New Buildings Institute

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Research Director

IEA-ECBCS Annex 61

Deep Energy Retrofits of Government and Public Buildings and Building Clusters

Experts Meeting September 9-11, 2013
Darmstadt, Germany

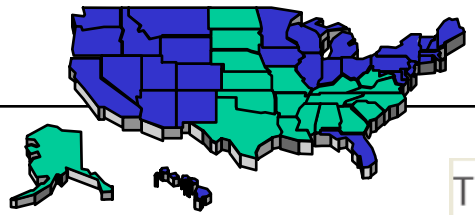
nbi new buildings institute

nbi

is a driving force behind improved energy performance in commercial buildings.

Deep technical expertise & understanding

- Leadership & Policy
- Design Guidance
- Research, Building Science & Performance



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U.S. GREEN BUILDING COUNCIL USGBC

BETTERBRICKS Powerful Energy Ideas. Delivered by NEEA.

SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL Company

Efficiency Vermont

ComEd An Exelon Company

CASCADIA REGION GREEN BUILDING COUNCIL

PG&E Pacific Gas and Electric Company

CBC ZERO ENERGY COMMERCIAL BUILDINGS CONSORTIUM

NSTAR

Preservation Green Lab NATIONAL TRUST FOR HISTORIC PRESERVATION

NASEO National Association of State Energy Officials

SMUD

DORIS DUKE CHARITABLE FOUNDATION

neea

ROCKY MOUNTAIN INSTITUTE

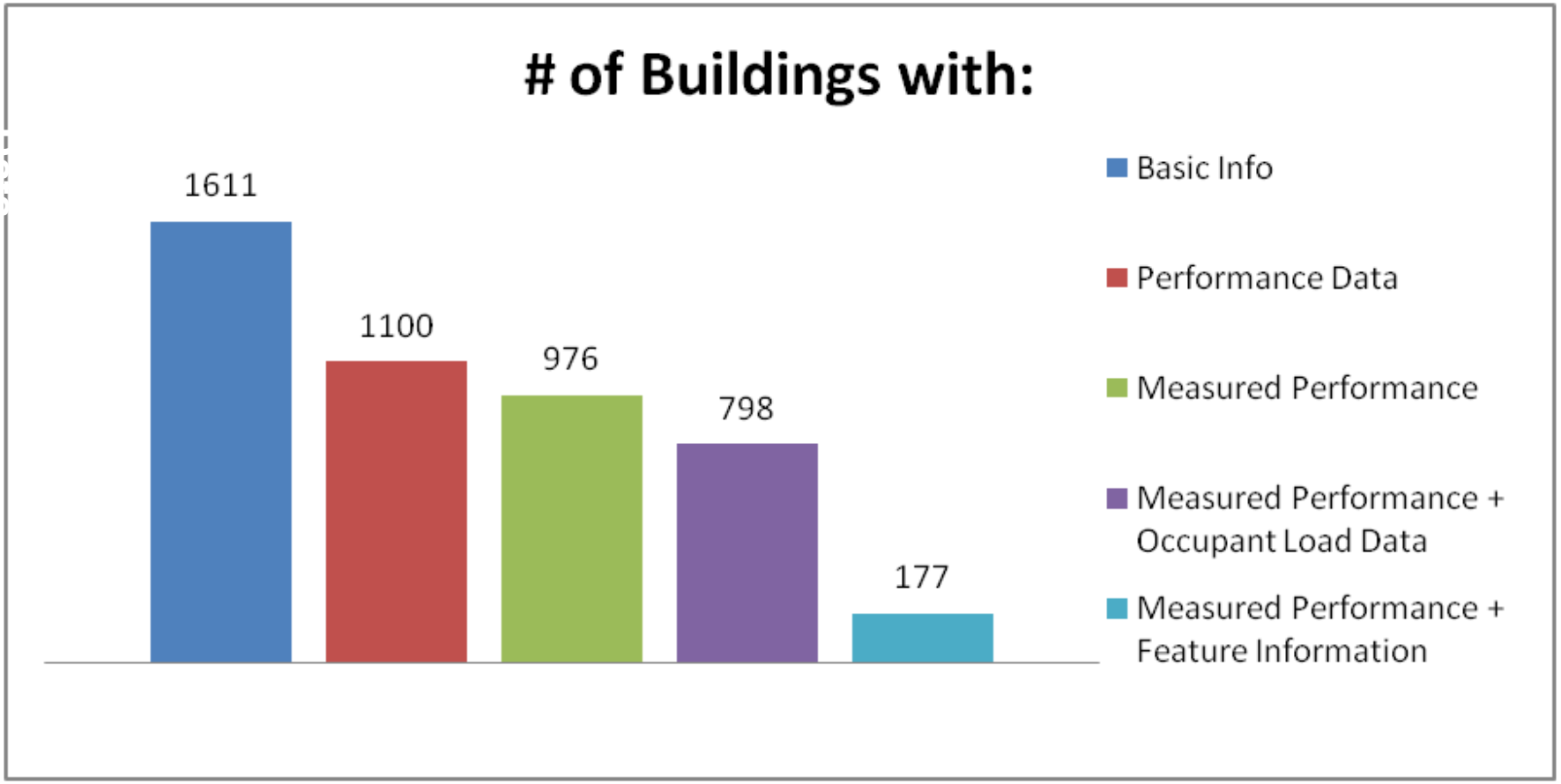
THE KRESGE FOUNDATION

pier PUBLIC INTEREST ENERGY RESEARCH "Research Powers the Future"

NBI's Interest in the Annex

1. Expand the dataset of Deep Retrofits
2. Improve the knowledge on technical solutions
3. Create simplified (bundled) solution sets to deep energy savings
4. Address market issues such as fiscal constraints and barriers

NBI Building Performance Database



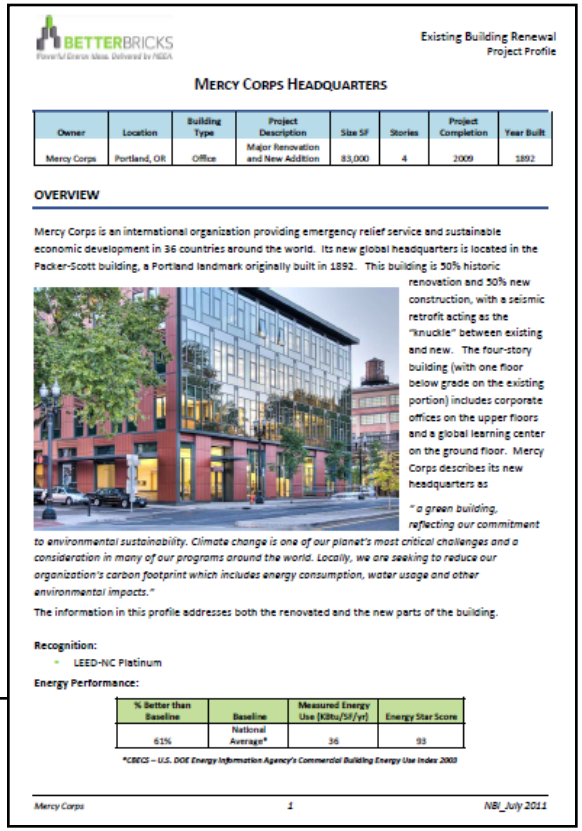
