

TOPIC

Understanding
Net-Zero Energy

INDUSTRY

Sustainability



BLACH INDUSTRY INSIGHTS

INTRODUCTION As new green codes and standards are being mandated (CALGreen), and Leadership in Energy and Environmental Design (LEED) and Collaborative for High Performance Schools (CHPS) requirements are fast becoming an industry standard, decision makers are gravitating toward smarter, more environmentally friendly buildings.

As a result, many have adopted or are pursuing a Net-Zero Energy approach. Net-Zero Energy Buildings (NZEBs) are classified as buildings that produce as much or more energy as they use over the course of a year. These buildings are highly energy efficient, meeting their remaining low energy needs with on-site renewable energy.

This brief explores the concept of Net-Zero, its benefits and the potential obstacles associated with its adoption. It will also address some initial steps that administrators and facilities professionals may take toward achieving Net-Zero, as well as provide examples of one school district that is aggressively working toward Net-Zero energy status.

WHY GO NET-ZERO? As a result of increased fossil fuel prices and their usage, which leads to harmful effects on the environment, the Net-Zero-energy design principle is becoming economically feasible to businesses and schools. Net-Zero-energy incorporates the use of renewable energy as a practical means to reduce emissions of greenhouse gases and promote a green image.

The state of California, via the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC), has set a goal of bringing 50 percent of all existing commercial buildings to Net-Zero by 2030 through “deep” energy efficiency retrofits and increased use of clean, renewable energy generation. Now, more than ever, the time is right to consider transforming buildings from energy consumers to energy producers.

SUSTAINABILITY



THE CHALLENGES

- **Cost:** It takes an investment of time and money to achieve Net-Zero, but there are financing options available through such initiatives as Property Assessed Clean Energy (PACE).
- **Making your facility as energy efficient as possible:** This can be a challenge as it takes a good deal of motivation to change occupants' or end users' behavior toward sustainability.
- **Finding the best renewable energy sources:** Identifying the most appropriate energy sources to match your "load profile" (a graph that shows the amount of energy your facility demands over time) requires the knowledge and experience of a professional.
- **Implementing incentives into your program:** Incentives and tax credits available to offset the installed cost of the renewable energy systems are variable in nature. If eligible, securing incentives or rebates such as the California Solar Initiative (CSI) or Self-Generation Incentive Program (SGIP) rebates can be challenging to the inexperienced and busy business owner or school administrator.

THE BENEFITS

- **Reducing your environmental impact:** By cutting down energy usage, specifically the use of fossil fuels, building users may drastically reduce the carbon footprint of their facilities. This may also function as a marketing tool, drawing positive attention from customers and the community. NZEBs can also be more easily "LEED certified" by the USGBC, should owners and districts elect to pursue additional certification.
- **Minimizing dependence on the electricity grid:** Through the use of energy-efficient technologies and with the installation of renewable energy solutions on-site, a facility will rely less on the electricity grid and more on its own on-site renewable energy systems. In most cases, it is possible to direct unused energy back into the grid, providing the user with [energy credits that can be utilized to offset periods when the renewable energy systems can't generate their rated capacity](#).
- **Improving perceptions:** A facility pursuing Net-Zero will generate positive publicity through signage and education and may increase business or student enrollment.
- **Reducing operating and maintenance costs:** Installing more energy-efficient equipment within your building and its systems will cut back energy consumption and improve efficiency.

- **Saving money:** In the long term, Net-Zero facilities will produce as much energy as they consume, reducing costs and dependence on traditional energy providers. In addition, installation of renewable energy systems makes facilities eligible for rebates and incentives from such bodies as the California Solar Initiative (CSI) or Self-Generation Incentive Program (SGIP), offsetting the cost of installation.

YOUR INITIAL STEPS

- **Contact your energy provider:** Ask your energy provider for a “load profile” and report on your total energy consumption. They will also help you identify which rebates and incentives are available to help offset the installed costs of the proposed upgrades.
- **Analyze your energy use:** Evaluate the current energy use of your facility utilizing tools such as the EnergyStar “Portfolio Manager.” Utilize energy modeling software services such as EnergyPro, eQUEST or Energy Plus to predict the effects of the proposed energy upgrades and create a life-cycle cost assessment to help guide the decision-making process.
- **Reduce energy consumption:** Look at the bigger picture and make small changes where you can through a modernization program that incorporates HVAC upgrades, lighting retrofits (day lighting and occupancy controls), cool roofs, glazing retrofits, window film installment and more efficient insulation.
- **Install new renewable energy systems:** Please see the following for summaries of solar, fuel cell and wind power.

