

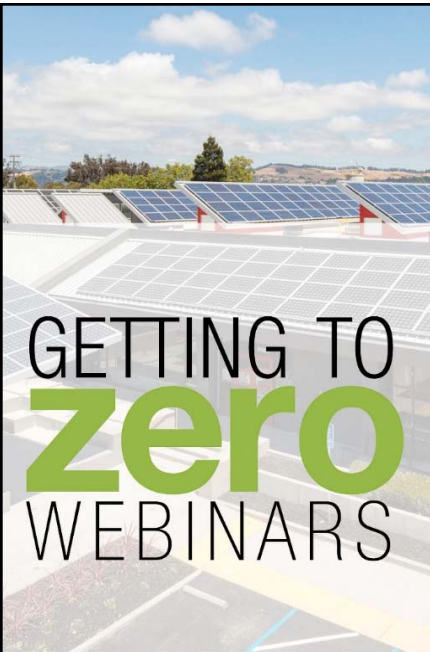


GETTING TO
zero
WEBINARS

nbi new buildings
institute

Zero Net Energy Building Trends and ZEDx Presentations

January 31, 2017



GETTING TO
zero
WEBINARS

nbi new buildings
institute

Thank you to our sponsors and supporters



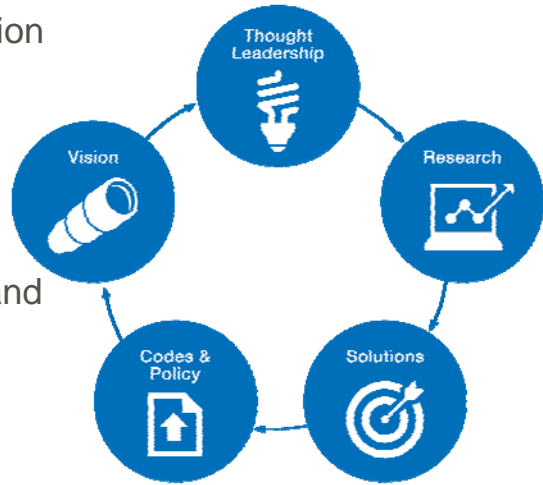


Ralph DiNola
CEO
New Buildings
Institute



nbi 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.



Cathy Higgins
Research Director
New Buildings Institute



Brett Moss
Training Director
Net Zero Plus
Electrical Training
Institute



Neil Bulger
Principal
Integral Group



Andy Bush
Managing Partner
Morgan Creek
Ventures



Kenner Kingston
President
Architectural Nexus

Getting to Zero:

The 2016 List of Zero Net Energy Buildings

January 31, 2017 Webinar

Cathy Higgins
NBI Research Director



All Rights Reserved © 2017 New Buildings Institute

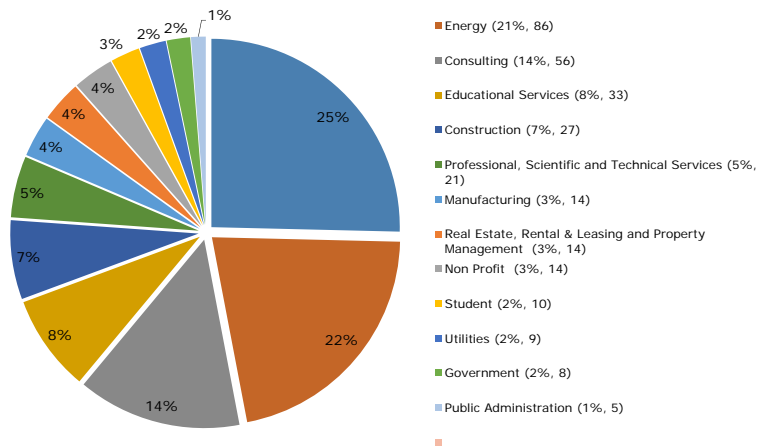
GETTING TO zero NATIONAL FORUM



October 2016 Denver Colorado



ATTENDEE BREAKDOWN | Industry



Top 3 Topic Areas at the GtZ Forum:

1. Designing and Delivering on ZNE Projects
2. Driving ZNE to Scale through Policy and Programs
3. The Owner and Developer Perspective

The Name Game

Zero Energy Buildings

Zero Net Energy

Zero Carbon Buildings

Net Zero Energy

Zero Electric Buildings

Living Buildings

Nearly Zero Energy Buildings

Zero Energy
Cost

Zero Net Ready Buildings

Passive
House

Ultra-low Energy Buildings

NBI Terms in the Report

Zero Net Energy

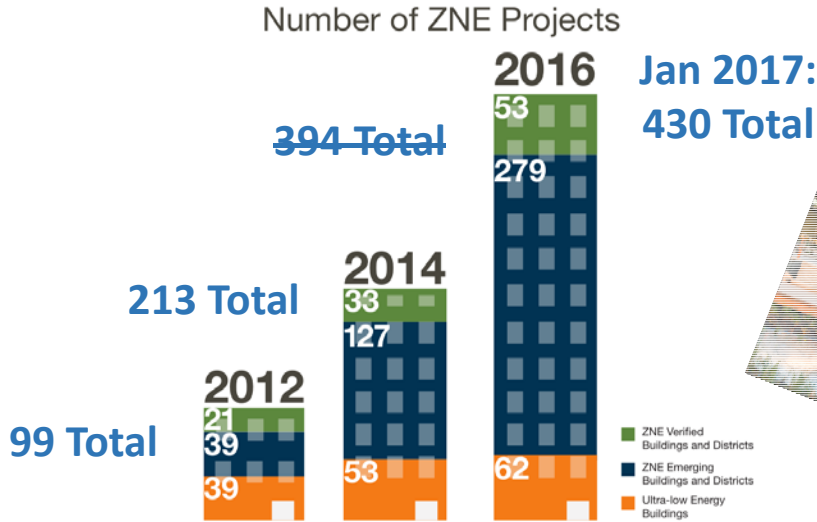
- EUI in Site & Source
- zEPI

- Verified

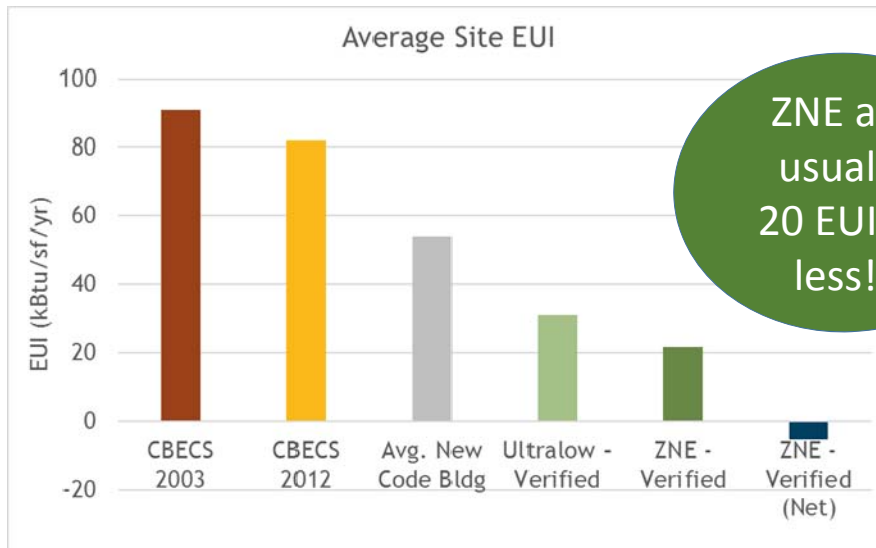
- Emerging

Ultra-low Energy Buildings

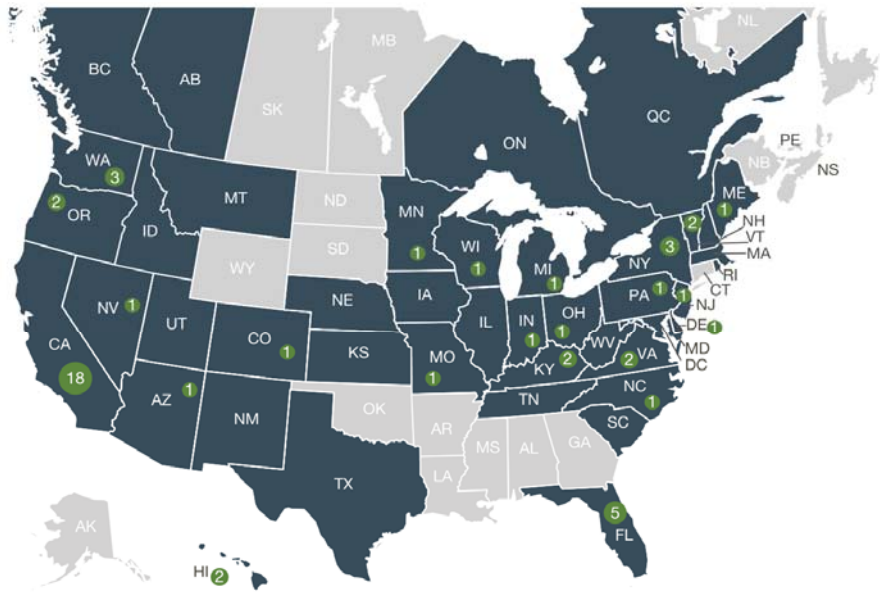
The 2016 List of ZNE Buildings!



