redefining what’s possible in the built environment

Upcoming Getting to Zero Webinars

All sessions 10-11:30 am Pacific/1-2:30 pm Eastern

March 16, 2016 Strategies for Getting to Zero
April 20, 2016 Beyond a Building
May 18, 2016 ZNE Policies within and Across Borders

More information at newbuildings.org/demand-webinars
Roadmap to Zero Energy Public Buildings

Darren Port
Building Energy Code Manager
Northeast Energy Efficiency Partnerships

The Current Zero Energy Building Landscape

Intermediate Steps to Zero Energy Public Buildings
Information and Education
Building Energy Codes
Finance
Utility Regulation

Critical Next Steps
Step 1: Develop a “Path to Highest Performance Campaign”
Step 2: Promote the Continued Development of Exemplary Buildings
Step 4: Implement Stretch Building Energy Codes
Step 5: Create Revolving Loan Fund or Similar Mechanism
Roadmap to Zero Energy Public Buildings

Zero Energy Progress In the NEEP Region

**Benchmarking:**
State Public Buildings – NY, CT, RI, DE
City – Boston, Cambridge, Philly, DC, NYC
County – Montgomery County, MD

**Zero Energy Communities:**
Montpelier, VT
Cambridge, MA

**Outstanding State Progress – Rhode Island**
The Rhode Island Zero Net Energy Taskforce – Roadmap Report
Executive Order 15-17 Lead By Example program for state facilities
Rhode Island Public Energy Partnership (RIPEP), 66 municipal buildings asset scores
Stretch Code - International Green Construction Code (IGCC)
“Rhode Island Infrastructure Bank” including the Efficient Buildings Fund

Roadmap to Zero Energy Public Buildings

Zero Energy Roadmap Progress Report – *Spring 2016*
State Progress Report Card
Zero Energy Communities
Public School Sector
Zero Energy Resilient Design and Construction
National Definition of Zero Energy Buildings
The Next 10-15 Years

Willow School, Gladstone NJ, Zero Energy – Living Building
East Bay Met School, Newport, RI – Zero Energy Public School
Hampshire College, Amherst, MA, Zero Energy – Living Building
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Cape Cod House by ZeroEnergy Design

Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

Energy Efficiency, ZEB Policy and the Pathways to Zero Program
Massachusetts Policy to Practice

1. Nation leading energy efficiency programs

2. Multiple policies to support energy efficiency and ZEBs:
   - Building codes
   - Training
   - Incentive programs

3. ZEB market stimulus through Leading by Example, grants, programs and utility incentives

EE Goals are Higher Than Ever

- Ranked #1 by ACEEE (2011-2015) for our energy efficiency programs and policies
- 2016-2018 Energy Efficiency Plan
  - Most aggressive energy efficiency goals in U.S.
  - Electric: 2.93% sales
  - Gas  1.24% sales
  - $8 billion in benefits
- All EE programs offered under Mass Save® brand
- 69,000 jobs and growing
Massachusetts ZNEB Task Force

How the Commonwealth can achieve:

• Broad marketability of ZNEBs by 2020, and universal adoption of zero net energy buildings for new construction by 2030
• More stringent standard for state owned construction
• First state-owned ZNEB by 2010

Getting to Zero Report Makes 44 recommendations that fall into four general categories that address both new and existing buildings.

“Getting to Zero” is available at www.mass.gov/eea, under “Forms and Publications”

1 – Financial Incentives

• Mass Save - 2016-2018 - $2.6b energy efficiency programs with $8b in benefits
  ➢ Available for residential and commercial
  ➢ New construction and existing buildings
  ➢ Res and C&I ZEB in 3 year plans
• HEAT Loans – 0% Residential Loans up to $25,000
• Renewable Energy Portfolio Standard (RPS)
  ➢ Renewable energy certificates (RECs) can be sold to utilities
2- Building Codes and Standards

- International Energy Conservation Code 2012 (IECC 2012)
  - went into effect July 1, 2014
  - MA Updates to new national model code every 3 years per state statute
  - IECC 2015 adoption is up for public comment
  - Adopting ASHRAE 2013

- Stretch Code – Performance based code
  - Adopted by 161 of the 351 Cities and Towns

Stretch Code Adoption, by Community

One hundred sixty-one (161) municipalities have adopted the Board of Building Regulations and Standards (BBRS) Stretch Code, as of November 3, 2015.
3 - Benchmarking

- **Commercial: Building Asset Rating**
  - Identify cost-effective, scalable methods to assess “as-built” building and systems
  - Final report to be released in 2016

- **Residential: Home MPG**
  - 3,800+ scorecards, 1,600+ retrofits, 1,250+ homes completed multiple measures

