

*A ZNE building produces as much energy as it consumes over the course of a year.*

## Q1 / WHAT IS A ZERO NET ENERGY BUILDING?

A zero net energy building produces as much energy as it consumes over the course of a year. These buildings achieve ZNE first through high levels of energy efficiency and then through the addition of onsite renewable power generation.

## Q2 / ARE ZNE BUILDINGS FEASIBLE?

Yes. While the market share of ZNE buildings is still small, there are numerous examples around the country, built by a variety of design teams and developers, across many different residential and commercial building types.

Zero net energy building projects are located in most U.S. climates. Mild climates—like those in California—certainly help make zero energy buildings more easily achievable, but successful projects have also been completed in the harsher climates of Vermont, Minnesota, Massachusetts, and New York.

ZNE performance is frequently an added feature of LEED Gold and Platinum buildings that already have a strong energy efficiency design.

## Q3 / WHAT ARE THE BENEFITS OF ZNE BUILDINGS?

- ZNE buildings and homes are higher performing, offering superior comfort and healthier places to work and live. Because ZNE buildings use passive strategies such as natural ventilation and daylighting, they are more resilient to the impacts of climate change and are also less vulnerable to the instability of energy prices.
- Homeowners and businesses pay less for energy—money they can spend to grow the company or use for necessities.



DPR Construction | San Diego, CA  
Photo: David Hewitt

- Investment in ZNE practices and technologies creates local jobs and new products that can be exported worldwide, strengthens local economies, and helps us gain control of our energy future.

## Q4 / WHY IS IT IMPORTANT TO MAKE BUILDINGS ZNE?

Energy efficiency improvements in design and operations substantially reduce the costs and environmental impacts associated with buildings. Buildings account for nearly 40% of carbon emissions contributing to climate change nationally. ZNE buildings are an important strategy to help reduce these emissions.

With rising energy costs and increasing climate-related impacts and natural disasters, ZNE buildings help reduce our demand for energy and provide more resilience to climate impacts.

## Q5 / WHO ARE THE LEADERS IN ADVANCING ZERO ENERGY BUILDINGS?

To date, California has more ZNE buildings than any other state in the nation. The state has set the stage for leadership by:

- **Setting bold goals** to achieve ZNE by 2020 for all new residential buildings and by 2030 for all new commercial (and 50% of existing commercial) structures.



- **Aligning codes with ZNE** to achieve 2020 and 2030 targets.
- **Providing technical assistance and incentives** for owners and design teams (e.g., through programs like “Savings by Design”).
- **Demonstrating ZNE leadership** in State buildings per Governor Jerry Brown’s Executive Order B-18-12, which requires 50% of new California State buildings to be ZNE by 2020 and all new State buildings to be ZNE by 2025.
- **Investing in new technologies and research** for increased energy efficiency.

Other leading states include Massachusetts, Vermont, New York, Oregon and Washington. In all cases, progressive policies and programs are driving increases in ZNE projects.

## Q6 / DOES ZERO NET ENERGY MEAN ALL FUELS OR ELECTRIC ONLY?

It depends. To meet the definition of a California ZNE building all fuels—gas and electric—must be offset through renewables to be truly zero energy.



Some definitions refer to ZNE electric buildings which do not offset direct use of gas or other fossil fuels. Alternatively, other definitions preclude the use of any combustion fuel at all.

## Q7 / WHAT IF I HAVE LIMITED SPACE ONSITE FOR RENEWABLES?

Even on the most energy efficient buildings, limited rooftop space on high-rise structures and shading from adjacent buildings means that ZNE buildings with solar photovoltaics (PVs) onsite may not be practical at this time in urban cores. In the future, new and emerging building-integrated PV products offer an innovative solution that could help address limitations of roof space for siting renewable generation. Alternatively, another class of ZNE may allow these buildings to achieve zero status. “ZNE Capable” or “ZNE Ready” refers to buildings that are as energy efficient as ZNE buildings but don’t have PV onsite. These buildings could access renewable generation from a community-scale project located elsewhere or purchase renewable energy from the local utility.



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## Q8 / HOW DO I CREATE A ZNE BUILDING?

