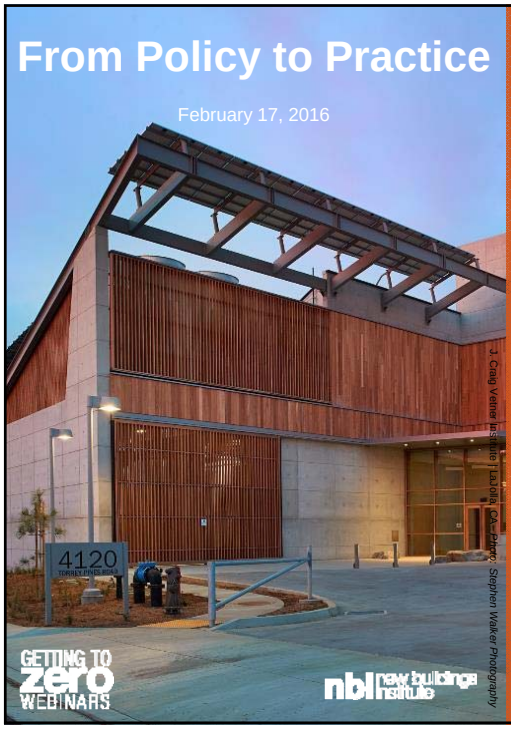
From Policy to Practice

February 17, 2016



J. Craig Venter Institute | La Jolla, CA – Photo: Stephen Walker Photography

GETTING TO zero WEBINARS

nbi new buildings institute

Ralph DiNola
CEO
New Buildings Institute

Darren Port
Building Energy Code Manager
Northeast Energy Efficiency Partnerships

Alex Pollard
Energy Efficiency Commercial Programs Manager
Massachusetts Department of Energy Resources

Cody Taylor
Energy Technology and Policy Specialist
U.S. Department of Energy

Dan Burgoyne
Sustainability Manager
State of California Department of General Services

Roger Grant CSI, CDT
Program Director
National Institute of Building Sciences

GETTING TO zero WEBINARS

nbi new buildings institute

Thank you to our sponsors!

nationalgrid

Pacific Gas and Electric Company

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL® Company

neea

ComEd
An Exelon Company

efficiency MAINE

Cape Light Compact

THE WEIDT GROUP®

Efficiency Vermont

CALMAC
IceBank Energy Storage

nbi new buildings institute

redefining what's possible in the built environment

GETTING TO zero WEBINARS

nbi new buildings institute

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

Roadmap to Zero Energy Public Buildings

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 3: Prioritize Measurement & Public Reporting of Energy Performance
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

Darren Port

Building Energy Code Manager
Northeast Energy Efficiency Partnerships

dport@neep.org
www.neep.org

http://www.neep.org/sites/default/files/resources/Report_zne-public-buildings-neep-2012_0.pdf

Cape Code House by ZeroEnergy Design

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

DOER
Massachusetts Department of Energy Resources

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

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

11

DOER Massachusetts Department of Energy Resources

EE Goals are Higher Than Ever

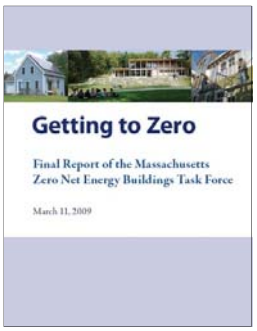
- Ranked #1 by ACEEE (2011-2015) for our energy efficiency programs and policies
- 2016-2018 Energy Efficiency Plan
  - Most aggressive energy efficiency goals in U.S.
  - Electric: 2.93% sales
  - Gas 1.24% sales
  - $8 billion in benefits
- All EE programs offered under Mass Save® brand
- 69,000 jobs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