4 - Education and Workforce Development

- Building code training for code compliance officials
- MassCEC workforce training programs
- Utilities provide Building Operator Certification, and other energy use reduction training

MA Leading By Example
Pathways to Zero Program - $3.5m

- $3m - Project-based feasibility ($30k), design ($50k), and construction funding for projects
  - up to $10,000 for single family homes
  - up to $400,000 for multi-family residential buildings (tiered approach), and
  - Non Energy Monitoring - $2,000/unit
  - up to $500,000 for commercial and institutional buildings
- $.5 m - Public awareness campaigns, workforce development trainings, and efforts to develop and standardize best practices related to ZEBs.
Early Pathways Program Results

- Feasibility Studies
  - 3 Science and Technology buildings
  - Multifamily development
  - Technology demonstration
- Integrated design
  - Food co-op – retrofit project
- Construction
  - First housing project completed in fall 2015
  - Many residential and C&I projects in 2016

Sample Projects

- Technology & Learning Center - Bristol Community College - Fall River
Sample Projects

- East Street Initiative - Pioneer Valley Habitat for Humanity – Easthampton
  $24,000 – 2 units, All volunteer workforce, donated materials. The project will be very affordable at 40% AMI.

Thank You

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From Policy to Practice:
California Leading By Example

February 17, 2016

Dan Burgoyne
Sustainability Manager, LEED Fellow
State of California
Department of General Services

Zero Net Energy (ZNE) in California

• California Executive Order B-18-12 for state-owned buildings:
  1. Zero Net Energy (ZNE) on new construction
     • 50% of new construction beginning design in 2020
     • 100% of new construction beginning design in 2025
  2. ZNE on 50% of existing building area by 2025

• California Building Standards Code Targeting ZNE
  1. ZNE on new residential construction by 2020
  2. ZNE on new non-residential construction by 2030
State of CA ZNE Status & Efforts

- 120 M s.f buildings using 10B kBu of energy
- 60 M sq. feet to ZNE by 2025
- Need ~1.8 M kWh or 800 MW of renewables
- ≥80 MW installed or planned by end of 2016

Strategies for Existing Building ZNE

1. Evaluate energy efficiency opportunities
   - Utilize incentives and alternative financing mechanisms
2. Consider increasing daylight
   - Skylights, reflecting louvers, etc.
3. Utilize thermal mass if possible
   - Insulate exterior
   - Utilize natural ventilation & diurnal temperature swing
4. Reduce plug loads aggressively
5. Upgrade building energy systems as possible
   - Lighting, HVAC, monitoring-based commissioning
Strategies for ZNE Renewables

6. Evaluate roof and/or site for PV’s & wind
   – Consider the life span of existing roofing, maint., access

7. Consider Power Purchase Agreement (PPA)
   financing alternative for renewable energy
   – If renewable purchase (self-financing) is not feasible

8. If on-site renewables are not feasible,
   consider off-site renewables at other state facilities

1st State ZNE Project – Fresno DMV
2nd State ZNE Project
Santa Fe Springs

- 10% operational savings vs previous facility
- New facility is 45% larger than previous facility

Images courtesy of CaLottery and LPAS Architecture + Design

CaLottery Santa Fe Springs, CA

- 12,800 existing warehouse
- Converted 1980 uninsulated concrete tilt-up building
- Purchased 9/2014, Occupied 10/2015
CaLottery Santa Fe Springs, CA

- Roof monitors, 22 skylights + 4 solatubes
- Insulated envelope
- Glazing w/ 2x solar heat coefficient
Further Information

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Defining Zero Energy Buildings

Getting to Zero Webinar
From Policy to Practice
February 12, 2016

Roger Grant
Program Director
National Institute of Building Sciences

Project Goal

Converge on an industry-accepted national DOE definition for ZE that will support program and policy goals and encourage commercial new construction and major renovation projects to design, construct, and operate buildings that achieve a high level of energy efficiency.

............. and More
ZEB Concept

Over the course of a year, if the on-site renewable energy produced ≥ the energy consumed within the boundary, it is considered a ZEB.

Goal 1: Reduce Consumption

Goal 2: Apply On-site Renewable Energy

Different Types of Zero Energy

- Site energy ZEB
- Source energy ZEB
- ZE Cost Building
- REC-ZEB
Definition Development Process Overview

Zero Energy Building (ZEB) Definition

An energy-efficient building, where on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.

Includes accompanying Nomenclature
ZEB Definition Variations

Zero Energy Campus
– An energy-efficient campus where the actual annual source energy consumption is balanced by on-site renewable energy.

Zero Energy Portfolio
– An energy-efficient portfolio where the combined actual annual source energy consumption is balanced by on-site renewable energy.