- Consolidated (internal) data repository from NBI whole-building performance projects
- Used for analysis, benchmarking and integration with new tools
- Primarily anonymous

Topic: US Database on Deep Energy Retrofits – *does not exist*

Sources, but not consistency on that topic

Address today:

1. **Case Studies**
2. **Energy Performance**



BETTERBRICKS

Existing Building Renewal
Project Profile

MERCY CORPS HEADQUARTERS

Owner	Location	Building Type	Project Description	Size SF	Stories	Project Completion	Year Built
Mercy Corps	Portland, OR	Office	Major Renovation and New Addition	83,000	4	2009	1892

OVERVIEW

Mercy Corps is an international organization providing emergency relief service and sustainable economic development in 36 countries around the world. Its new global headquarters is located in the Packer-Scott building, a Portland landmark originally built in 1892. This building is 50% historic renovation and 50% new construction, with a seismic retrofit acting as the "knuckle" between existing and new. The four-story building (with one floor below grade on the existing portion) includes corporate offices on the upper floors and a global learning center on the ground floor. Mercy Corps describes its new headquarters as

" a green building, reflecting our commitment to environmental sustainability. Climate change is one of our planet's most critical challenges and a consideration in many of our programs around the world. Locally, we are seeking to reduce our organization's carbon footprint which includes energy consumption, water usage and other environmental impacts."