Energy Performance



Where are ZNE Projects?

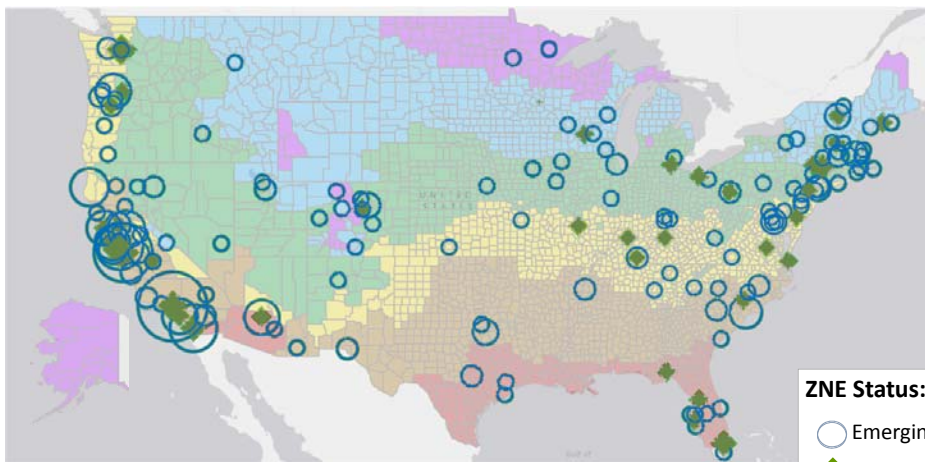


Number of ZNE Verified Buildings
 States and Provinces with ZNE Emerging or Verified Buildings (44)

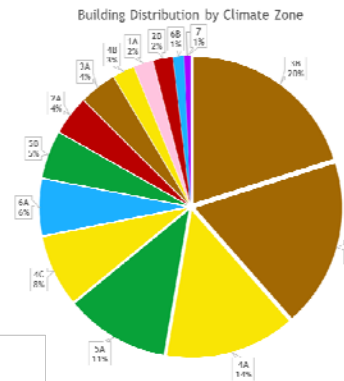
nbi new buildings institute

All Rights Reserved © 2017 New Buildings Institute

ZNE Buildings in Every Climate Zone



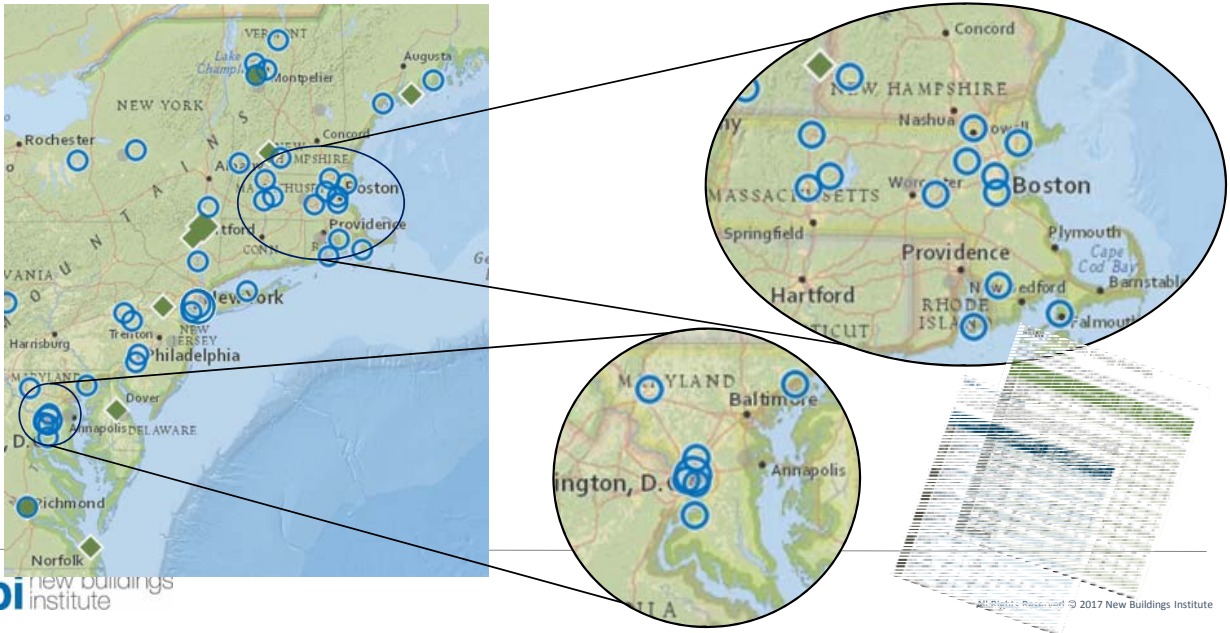
ZNE Status:
 ○ Emerging
 ◆ Verified



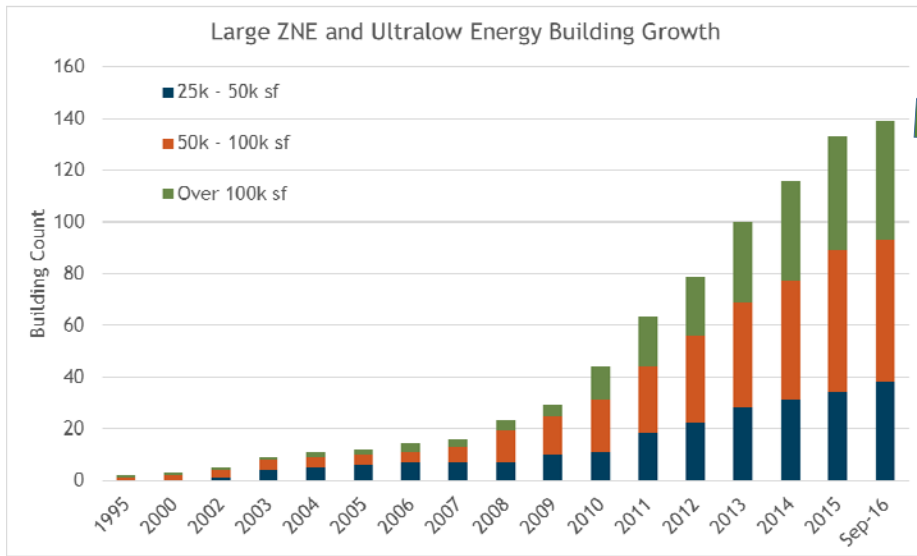
nbi new buildings institute

All Rights Reserved © 2017 New Buildings Institute

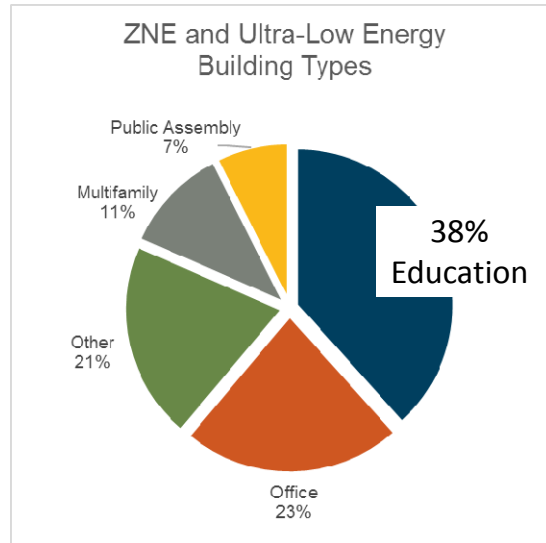
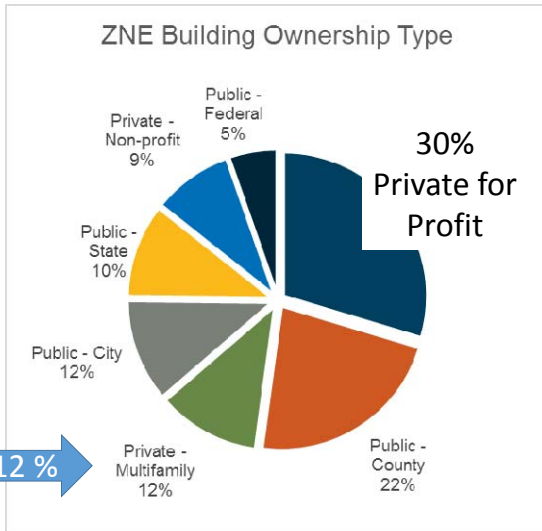
ZNE Buildings on the Eastern Seaboard



ZNE – Now Available in Your Size



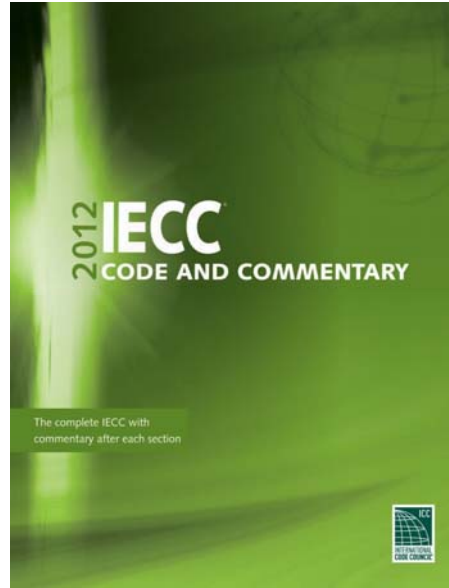
Who is Aiming for ZNE?