Zero Energy Community
– An energy-efficient community where the actual annual source energy consumption is balanced by on-site renewable energy.

Measurement and Implementation Guidelines

1. Establish consistent measurement boundary

2. Clearly define all energy acquired, used and generated

3. Use Source Energy to measure all energy equitably
Using “Zero Energy Building” Designation

• Only buildings that have demonstrated through actual annual measurements that the on-site renewable exported energy is greater than or equal to delivered energy.

• Buildings designed to be zero energy, but have not yet had a full year of operation are encouraged to identify their intent to be a Zero Energy Building.

Additional Considerations

1. Definition for a Zero Energy Building that uses Renewable Energy Certificates (RECs)

   An energy-efficient building where on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy plus Renewable Energy Certificates (RECs).

2. Zero Energy Ready (ZER) Building

   A highly energy efficient building that could conceivably become a ZEB in the future with the addition of renewable energy.
Get the Definition Report

A COMMON DEFINITION FOR ZERO ENERGY BUILDINGS

Thousands of project teams throughout the country seek to push the envelope and develop zero energy buildings. Generally speaking, a zero energy building produces enough renewable energy to meet its own annual energy consumption requirements, thereby reducing the use of non-renewable energy in the building sector. This definition also applies to campuses, portfolios, and communities. In addition to providing clarity across the industry, this publication provides guidelines for measurement and implementation, specifically explaining how to utilize this definition for building projects.

DOWNLOAD THE REPORT
A Common Definition for Zero Energy Buildings


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www.nrel.
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www.wbdg.org

2/17/2016

Cody Taylor
Department of Energy
Building Technologies Office
Commercial Buildings Integration

DOE Commercial Buildings Integration

Supports technology demonstration and deployment, e.g. HPS to LED lighting upgrade

Supports tool development, e.g. the standardized BuildingSync data format for tracking energy audit data & streamlined reporting to CTS

Develops technical guidance e.g. purchasing specifications for advanced control retrofits to rooftop HVAC units

http://energy.gov/eere/buildings/commercial-buildings-integration
To Create a Zero Energy Building...

**STEP 1** Increase energy efficiency
- Efficient building construction
- Efficient systems and appliances
- Operations and maintenance
- Change in user behavior

**STEP 2** Address remaining needs with on-site renewable energy generation
- Wind
- Solar
- Hydro Energy

It’s Easy!

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Zero Energy Building Definition

Converge on an industry-accepted national definition for ZE that will support program and policy goals and encourage commercial new construction and major renovation projects to design, construct, and operate buildings that achieve a high level of energy efficiency.
Zero Energy Building (ZEB) Definition

An energy-efficient building*, where on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.

*or campus, community, or portfolio

Zero Energy In Context

Performance Contracting  New Technology  Purchasing Decisions  Building Codes
Split Incentives  Workforce Development  Policies  Continuous Energy Management
Barriers to ZEBs

1. Fear that a Zero Energy Building will be too expensive
2. Risk of new technologies: cost, time, underperformance
3. Limited supply of design and construction expertise
4. Uncertainty about utility rate structures
5. Risk that building does not perform as designed
6. Fear that occupants will be less comfortable/happy
7. Risk that building operator will not know how to operate
8. Risk that market will undervalue an unusual building

Policymakers can address most of these!

Addressing Barriers to ZEBs

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Policy/Program</th>
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<tbody>
<tr>
<td>Cost risk</td>
<td>Lead by example</td>
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<tr>
<td>Technology risk</td>
<td>Clear direction for future energy codes</td>
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<tr>
<td>Limited A/E/C expertise</td>
<td>Campaigns that drive market demand</td>
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<tr>
<td>Utility rate uncertainty</td>
<td>Create financial incentives</td>
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<td>Performance Risk</td>
<td>Give policy certainty around utility rate structure</td>
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<td>Fear of reduced occupant</td>
<td>Ensure data availability</td>
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<td>satisfaction</td>
<td>Explicitly address split incentives</td>
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<td>Operator knowledge gap</td>
<td>Develop the workforce</td>
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<td>Market value risk</td>
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What is DOE doing?


Thank you!

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GETTING TO ZERO
NATIONAL FORUM 2016

Call for Speakers
October 12-14, 2016 | Denver, CO

http://gettingtozeroforum.org/call-for-speakers/

NATIONAL FORUM 2016

GETTING TO ZERO
SPONSORSHIP OVERVIEW

Catalyzing the future of zero net energy buildings.

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Thank you for joining us!

You will receive an email with a link to the on-demand presentation as well as a PDF of the slides tomorrow.

A survey will open as you exit the webinar, please help us make the best webinars possible by answering the survey. Your opportunity to enter your AIA member number for credits is in the survey.