The information in this profile addresses both the renovated and the new parts of the building.

Recognition:

- LEED-NC Platinum

Energy Performance:

% Better than Baseline	Baseline	Measured Energy Use (KBtu/SF/yr)	Energy Star Score
61%	National Average*	36	93

*CBECS – U.S. DOE Energy Information Agency's Commercial Building Energy Use Index 2003

Mercy Corps 1 NBI_July 2011

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Sources for Case Studies on Deep Energy Retrofits

New Buildings Institute *Gettingto50* and Zero Net Energy Databases
US DOE High Performance Buildings Database
AIA Committee on the Environment (COTE) – Top Ten Awards
Urban Land Institute (ULI)
US Green Building Council (USGBC) LEED Database
Cascadia Region Green Building Council
Rocky Mountain Institute (RMI) Retrofit Depot
Ashare High Performance Buildings Magazine
Midwest Regional Green Building Data
NEEA BetterBricks Case Studies
Building Green
Renewable Energy Trust
Advanced Energy Design Guides for Existing Buildings (NREL/DOE)

NBI Recent Research

11 DEEP DIVES

OWNER CATEGORIES	#
Owner Occupied: Private 'Green' Firm*	3
Owner Occupied: Non-profit	2
Owner Occupied: Non-profit + 80% tenants	1
Private Investor: Tenant Occupied	5
TOTAL PROJECTS	11

**Firms in the business of demonstrating or recommending green design practices.*

Energy use for these buildings is 30% - 76% less than the national average! Half of the buildings have EUIs less than 40 kBtu/ft²/year.

Source: NBI

3 Values of Case Studies:

1. Spotlight on **leaders and innovators** – creates a pull of interest and replication
2. Demonstrate the **technologies and strategies**
3. Provide **proof of performance** – must be measured results

NBI Case Study Examples

Case Study Info:

- Size, use, climate, age
- Owner & design firm
- Energy Use Targets
- Energy Use Actual
- Technologies
- Business Rationale
- Lessons Learned
- Cost
- Split delivery of info:
  a) market = concise
  b) deeper technical

The Vance Building

Seattle, WA, USA

134,000 sf
1929 built
2007 remodel
39 EUI

BUSINESS OVERVIEW:

- Building occupied during renovation
- Improvement cost: $26/sq ft
- Increased occupancy by 26% since renovation
- Created TI guidelines for tenant retrofits to guide design decisions for daylighting, ventilation, and finishes.

