

CA Goals, Trends and National Status of ZNE

Cathy Higgins, NBI Research Director



THANK YOU TO THE CPUC

This workshop is offered with support from the California Public Utilities Commission to support advancement of zero net energy buildings



New Buildings Institute:

We are an engine of innovation for the energy efficiency industry. We drive research, uncover solutions, and advance industry practices and policies that deliver positive change in the built environment.



The Name Game

Zero Energy Buildings

Zero Net Energy

Zero Carbon Buildings

Net Zero Energy

Zero Electric Buildings

Living Buildings

Zero Energy
Cost

Nearly Zero Energy Buildings

Passive
House

Zero Net Ready Buildings

Ultra-low Energy Buildings



TNBI's Terms

Zero Energy Buildings

Zero Net Energy

Zero Carbon Buildings

Net-Zero **Verified** Energy

Zero Electric Buildings

Living **Emerging** Buildings

Zero Energy
Cost

Nearly Zero Energy Buildings
- EUI in Site & Source
Zero Net Ready Buildings
- ZENR

Passive
House

Ultra-low Energy Buildings

Zero Net Energy – What is it?

A ZNE building is an ultra-efficient building that generates as much energy as it consumes annually. Also known as Net Zero Energy.



Marin Country Day School (Photo: Michael David Rose)

“Big Bold” Goals for ZNE in California



1 All new commercial construction will be ZNE by 2030

2 50% of existing buildings will be retrofit to ZNE by 2030



Exploratorium | San Francisco, CA

3 All new residential construction in California will be ZNE by 2020

The California Efficiency Strategic Plan (Sep 2008)
californiaenergyefficiency.com/docs/EEStrategicPlan.pdf

California ZNE Policy



CA “Big Bold” Goals

- 1** All new commercial construction will be ZNE by 2030
- 2** 50% of existing buildings will be retrofitted to ZNE by 2030
- 3** All new residential construction in California will be ZNE by 2020

The California Efficiency Strategic Plan (Sep 2008)
californiaenergyefficiency.com/docs/EEStrategicPlan.pdf



Exploratorium | San Francisco, CA

energy
upgrade[®]
CALIFORNIA

Non-commercial reproduction of this content or use in other materials is allowed.
Please cite the source as: “California ZNE Communications Toolkit, July 2013”



CA State Buildings

- 50% of new facilities designed after 2020 to be ZNE
- 100% of new buildings & major renovations designed after 2025 to be ZNE

Actions in other states: Washington State, New York, Mass, Vermont roadmaps for ZNE



Foundation of State Policies

Global Warming Solutions Act (2006)

AB 32 Reduces statewide greenhouse gas (GHG) emissions to 1990 levels by 2020 and to 20 percent of 1990 levels by 2050.

Energy Efficiency Program for Existing Buildings (2009)

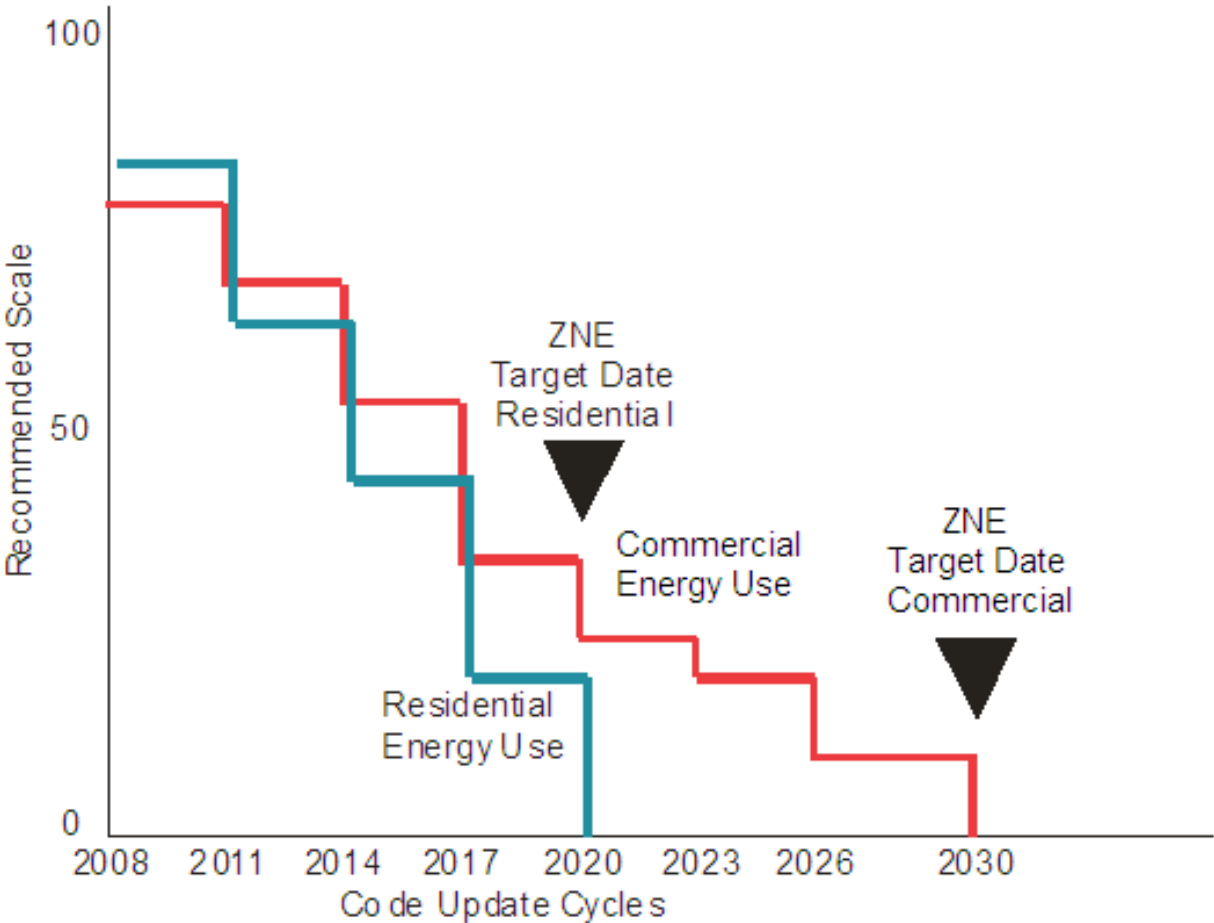
AB 758 Requires the Energy Commission to develop and implement a comprehensive program to achieve greater energy savings in the state of California's existing residential and nonresidential building stock.

Long Term Energy Efficiency Strategic Plan (2008)

State's first integrated framework—a single roadmap to achieve maximum energy savings across all major groups and sectors.



