

David and Lucile Packard Foundation | Los Altos, CA
Photo: Jeremy Bittermann

A Guide to Zero Energy Terminology

What is a ZE Building?

A zero energy (ZE) building is an energy-efficient building that produces as much energy as it consumes over the course of a year, usually by incorporating solar photovoltaic (PV) on-site.

ZE (also known as a Zero Energy Building (ZEB) or Net Zero Energy Building (NZE)) is a fast growing segment of the nation's building industry and the new and changing regional terminology. States like California and New York, and cities like Washington DC have set bold goals to achieve ZE for all new buildings the next decade. This factsheet provides an explanation of the language and terms people commonly use when they discuss zero energy buildings.

While definitions vary, industry professionals agree that these buildings achieve ZE by first incorporating energy efficiency measures followed by on-site renewable power.

Scales of ZE

When defining ZE, clear boundaries are critical for consistent measurement and comparison. Different policies and organizations may focus ZE objectives on a building, community, campus, district, or portfolio scale.

ZE BUILDING: An energy-efficient building that, over the course of a year, consumes an amount of energy less than or equal to the renewable energy generated on-site.

ZE PORTFOLIO: An energy-efficient portfolio of buildings is a group of buildings that, together, annually consume an amount of energy less than or equal to the renewable energy generated on the sites. The buildings included in the portfolio may be located apart from each other, or on the same campus.

ZE CAMPUS/DISTRICT: An energy-efficient campus or district comprised of multiple buildings that annually consumes no more energy than the on-site renewable energy generated.

ZE SOURCE: A building that produces at least as much energy as it uses in a year, when grid-supplied energy is accounted for at the source (including primary energy for generation, transmission and delivery to the site).

ZE SITE: The building produces at least as much energy as it uses in a year, when grid-supplied energy is accounted for at the site boundary.

ZE EMISSIONS BUILDING: A building that produces or purchases enough emission-free renewable energy to offset emissions from all energy the building uses over the course of a year.

Broader ZE definitions

Broader definitions account for the environmental or financial impacts of fuel use. Any selection of a metric between fuels and their emission impacts (eg. site, source, carbon) requires selecting appropriate scope-dependent values to ensure comparability between fuels consumed. Further metric equivalence is required when both renewable energy credits (RECs) and cost are used to measure comparability among the fuels consumed.

ZERO CARBON (ZC): A highly energy-efficient building that produces on-site, or procures, enough carbon free renewable energy to meet all building operations energy consumption annually. Also known as carbon-neutral operations.

EMBODIED CARBON: all carbon emissions emitted in the production, transportation, and installation of a building material or product together with end of life emissions are offset through RECs (see back) and/or on-site renewable energy

ZE ELECTRIC: a ZE building that does not offset direct use of gas or other fossil fuels.

ZE COST: An energy-efficient building where the actual cost of annual energy consumption is offset by the value of on-site renewable energy production.

REC ZERO ENERGY BUILDING (REC-ZEB): An energy-efficient building where the actual annual source energy consumption is supplied by on-site renewable energy production to the maximum extent possible and then offsets fossil energy use with the purchase of Renewable Energy Credits (RECs) from certified sources to achieve a ZEB level.

Verifying Zero Energy Performance

ZE VERIFIED: A building that has 12 months of metered energy data that show zero or positive energy production over a given consecutive 12 months.

ZE EMERGING: A building that has a publically stated goal of ZE but has not yet demonstrated achievement of that goal. This building may be in the planning or design phase, under construction or have been in operation for less than a year. An Emerging building may have been operating for 12 months or longer, but the measured performance energy has not yet documented ZE performance for 12 consecutive months.

NET ZERO ENERGY CERTIFIED (ILFI): A building certified under The International Living Future Institute's (ILFI) [Net Zero Energy Building Certification \(NZEBC\) program](#). NZEBC certifies zero energy building performance as one of three paths under the Living Building Challenge.

NET POSITIVE: A building that produces more energy than it consumes over 12 consecutive months.

Related Terms

Understanding other common terminology and metrics in the building community is also helpful. Here are some important ones:

ENERGY USE INTENSITY: A common metric to measure energy consumption level is the Energy Use Intensity (EUI) metric, which is measured in kBtu/sf/yr. Different metrics are used to calculate EUI site and EUI source.