Source: NBI
Photo Credit: Lara Swimmer

The Vance Building

Seattle, WA, USA

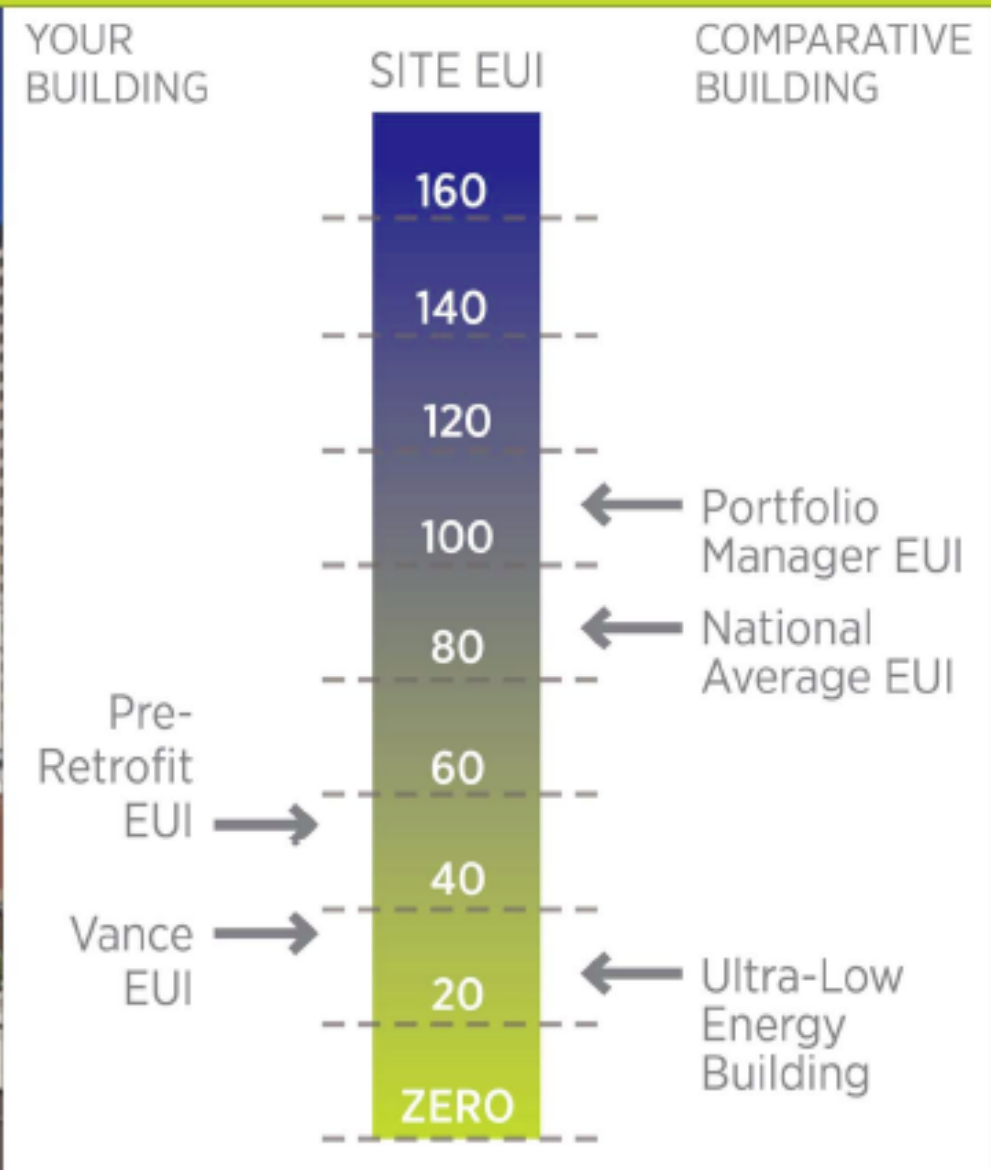
Source: NBI
Photo Credit: William Wright Photography

EFFICIENCY MEASURES

- Removed ducted heating systems
- Recalibrated steam heating system
- Localized thermostats
- Operable windows
- Automated sunshades
- Lighting retrofit with automated controls
- Light shelves
- CO2 sensors
- Re-commissioning

The Vance Building

Seattle, WA, USA



The Alliance Center

Denver, CO, USA

PROJECT OVERVIEW

- Multi-tenant non-profit office
- 6-story, 38,000 ft^2
- Constructed: 1908
- Retrofit: 2006
- EUI: 42 $kBtu/ft^2/year$
- EnergyStar rating: 85
- LEED EB Gold, CI Silver, EnergyStar Champion Award
- Owner: Alliance for Sustainable Colorado

Source: NBI
Photo Credit: Alliance for Sustainable Colorado

The Alliance Center

Denver, CO, USA

Source: NBI
Photo Credit: Alliance for Sustainable Colorado

EFFICIENCY MEASURES

- Direct Digital HVAC Control system
- Occupancy sensors
- Photocells for daylight harvesting (fifth floor only)
- High-Efficiency glazing
- Commissioning
- T8 fixtures with dimmable ballasts
- Commissioning
- Photovoltaics
- Translucent Wall Panels
- Increased insulation
- Sun Shades (sixth floor only)
- Un-refrigerated water fountains