Code Cycles to Net Zero in CA



Code Cycles to ZNE, Source: SCE & AEC, 2009

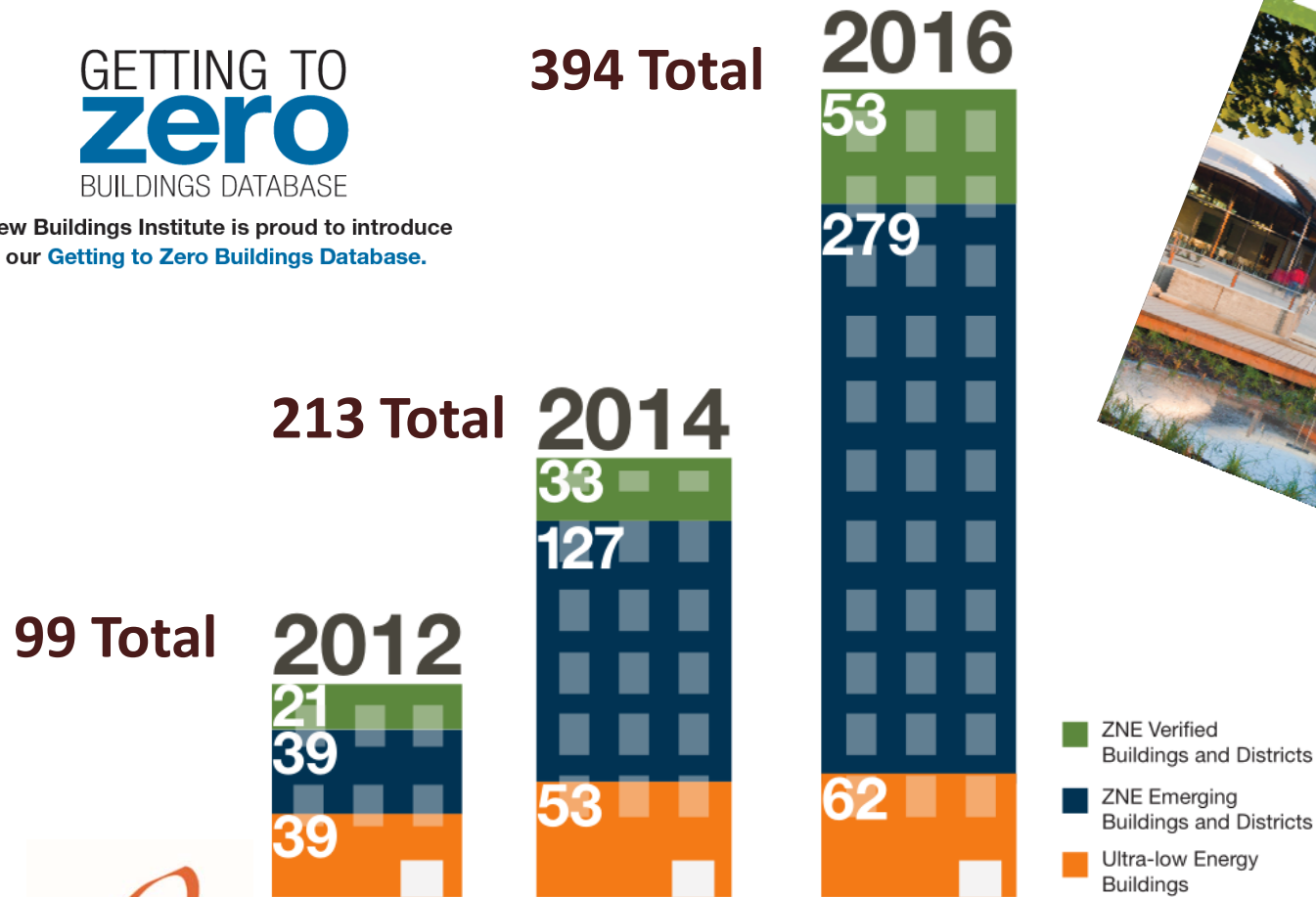


The 2016 List of ZNE Buildings

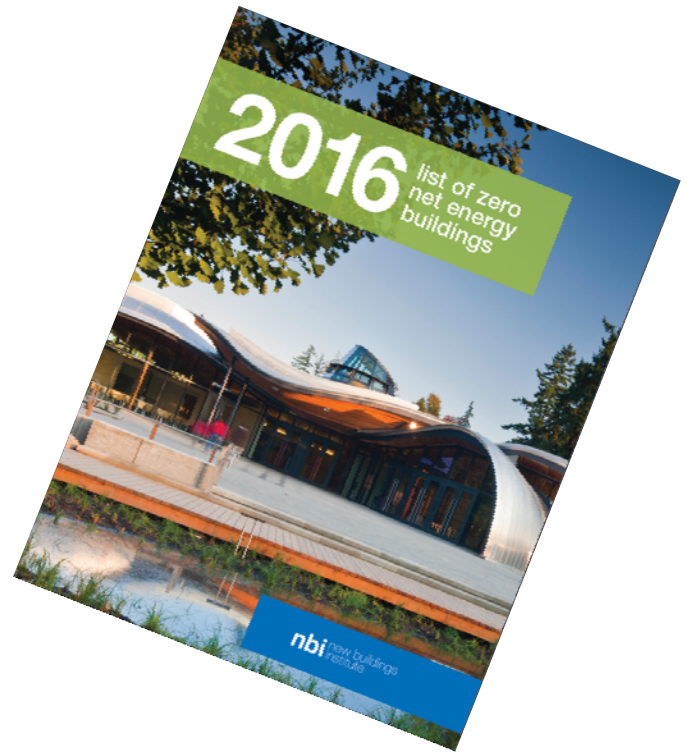
Number of ZNE Projects

GETTING TO
zero
BUILDINGS DATABASE

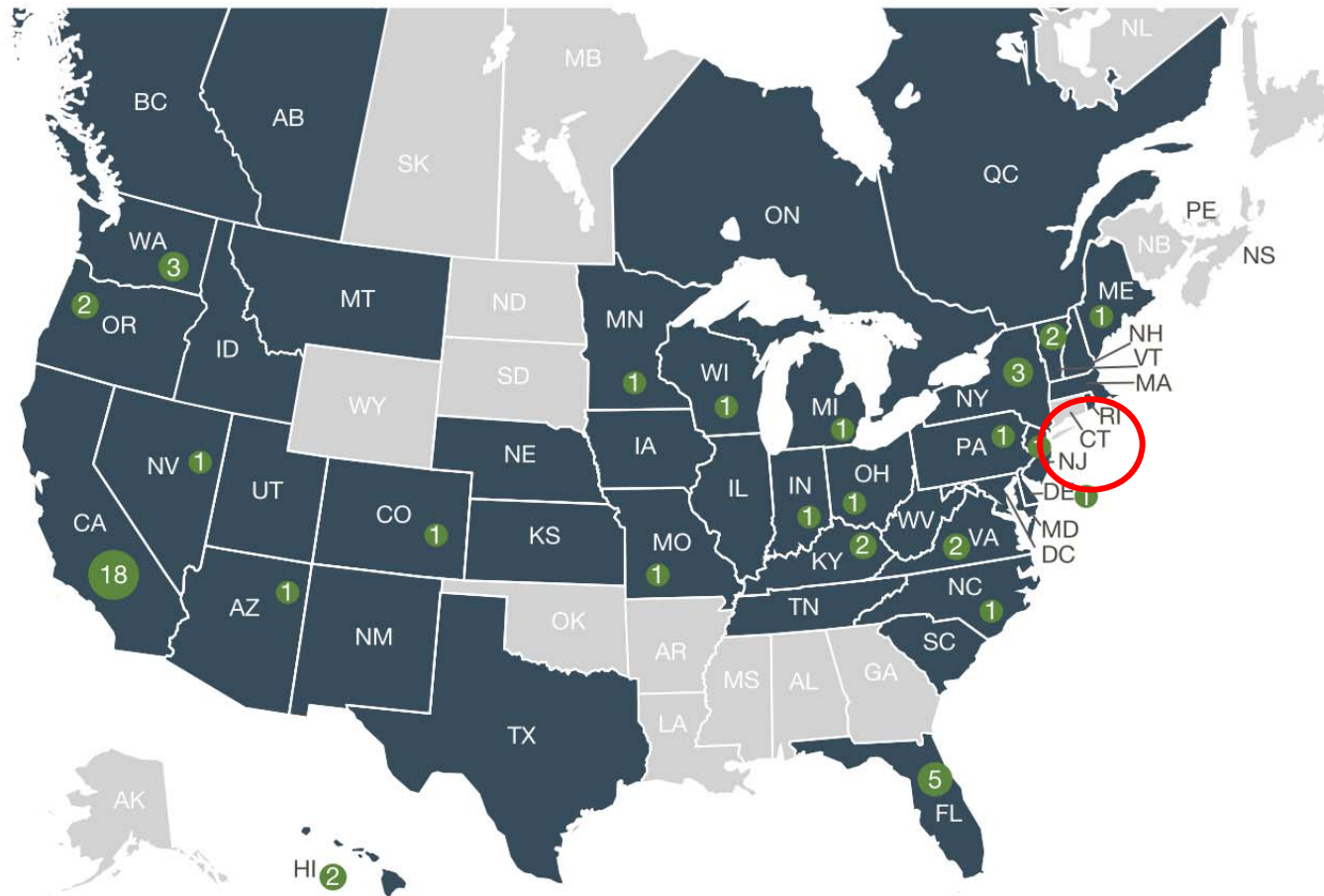
New Buildings Institute is proud to introduce our [Getting to Zero Buildings Database](#).



- ZNE Verified Buildings and Districts
- ZNE Emerging Buildings and Districts
- Ultra-low Energy Buildings



Where are the ZNE Projects?

