



# Net Zero Building Guide

Commercial New Construction

Version 1.2

Efficiency  
Vermont

# Introduction

## Description

This Guide is intended to be used for projects with an “Efficiency Vermont Certified: Net Zero” energy efficiency goal. This Net Zero goal is a whole-building efficiency approach rather than an equipment approach. Energy intensity varies significantly depending on building type, occupancy, and usage, as well as envelope, mechanical, and electrical systems used. However, at least a 30% energy use reduction compared to a building built to the minimum requirements of the 2015 Vermont Commercial Building Energy Standards can be cost-effectively achieved for nearly all buildings. This guide provides a list of the measures necessary to achieve a net zero energy building for commercial new construction and major renovation projects.

 <b>Equipment Approach</b> <b>5-10%*</b> energy savings Minimum Assistance   Above-Code Equipment  Efficiency Vermont provided financial support for efficient equipment, enabling above-code energy performance. <i>Yankee Farm Credit</i> Equipment Approach	 <b>High Performance</b> <b>10-20%*</b> energy savings Moderate Assistance   Above-Code Performance  Supporting a comprehensive approach to energy efficiency, Efficiency Vermont helped this customer attain a high performance goal. <i>Norwich University</i> Whole Building Approach	 <b>Net Zero</b> <b>30-45%*</b> energy savings Extensive Assistance   Best Building Performance  Efficiency Vermont worked closely with the project team to set a path to achieve their net zero goal. <i>Northfield Savings Bank</i> Whole Building Approach
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\*Versus 2015 VT CBES  
Photos: Leslie O'Halloran & Gary Hall Photography



## Get Started

Bring us to the table at your first design meeting, to maximize impact and incentives.

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## Technical Assistance

For design teams and building owners who participate in the Net Zero program, Efficiency Vermont will facilitate efficiency and energy goal discussions, sponsor an energy charrette and cashflow financial analysis. Increased technical assistance will be offered from design through to one year of occupancy. Services will go beyond Efficiency Vermont typical building systems focus to include assistance on metering equipment for energy data collection, renewable energy systems and transportation analysis services.

## Financial Assistance

Financial incentives will be provided to the owner for each measure:

- Standard equipment incentive – Specific to each project. Includes all lighting, refrigeration, and mechanical efficiency upgrades as defined in Equipment Efficiency Guide.
- Custom equipment incentives - May be available for measures not included in Equipment Efficiency Guide if presented to Efficiency Vermont during early design to review.
- Energy charrette incentive - \$2,500
- Energy simulation incentive – 50% of cost
- Energy monitoring equipment incentive – 50% of cost
- Commissioning incentive – 25% of cost
- Performance Incentive – up to 25% of equipment incentive, based on building operation for one year after construction completion.

## Documentation Review & Verification

Design and Construction Documents, including all drawings and specifications, as well as equipment submittals during construction, must be submitted to Efficiency Vermont. These documents, as well as a final inspection, will be used to verify all requirements have been met.

## Recognition & Marketing

Projects completing the requirements in this Guide will be recognized as achieving the ***Efficiency Vermont Certified: Net Zero*** designation. Specific benefits provided by Efficiency Vermont include:

- A customized plaque for display in the building, after one year of data confirming performance
- Certificates for contributing firms on the project team
- Marketing support for creating a press release
- Inclusion in Efficiency Vermont promotions (advertising, publicity on high-performance buildings and best practices), and possibly a project case study.

# Requirements

## Energy Charette

Hold a design team energy charrette to present and discuss the challenges and solutions to achieving a net zero building. Topics could include building and equipment efficiency, renewable energy sources, transportation and other green building issues. The charrette could include unresolved issues and the group could give input to help create a path forward and solution to the design challenge. The energy charrette will be led by the design team and will include the building owner, Efficiency Vermont and the commissioning agent.

## Energy Design and Performance

Design and operate the building over a one-year period, as a net zero source energy building. Enable the building to produce as much renewable energy on-site as it uses in one year. Energy can be exchanged with the power grid as long as the net energy balance is zero on an annual basis. Renewable energy sources available off-site used to generate energy through on-site processes may be used (e.g. wood). Eligible renewable energy technologies include photovoltaics, wind energy, solar thermal, low-impact hydroelectric, bio-based electrical and thermal systems (e.g. wood and agricultural products).

## Energy Efficiency

Design and operate the building to use no more than 70% of the site energy of a building built to meet the 2015 Vermont Commercial Building Energy Standards (VT CBES), before site-produced renewable energy is counted. Focusing on efficiency first, renewables second is typically the most cost-effective way to net zero.

Efficiency measures usually include:

1. Air-tight building envelope - Achieving no more than 0.15 cfm/sq.ft. @ 50 Pa
2. Highly insulated building envelope - More insulation than required by the CBES, varies depending on the building type and heating system.
3. Highest efficiency lighting and controls - Maximum utilization of natural daylight where feasible. Interior lighting power at least 40% less, and exterior lighting 75% less than maximum allowed by the CBES. Fixtures qualified by Design Lights Consortium or ENERGY STAR.
4. Highest efficiency mechanical systems, equipment, and controls - If looking to achieve truly zero energy, electric heat pump or wood-based heating system.

## **Energy Simulation**

Perform an energy modeling analysis prior to completion of the schematic design phase. Use this model to explore various building design and operational alternatives that could reduce peak loads and overall energy use. Also use the model to set performance targets, and verify the building is designed to operate using no more than 70% of the site energy of a building built to Code.

## **Energy Monitoring**

Incorporate measurement devices for each energy supply source to the building, including electric and fuel (oil, gas), each on-site renewable energy production system and each major building electric system: HVAC, lighting, and plug loads. Enable all measurement devices to automatically communicate the energy consumption data to a data acquisition system. Take and store all measurements at a minimum of hourly increments. Electronically store the data for a minimum of 3 years with the data acquisition system, and have the ability to create user reports, showing hourly, monthly, and annual energy use. Provide Efficiency Vermont with access/permission to the acquired data for a minimum of 5 years.

## **Commissioning**

Throughout the design, construction, and first-year-of-occupancy phases, perform building commissioning, including acceptance testing, for mechanical systems (heating, ventilating, air-conditioning, indoor air quality, refrigeration, and controls), domestic hot water, lighting systems (daylighting controls, occupancy sensing devices, automatic shut-off controls), renewable energy systems, building envelope (thermal and moisture integrity, blower door test for air-tightness), and energy measurement devices.