RENEWABLE PRODUCTION INTENSITY (RPI): A metric also measured in kBtu/sf/yr representing renewable energy generated at the site.

A DOE ZERO ENERGY READY HOME: A high performance home that is so energy efficient, that a renewable energy system could potentially offset all or most of its annual energy consumption.

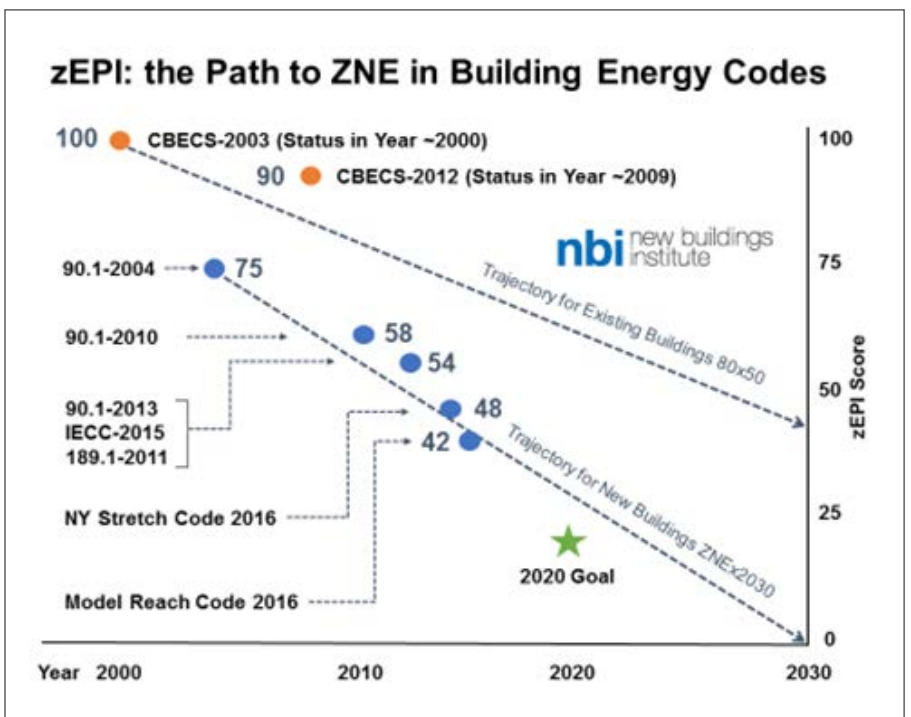
RENEWABLE ENERGY CREDITS: RECs, also known as [renewable energy certificates](#), green certificates, green tags, or tradable renewable certificates, represent the environmental attributes of the power produced from renewable energy projects and are sold separate from commodity electricity. RECs allow an opportunity to offset fossil fuel use in situations where they are not able to install or obtain renewable energy to power their building.¹

ULTRA-LOW ENERGY: A building that has demonstrated significant technical progress toward goals of energy use reduction, even though it may not have pursued a ZE energy path by investing in on-site renewables. The annual base (gross) energy consumption (including all sources: both energy delivered to the building and renewable energy produced on-site) must be lower than certain targets. The target is based on a zEPI score of 39 for buildings first occupied between 2015 and 2020.

ZERO ENERGY PERFORMANCE INDEX (ZEPI):

zEPI provides a common and fixed scale for measuring commercial building energy performance. zEPI normalizes energy performance for location and climate on a scale from 100 (based on CBECS 2003) to 0 representing ZE.

For more information: newbuildings.org/code_policy/zepi/



¹ In order to count the renewable energy generation for a building toward a net zero goal, RECs must be retained or retired. If an owner has not retained or retired the RECs associated with their on-site renewable energy system, other parties may be claiming the RECs toward their own environmental goals. The intent is to prevent double counting of the environmental attributes of on-site renewable generation.

RESOURCES

To access NBI's collection of ZE resources, including case studies, research, and tools and guides for getting your project to ZE, visit gettingtozeroforum.org.



New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in commercial buildings. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates and building professionals—to promote advanced design practices, innovative technologies, public policies and programs that improve energy efficiency. We also develop and offer guidance and tools to support the design and construction of energy efficient buildings.

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