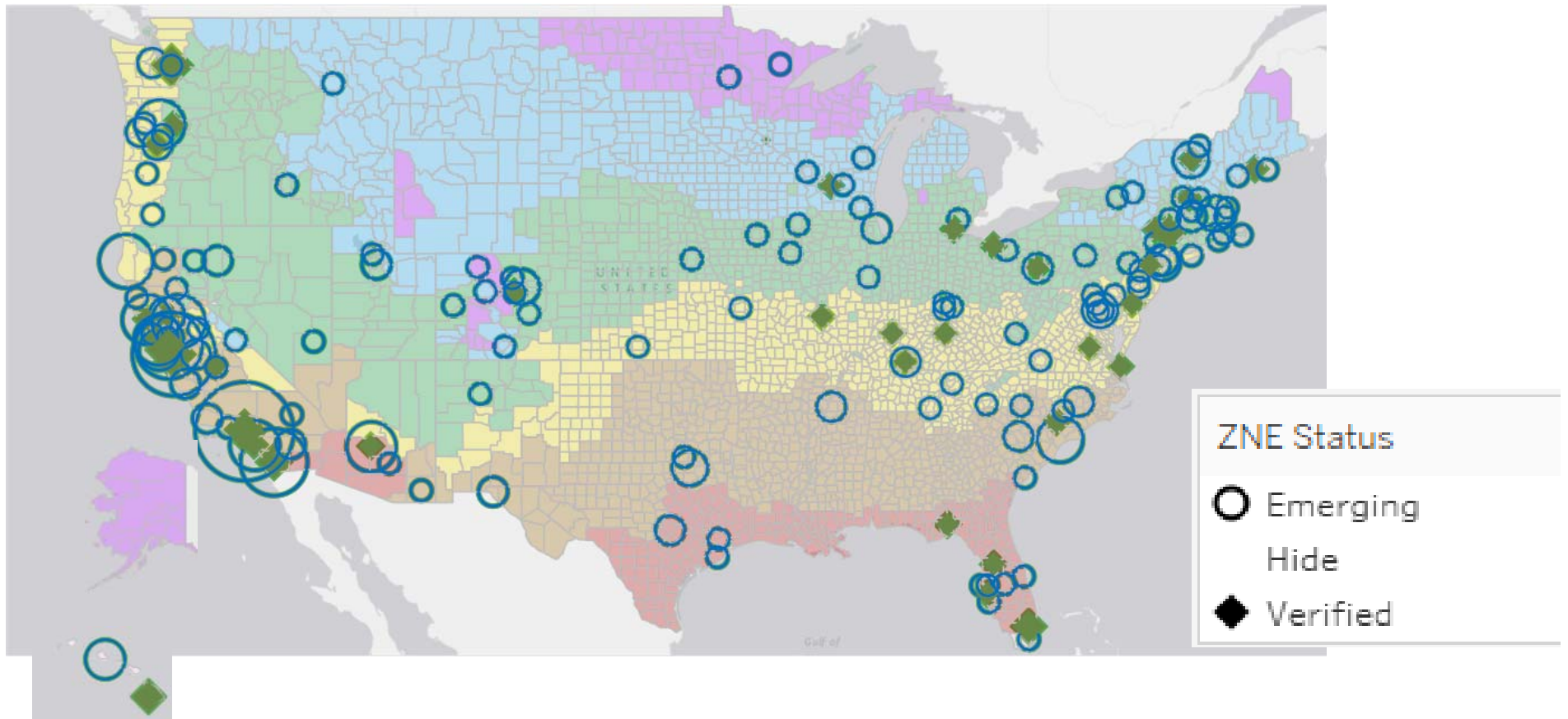


Number of ZNE Verified Buildings

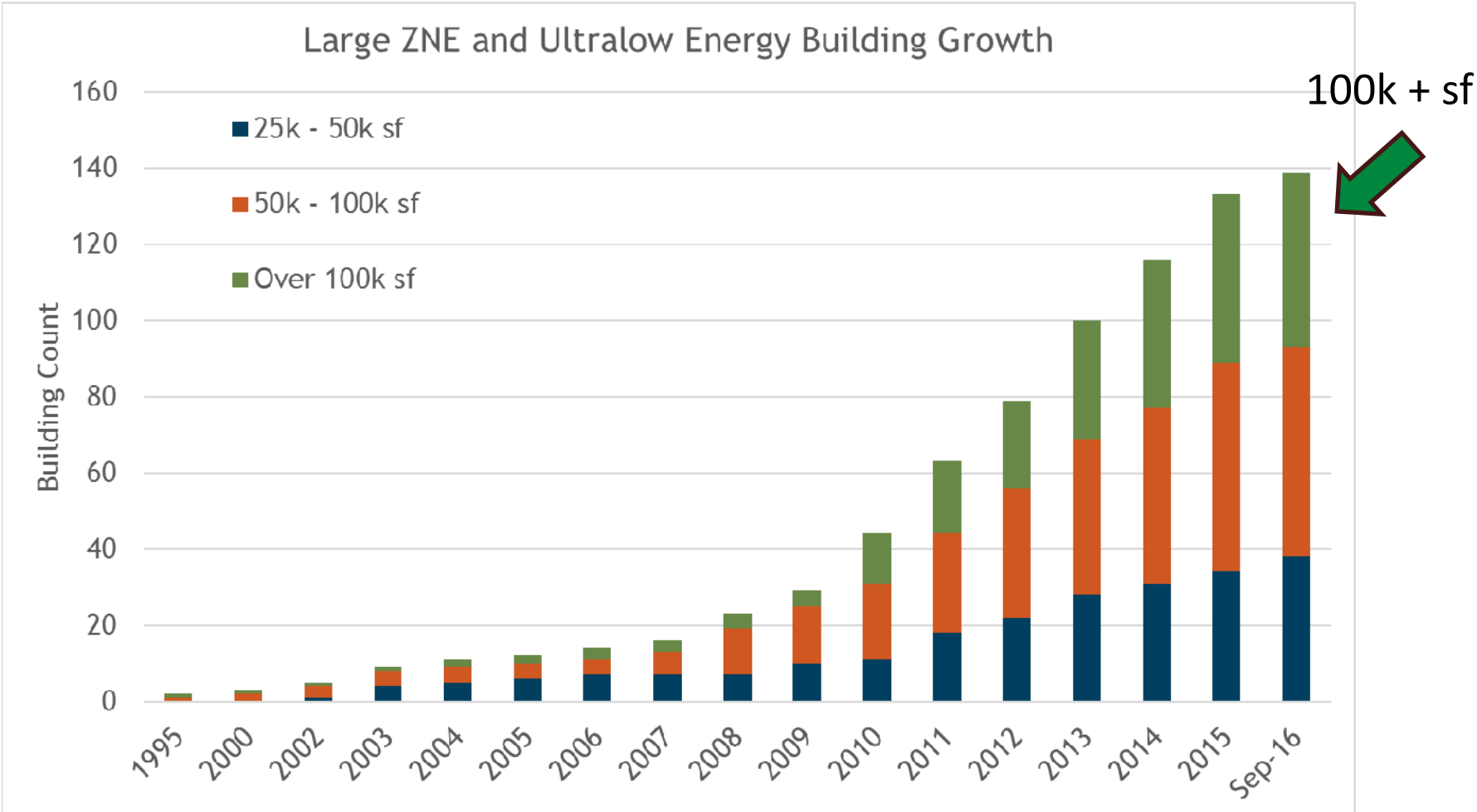
States and Provinces with ZNE Emerging or Verified Buildings (44)



