GARRISON INSTITUTE

Beyond the Building:

Individuals and System Approaches

Cathy Higgins

Research Director, New Buildings Institute

Garrison Climate, Buildings and Behavior
May 23, 2012

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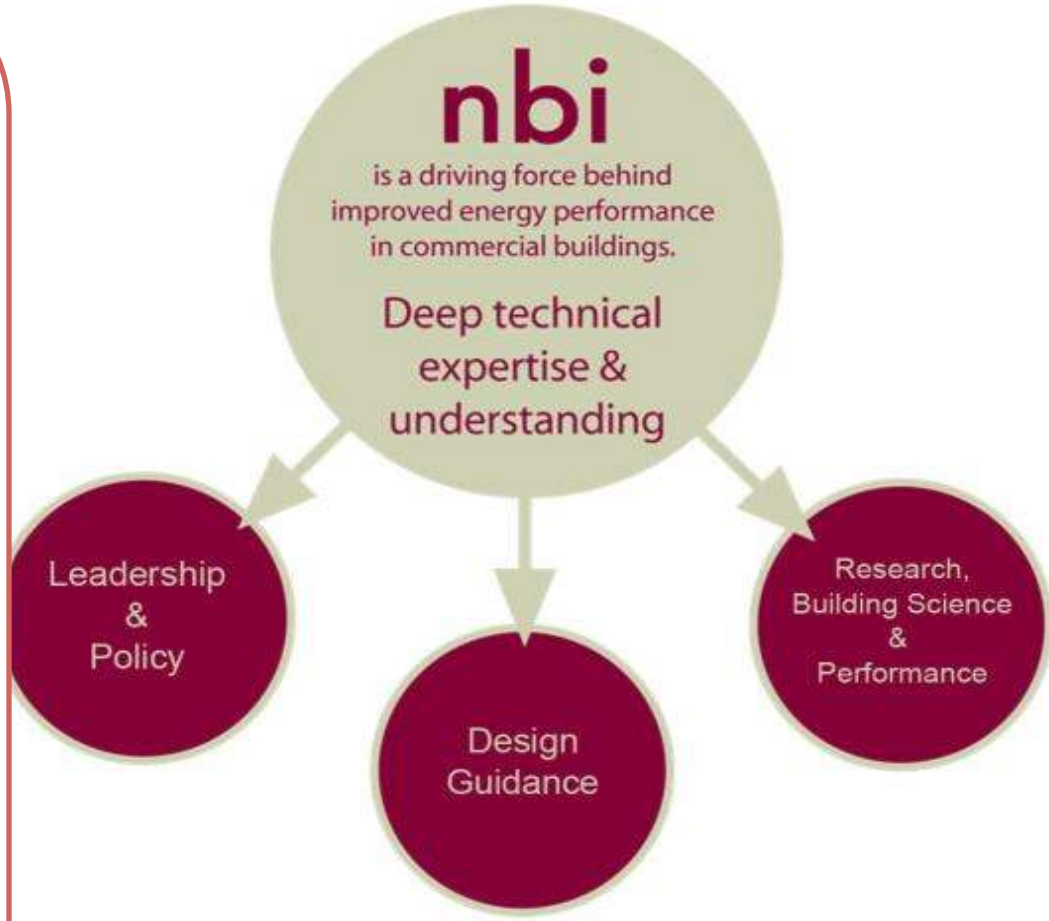
New Buildings Institute (nbi)

- National non-profit, offices in WA
- Board of Directors represent leaders in energy and green building
- Sponsors include progressive utilities, PBAs, market transformation entities, and work with federal / state gov and foundations
- Strategic relationships with leading organizations including AIA, USGBC, WCEC, CLTC, CPUC, CEC, RMI, Earth Advantage, CIEE
- Strong staff of leading technical experts and project managers



Two questions tonight:

1) Who Cares?

2) Can we Cluster?