mass save®
Savings through energy efficiency

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"*

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

DOER Massachusetts Department of Energy Resources

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

Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth 14

DOER Massachusetts Department of Energy Resources

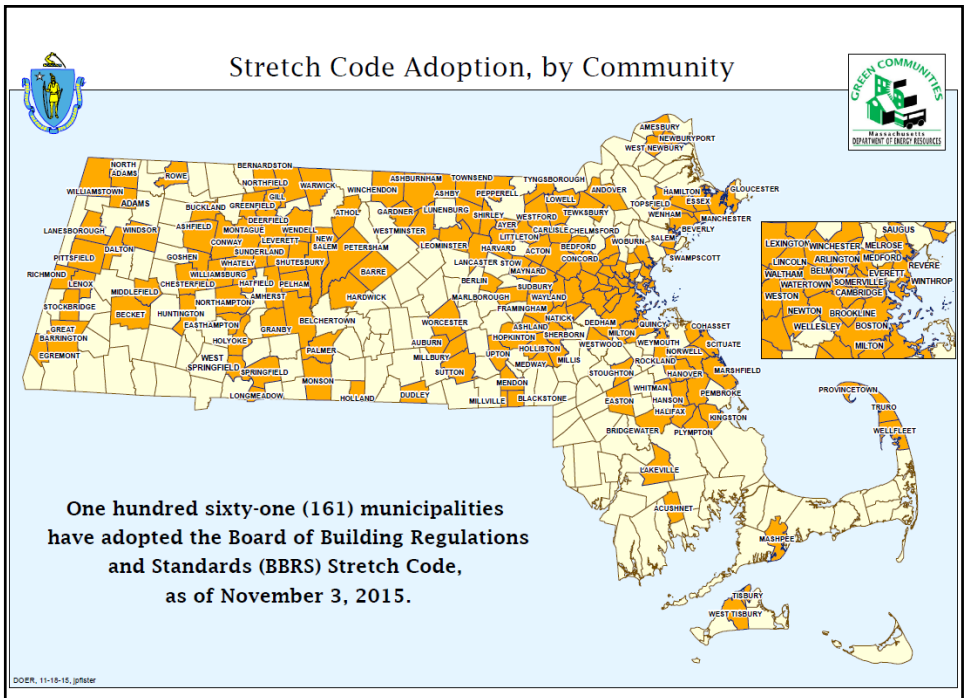
2- Building Codes and Standards

- 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

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

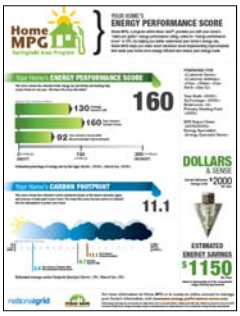
15

DOER Massachusetts Department of Energy Resources



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, 1250+ 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

17

MA Leading By Example

18

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.

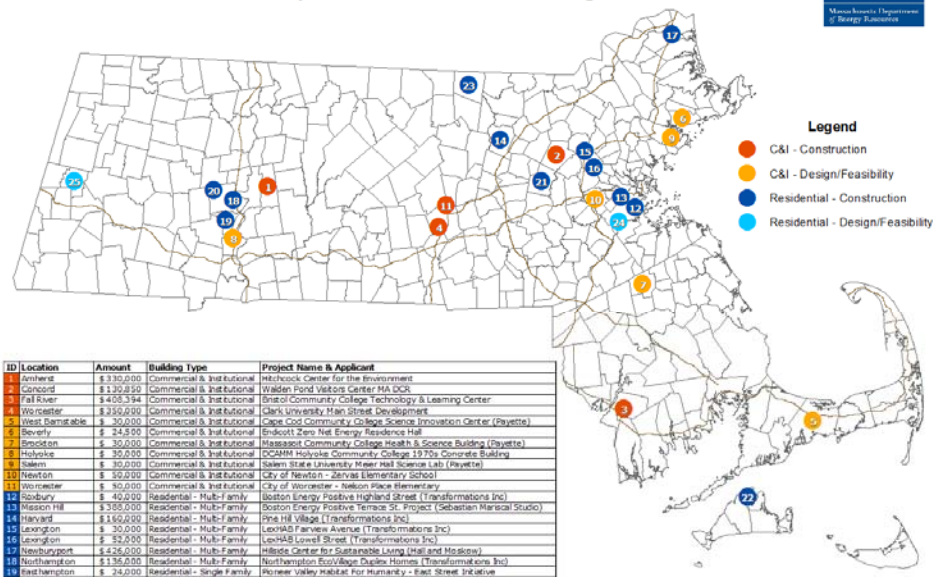
Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