The Alliance Center

Denver, CO, USA

Source: NBI
Photo Credit: Slaterpaull Architects

BUSINESS HIGHLIGHTS

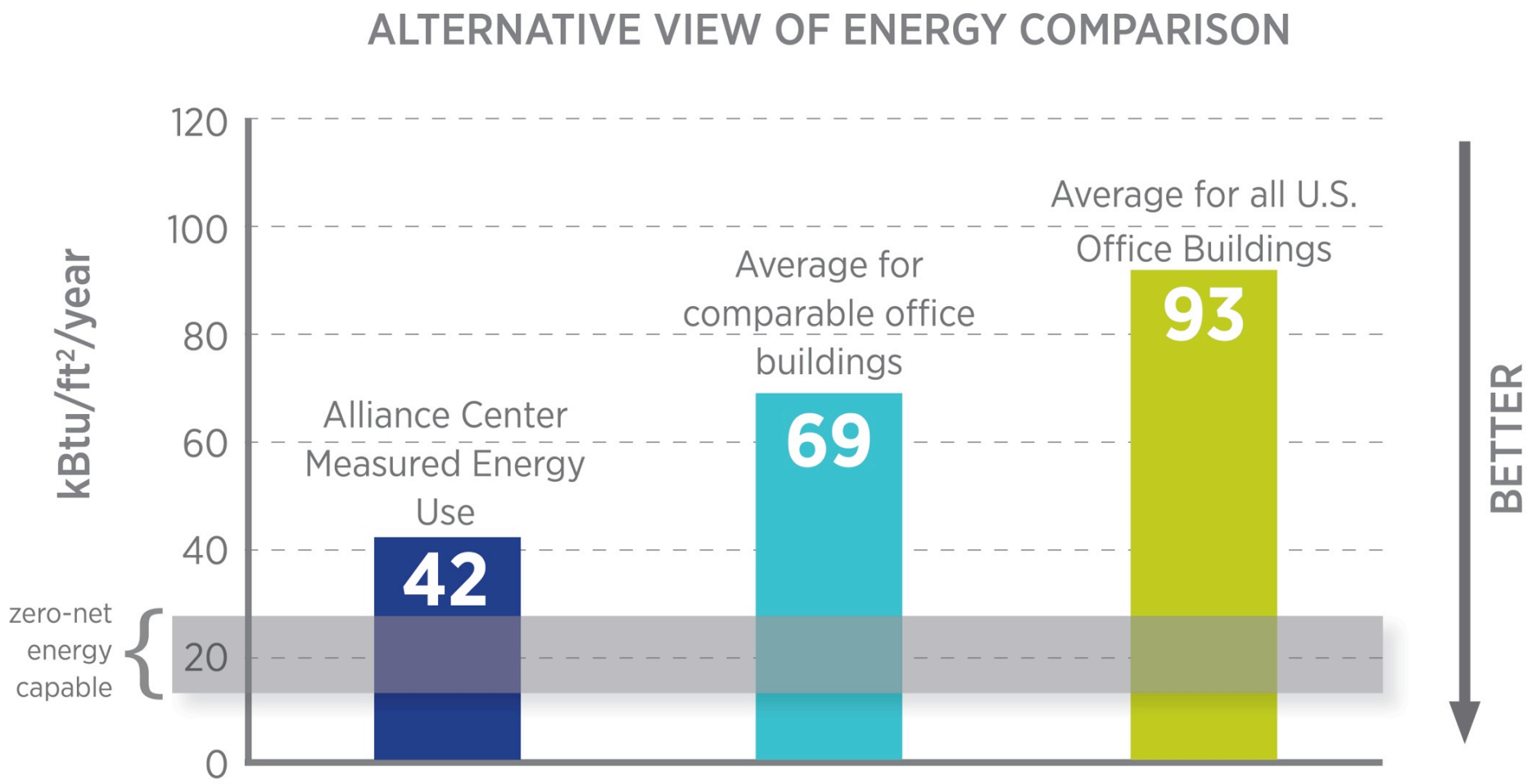
- Total project cost: $3.07/ft2
- Average annual energy savings: $8,800
- 35 tenants focused on advancing sustainability
- Serves as public demonstration project for advanced design strategies

The Alliance Center

Denver, CO, USA

Source: NBI
Photo Credit: Alliance for Sustainable Colorado

The Alliance Center Office Building
Denver, CO USA



Source: NBI, 2011

The Aventine Office Building

La Jolla, CA, USA

HIGH PERFORMANCE RESULTS:

- 23 kBtu/ft^2 - Site Energy Use Intensity
- EnergyStar Rating of 100 for over 3 straight years