ZNE Schools: Top Five States

State	ZNE Verified	ZNE Emerging	Ultra-Low Energy Verified	Grand Total
CA	1	18	6	25
KY	2	3	4	9
NC	1	4	2	7
TX	0	5	1	6
SC	0	5	0	5
Total	9	50	19	78

Codes and Policy

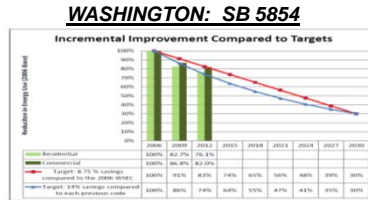
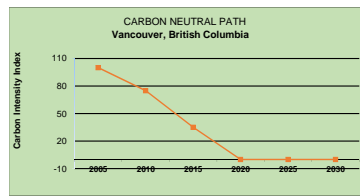
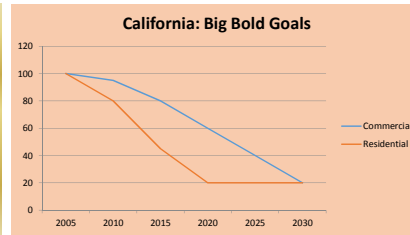
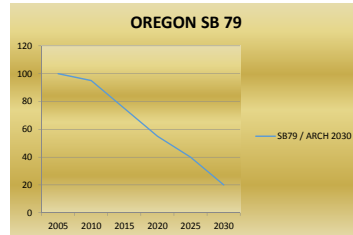


Codes and Policy

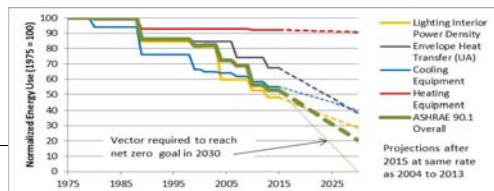
GETTING TO ZNE

Tools for the Policy:

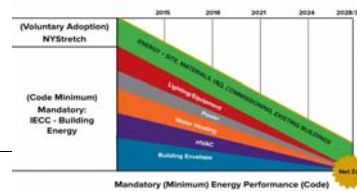
1. Goals and Definitions
2. Market Readiness
3. Public Buildings
4. Case Studies
5. Outreach to Stakeholders
6. Emerging issues – DG, EV, etc...
7. Engagement w/ Energy Utilities



ASHRAE 90.1 – Energy Use Targets



NYStretch and Code Minimum



Resources

- CPUC & NBI ZNE Case Studies
- PG&E Case Studies
- Getting to Zero Database
- **NBI Registry**



www.newbuildings.org



RESEARCH CODES & POLICY TOOLS & GUIDES EVENTS NEWS BLOG ABOUT NBI DONATE MY ACCOUNT

ZERO NET ENERGY ADVANCED BUILDINGS OUTCOME-BASED PERFORMANCE DEEP ENERGY RETROFITS

All Rights Reserved © 2017 New Buildings Institute



All Rights Reserved © 2017 New Buildings Institute



Getting to Zero Workshops

- ZNE Project Profiles
- News & Events
- Policy & Planning Updates
- Upcoming Training & Education
- New Research
- Low Energy Building Innovations

ZNE ACTION BULLETIN
Progress Towards Zero Net Energy Buildings

Email connie@newbuildings.org to sign up

what part will you play in solving the greatest challenge of our time?



Thank you!

Cathy Higgins

Research Director, NBI
higgins@newbuildings.org



All Rights Reserved © 2017 New Buildings Institute



Best Practices for Achieving Net Zero Energy for Existing Commercial Buildings Through Extensive Retrofits
Zero Net Energy Buildings Trends and ZEDx Session
January 31, 2017

A Model for Net Zero Energy Buildings of the Future



BUILDING USE
Electrical Apprenticeship

BUILDING TYPE
Originally constructed in
Renovations in 1963 & 2002

AREA
142,000 sq ft

COST
\$113/sq ft

Energy Use Intensity (EUI)
16 kBTU/sf/yr

LOCATION
Commerce, CA



Efficient Building Envelope & HVAC



With these strategies, HVAC consumes 70% less energy, which is a reduction of 585,000kWh or 403 metric tons of CO2 annually.



Plug Loads & Service Hot Water



Plug load efficiency measures account for a reduction of 85,000 kWh or 59 metric tons of CO2 annually.

Energy usage for hot water was reduced by 93% - a decrease of 65,000 kWh annually

LED Lighting & Advanced Controls



An annual reduction of 17,000kWh was achieved by installing the latest generation of dimmable LED lighting monitored by advanced controls.

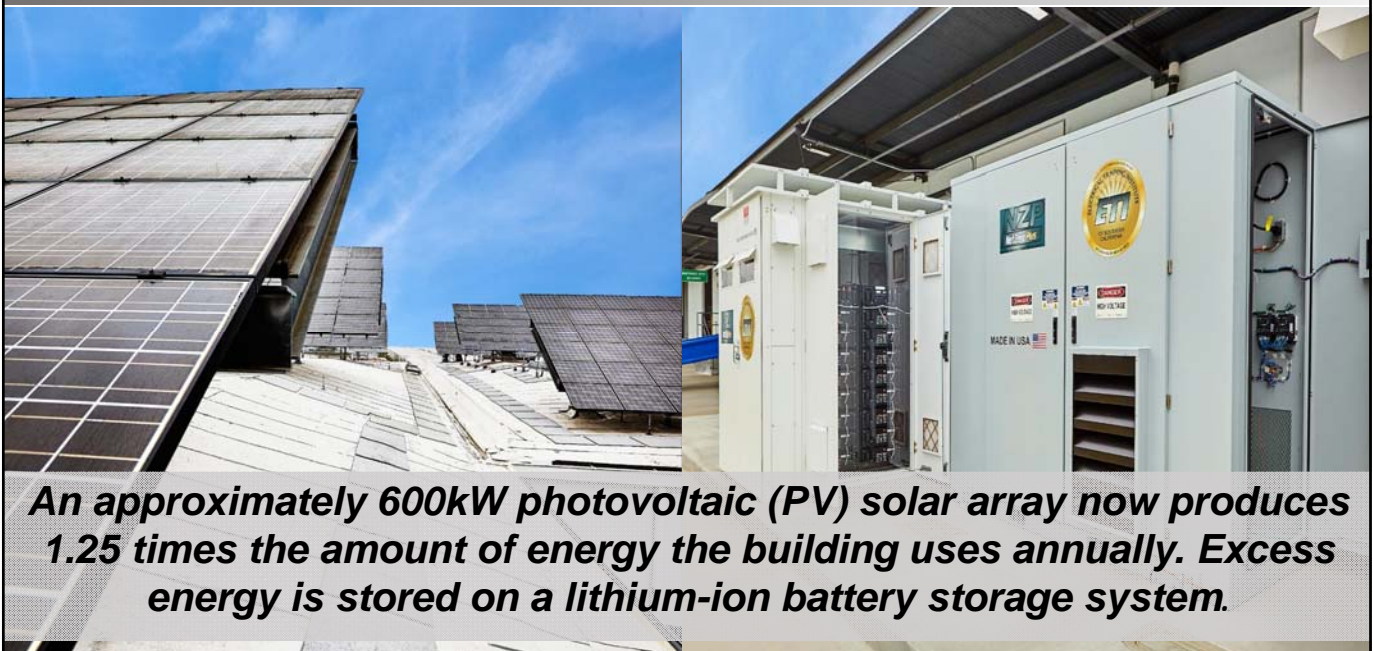


Interactive Dashboard Displays



Real-time and historic analytics on the NXP ETI's energy generation, consumption, and storage are displayed on interactive dashboard displays in building's lobby.