19

DOER Massachusetts Department of Energy Resources

Pathways to Zero Grant Program

DOER Massachusetts Department of Energy Resources



ID	Location	Amount	Building Type	Project Name & Applicant
1	Amherst	$ 330,000	Commercial & Institutional	Hitchcock Center for the Environment
2	Concord	$ 130,850	Commercial & Institutional	Walden Pond Visitors Center MA DCR
3	Fall River	$ 408,594	Commercial & Institutional	Bristol Community College Technology & Learning Center
4	Worcester	$ 330,000	Commercial & Institutional	Clark University Main Street Development
5	West Barnstable	$ 30,000	Commercial & Institutional	Cape Cod Community College Science Innovation Center (Payette)
6	Beverly	$ 24,500	Commercial & Institutional	Endicott Zero Net Energy Residence Hall
7	Brockton	$ 30,000	Commercial & Institutional	Massasoit Community College Health & Science Building (Payette)
8	Holyoke	$ 30,000	Commercial & Institutional	DCAMM Holyoke Community College 1970s Concrete Building
9	Salem	$ 30,000	Commercial & Institutional	Salem State University Meier Hall Science Lab (Payette)
10	Newton	$ 90,000	Commercial & Institutional	City of Newton - Zervas Elementary School
11	Worcester	$ 90,000	Commercial & Institutional	City of Worcester - Nelson Place Elementary
12	Roxbury	$ 40,000	Residential - Multi-Family	Boston Energy Positive Highland Street (Transformations Inc)
13	Mission Hill	$ 388,000	Residential - Multi-Family	Boston Energy Positive Terrace St. Project (Sebastian Mariscal Studio)
14	Harvard	$ 160,000	Residential - Multi-Family	Pine Hill Village (Transformations Inc)
15	Lexington	$ 30,000	Residential - Multi-Family	LexHAB Fairview Avenue (Transformations Inc)
16	Lexington	$ 52,000	Residential - Multi-Family	LexHAB Lowell Street (Transformations Inc)
17	Newburyport	$ 426,000	Residential - Multi-Family	Hillside Center for Sustainable Living (Hall and Maskow)
18	Northampton	$ 136,000	Residential - Multi-Family	Northampton EcoVillage Duplex Homes (Transformations Inc)
19	Easthampton	$ 24,000	Residential - Single Family	Pioneer Valley Habitat For Humanity - East Street Initiative
20	Northampton	$ 20,000	Residential - Single Family	Laurel Street (Transformations Inc)
21	Sudbury	$ 30,000	Residential - Single Family	Sudbury Housing Trust (Transformations Inc)
22	Vineyard Haven	$ 12,000	Residential - Single Family	Martha's Vineyard Holland Passive House
23	Townsend	$ 94,000	Residential - Single Family	Coppersmith Way Development (Transformations Inc)
24	Dorchester	$ 30,000	Residential - Multi-Family	Codman Sq. Neighborhood Development Corp - Church Lots Project
25	Lenox	$ 50,000	Residential - Multi-Family	Sawmill Brook (Transformations Inc)

J.Pfister, 10-23-14, DOER

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

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

21

DOER Massachusetts Department of Energy Resources

Sample Projects

- **Technology & Learning Center - Bristol Community College - Fall River**

22

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.