Source: Glenborough Properties

Sept. 9, 2013

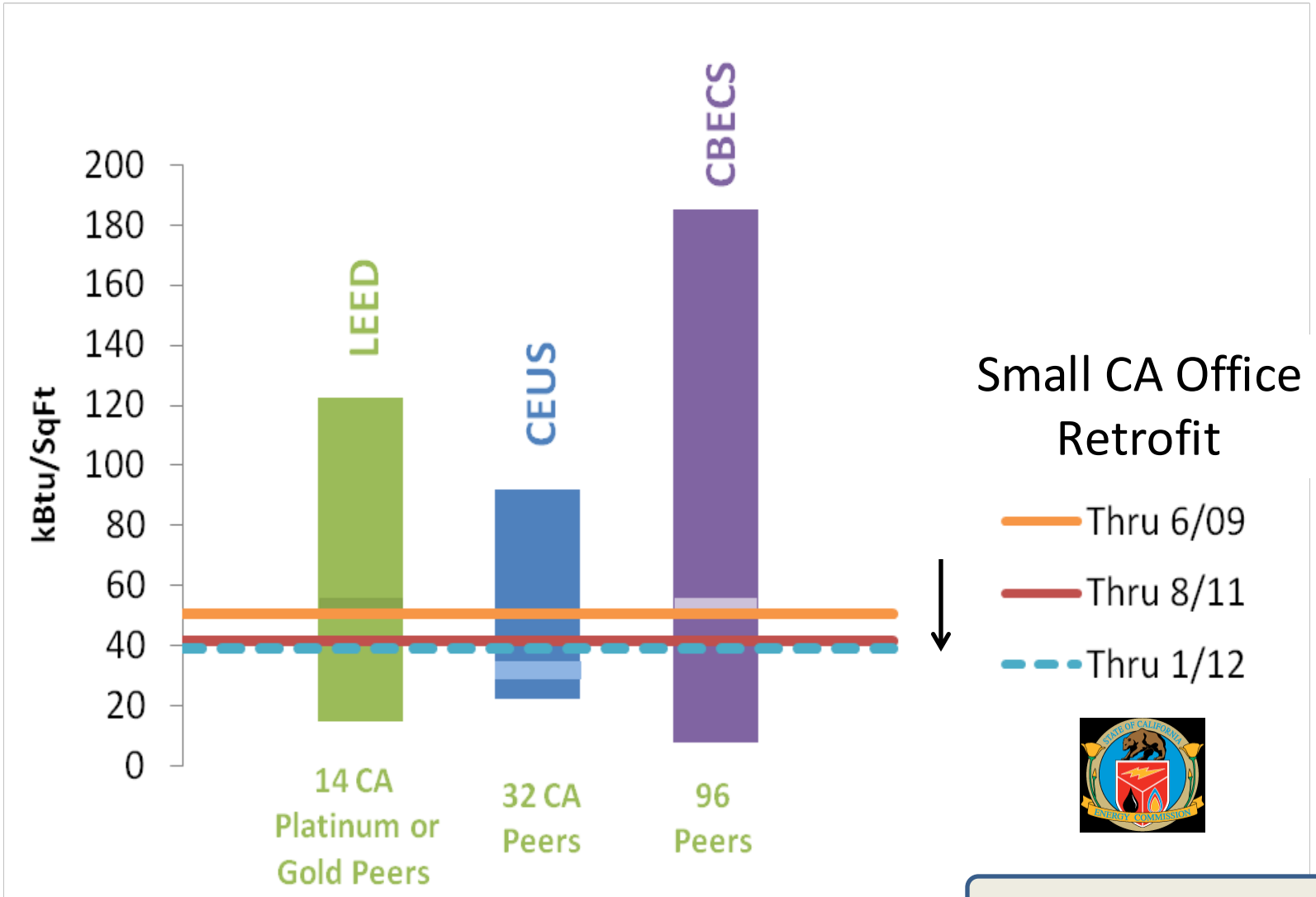
The Aventine Office Building

La Jolla, CA, USA

ENERGY MANAGEMENT STRATEGIES:

- Chiller plant identified as energy load with single biggest savings opportunities
- Glenborough installs Optimum Energy's Software Solution / "OptimumLOOP"
- Improved plant efficiency from a 1.4 KW/per/ton to a .40 - .60 KW/per/ton plant efficiency range
- The Aventine reduced over 501,745 kilowatts of energy, saving $75,763