Energy Production & Storage



An approximately 600kW photovoltaic (PV) solar array now produces 1.25 times the amount of energy the building uses annually. Excess energy is stored on a lithium-ion battery storage system.

The Microgrid



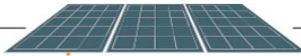
BATTERY STORAGE

stores solar electricity from PV for use when PV isn't generating and in emergencies.



ON-SITE PV

generates enough electricity over the year to power the building, EV charging stations, and an on-site battery.



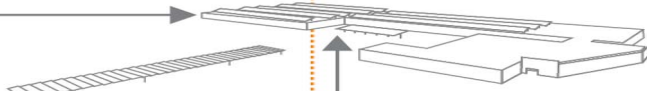
ELECTRIC VEHICLE CHARGERS

powered by the PV array provide electricity to power 16 vehicles at once.



ETI FACILITY

generates enough electricity over the year to power the building, EV charging stations, and an on-site battery.



ELECTROCHROMIC GLAZING



LED LIGHTING & CONTROLS



TURBO-CORE CHILLERS + VAV BOXES



PUBLIC UTILITY GRID
provides electricity when PV and battery storage can't meet demand.



ENERGY MANAGEMENT SYSTEM
optimizes energy flows based on peak demand, deciding when electricity generated on-site should be stored and when it should be used.



WEATHER STATION
onsite collects hyper-local data, which helps explain discrepancies between predicted performance and actual performance.



DASHBOARDS
in main lobby display current and historical energy use; weather conditions; and interactive graphs to engage students, staff, and visitors.

PBS So Cal Building Below Zero: The Net Zero Plus Transformation



WATCH NOW SCHEDULE KIDS EDUCATION ▾ EVENTS BLOG ABOUT ▾ Q

MEMBER SIGN IN

DONATE

Building Below Zero: The Net Zero Plus Transformation

Actor and environmentalist Ted Danson narrates this examination of the Net Zero Plus Transformation: buildings that produce and store more energy than they consume, lowering greenhouse gas emissions and potentially impacting global climate change.



Watch the Net Zero Plus Transformation

<http://www.pbssocal.org/programs/building-zero-net-zero-plus-transformation/>

Building Below Zero: The Net Zero Plus Transformation

Aired: 10/19/2016 | 0:56:40

Qualified Design Team & Highly-Trained Workforce

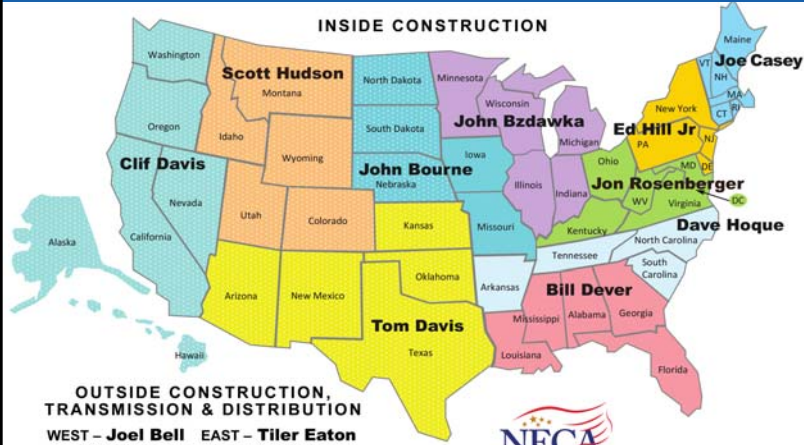


Powering America Team



POWERING AMERICA

POWERING AMERICA TEAM



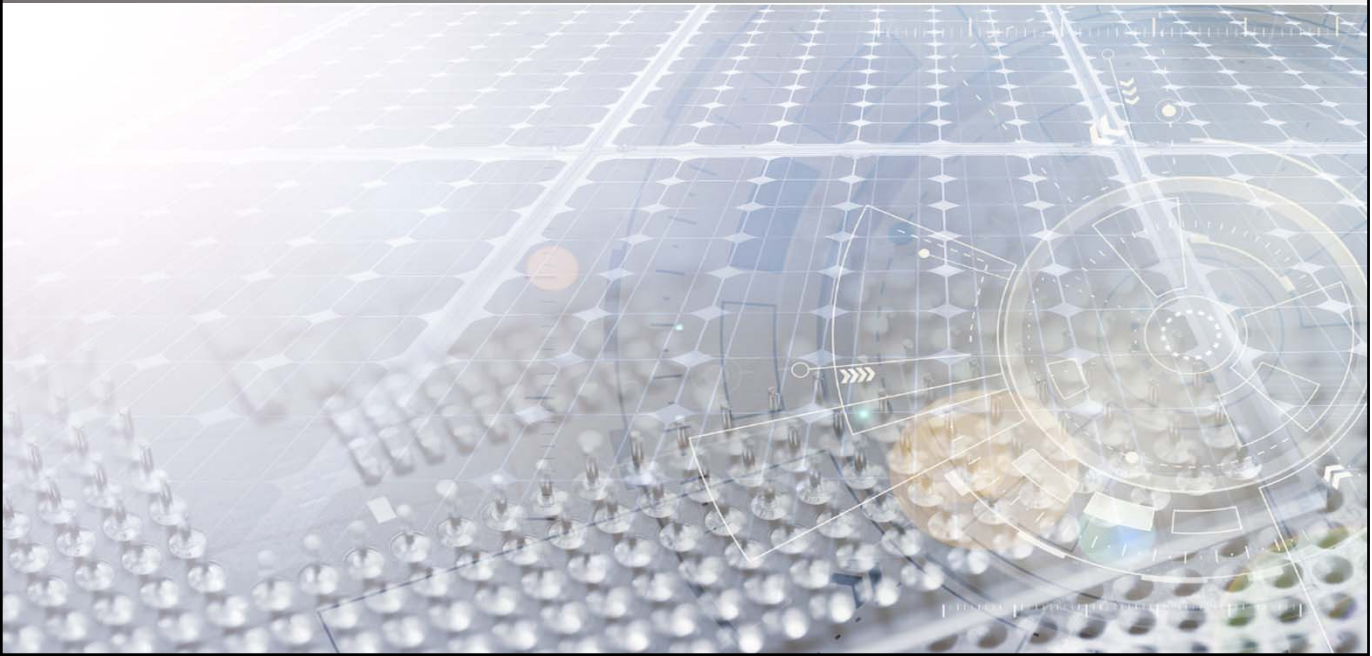
NECA
 Mir Mustafa, Executive Director
 Caitlin Gross, Director
 NECA – Entire United States

Ray Kasmark, Director
 IBEW – Entire United States

Powering America Team

A conduit to assist various customers with project needs including permitting, regulatory assistance, pre-qualification of signatory electrical contractors and workforce development plans

Powering America Team Contact Information



Thank You!



Brett Moss
Training Director
The Net Zero Plus Electrical Training Institute
BrettM@LAETT.com