23

Thank You

Alex Pollard
Energy Efficiency Commercial Programs Manager
Massachusetts DOER
Alexander.Pollard@state.ma.us
(617) 626-7360

24

Creating A Cleaner Energy Future For the Commonwealth

DOER Massachusetts Department of Energy Resources

From Policy to Practice: California Leading By Example

February 17, 2016

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

DGS
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 kBtu 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

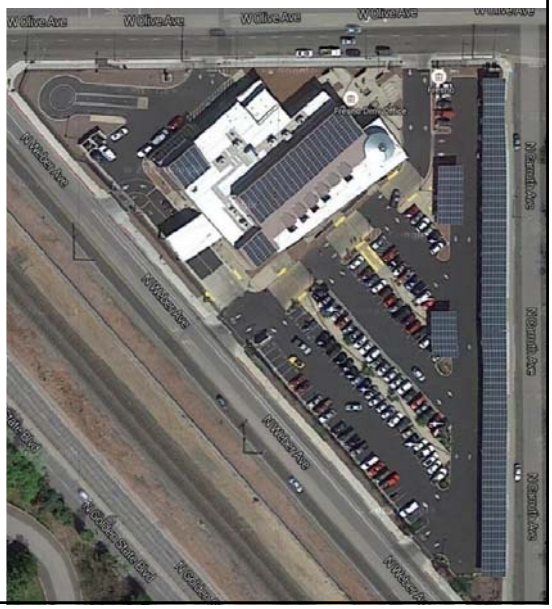
Strategies for Existing Building ZNE

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



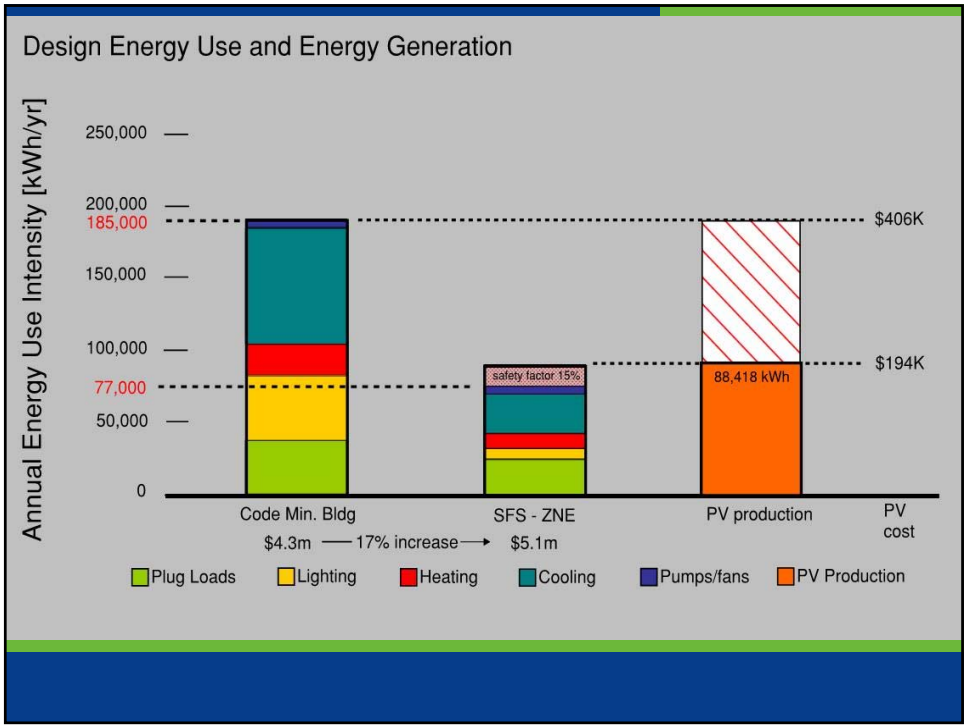
2nd State ZNE Project Santa Fe Springs

- 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

Dan Burgoyne
Sustainability Manager
State of California
Department of General Services
daniel.burgoyne@dgs.ca.gov
www.green.ca.gov
(916) 376-5010

Defining Zero Energy Buildings

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

Roger Grant
Program Director
National Institute of Building Sciences

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

High Performance Building Council
a council of the National Institute of Building Sciences

National Institute of BUILDING SCIENCES

39

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.

nbi new buildings institute
INTERNATIONAL LIVING FUTURE INSTITUTE
NREL
architecture 2030
GSA