SOLAR ENERGY As the costs of solar photovoltaic (PV) systems drop and newer designs increase convenience of installation and maintenance, this type of renewable energy is a natural fit for businesses and schools.

Solar PV systems can also serve dual purposes if installed as shade structures in parking lots or as awnings over common areas. Schools are best suited for solar energy systems because their load profiles are compatible and their campuses offer an abundance of rooftop and parking areas. Other commercial, industrial and institutional facilities with available roof space or parking space for shade structures are also good candidates for solar energy.



FUEL CELLS Fuel Cells are another option available to those working toward reducing their environmental impact. In general, a fuel cell generates power by converting the chemical energy from a fuel into electricity through a chemical reaction with oxygen.

Natural gas is known as the most common type of energy used in fuel cells. However, one can elect to pay more to use “biogas” (available from natural gas providers) if they are interested in a truly sustainable, renewable energy solution.

Fuel cells need a continuous source of fuel and oxygen to operate, but can consistently produce electricity as long as the two are supplied. This type of system can also serve as a source of backup power if the electrical grid becomes taxed or unavailable. Combined Heat and Power (CHP) fuel cells can also serve as a source of heat for buildings or hot water heating systems.

Due to the limitations of turning fuel cells off, buildings with constant load profiles throughout the day and night, such as hospitals, universities, data centers and other industrial facilities, are the best fit for this type of energy system.

WIND POWER Generated by the movement of wind through turbines, this type of power is not typically as popular as its solar counterpart due to aesthetic concerns and potential damage to wildlife. In addition, wind turbines must be installed in areas of high wind (NREL Class III or better) to be economically feasible.

Wind power could be a viable option for any type of building that is located in a windy area, whose neighbors accept the potential impact on to wildlife, and a visual impact on the surrounding environment.



Any or all of the above renewable energy options may be considered when trying to achieve Net-Zero. However, it is very important to understand that the sizing and installation of these energy production systems should be considered only after making every effort to reduce the building or facility’s energy usage.

This will not only reduce the carbon footprint associated with the building’s usage and operation, but it will also reduce the size and installed cost of the renewable energy system required to reach Net-Zero.



CASE STUDY EXAMPLE Orchard School, Orchard School District, San Jose, CA

The Orchard School District is recognized for its approach to sustainability and is slowly working towards becoming a Net-Zero energy campus. Specialists at Blach Construction evaluated the school's energy needs and determined that solar energy was the best fit.

Blach worked with the District to reduce its energy usage by upgrading its facilities and installing energy-efficient building systems. Blach's first step was to reduce the District's energy costs by recommissioning and repurposing existing equipment. This reduced the school's energy bill by roughly 15%. The second step was to install more efficient systems, resulting in an additional 10% reduction in energy usage.

Blach installed day lighting systems and controls, HVAC economizers for increased ventilation and "free" cooling, and upgrades to the existing Energy Management System. These system enhancements improved the school's Indoor Environmental Quality (IEQ) and reduced operating costs while creating a more healthy atmosphere and more productive learning environment. In addition to energy efficiency upgrades, the District invested in renewable energy through the placement of solar photovoltaic systems on shade structures.

The District had considered both "Combined Heat and Power" fuel cells (fed by bio-gas) and solar energy, and chose solar because of the campus's fluctuating load profile.

With careful planning using their facilities modernization bond dollars to install renewable energy systems, the District has experienced at least a 25% drop in its energy costs, allowing the savings to be reallocated toward teachers' salaries and educational programs.

In addition to reducing their energy bill, Orchard School was eligible for incentives through the California Solar Initiative (CSI). Blach assisted with the application, which resulted in a \$500,000 rebate for the school over the course of five years. The initial cost of installing the 240 kw solar PV system is estimated to be paid back in 12-15 years, and will eventually offset the school's energy usage by 40%.

The next step is to offset the remaining 60% through installation of shade structures over the rest of the school’s parking lots, eating areas and outdoor amphitheater, further positioning the District closer to its goal of Net-Zero energy.

Alongside its efforts to reach Net-Zero, this school has been recognized by the United States Green Building Council (USGBC) for achieving LEED “Gold” on the recent renovation of its Administration/Library building, the third such public school building in California.