficiency achieved in budget was desirable. Often the owner even went on to give priority to project proposals with drastic

energy reduction techniques or teams with energy efficiency expertise.

- Finally, a portion of the selection process or scoring of the project proposals gave added incentive for teams to achieve Zero Energy. Zero Energy expertise was either a portion of the selection interviews or, in the case of the design/bid example, the Zero Energy betterment option was later cited as a team differentiator.

Including energy efficiency and/or Zero Energy in the project goals pushed Zero Energy up on the priority list. In two of the examples discussed in this article the goal of zero energy wasn't fully seen as achievable within budget until after bids were received. The third project was a design/build project for a major metropolitan area.

The city noted in the project award letter that the proposed betterment option of Zero Energy was “one of the highest achievable sustainable initiatives” and was one of the five reasons the project was awarded to the successful team. The project was also under budget and hit all the compulsory requirements of the Request for Proposals.

Collaboration between the design team and the owner was an important factor in these projects achieving Zero Energy with the stipulated budget.

- **Discovery Elementary School**

98,000 sf new elementary school designed by VMDO Architects in Charlottesville, Virginia for Arlington Public Schools. The project had a strong focus on designing for learning and received an AIA COTE Award in 2017. The committee commented, “This project gives students the opportunity to enjoy hands-on learning around energy efficiency and generation.”

- **Cincinnati District Three Police Station**

Design/build project with a typical two-stage selection process. An extremely collaborative design and construction team was led by Messer Construction and emersionDESIGN. The project RFP called for an emphasis on reducing the operations and maintenance costs of the facility while staying in budget. A betterment option of going Zero Energy was discussed by the team, but many did not feel it was financially achievable. A modeled drastic energy reduction resulted in the PV array included in the owner’s budget.

- **Raleigh County Elementary School**

The West Virginia School Board Administration visited Zero Energy schools in other states, but with very tight budgets and an emphasis on energy and operational cost reductions without additional first costs, Zero Energy did not seem achievable. OWPR Architects had achieved great sustainability goals in past projects but wanted to design an elementary school that was Zero Energy Ready by reducing energy consumption to a 70 percent level but stopping short of providing the renewables. When the project bid under budget, the team stepped up to make Zero Energy a reality.

The following steps to Zero Energy and achieved metrics by each project also tell the story. Sizing of the renewable energy solution is directly proportional to the amount of energy savings achieved.

First, an intense energy study on all aspects of energy consuming components of the building results in a successful energy reduction. If significant energy reduction is achieved then the amount of renewable energy is reduced.

Second, continuity between the original energy goals, the design team and operation and verification of the post-occupancy energy consumption is key to successful energy reduction. This continuity helps ensure the goal is prioritized and verified throughout the process. A valid energy model is also critical to setting an achievable goal. Tracking achieved EUIs and the percent difference

between the modeled EUI and achieved EUI ensures confidence in energy performance when compared to a model.

**“The best predictor of future behavior is past behavior.”**

-Mark Twain

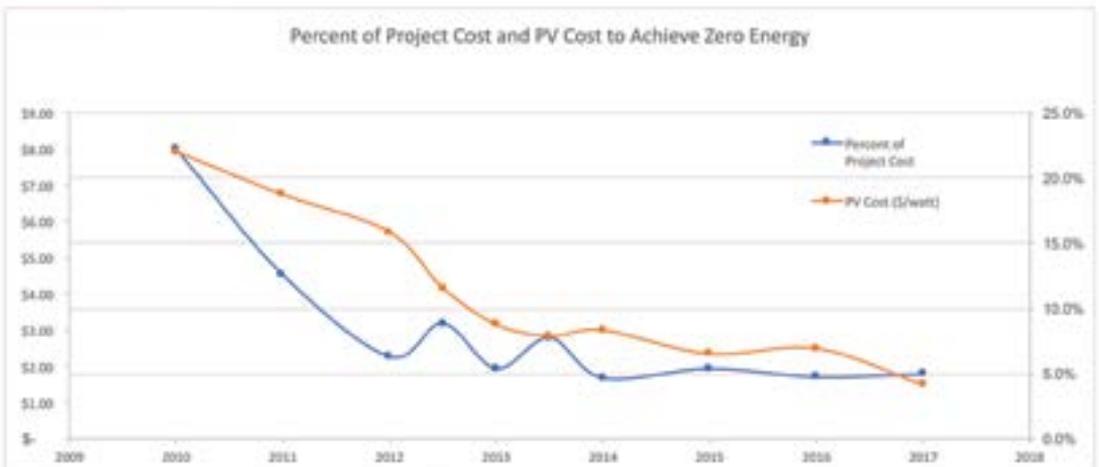
Third, the growing opportunities to maximize energy efficiency and the decreasing costs of renewable energy have helped drastically reduce the percent of project costs associated with the Zero Energy goal from 15 percent of a project a decade ago to most recently 5 percent of the total project. One of the primary factors has been the drastic cost reductions in LED lighting. The rapid adoption of LED lighting is arguably the fastest technology shift ever in the A/E/C industry and has cut lighting power density by up to 50 percent. The increase in energy code requirements has also shaped the market and driven manufacturers to invest in energy reducing equipment. Also, photovoltaic panels and the costs of racking

have decreased steadily. All-in Solar PV costs on Zero Energy projects over the last decade have dropped 74 percent from a whopping \$5.80/watt to most recently \$1.50/watt.

**“Nothing great was ever achieved without enthusiasm.”**

-Ralph Waldo Emerson

Finally, a Zero Energy goal that connects to the vision of the client reprioritizes and protects the goal throughout the design and construction period. Having a vision for a building that includes visible environment stewardship (like solar PV) raises the importance of achieving that goal and protects it from processes like Value Engineering. All building owners have to consider return on investment (ROI). However, the ROI on Zero Energy is tangible (reduced energy bills) and is just as visible as the great view from the corner office or the terrazzo floors in the lobby.



Many Zero Energy buildings also have real time energy monitors that educate occupants and visitors on the sustainability factors of their environment. Some studies maintain that this real-time feedback also helps reduce energy use. In learning environments like K-12 schools these tools connect the owner's Zero Energy goal to the "why" (learning) of the building. The result tied Zero Energy to the "why" of the building in a unique way.

Zero Energy buildings cannot be affordably achieved in large energy users such as data centers, hospitals and restaurants yet, but common commercial, educational and civic buildings have been proven to achieve drastic energy reduction and Zero Energy while maintaining budget.

Tony Hans, PE, LEED AP, RCDD is the national director of sustainable projects for CMTA, Inc. In this capacity, he works with architects and owners to increase the potential of projects to be sustainable. He has worked on the majority of CMTA's Net Zero Energy projects including Richardsville Elementary School, the first Net Zero Energy Public School in the United States. He speaks at many regional and national conferences on the subject of net zero energy buildings.

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