…….. and More

National Institute of BUILDING SCIENCES

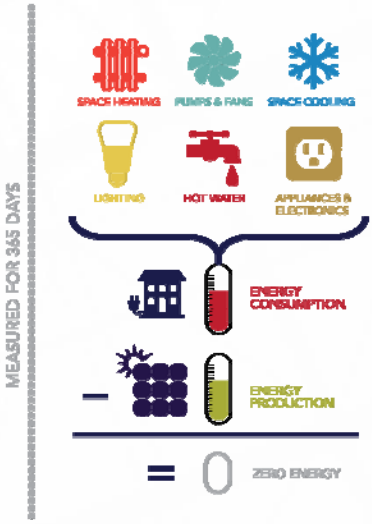
40

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

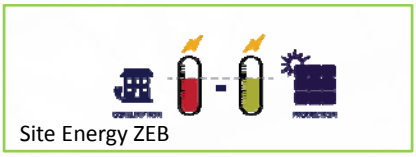


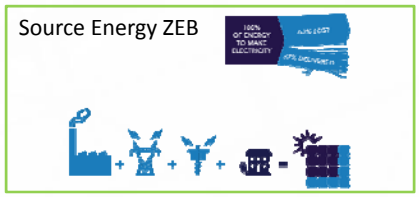
National Institute of BUILDING SCIENCES

41

Different Types of Zero Energy

- Site energy ZEB
- Source energy ZEB
- ZE Cost Building
- REC-ZEB


Site Energy ZEB


Source Energy ZEB

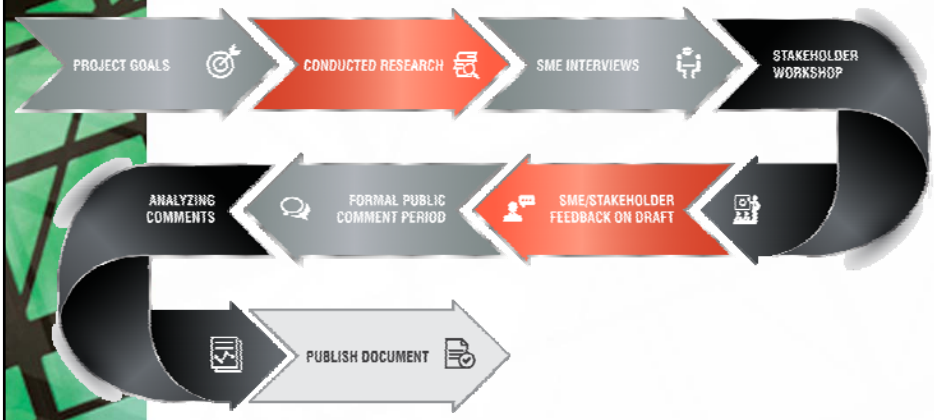

REC - ZEB


ZE Cost Building

National Institute of BUILDING SCIENCES

42

Definition Development Process Overview



National Institute of BUILDING SCIENCES

43

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

National Institute of BUILDING SCIENCES

44

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**.

National Institute of BUILDING SCIENCES

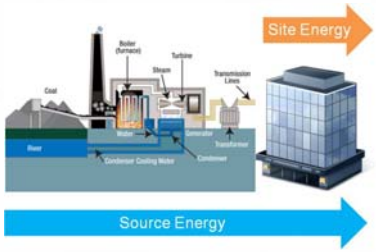
45

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



National Institute of BUILDING SCIENCES

46

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.*

National Institute of BUILDING SCIENCES

47

Additional Considerations

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

   Renewable Energy Certificate - Zero Energy Building (REC-ZEB)
   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).**