Actual Energy Performance and Comparisons



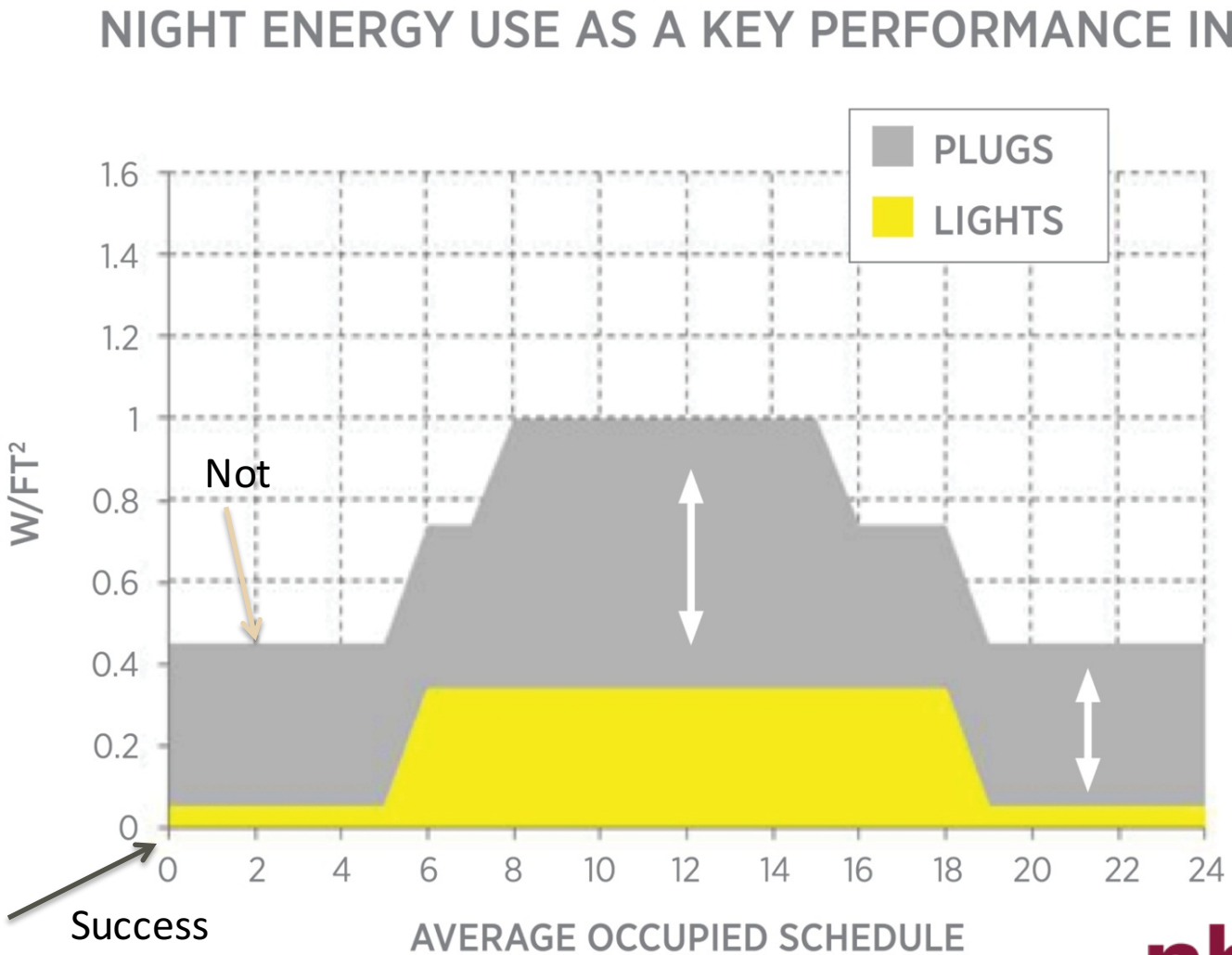
Cost of Deep Energy Savings

STANDARD U.S. OFFICE BUILDING SYSTEM	KBTU/FT²/YEAR REDUCTION	COST/FT²
Plug Load	6 - 15	$0
Lighting	6 - 8	$3 - $5
Ventilation	4 - 5	$2 - $5
Cooling	10 - 15	$3 - $7
Heating	3 - 10	$1 - $2
TOTAL	**30 - 50**	**$10 - $20**