ZNE Buildings in Every Climate Zone

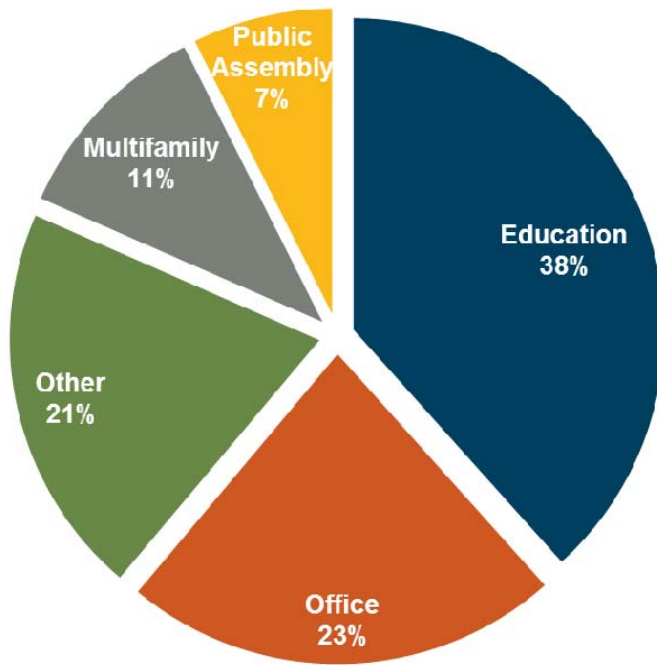


ZNE – Now Available in Your Size

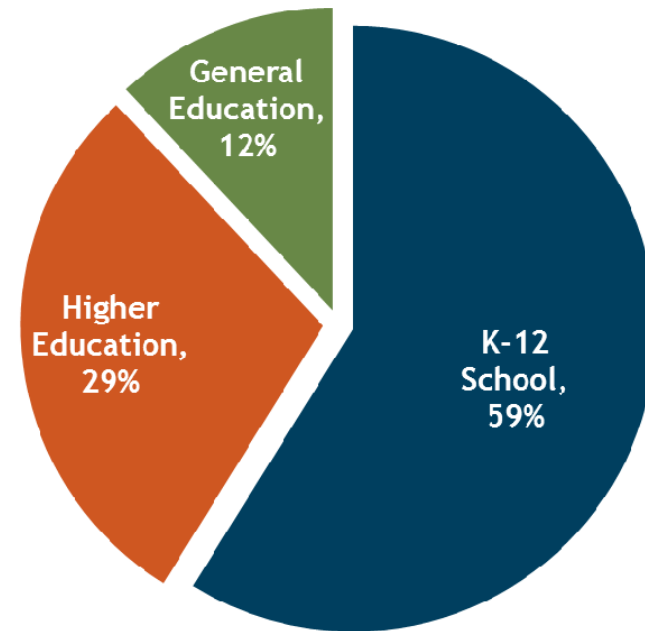


ZNE Building Types

ZNE and Ultra-low Energy Building Types

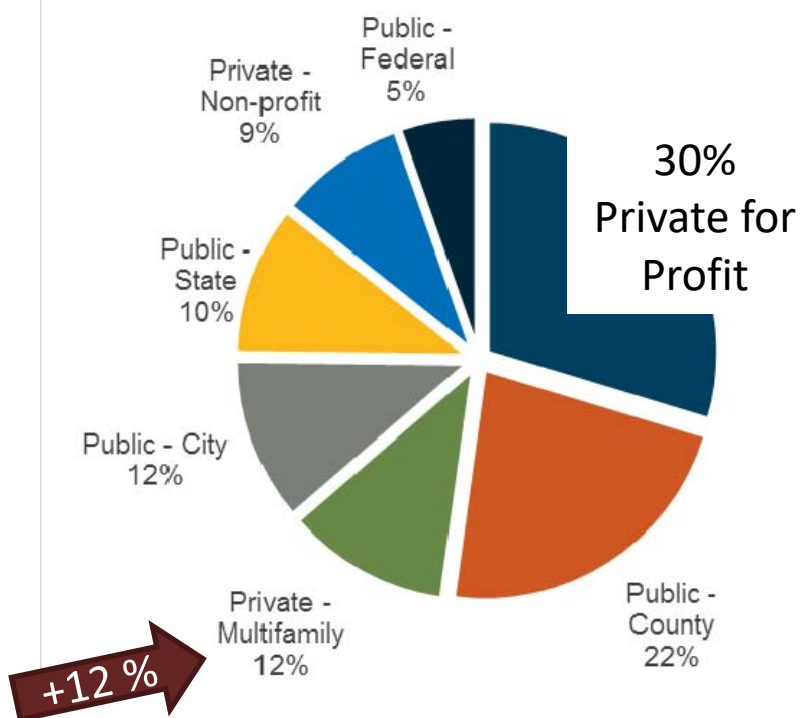


Breakdown of Education Building Types

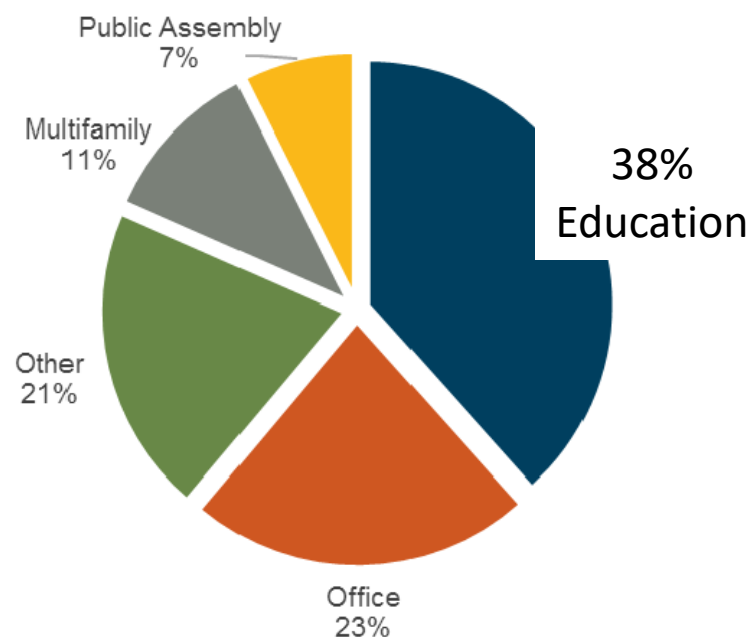


Who is Aiming for ZNE?