Slide photos from Chris Pyke, USGBC

Individuals

SCALE JUMPING

Image courtesy of ILFI

Individuals

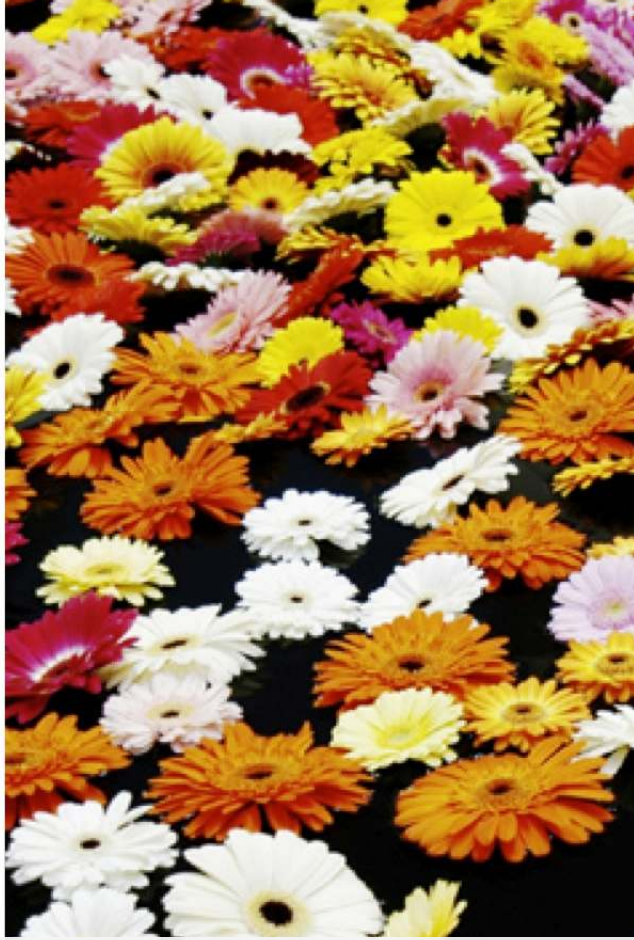
Groups

SCALE JUMPING

Image courtesy of ILFI

Individuals

Groups



Systems

SCALE JUMPING

Image courtesy of ILFI

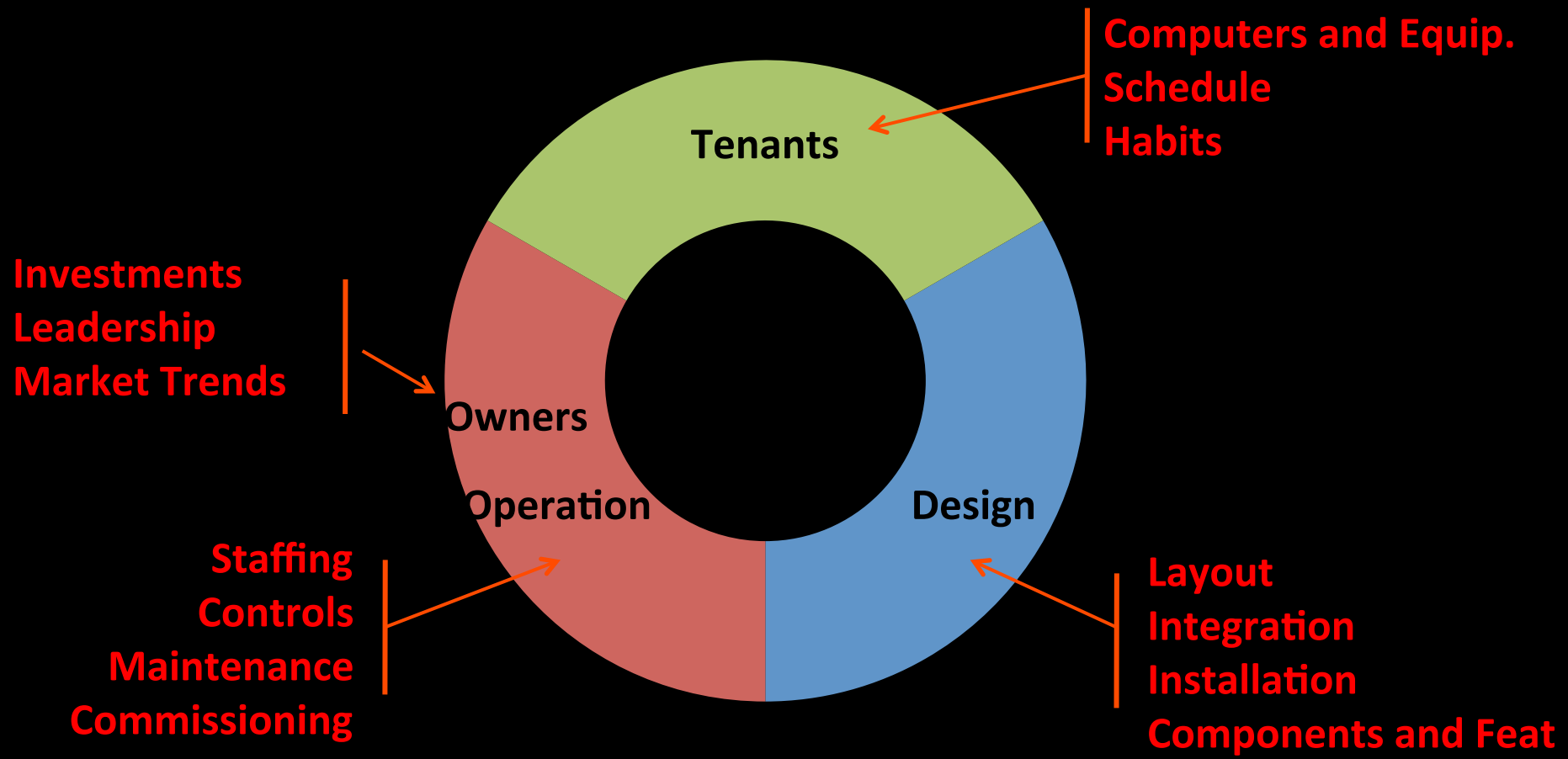
Connecting the D-O-Ts

"It was a perfectly good building until people moved in."
--Steve Fry, Washington Dept of Ecology

Audience	Feedback Needs	Uses
Design community	▪ What worked at the component level ▪ Whole building report cards ▪ Compatible benchmarks	▪ Verify design-intent is met ▪ Improve future designs ▪ Benchmark to national goals
Owners & Operators	▪ Whole building report cards ▪ Action-oriented guidance ▪ Results-responsibility alignment	▪ Prioritize enhancements ▪ Baselines for tracking progress
Tenants	▪ System level / Plug Load Use ▪ Schedule data ▪ Environmental correlation	▪ Inform behavior ▪ Green Leases ▪ Shift of costs

Other audiences:
Policymakers -- Building Rating Systems -- **Financial Institutions** - researchers

Different Players Affect Building Performance



Glazing performance – building orientation – cooling efficiency – infiltration – operating hours – climate – weather – occupant density – heating efficiency – duct design – fan size – window area – HVAC control sophistication – building mass – interior shading – occupant habits – data centers – kitchen equipment – lighting power density – filter condition – wall color – lighting controls - furniture configuration – exterior vegetation - operable window use – insolation- glazing orientation – wall insulation – ventilation rate - exposed interior surface characteristics - domestic hot water use – number of computers – copiers and printers – elevators – exterior lighting - occupant gender ratio – elevation – photovoltaics - development density – register location – cooling distribution system – roof insulation – building manager training – cool roof – building surface to volume ratio – building use type – janitorial services – metering strategies – commissioning – structural system – acoustic treatment – slab edge detailing – night setback temperature – ground water temperature – humidity – occupant dress code – lamp replacement strategy – roof slope – daylight controls – sensor calibration – corporate culture – lease terms – utility meter characteristics – parking garage ventilation – HVAC system capacity – number of separate tenants – retail space – age of equipment – ceiling height – heating fuel – transformer capacity – window mullion pattern – terms of maintenance contract – wall thickness – building height – lighting fixture layout – overhangs – thermostat location – exit lighting – private offices – refrigerators – solar hot water – utility meter – load diversity

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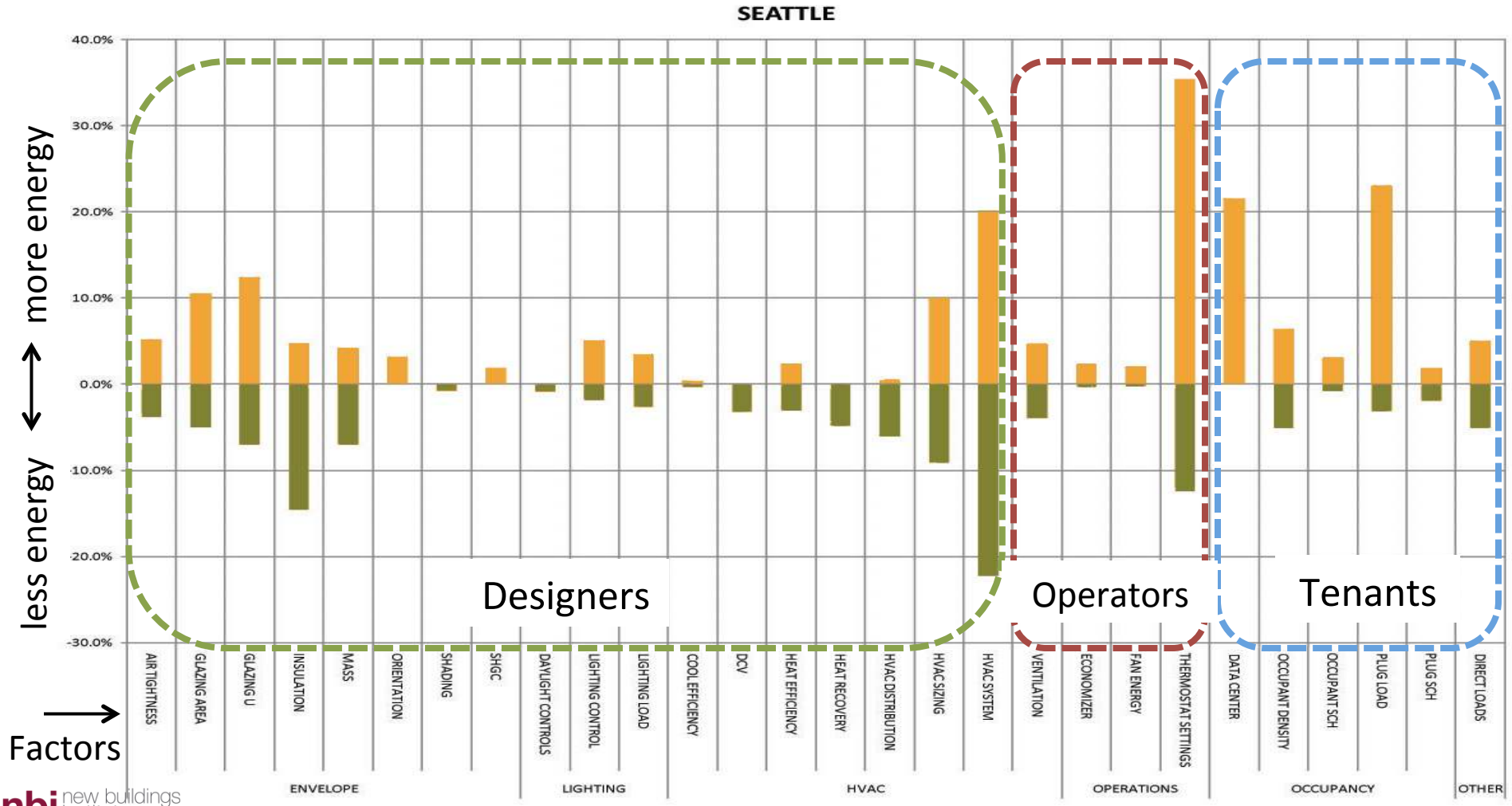
Sensitivity Analysis