Achieving ZNE requires a combination of best practice energy efficiency and renewable energy production. Designing for high energy performance is the first step and requires establishing a goal at the beginning of the project and working under an “Integrated Design Process.” Design teams must:

- 1) Reduce the amount of energy a building uses through the most efficient envelope strategies and application of highly energy efficient technologies including lighting, HVAC and controls. Proper siting to take advantage of passive cooling is also important.
- 2) Install renewable generation onsite to meet the remaining energy needs of the building. Installed renewable resources have been primarily solar photovoltaic panels.
- 3) Optimize the way the building actually operates and how people use it, including management of plugged-in devices and system controls. Work with occupants and tenants to ensure they understand ZNE goals and how to maintain low energy use.

## Q9 / HOW EFFICIENT ARE TYPICAL ZNE OR ZNE-CAPABLE BUILDINGS?

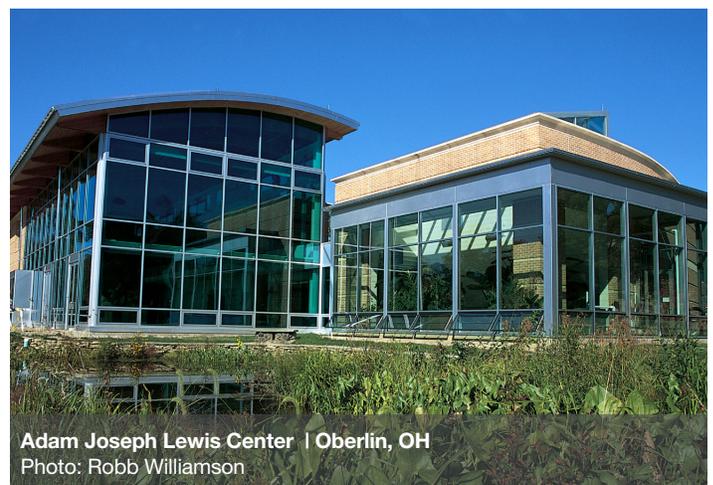
Energy efficiency should be the first and largest step toward ZNE. The exact targets vary by building type and climate, but generally buildings should use about one-third of the energy of typical existing commercial buildings— about 30 kBtus or less per square foot. The best examples are closer to 20 kBtus per square foot. Generally, for single-family residential buildings the energy use intensity (EUI) for ZNE performance is typically between 11-17 kBtus per square foot.



## Q10 / WHAT ARE THE ADDITIONAL COSTS TO BUILD FOR ZNE PERFORMANCE?

There are examples of commercial buildings achieving ZNE (or near ZNE) at little or no additional cost. Low-cost are usually due to trade-offs made by the project team during the integrated design process.

Several studies have found the incremental cost of ZNE buildings to be in the range of 0-15% more than conventional construction costs. This incremental cost is for design and construction only, and does not consider the life-cycle cost savings of lower energy costs to operate the building over time.





Rooftop of the IDEAs Z2 Design Facility | San Jose, CA  
Photo: David Wakely

## Q11 / DOES ZNE = A ZERO ENERGY UTILITY BILL?

Probably not. The “net” in zero net energy means that sometimes a building will draw energy from the grid when renewable generation is low and other times it will return energy to the grid or a battery storage system or a battery storage system when it generates more than is used. There are also ongoing charges for maintenance of transmission and distribution lines beyond the cost of energy.

## Q12 / HOW DO I KNOW IF MY BUILDING HAS ACHIEVED ZNE PERFORMANCE?

Metered data will tell an owner if the building has met a ZNE standard—both energy used by the building and generated by the renewable resources. Because ZNE buildings achieve this status over the course of a year, data at full occupancy for 12 consecutive months is required to verify net zero energy use.

Plugged-in devices, proper management of controls and occupant behavior all have a significant and ongoing impact on a building’s energy performance. This means that buildings designed to be ZNE may not be designated ZNE for some time after the doors are officially opened. New Buildings Institute (NBI) verifies ZNE energy performance and maintains a list of ZNE and ZNE-capable buildings. In addition, the International Living Future Institute offers a zero-energy certification as part of its Living Building Challenge.

## Q13 / WHERE CAN I LEARN MORE?

For more information on ZNE, including case studies, special studies, books, newsletters, blogs and other resources, additional ZNE Communications Toolkit materials, visit: [newbuildings.org/zero-energy](http://newbuildings.org/zero-energy)



Walgreens | Evanston, IL  
Photo: Courtesy Walgreens

## Resources for more information:

New Buildings Institute ZNE Resources:

<http://newbuildings.org/zero-net-energy-resources>

International Living Future Institute: <http://living-future.org/netzero>

Earth Advantage:

<http://earthadvantage.org/certification/earth-advantage-net-zero-ready>