ZNE Building Ownership Type



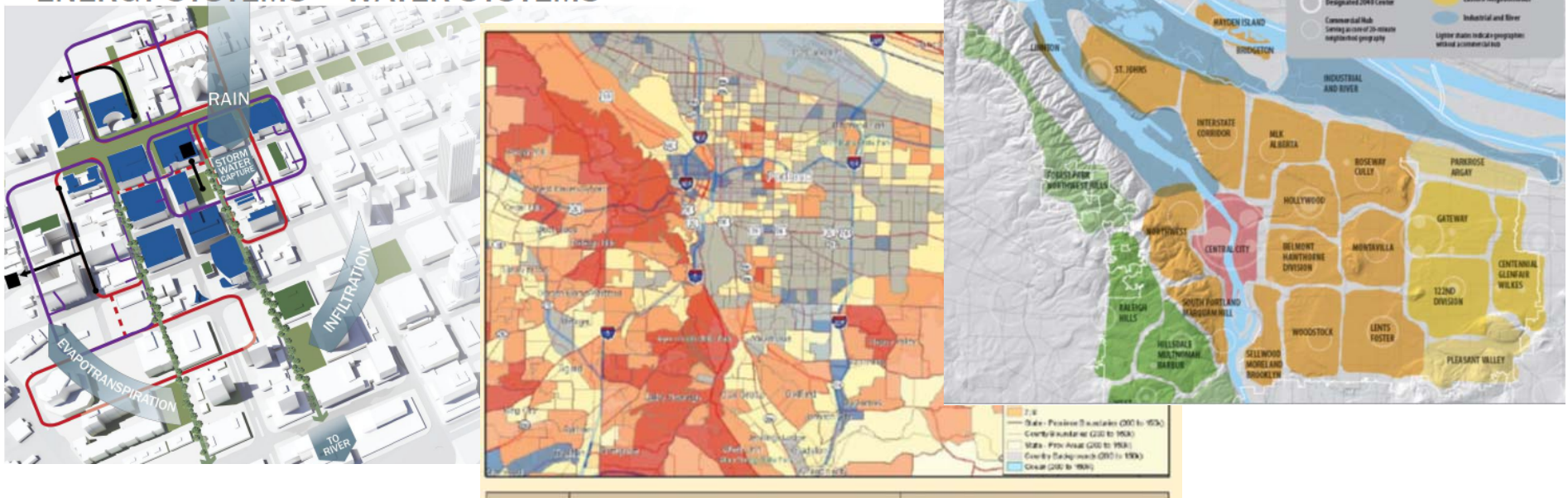
ZNE and Ultra-Low Energy Building Types



Trend - DISTRICTS: *Going Beyond the Building*

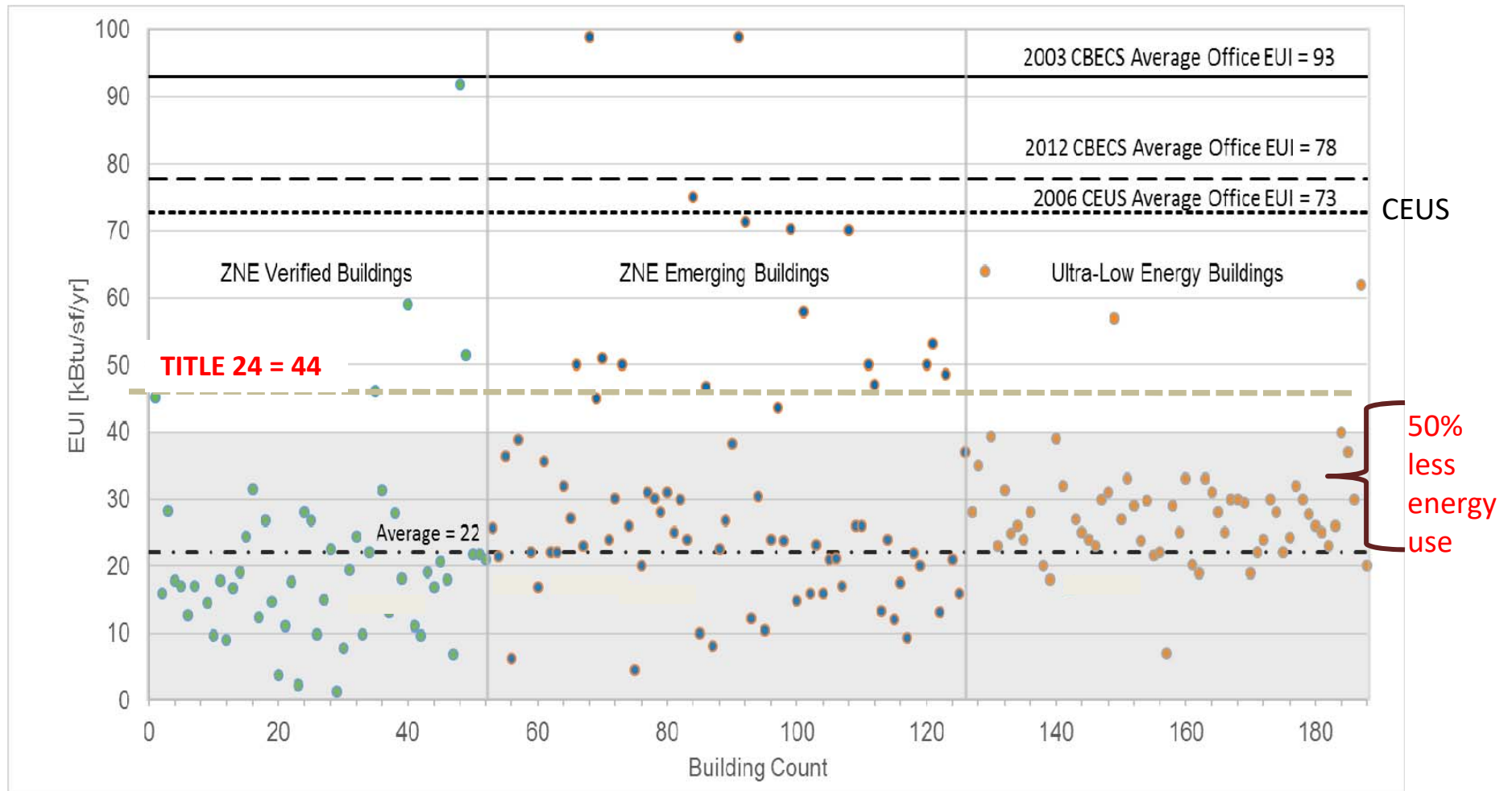
DISTRICT SCALE

ENERGY SYSTEMS + WATER SYSTEMS



*districts, communities, grids, aggregation, resilience,
storage, fuel access & price, energy transactions,
resources, scale, utility*

Gross EUI Performance Ranges



Overall Trends

- ZNE is achievable in a **wide variety of regions and climate zones**
- ZNE works for many **building types and sizes**
- ZNE is achievable during **existing buildings renovations**
- **Private sector** is increasingly embracing ZNE
- **ZNE districts** are a growing trend
- Large proportion ZNE buildings are in the **educational sector**

Names and Numbers

Leading Firms with Buildings on the ZNE List	
AP+I Design	
Capital Engineering Consultants	
Castle Wells Company	
Davis Energy Group	
DLR Group	
EHDD	
Green Hammer	
HOK Architects	
Integral Group	
Maclay Architects	
ME Group	
Mithun	

Morgan Creek Developers
Optima Engineering
PAE Consulting Engineers
Point Energy Innovations
RNL Design
TD Bank
United Therapeutics
JC Venter Institute
WRNS Studio
WSP Parsons Brinkerhoff

2016 List of Zero Energy Buildings

ZNE Verified Buildings
Zero Net Energy Verified Buildings have achieved ZNE for at least one full year. The total consumption of energy, from all sources, has been fully balanced by onsite renewable energy go.

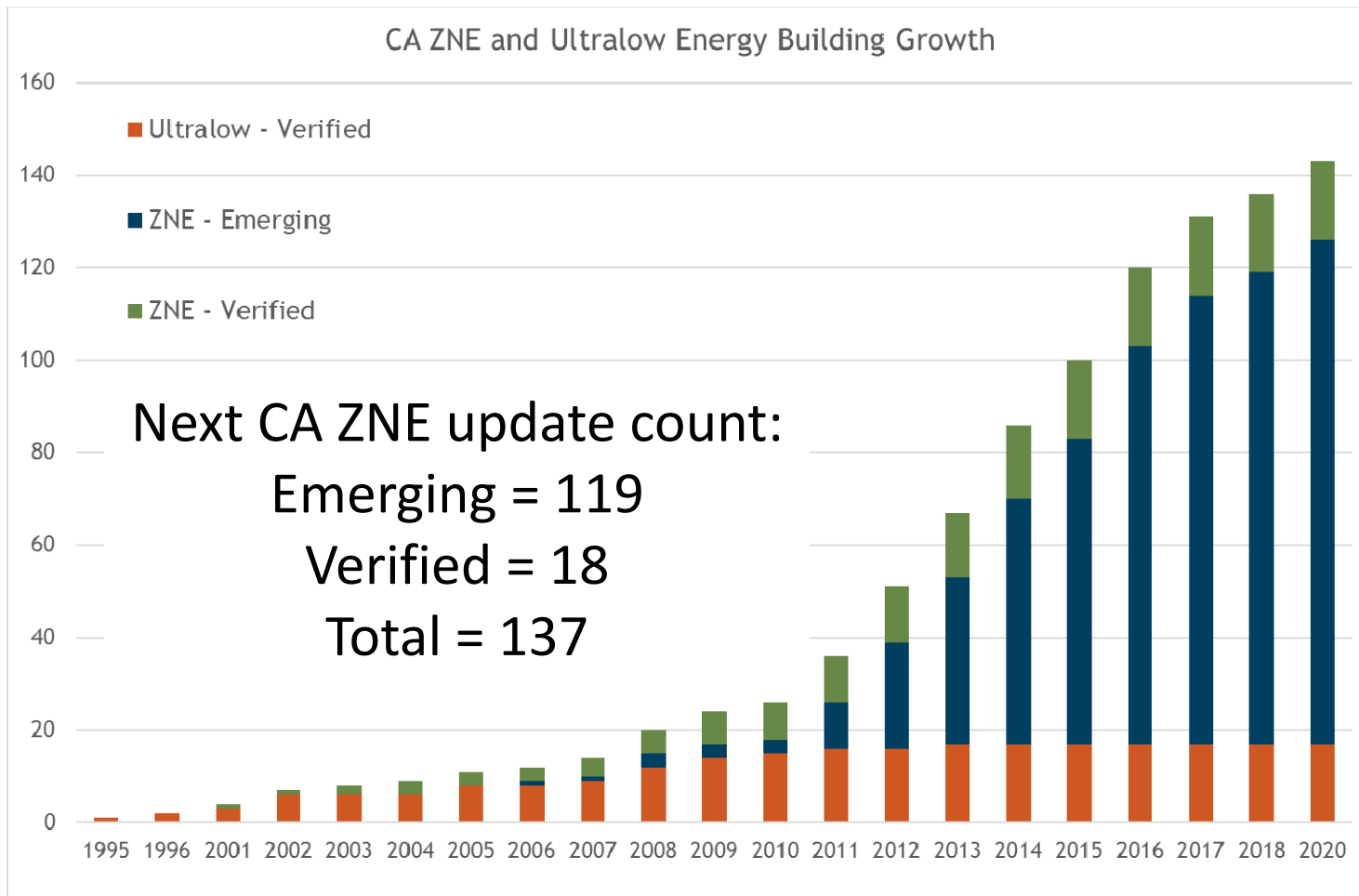
Year	Project Name	City	State	#
2000	Stanford Design Tower	Stanford	CA	1
2001	Environmental Health Center	South	CA	1
2002	Labson Center at Ohio Park	Denver Park	CA	1
2003	Source House	Los Angeles	CA	1
2004	Challenger North Club	St. Paul	MI	1
2005	Home Gateway Energy Center	Los Angeles	CA	1
2007	Ball-Lippard Legacy Center	Kalamazoo	MI	1
2008	Bank of America Tower	San Jose	CA	1
2008	Chancellor Robert Grayson Building	San Diego	CA	1
2008	Environmental Health Center	San Diego	CA	1
2008	University of California	San Diego	CA	1