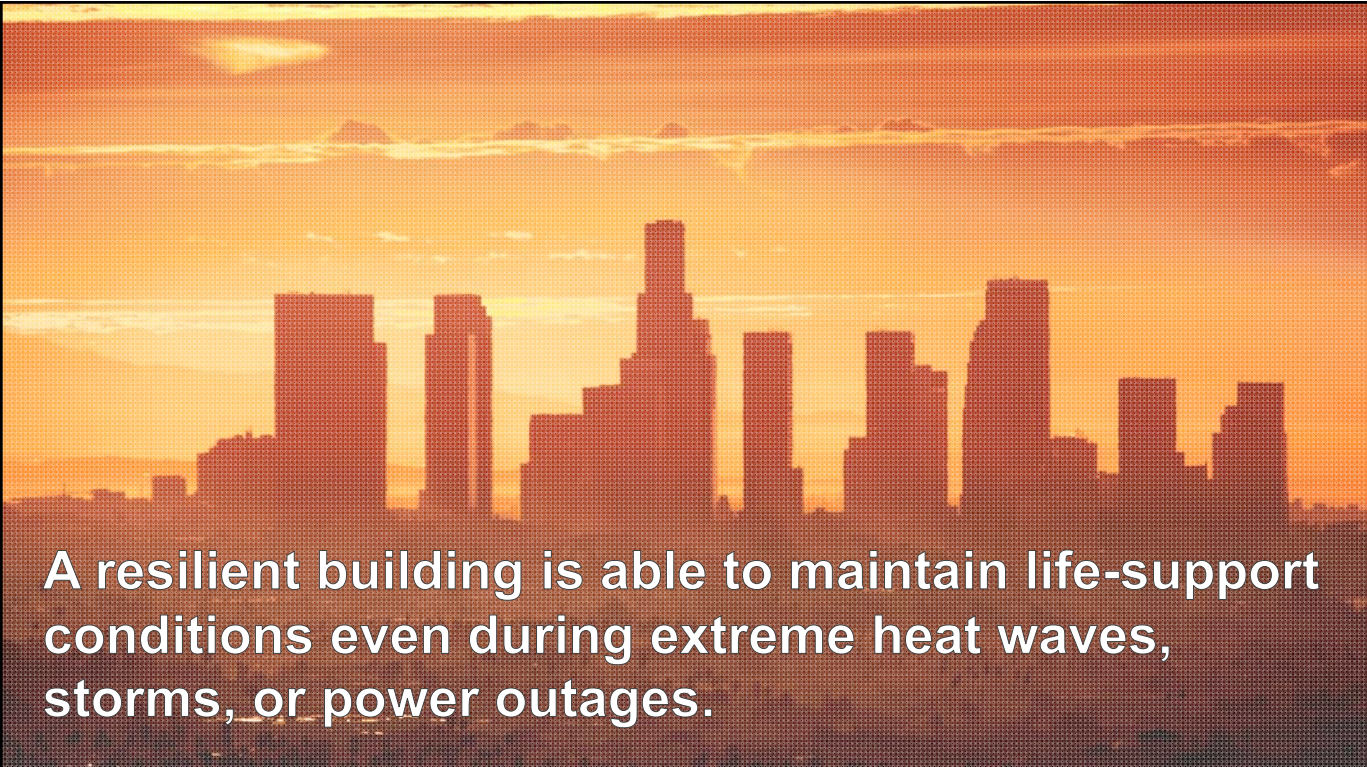
www.facebook.com/netzeroplus

[@NetZero_Plus](https://twitter.com/NetZero_Plus)



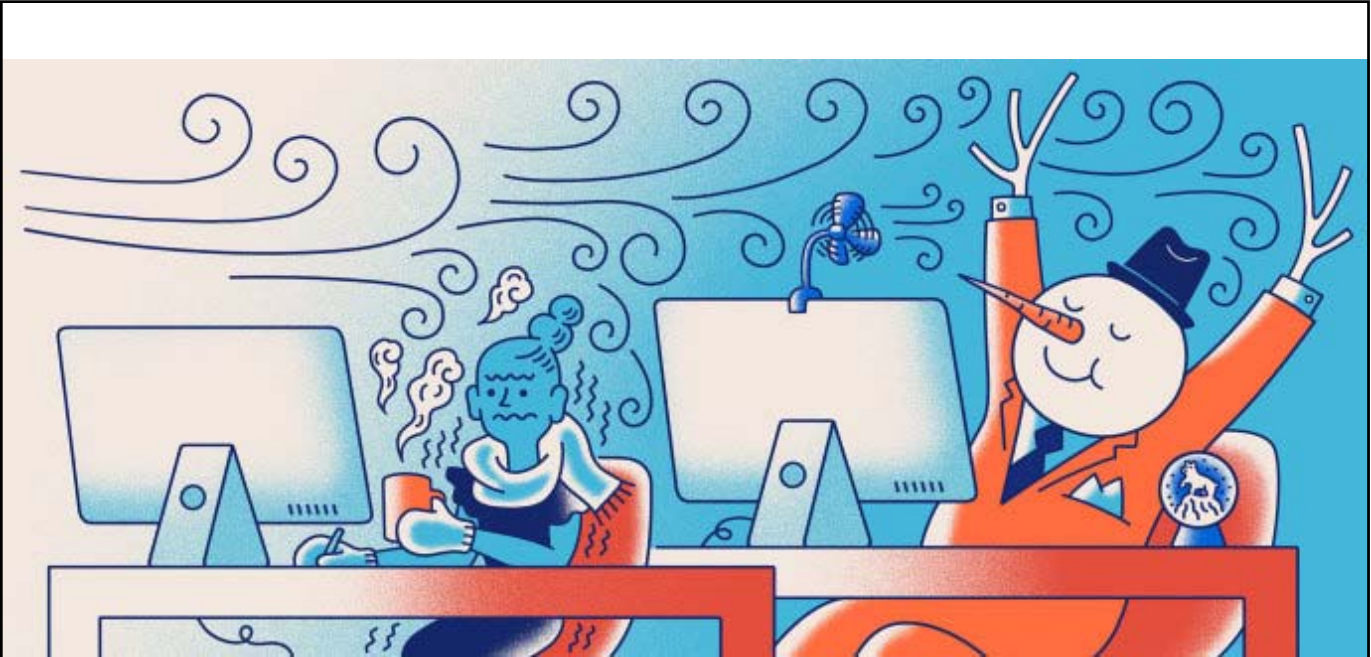
Designing for Resilient & Net Zero Buildings

Neil Bulger PE | Integral Group

A photograph of a city skyline at sunset, with buildings silhouetted against a bright orange and yellow sky. The image has a halftone or dithered texture.

A resilient building is able to maintain life-support conditions even during extreme heat waves, storms, or power outages.

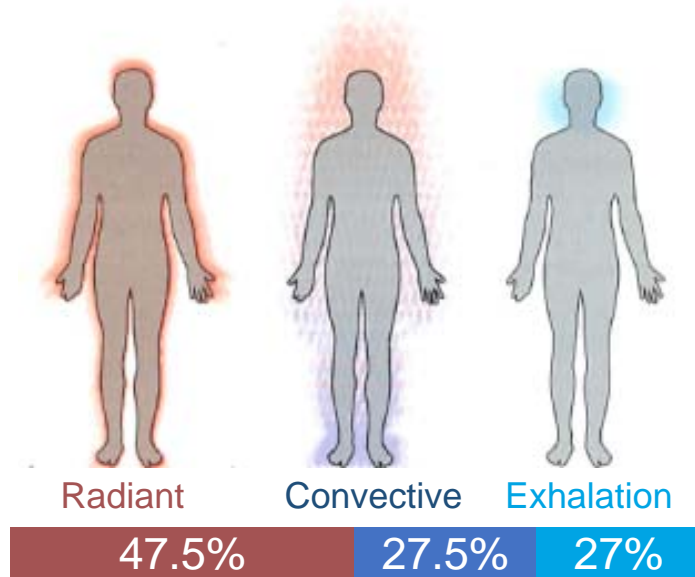




Newyorker, Aug 2015

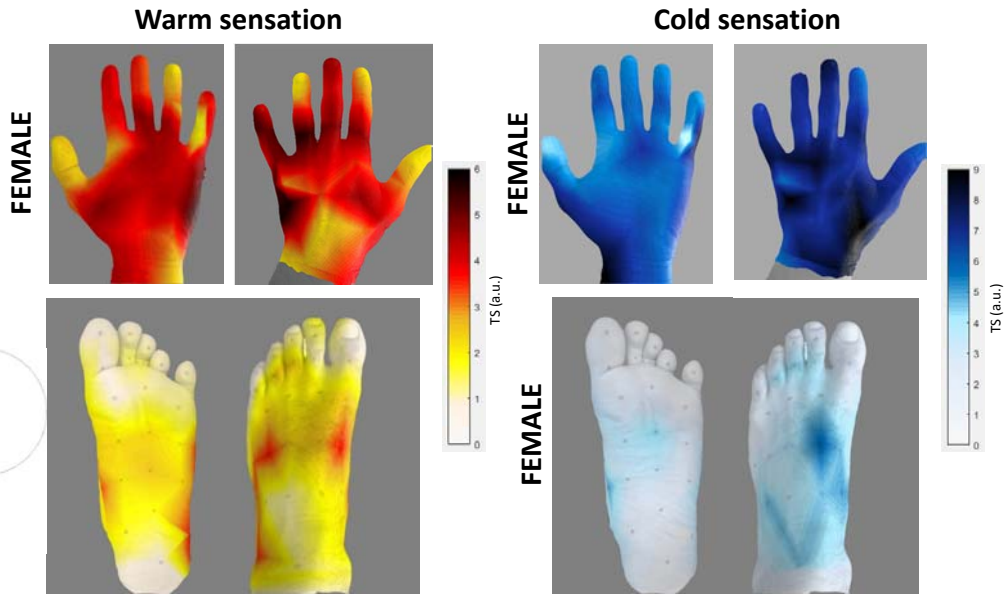
INTEGRAL GROUP

We Love Radiant Comfort



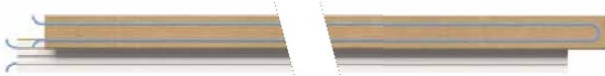
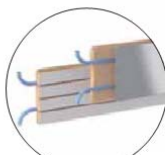
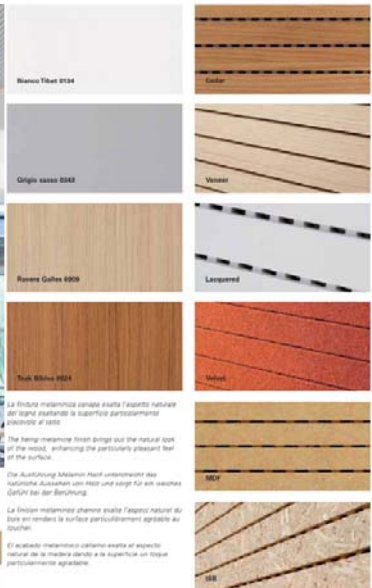
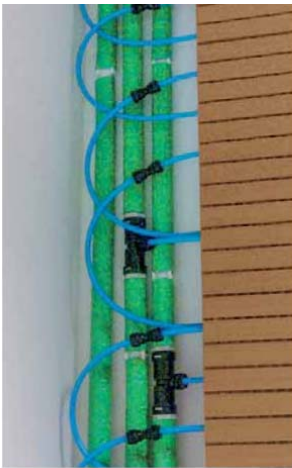
INTEGRAL GROUP