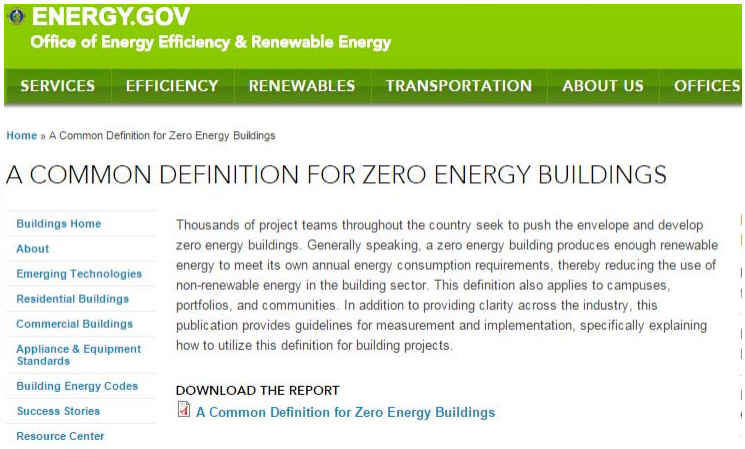
2. *Zero Energy Ready (ZER)* Building

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

National Institute of BUILDING SCIENCES

48

Get the Definition Report



http://bit.ly/doeZEBdefinition

National Institute of BUILDING SCIENCES

49

Contact Information

Roger Grant
rgrant@nibs.org

Cody Taylor
cody.taylor@ee.doe.gov

More information:
www.doe.gov
www.nrel.
www.nibs.org
www.wbdg.org

National Institute of BUILDING SCIENCES

50

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Zero Energy Buildings: How Government Can Accelerate The Market

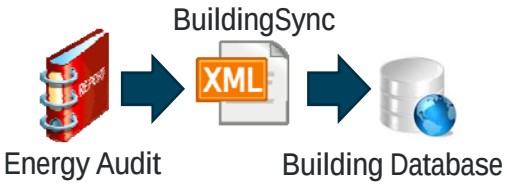
2/17/2016

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

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

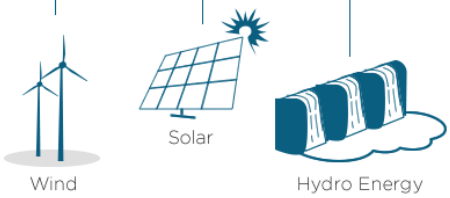
52 http://energy.gov/eere/buildings/commercial-buildings-integration

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



It's Easy!

53

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Zero Energy Building Definition

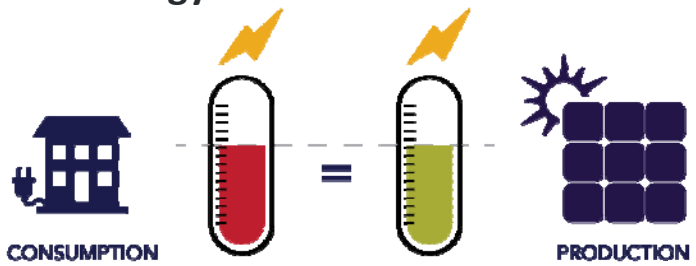
Converge on an industry-accepted national definition for ZE that will support program and policy goals and encourage commercial new construction and major renovation projects to design, construct, and operate buildings that achieve a high level of energy efficiency.

54

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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

55

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Zero Energy In Context

56

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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!

57

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Addressing Barriers to ZEBs

Barrier

1. Cost risk
2. Technology risk
3. Limited A/E/C expertise
4. Utility rate uncertainty
5. Performance Risk
6. Fear of reduced occupant satisfaction
7. Operator knowledge gap
8. Market value risk

Policy/Program

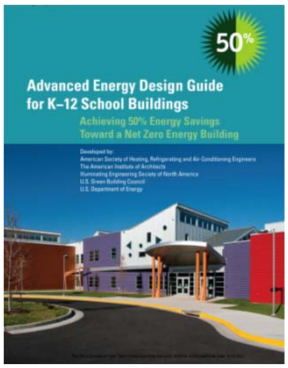
- Lead by example
- Clear direction for future energy codes
- Campaigns that drive market demand
- Create financial incentives
- Give policy certainty around utility rate structure
- Ensure data availability
- Explicitly address split incentives
- Develop the workforce

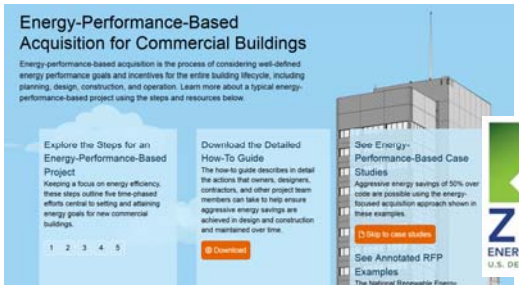
58

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

What is DOE doing?