Source: Kok, Nils, Norm Miller, and Peter Morris, 2011: "The Economics of Renovation"

PLUG LOADS

Operations and Occupancy are Critical



PLUGS:

- Often 2-5 times lighting loads!
- Typically approximately 50-90% of day use still used at night

Source: NBI CEC PIER Research

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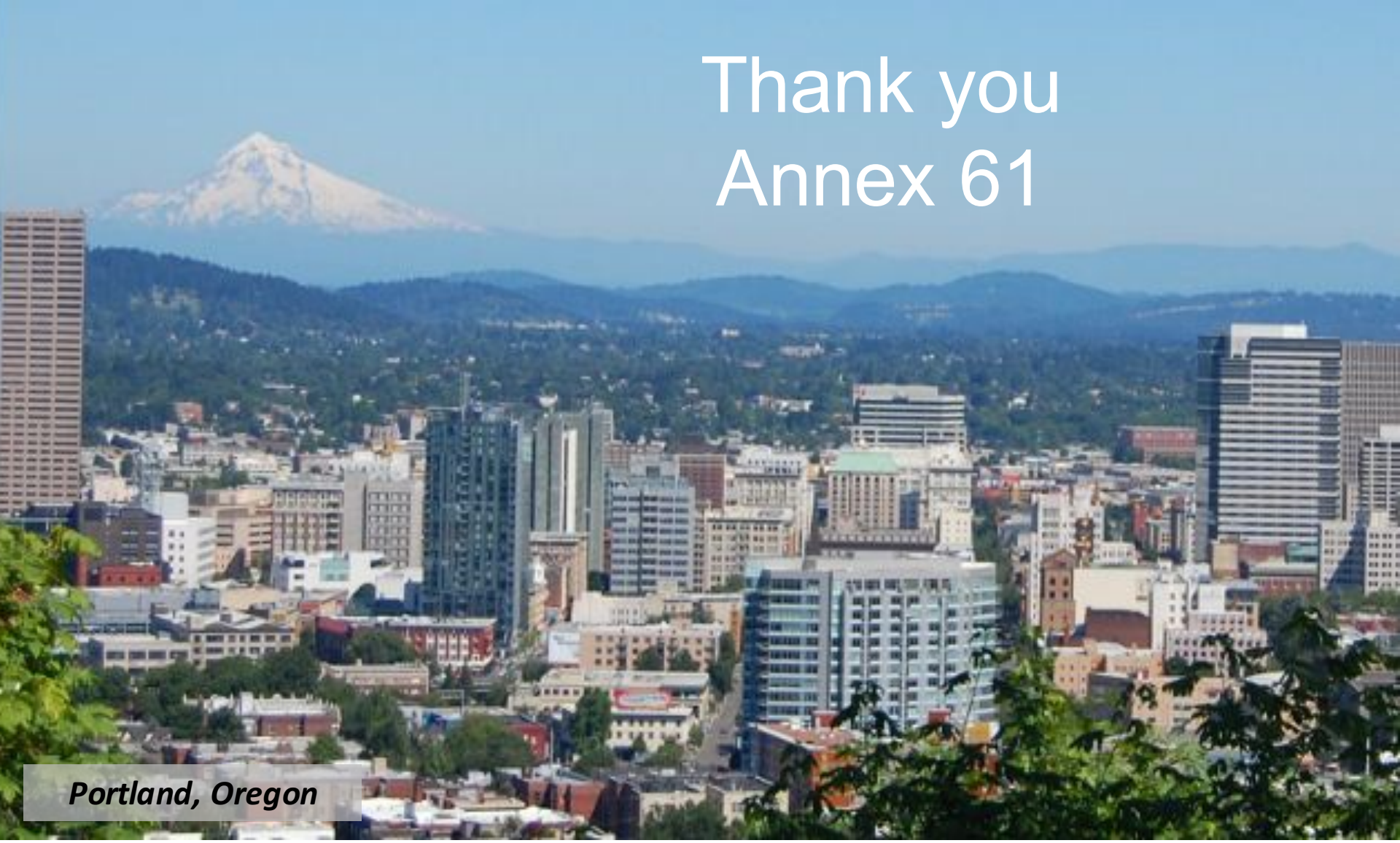
Thank you
Annex 61



www.newbuildings.org

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