ZNE Emerging Buildings
Zero Net Energy Emerging Buildings have publicly stated a goal of achieving ZNE, but have not yet demonstrated achievement of that goal. These buildings may be in the planning or design phase, under construction, or have been in operation for less than 12 months. Owners may have been operating for at least a year, but their measured energy either has yet to achieve ZNE, or the measured data to document ZNE performance was not available.

Year	Project Name	City	State	Energy Type	Net Zero Energy (kWh)	Net Zero Energy (kWh)	Net Zero Energy (kWh)	Net Zero Energy (kWh)	Net Zero Energy (kWh)
2007	Ball-Lippard Legacy Center	Kalamazoo	MI	100%	100%	100%	100%	100%	100%
2007	Ball-Lippard Legacy Center	Kalamazoo	MI	100%	100%	100%	100%	100%	100%
2007	Ball-Lippard Legacy Center	Kalamazoo	MI	100%	100%	100%	100%	100%	100%



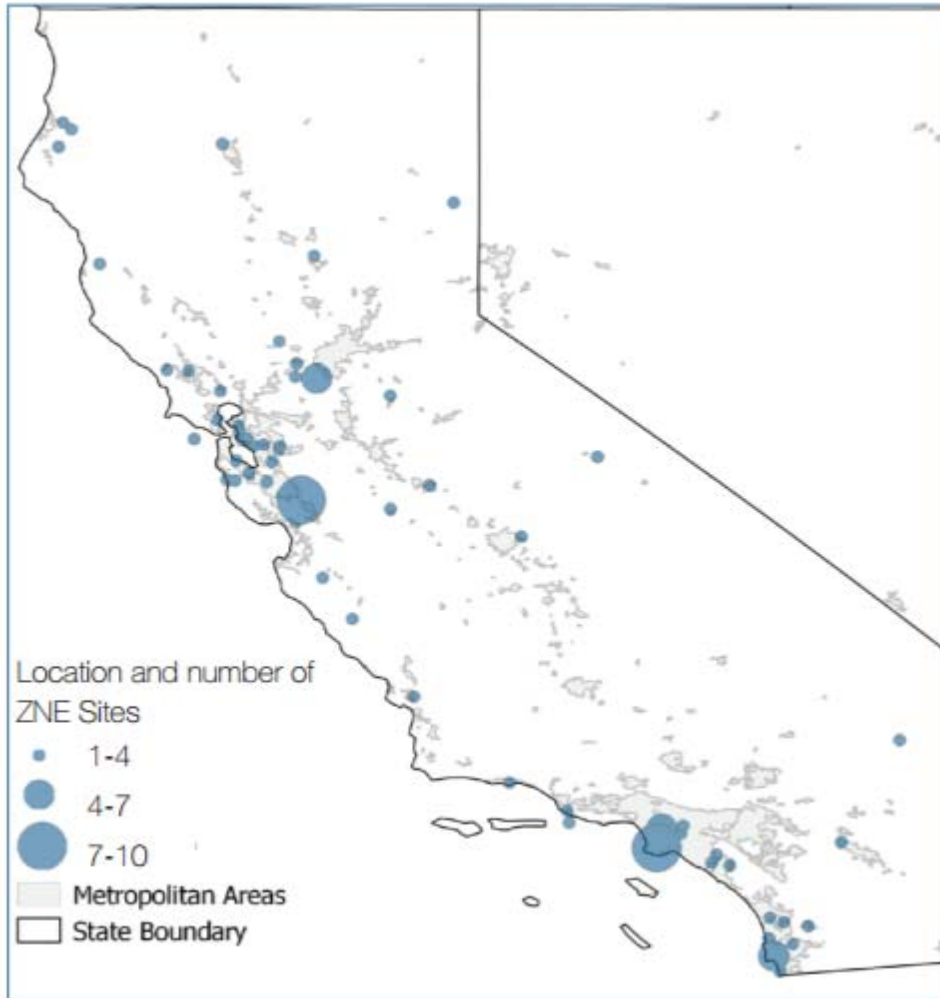
California in the Lead





California ZNE Watchlist

Zero Energy & Ultra-Low Energy Buildings



California ZNE Watchlist

California leads the country in both policy and projects that are laying the path to a zero net energy (ZNE) future. California state agencies have adopted goals for 100% of new and 50% of existing commercial buildings to be ZNE by 2030. Leading design firms and owners have already recognized the real estate and occupancy advantages of these high performance buildings and today California has over 50 commercial buildings either verified (15) as ZNE or emerging (34) toward that target.

The CA ZNE Watchlist tracks commercial buildings (including multi-family) based on information gathered by New Buildings Institute (NBI) from multiple sources including designers, owners, utility programs, private and public organizations, articles, e-news, research, and commercial real estate professionals. It serves, along with other available ZNE resources¹, to support the awareness, acceptance and adoption of ZNE goals and outcomes throughout California and the nation. Buildings with ultra-low energy performance comparable to ZNE are also included.

The graphics below show the trends in location, type and size of the ZNE buildings in California.

ZNE and Ultra Low Energy Buildings by Size

ZNE and Ultra Low Energy Buildings by Type

Locations of CA ZNE and emerging ZNE buildings. Dot size represents volume of buildings.

List of Zero Energy & Ultra-Low Energy Buildings in California

The ZNE Watchlist provides examples of commercial buildings that have verified zero net energy (ZNE) performance, are emerging toward a ZNE goal or reflect comparable ultra-low energy performance. The buildings on the list are categorized as ZNE, verified, ZNE Emerging, and Ultra-Low Energy.