- Provide clear definitions, http://bit.ly/doeZEBdefinition
- Develop the workforce, http://bit.ly/BBWorkforceGuidelines
- Improve data access, http://bit.ly/DOEEnergyDataAccelerator
- Publish technical guidance, http://energy.gov/eere/buildings/zero-energy-buildings





ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

59

Thank you!

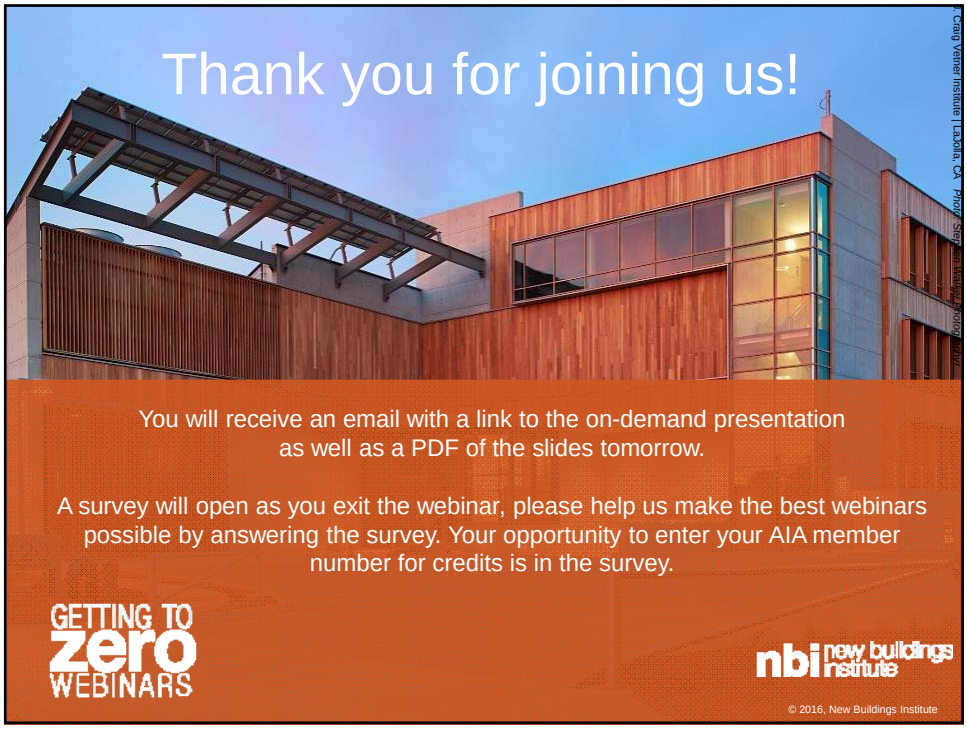
Cody Taylor
Team Lead, Commercial Building Integration
U.S. Department of Energy
Cody.taylor@ee.doe.gov

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

60


GETTING TO
zero
NATIONAL FORUM 2016
Bertschi School Science Wing Seattle, WA | Photo: KMB Architects
Call for Speakers
October 12-14, 2016 | Denver, CO
http://gettingtozeroforum.org/call-for-speakers/
nbi new buildings institute
ROCKY MOUNTAIN INSTITUTE


GETTING TO
zero
NATIONAL FORUM 2016
SPONSORSHIP OVERVIEW
Catalyzing the future of zero net energy buildings.
PHOTO: Bertschi School, Seattle, WA
nbi new buildings institute



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.

GETTING TO zero WEBINARS

nbi new buildings institute