Comparing the Magnitude of Impact of Design, Operation, and Tenant Behavior on Building Energy Performance



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Measured Performance Feedback as seen by NBI's *FirstView* tool

Using building monthly fuel bills, location and size

Design & construction:

–Heating Slope

Analytics	
Occupant Load	Low
Shell and Ventilation Effectiveness	Poor
Cooling Efficiency	Good
Control Problems	None
Summer Gas Use	High
Reheat	None
Data Consistency	Orderly

–Water Heating

Ref: 4

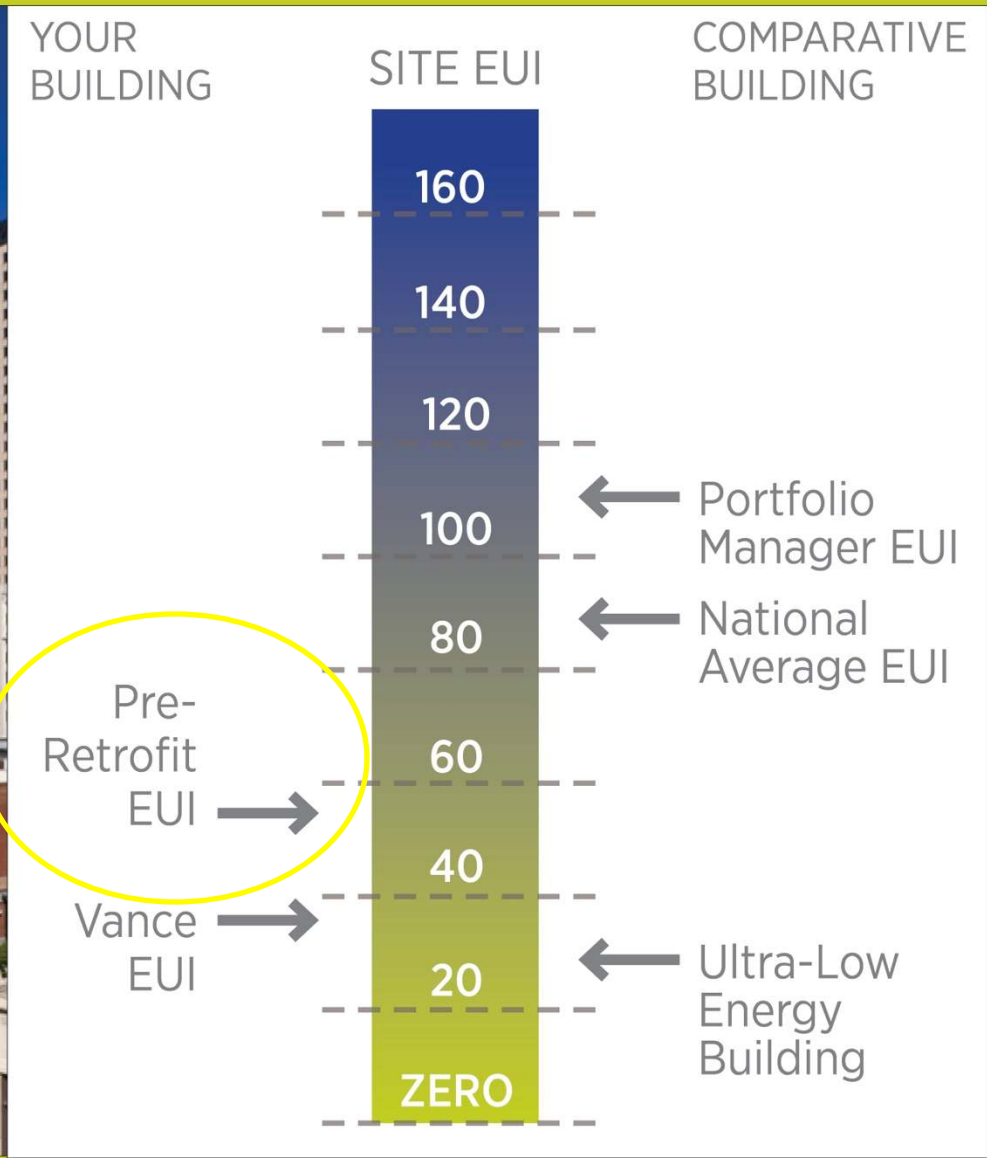
Mean Monthly Temperature, deg F

Key Performance Indicators

The Vance Building

Seattle, WA, USA

Built in 1929
14-story - 134,000 sf
Retrofit in 2007
ENERGYSTAR 98



The Vance Building

Seattle, WA, USA

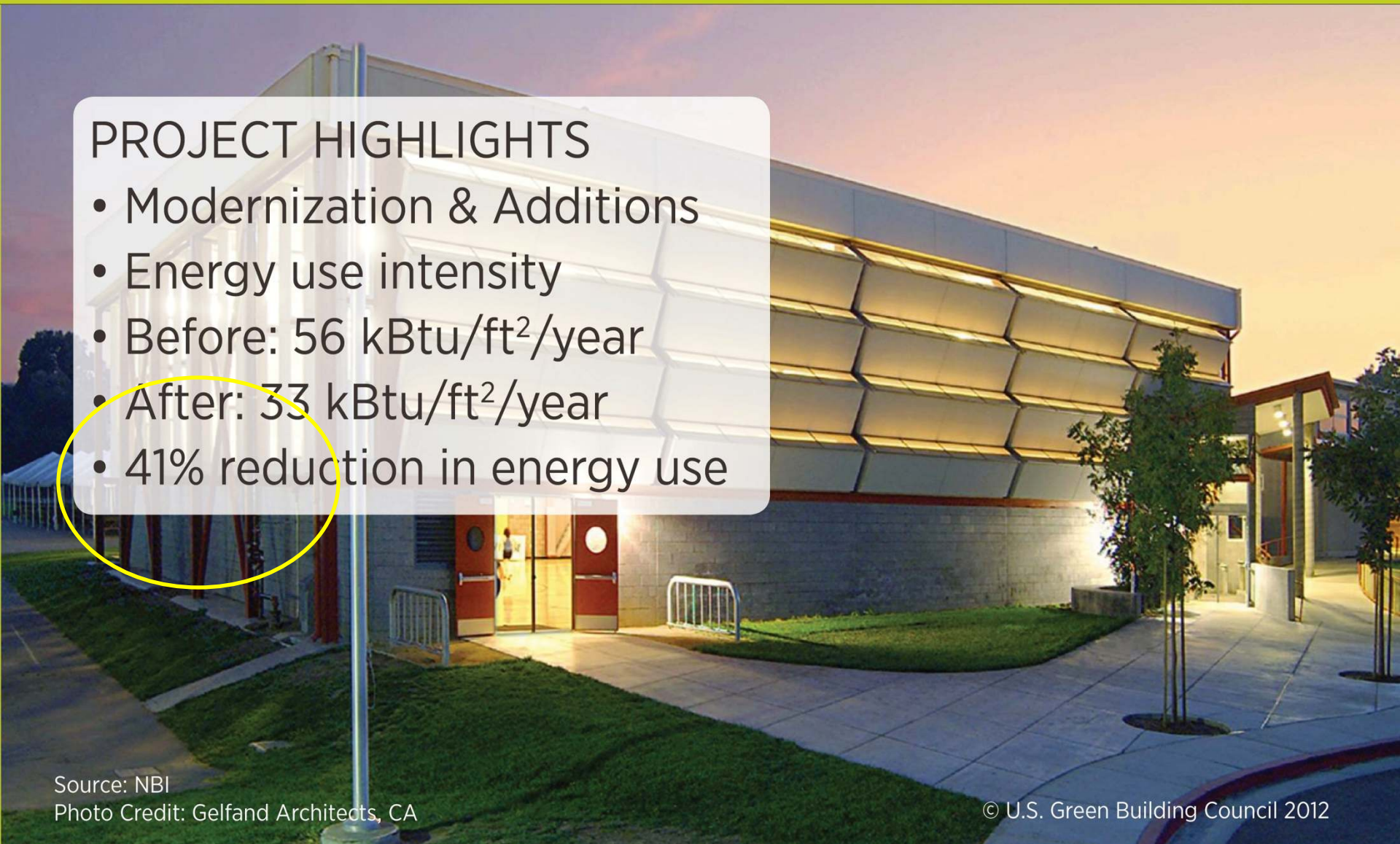
BUSINESS OVERVIEW:

- 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

Blach Intermediate School

Los Altos, CA, USA



PROJECT HIGHLIGHTS

- Modernization & Additions
- Energy use intensity
- Before: 56 kBtu/ft^2/year
- After: 33 kBtu/ft^2/year
- 41% reduction in energy use

Source: NBI
Photo Credit: Gelfand Architects, CA

The Aventine Office Building

La Jolla, CA, USA

Built in 1990
253,000 sf
Cut Electricity $ from $2.90/sf to $1.90 (34%)

HIGH PERFORMANCE RESULTS:

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

"Just one of five 20+ year old multi-tenant LEED Platinum Buildings in the World"

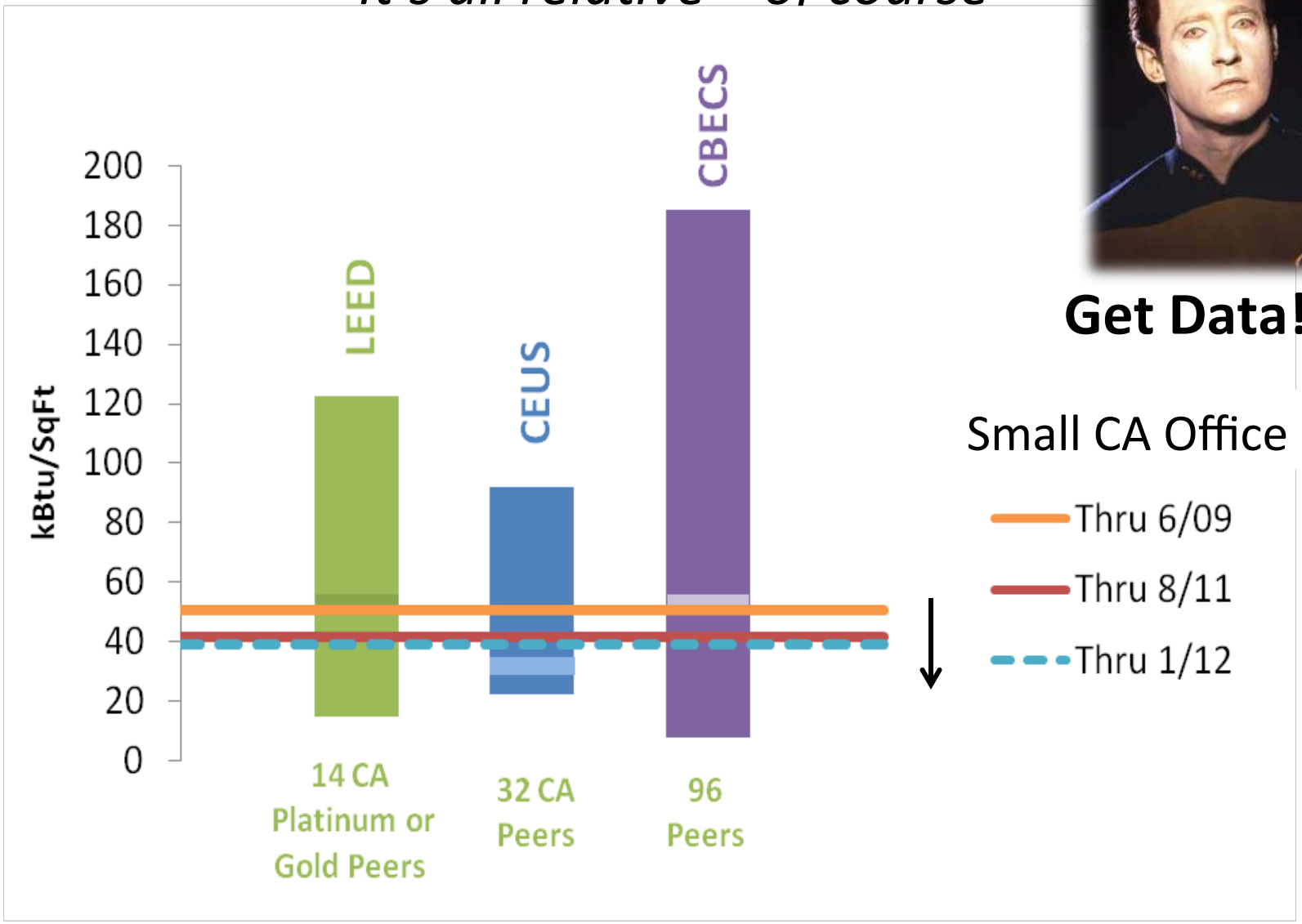
Glenborough Properties

Source: Glenborough Properties

Compared to What?