Warm/cool sensitivity maps of hands and feet



INTEGRAL GROUP

Radiant for All



Climacoustic è disponibile anche in versione a lamelle da 188x128 mm

Climacoustic is also available in a version with 4086x128 mm

Climacoustic ist auch in der Ausführung mit Lamellen 4086x128 mm

Climacoustic está disponible también en la versión de lamas de 4086x128 mm

Climacoustic est disponible également en version à lamelles 4086x128 mm

INTEGRAL GROUP

6th International Building Physics Conference, IBPC 2015

Load calculations of radiant cooling systems for sizing the plant

Eleftherios Bourdakis^{*a}, Ogun B. Kazanci^a, Bjarne W. Olesen^a

^aTechnical University of Denmark, Nils Koppels Alle – Building 402, Kgs. Lungby, 2800, Denmark

Abstract

The aim of this study was, by using a building simulation software, to prove that a radiant cooling system should not be sized based on the maximum cooling load but at a lower value. For that reason six radiant cooling models were simulated with two control principles using 100%, 70% and 50% of the maximum cooling load. It was concluded that all tested systems were able to provide an acceptable thermal environment even when the 50% of the maximum cooling load was used. From all the simulated systems the one that performed the best under both control principles was the ESCS ceiling system. Finally it was proved that ventilation systems should be sized based on the maximum cooling load.

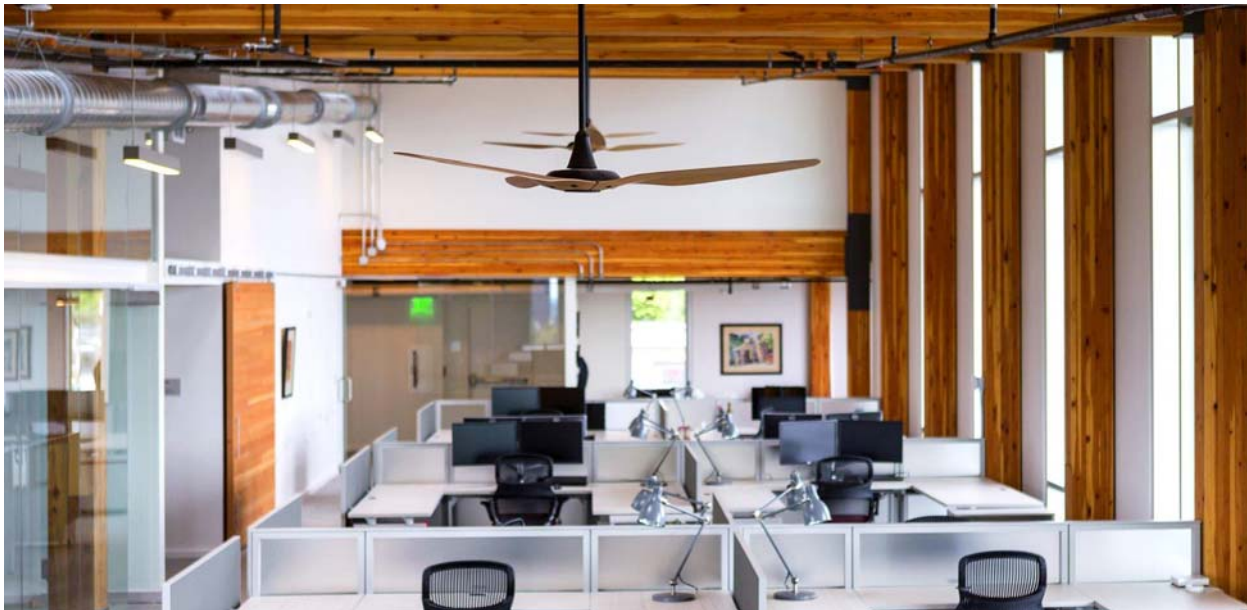
© 2015 The Authors. Published by
Peer-review under responsibility of

Keywords: Radiant cooling systems; T/

All tested (radiant) systems were able to provide acceptable thermal environment even when (sized) to 50% of the maximum cooling load.