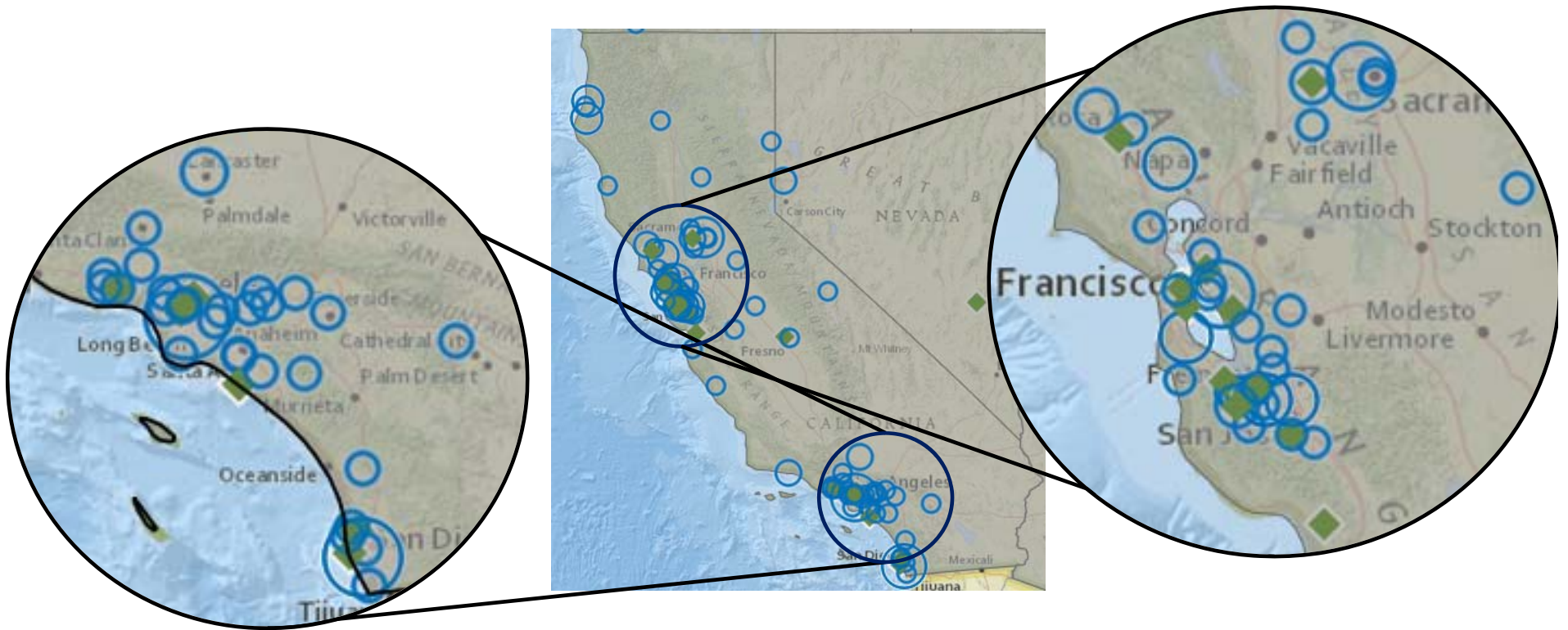
ZNE Verified buildings (or devices) have been documented to have met, over the course of a year, all net energy use through on-site renewables. The energy use of all fuels (electric, natural gas, steam, etc.) is counted and offset by production from on-site renewables.

Not all energy buildings listed and NBI (www.newbuildings.org/zero-energy) monitor, visit www.newbuildings.org in other materials is allowed. Please cite as "California ZNE Watchlist".