It's all relative – of course

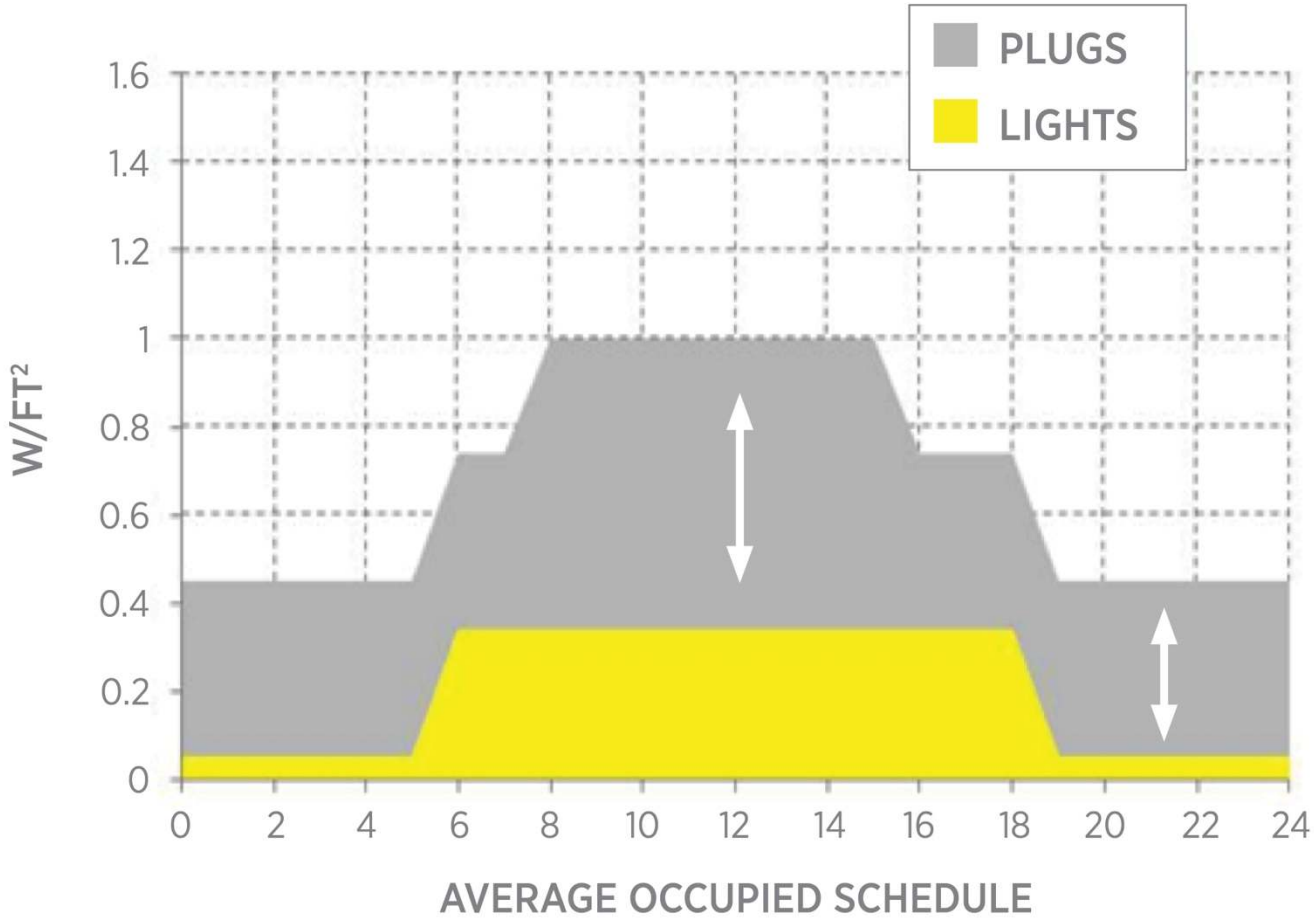
Get Data!!!




Windows XP
66
Coke

PLUG LOADS

NIGHT ENERGY USE AS A KEY PERFORMANCE INDICATOR (KPI)



PLUGS:

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

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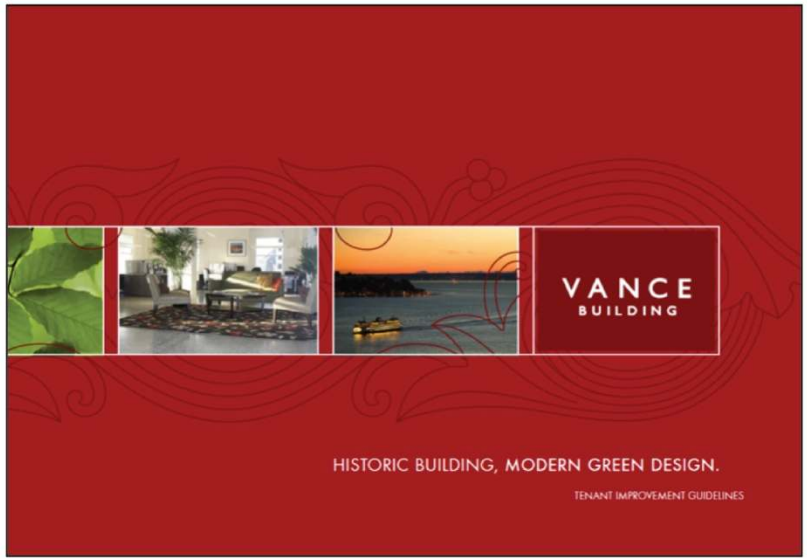
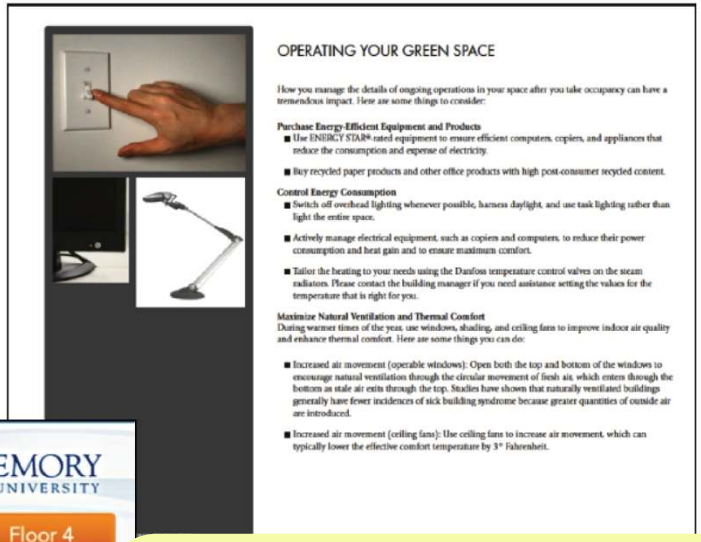
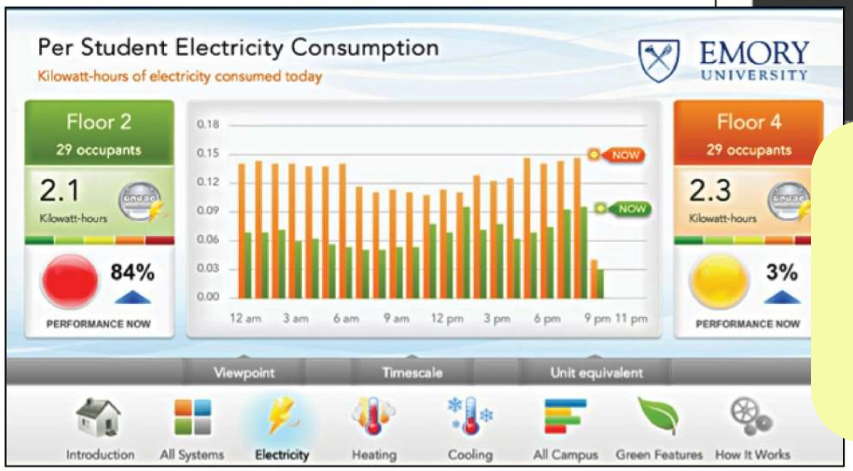
pier PUBLIC INTEREST ENERGY RESEARCH "Research Powers the Future"

TENANT STRATEGIES







Office Guide to Plug Load Energy Savings Coming soon……

Two questions tonight:

1) Who Cares?

2) Can we Cluster?