INTEGRAL
GROUP

We Love Ceiling Fans



INTEGRAL
GROUP

The Solution I Buy at Target



INTEGRAL GROUP

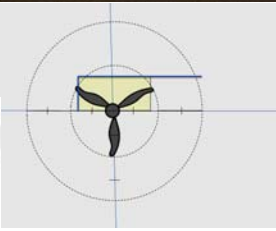
Building Design Tools for Fans



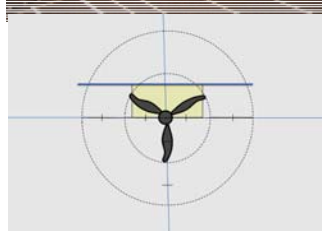
Anemometer three



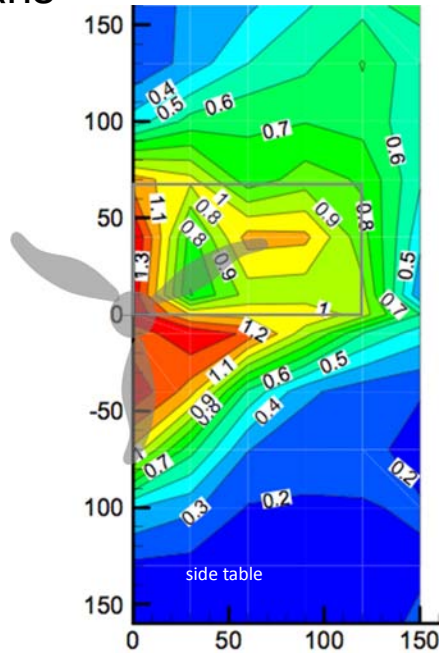
Katrina performing tests



L-shape partition



line partition



INTEGRAL GROUP

Fans Make Us Resilient



From the Center for Built Environment & TRC

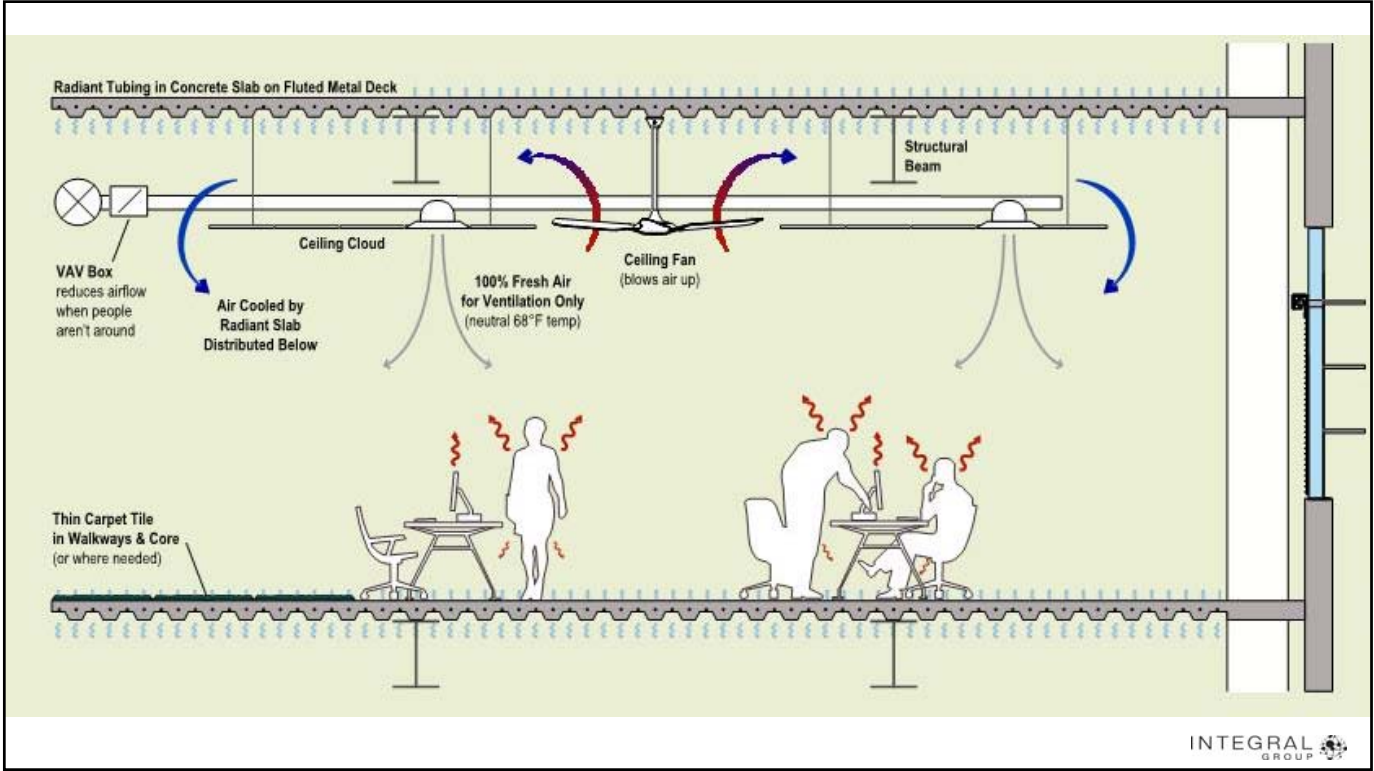


Gwelen Paliaga, TRC
CBE Industry Chair

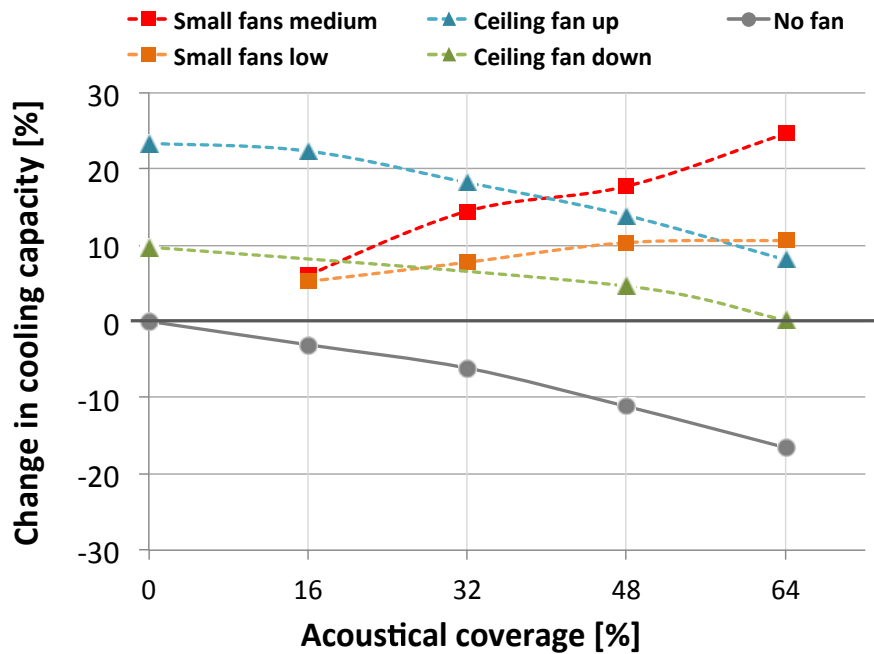


Sharp Development - Hill House Construction
Integral Group MEP











Radiant chilled ceiling: Cooling capacity results



Future Ready Buildings

   Less Cooling = Same Comfort
750 sf/ton radiant = 500 sf/ton air

Future Ready Buildings

   Less Cooling = Same Comfort
750 sf/ton radiant = 500 sf/ton air



Ceiling Fans for All (\$1/sf?)

Future Ready Buildings

   **Less Cooling = Same Comfort**
750 sf/ton radiant ~ = 500 sf/ton air

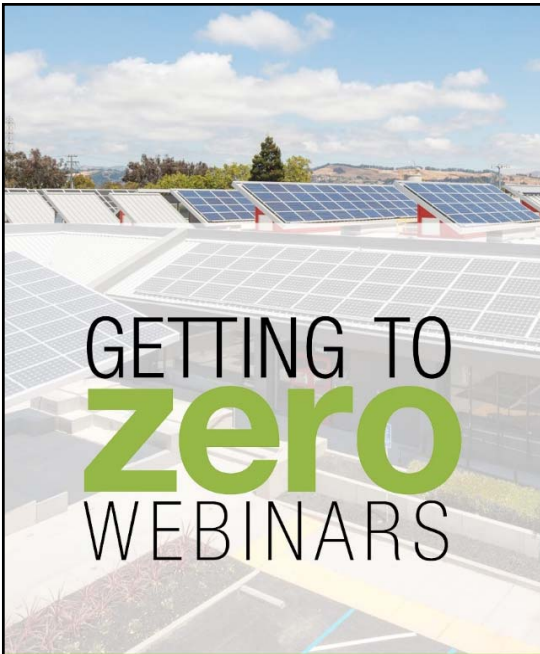


Ceiling Fans for All (\$1/sf?)



W/

Batteries
Solar Systems
Demand Side Management
RESILIENCY



GETTING TO
zero
WEBINARS

nbi new buildings
institute

A few questions?

Designing for Resilient & Net Zero Buildings

Neil Bulger, PE | Principal
INTEGRAL GROUP
nbulger@integralgroup.com



Andy Bush , Principal
Morgan Creek Ventures
andy@morgancreekventures.com





Daylight, views, efficient floor plans, flexible configurations

"Off the shelf" Components

- Narrow Floor Plates
- Variable Volume Refrigerant System
 - Composite Steel Structure
 - Triple Glazed Windows-gas filled
- Good Thermal envelope-mineral wool on exterior
 - All LED Lighting





Southeast solar wall....panel selection...attachment system....



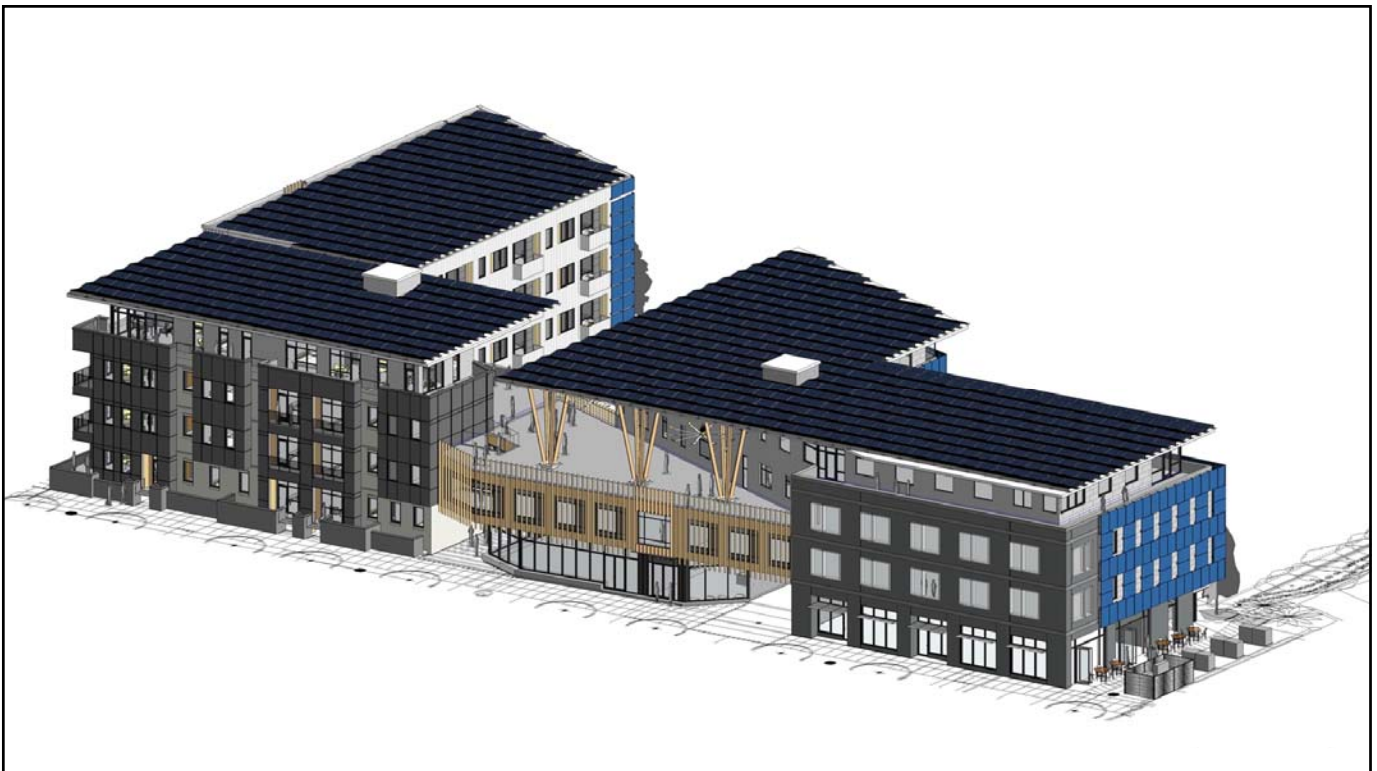
**BOULDER
COMMONS**

Creating a Market Rate Return on Solar

- Total Solar Cost-including attachment \$1.9 2.3M
- Market Rate for Energy (low end) \$1.90/foot/year
\$190,000 per year before depreciation/credits
- 10 8.3% Cash on Cash Return before financing

100,000 Square Foot Building

Currently Negotiating an “all electric” restaurant





ehdd.



