

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

What is a ZNE Building?

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

ZNE (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 it is hard to keep up with the new and changing terminology. California has set bold goals to achieve ZNE for all new residential buildings by 2020 and all new commercial as well as 50% of existing buildings by 2030. This fact sheet provides an explanation of the language and terms people commonly use when they discuss zero net energy buildings.

Scales of ZNE

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

- **ZNE 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.
- **ZNE Portfolio:** An energy-efficient portfolio of buildings is a group of the buildings that, together, annually consume an amount of energy less than or equal to the renewable generated energy on-site. The buildings included in the portfolio may be located apart from each other.
- **ZNE Campus/District:** An energy-efficient campus or district comprised of multiple buildings that annually consumes no more energy than the renewable energy generated on-site.
- **ZNE Community:** An energy-efficient community that annually consumes no more energy than the renewable energy generated on-site.

1 For more information on TDV: http://www.energy.ca.gov/title24/2013standards/prulemaking/documents/general_cec_documents/Title24_2013_TDV_Methodology_Report_23Feb2011.pdf

While definitions vary, industry professionals agree that these buildings achieve ZNE by first incorporating high levels of energy efficiency followed by the addition of onsite renewable power.

- **ZNE 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).
- **ZNE 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.
- **Time Dependent Valuation (TDV)¹:** A metric used in California's Title 24 Building Energy Code to quantify the value of energy and energy savings in residential and non-residential buildings. TDV takes into account time-of-use, CO₂ emissions retail power cost adjustment, transmission and distribution costs, grid capacity, ancillary services, line losses and energy cost, as well as other secondary cost factors.
- **ZNE Emissions Building:** A building that produces or purchases enough emissions-free renewable energy to offset emissions from all energy the building uses over the course of a year.

Broader ZNE 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 used.

- **Zero Net Carbon (ZNC):** A highly energy-efficient building that produces on-site, or procures, enough carbon free renewable energy to meet all building operations energy consumption annually.

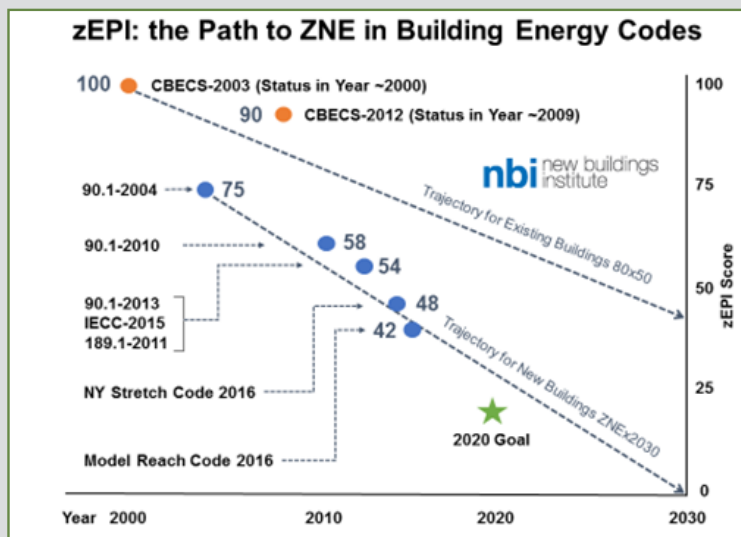
- **ZNE Electric:** a ZNE building that does not offset direct use of gas or other fossil fuels.
- **ZNE Cost²:** An energy-efficient building where the actual cost of annual energy consumption is offset by the value of on-site renewable energy production.
- **REC Zero Energy Building (REC-ZEB)^{3,4}:** 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

- **ZNE Verified⁵:** A building that has 12 months of metered data that show zero net or positive energy production over a given consecutive 12 months.
- **ZNE Emerging:** A building that has a publically stated goal of ZNE 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 zero net energy performance for 12 consecutive months.
- **Net Zero Certified (ILFI):** A building certified under The International Living Future Institute's (ILFI) Net Zero Energy Building Certification (NZEB) program⁶. NZEB certifies net 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.

Zero Energy Performance Index (zEPI). zEPI provides a common and fixed scale for measuring commercial building energy performance. zEPI normalizes energy performance on a scale from 100 (based on CBECS 2003) to 0 representing ZNE.

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



² Defining Net-Zero Energy Buildings: https://bdcnetwork.s3.amazonaws.com/s3fs-public/1.%20Defining%20Net-Zero%20Energy%20Buildings_0.pdf

³ DOE Definition of REC-ZEB: http://energy.gov/sites/prod/files/2015/09/f26/bto_common_definition_zero_energy_buildings_093015.pdf

⁴ 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 onsite 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.

⁵ ZNE Verified, ZNE Emerging and Ultra-low Energy Definitions: http://newbuildings.org/wp-content/uploads/2016/06/ZNE_Tracker_FAQ_201609.pdf

⁶ For more information: <http://living-future.org/netzero>

Related Terms

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

- **Energy Use Intensity (EUI)⁷:** A common metric to measure energy consumption level is the Energy Use Intensity (EUI) metric, which is measured in kBtu/square foot/year. Different metrics are used to calculate EUI site and EUI source.
- **Renewable Production Intensity (RPI)⁸:** A metric also measured in kBtu/square foot/year representing renewable energy generated at the site.
- **A DOE Zero Energy Ready Home:** Is 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 credits, 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. Customers can buy green certificates whether or not they have access to green power through their local utility or a competitive electricity marketer and they can purchase RECs without having to switch electricity suppliers. Customers use RECs to offset fossil fuel use in situations where they are not able to install or obtain renewable energy to power their building.⁹
- **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 ZNE 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 onsite) must be lower than certain targets. The target is based on a zEPI score of 39 for buildings first occupied between 2015 and 2020.

For more information on Zero Net Energy please visit:

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

7 EUI: https://newbuildings.org/wp-content/uploads/2016/07/FAQs-for-ZNE-Schools-Recognition-Program_FINAL_8-22.pdf

8 RPI: http://newbuildings.org/wp-content/uploads/2016/06/ZNE_Tracker_FAQ_201609.pdf

9 Renewable Energy Credits: <http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml>



RESOURCES

- NBI's 2016 List of ZNE Buildings: <http://newbuildings.org/2016-zne-list/>
- J.P. Morgan: Decoding the Elements of Sustainable Investing: <https://am.jpmorgan.com/blob-pbstudio/1383335319956/83456/sustainable-investing-2016.pdf>
- Morgan Stanley Institute for Sustainable Investing: <http://www.morganstanley.com/what-we-do/institute-for-sustainable-investing>
- Sustainable Real Estate Investment | Implementing the Paris Climate Agreement: An Action Framework http://www.iigcc.org/files/publication-files/Sustainable_Real_Estate_Investment_Framework_website_compressed.pdf
- The Global Real Estate Sustainability Benchmark (GRESB): <https://www.gresb.com/debt2015/assessment>
- ZNE Communications Toolkit: <http://newbuildings.org/resource/zero-net-energy-communications-toolkit/>
- Green Building Resources from the Appraisal Institute: <http://www.appraisalinstitute.org/education/education-resources/green-building-resources/>
- Value Beyond Cost Savings: How to Underwrite Sustainable Properties by Scott R. Muldavin. Green Building finance Consortium, 2010. http://www.gbcsa.org.za/wp-content/uploads/2013/06/Scott-Muldavin-Report-Value-Beyond-Cost-Savings_How-to-Underwrite-Sustainable-Properties-2010.pdf