Slide photos from Chris Pyke, USGBC

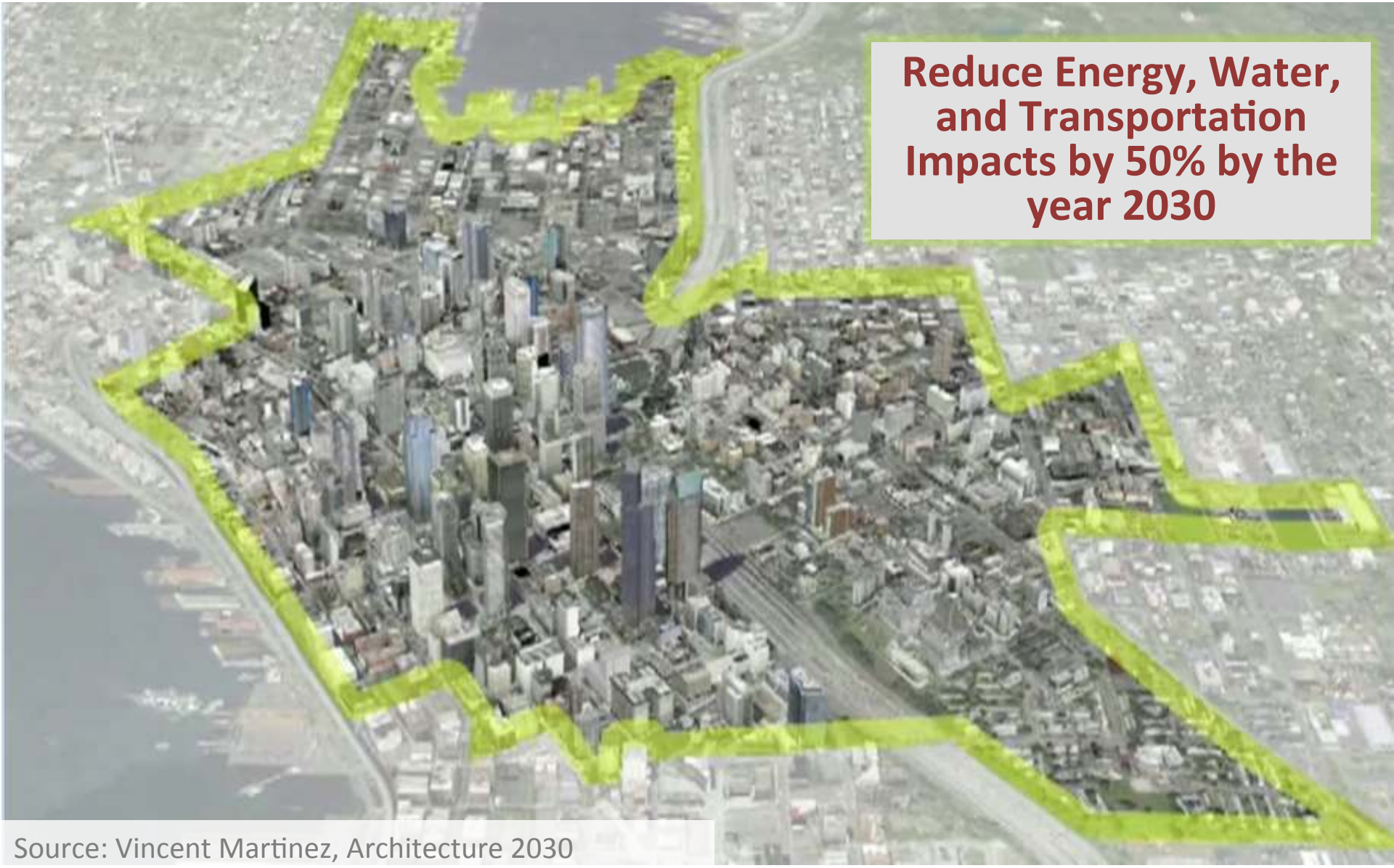
Clusters of Building

Systems as Solutions

ECODISTRICTS

SEATTLE 2030 DISTRICT

The first high-performance urban building district



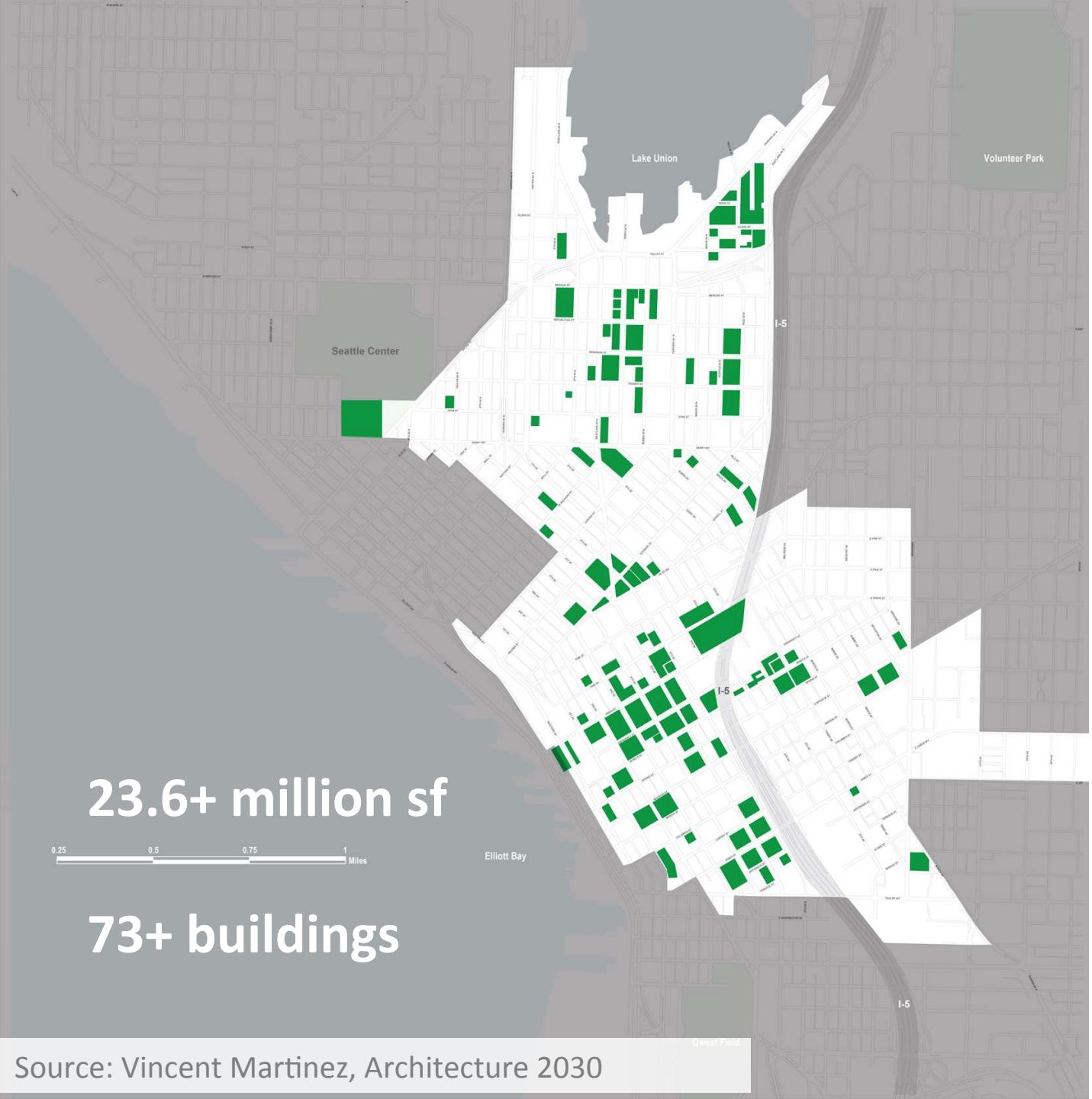
Source: Vincent Martinez, Architecture 2030