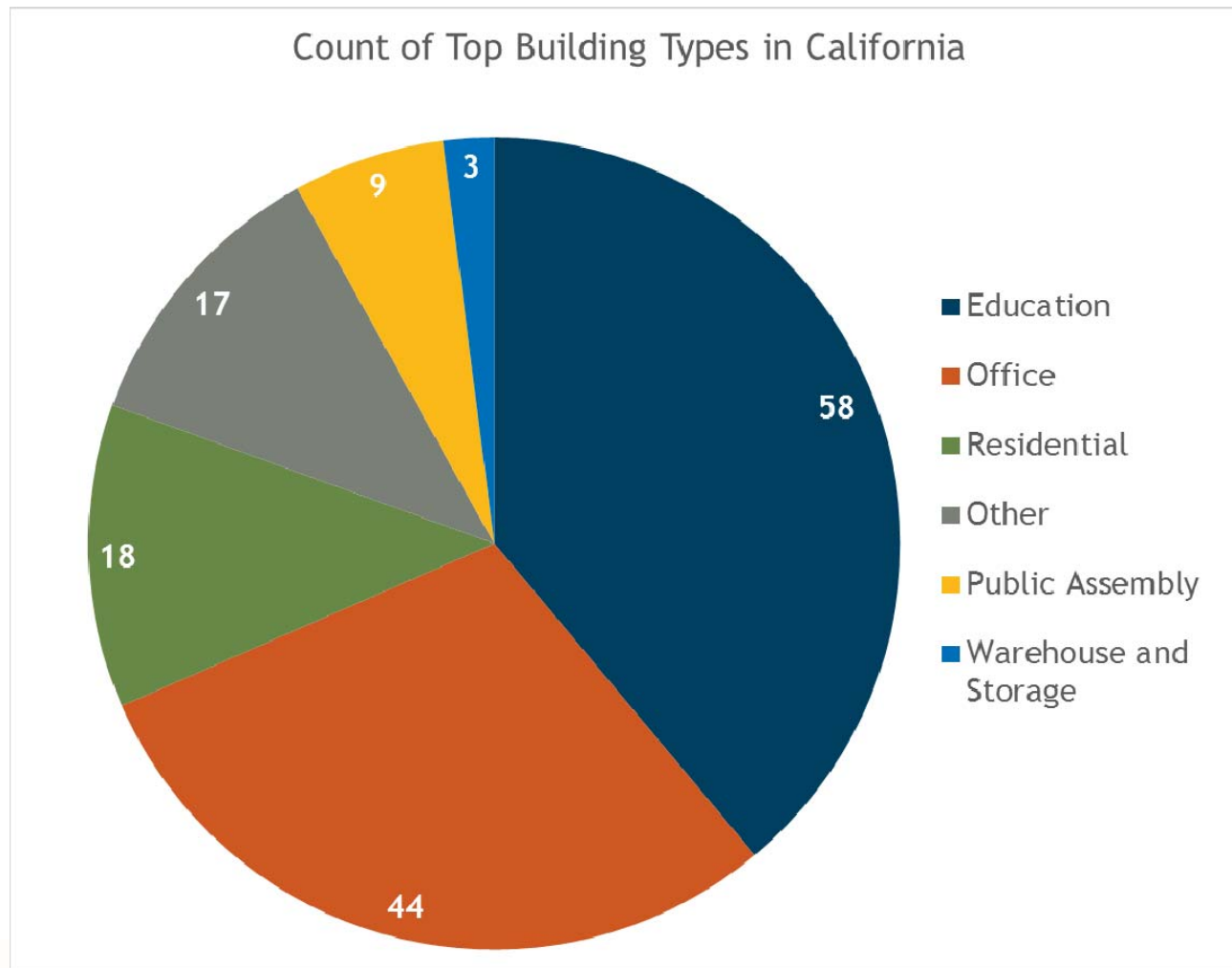
California ZNE Watchlist Spring 2015

Building Name	Year Completed	Location	Building Type	Size (sq ft)	Energy Use (kWh/sq ft/yr)	Category
Verified ZNE						
Advent Center at Lake Park off grid	2003	Los Angeles	Other	1,000	0	ZNE
Bentley Office	2008	San Diego	Office	4,500	0	ZNE
Challenges Series (2)	2002	Los Angeles	Other	1,000	0	ZNE
Good and Beautiful Foundation	2012	San Diego	Office	10,000	0	ZNE
Sanford-Brown Medical Center Building	2011	San Diego	Other	3,000	0	ZNE
UP Foundation San Diego for Day Care Office	2010	San Diego	Office	20,000	0	ZNE
UP San Francisco Office	2014	San Francisco	Office	20,000	0	ZNE
University of Oregon New Park off grid	2011	San Francisco	Education - General	4,000	0	ZNE
University of Oregon Center	2008	Portland, Ore.	Other	4,000	0	ZNE
University of Oregon Center Science Hall	2002	Portland, Ore.	Education - Higher	2,000	0	ZNE
UPSD East Hill Zero Net Energy Center	2012	San Francisco	Education - General	4,000	0	ZNE
UPSD 27 Design Facility	2007	San Jose	Office	6,500	0	ZNE
UPSD Jackson Lakehead Energy Building	2014	San Jose	Education - Higher	4,000	0	ZNE
UPSD San Diego San Pedro Station	2002	Redwood City	Education - Higher	13,000	0	ZNE
University of Oregon Health Sciences Center	2012	Portland	Education - Higher	3,000	0	ZNE
University of Oregon Health Sciences Center Energy Building	2008	Portland	Office	10,000	0	ZNE
UPSD Berkeley Public School	2010	Berkeley	Other	3,000	0	ZNE
ZNE Emerging						
Advent Center at Lake Park off grid	2003	Los Angeles	Other	1,000	0	ZNE Emerging
Bentley Office	2008	San Diego	Office	4,500	0	ZNE Emerging
Challenges Series (2)	2002	Los Angeles	Other	1,000	0	ZNE Emerging
Good and Beautiful Foundation	2012	San Diego	Office	10,000	0	ZNE Emerging
Sanford-Brown Medical Center Building	2011	San Diego	Other	3,000	0	ZNE Emerging
UP Foundation San Diego for Day Care Office	2010	San Diego	Office	20,000	0	ZNE Emerging
UP San Francisco Office	2014	San Francisco	Office	20,000	0	ZNE Emerging
University of Oregon New Park off grid	2011	San Francisco	Education - General	4,000	0	ZNE Emerging
University of Oregon Center	2008	Portland, Ore.	Other	4,000	0	ZNE Emerging
University of Oregon Center Science Hall	2002	Portland, Ore.	Education - Higher	2,000	0	ZNE Emerging
UPSD East Hill Zero Net Energy Center	2012	San Francisco	Education - General	4,000	0	ZNE Emerging
UPSD 27 Design Facility	2007	San Jose	Office	6,500	0	ZNE Emerging
UPSD Jackson Lakehead Energy Building	2014	San Jose	Education - Higher	4,000	0	ZNE Emerging
UPSD San Diego San Pedro Station	2002	Redwood City	Education - Higher	13,000	0	ZNE Emerging
University of Oregon Health Sciences Center	2012	Portland	Education - Higher	3,000	0	ZNE Emerging
University of Oregon Health Sciences Center Energy Building	2008	Portland	Office	10,000	0	ZNE Emerging
UPSD Berkeley Public School	2010	Berkeley	Other	3,000	0	ZNE Emerging
Ultra-Low Energy						
Advent Center at Lake Park off grid	2003	Los Angeles	Other	1,000	0	Ultra-Low Energy
Bentley Office	2008	San Diego	Office	4,500	0	Ultra-Low Energy
Challenges Series (2)	2002	Los Angeles	Other	1,000	0	Ultra-Low Energy
Good and Beautiful Foundation	2012	San Diego	Office	10,000	0	Ultra-Low Energy
Sanford-Brown Medical Center Building	2011	San Diego	Other	3,000	0	Ultra-Low Energy
UP Foundation San Diego for Day Care Office	2010	San Diego	Office	20,000	0	Ultra-Low Energy
UP San Francisco Office	2014	San Francisco	Office	20,000	0	Ultra-Low Energy
University of Oregon New Park off grid	2011	San Francisco	Education - General	4,000	0	Ultra-Low Energy
University of Oregon Center	2008	Portland, Ore.	Other	4,000	0	Ultra-Low Energy
University of Oregon Center Science Hall	2002	Portland, Ore.	Education - Higher	2,000	0	Ultra-Low Energy
UPSD East Hill Zero Net Energy Center	2012	San Francisco	Education - General	4,000	0	Ultra-Low Energy
UPSD 27 Design Facility	2007	San Jose	Office	6,500	0	Ultra-Low Energy
UPSD Jackson Lakehead Energy Building	2014	San Jose	Education - Higher	4,000	0	Ultra-Low Energy
UPSD San Diego San Pedro Station	2002	Redwood City	Education - Higher	13,000	0	Ultra-Low Energy
University of Oregon Health Sciences Center	2012	Portland	Education - Higher	3,000	0	Ultra-Low Energy
University of Oregon Health Sciences Center Energy Building	2008	Portland	Office	10,000	0	Ultra-Low Energy
UPSD Berkeley Public School	2010	Berkeley	Other	3,000	0	Ultra-Low Energy

ZNE Buildings in California



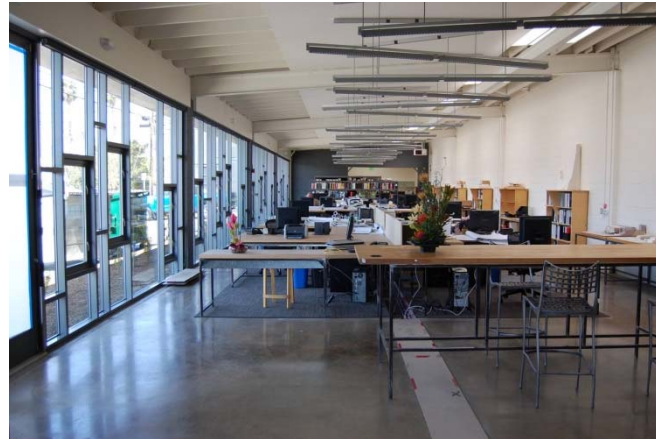
California in the Lead



ZERO NET ENERGY BUILDINGS IN CALIFORNIA: COMMERCIAL BUILDINGS



**DPR Construction San
Diego Corporate Office**



**Bacon St. Offices, SDG&E &
Hanna Gabriel Wells Architects**



**SMUD East Campus
Operations Center**

Getting Existing Buildings to Zero

- ¼ of ZNE projects we are tracking are retrofits
- Trigger points for change
- Models from others



DPR Construction ZNE Offices| San Diego
Photo: David Hewitt

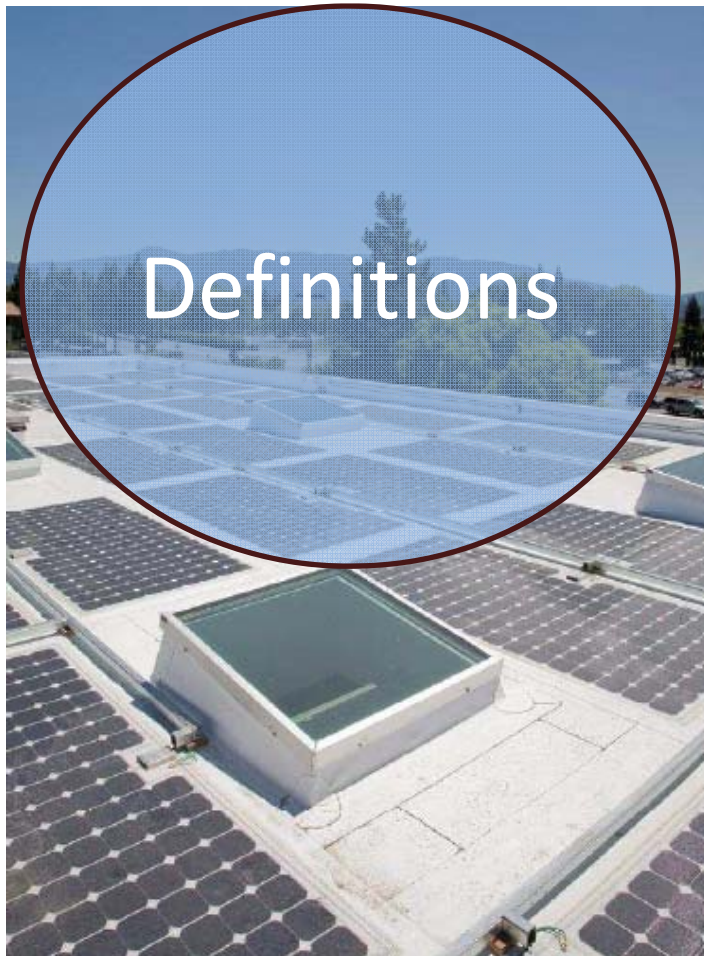
Advancing ZNE Professional Leadership and Innovation

- Getting an edge on the competition
- RFP's & RFQ's will be asking for ZNE experience and approaches – are you ready?
- Future proofing for carbon tracking
- Meeting real estate expectations



HGW Architects | Bacon Street Offices
Photo: HGW ARCHITECTS

Challenges



- Cost perception
- Data gathering
- PV delayed due to cost
- Projects not occupied or operated as modeled
- Getting the metering right
- Commissioning – new form of ZNE Cx
- **Fear of disclosure** - ZNE seen as an end-all

The growing world of ZNE

New Buildings Institute 2016 Snapshot

Zero Net Energy Activities in California

POLICY | PROGRAMS & PROJECTS | PEOPLE