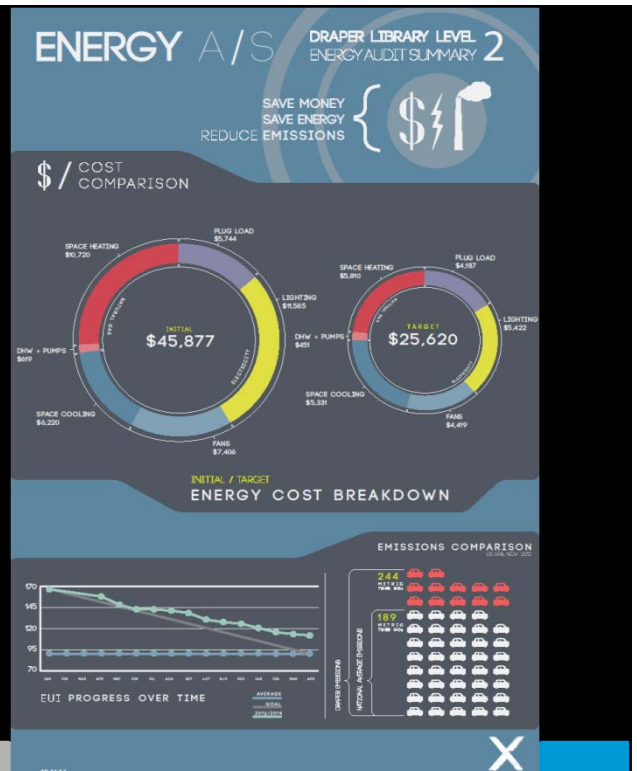
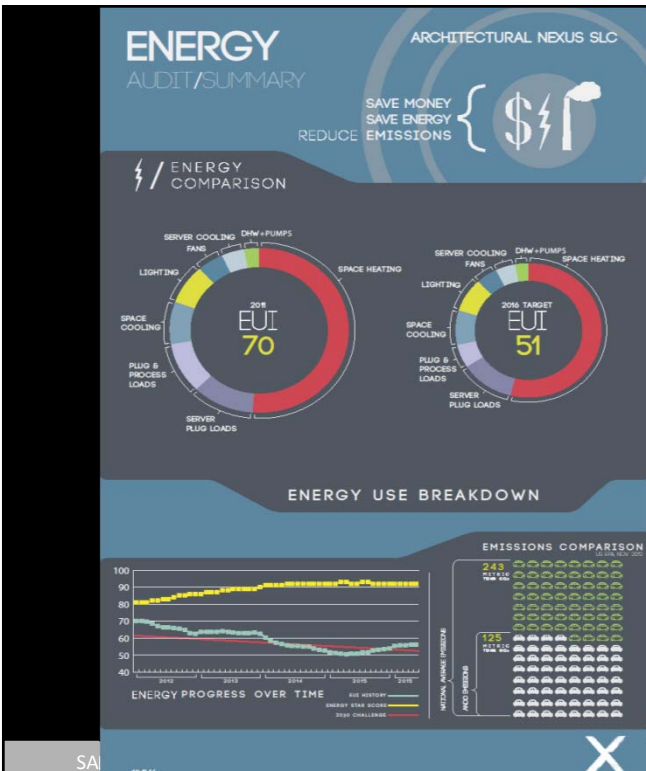
andy@morgancreekventures.com



Turning Passive Occupants into
Active INHABITANTS

ARCH | NEXUS







TRANSFORM

Occupants into Inhabitants

- Education
- Action
- Reward
- (repeat)

inhabit.archnexus.com

Waste
Waste Free is the Way to Be

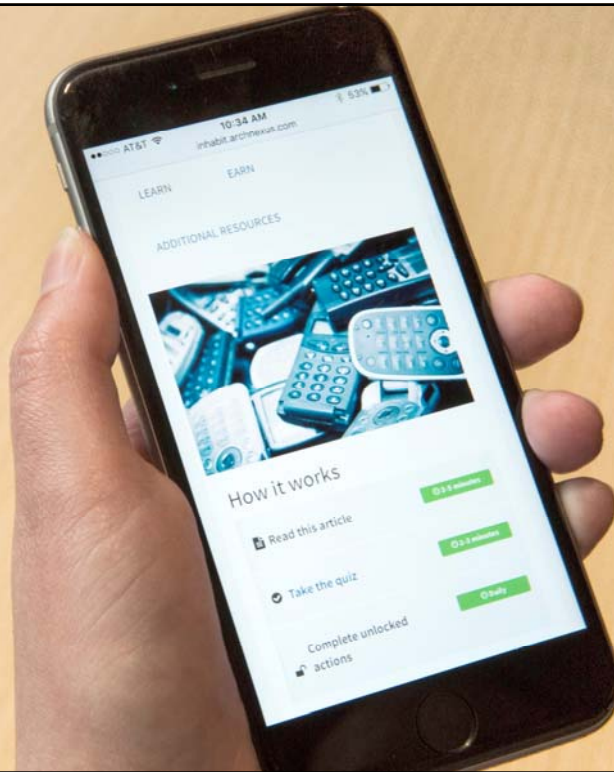
Competition: Waste Diversion Challenge

Team SAC will compete against Team SLC in a waste diversion challenge starting the week of July 21 and ending Sept 2. Waste audits will be conducted weekly at both locations and the team with the highest score at the end of the competition will be eligible to receive a portion of this year's philanthropy funds will be disbursed. Team scores will base into consideration. Both office locations will and INHABIT participation rate.

PROCESS

How it Works

- Episodic Competitions
- Weekly “Learn & Earns”
- Short Quiz
- **Unlock Actions**
- Earn Individual & Team Points
- Dashboard Metrics
 - Points
 - kWh Saved
 - CO2 Avoided
 - Pounds of Waste Diverted
 - Etc.



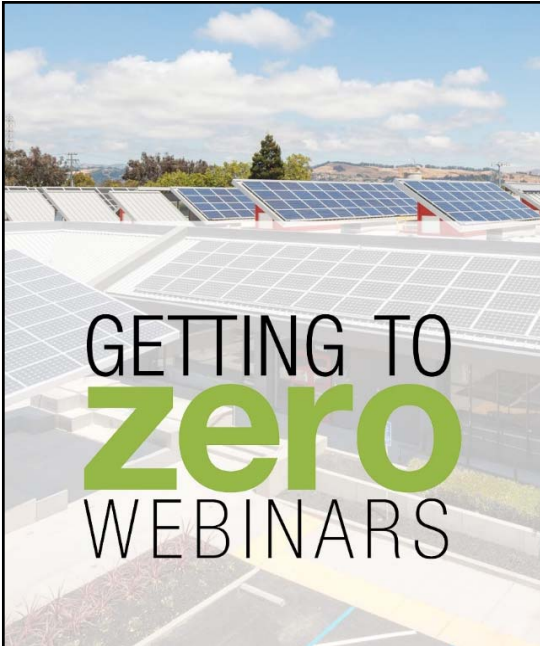


KENNER KINGSTON

AIA, LFA, LEED AP BD+C, O+M
PRESIDENT

kkingston@archnexus.com

ARCH | NEXUS



GETTING TO
zero
WEBINARS

nbi new buildings
institute

More questions?

Join us for zero net energy webinars in February and March



Planning for Districts and Urban Environments

February 23, 10-11 am PT

Risks and Rewards in the ZNE Marketplace

March 30, 10-11 am PT

Register at: newbuildings.org/event/



Thank you for joining us for today's session

nbi new buildings institute