Seattle 2030 District

- Over 25% of the floor space in Seattle is actively sharing building performance data with each other, voluntarily
- Over 30 major property owners, aligned with dozens of industry partners
- Participating portfolios are performing over 25% better than baseline average
- Starting to address water (10% savings) and transportation (7% savings)

Source: Vincent Martinez, Architecture 2030

Photo: NBBJ, Seattle

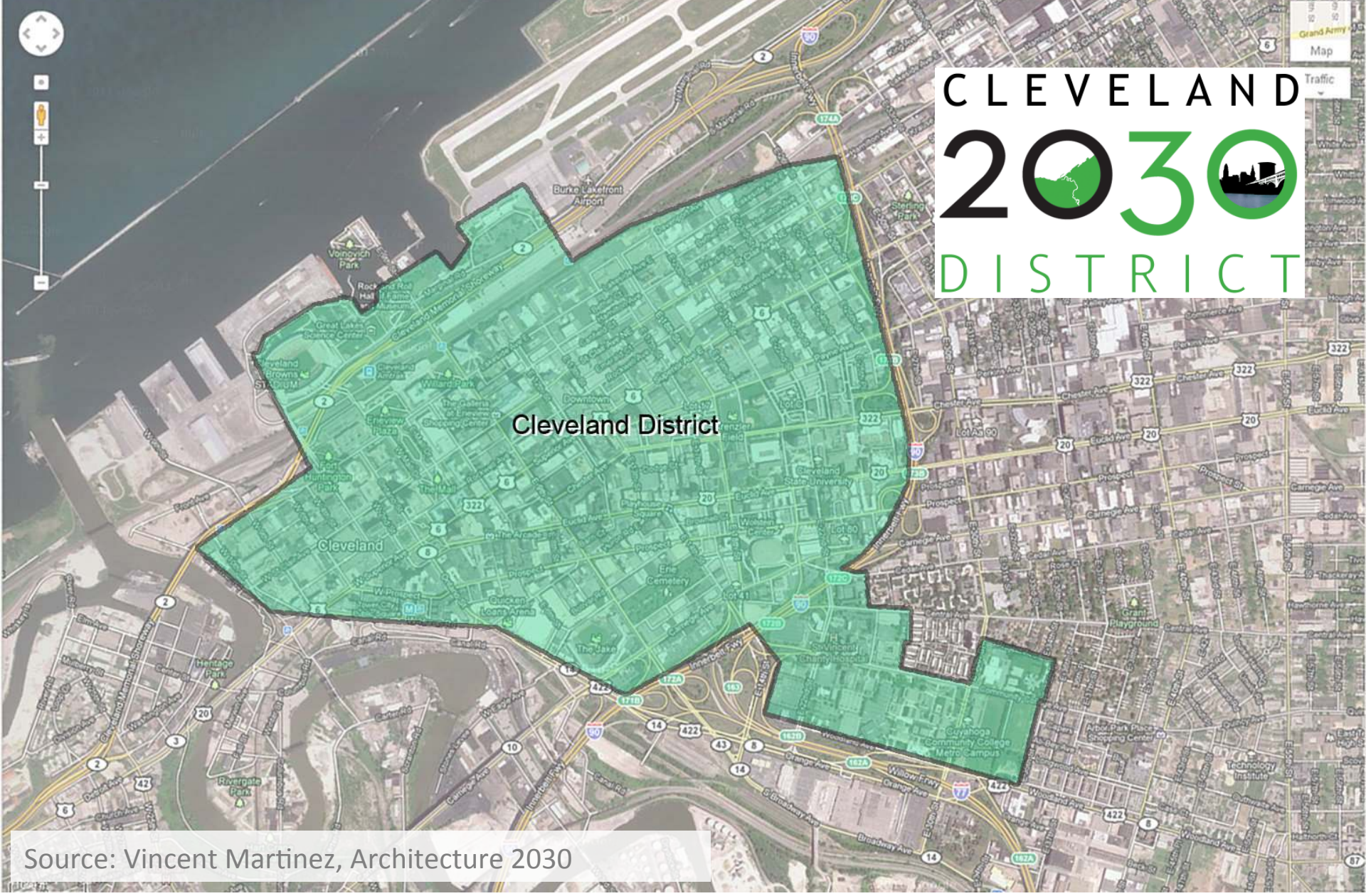


23.6+ million sf

73+ buildings

Source: Vincent Martinez, Architecture 2030

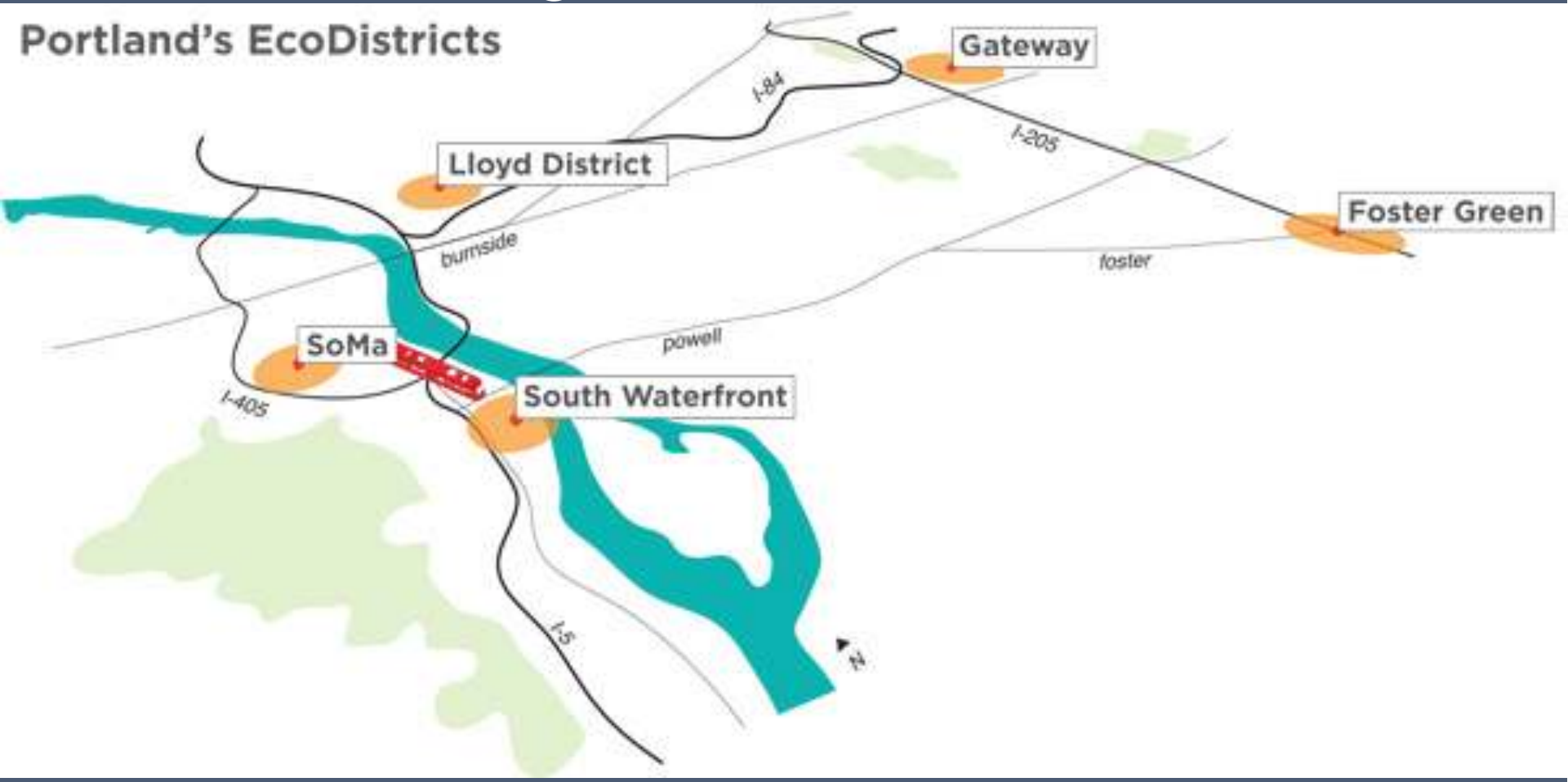
Bentall Kennedy
CB Richard Ellis
City of Seattle
Clise Properties
Fairmont Olympic Hotel
Fred Hutchinson Cancer Research Center
The General Services Administration (GSA)
Horizon House
Kidder Mathews
King County
Pacific Science Center
Pan Pacific Hotel
Stephen Grey & Associates
Tishman Speyer
Unico Properties, LLC
Vance Corporation
Virginia Mason Medical Center
Vulcan
Washington Holdings
Washington State Convention Center
Watermark Tower
Westin Hotel
Wright Runstad



Pittsburgh 2030 District, and others coming soon!

Similar Efforts: Living City Block in Denver is underway

Ecodistricts – neighborhood clusters



Merging, Clustering, Collaborating

- Greenprint Center for Building Performance joining with ULI's - Leading Real Estate Firms
- Denver Living City Block and Sustainability Alliance
- Retfofit Portfolio Challenge: RMI, NBI and True Market Solutions
- Chicago work by Claretian Associates

Building the future one block at a time.
Living City Block

RetroFit
CHALLENGE
AN RMI INITIATIVE

GREENPRINT FOUNDATION

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Typologies and tools

Where to leverage commonalities?

How to Support Small / Medium Buildings?

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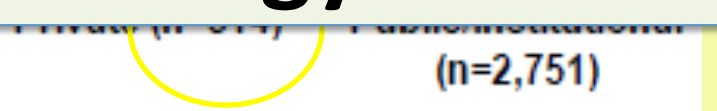
Preservation Green Lab
NATIONAL TRUST FOR HISTORIC PRESERVATION

US Energy Service Companies (ESCOs) projects and approach

No Building Left Behind agenda:

Buildings under 50,000 SF are:

- **95% of the buildings**
- **50% of the square footage**
- **45% of Energy Use**



…k in the Public / Institutional area – need to **create an attractive business model in the private sector**

Source: Peter Larsen, LBL Study, NECC Briefing Jan. 2011

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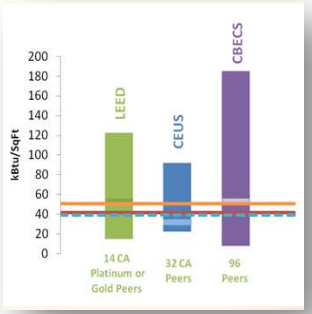
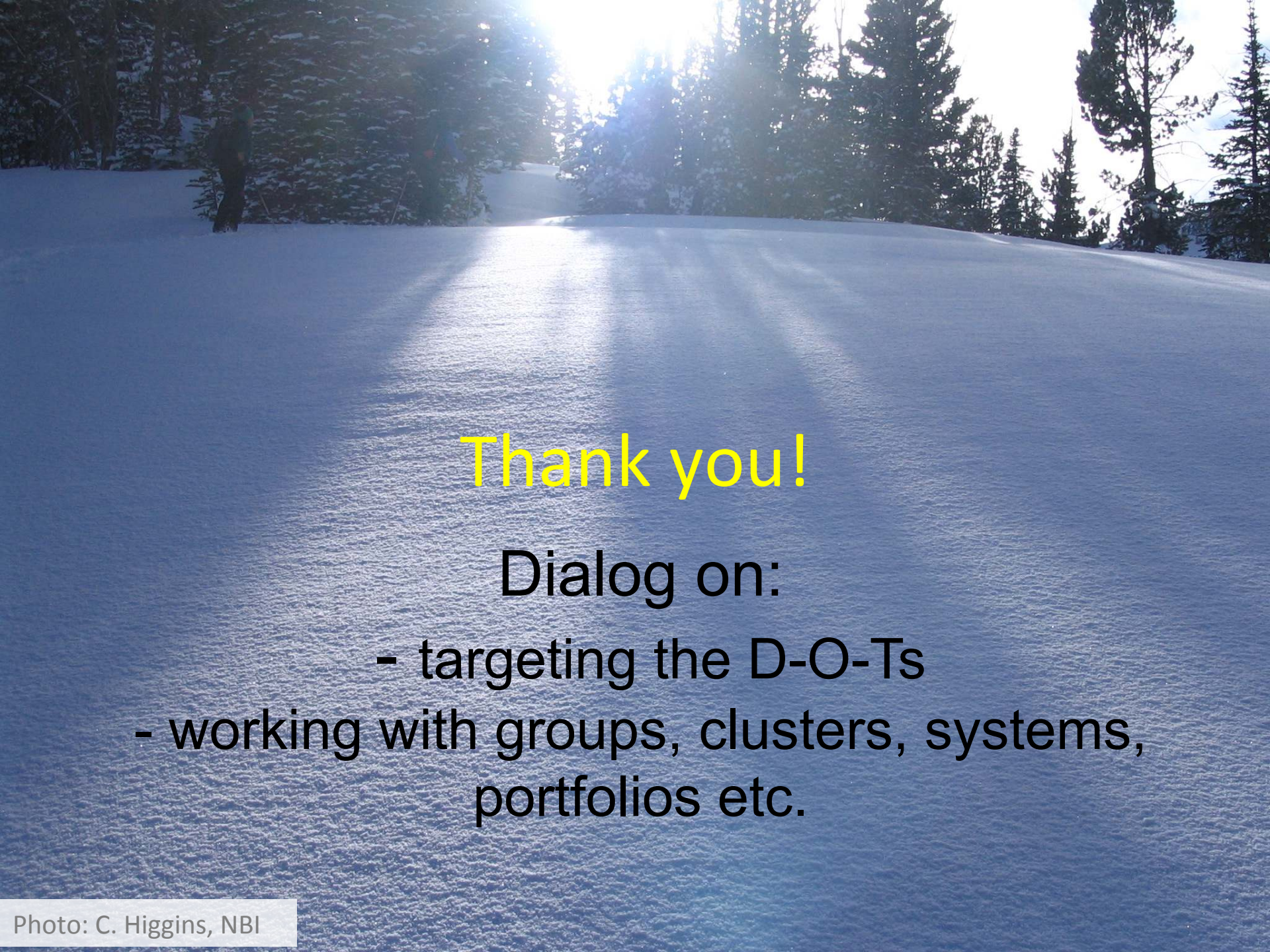
Beyond Buildings:



Connect the DOTS: What does the building use now? Compared to what?
Who Cares?

Remember data….

Widgets are in the Way – work through champions, groups and clusters of buildings for new delivery systems and opportunities.



Thank you!

Dialog on:

- targeting the D-O-Ts
- working with groups, clusters, systems, portfolios etc.

Photo: C. Higgins, NBI