

# New Buildings Institute

- Formed in December 1997 as 501(c)3
- Annual revenues of \$1.5 million
- Think tank on commercial building efficiency
- National Board
- Staff in Seattle, Portland, Vancouver, and White Salmon



# National Coalitions for GT50

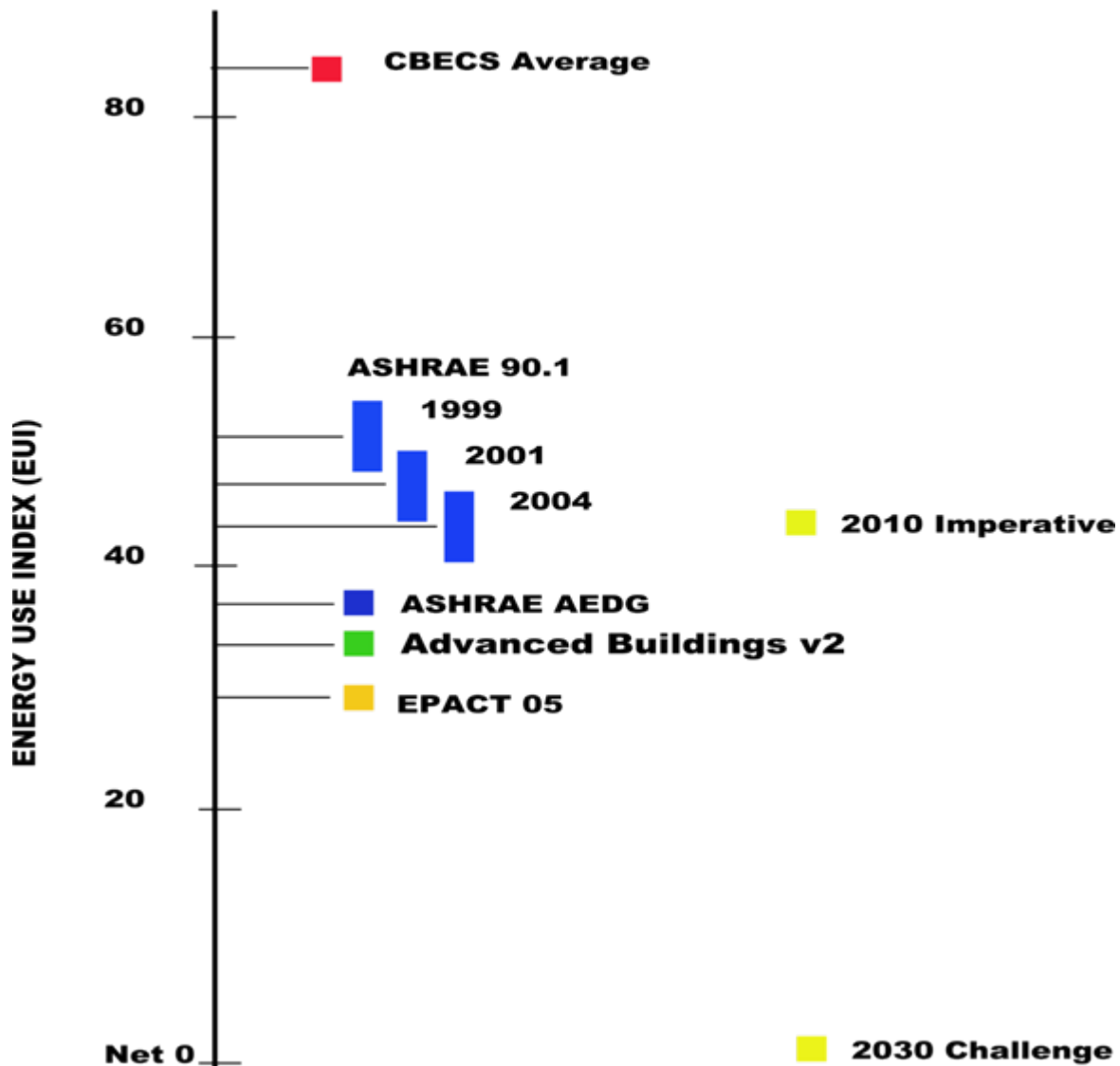
- AIA
  - 50% reduction in fossil fuel used by new and renovated buildings by 2010; subsequent 10%/yr improvement
- ASHRAE
  - Collaborating on the development of design guidelines for 50% energy savings, with IESNA, AIA, USGBC
- USGBC
  - LEED to include prerequisite energy performance requirements of ~15%, potentially increasing annually
- EPACT 05

# GT50 Summit

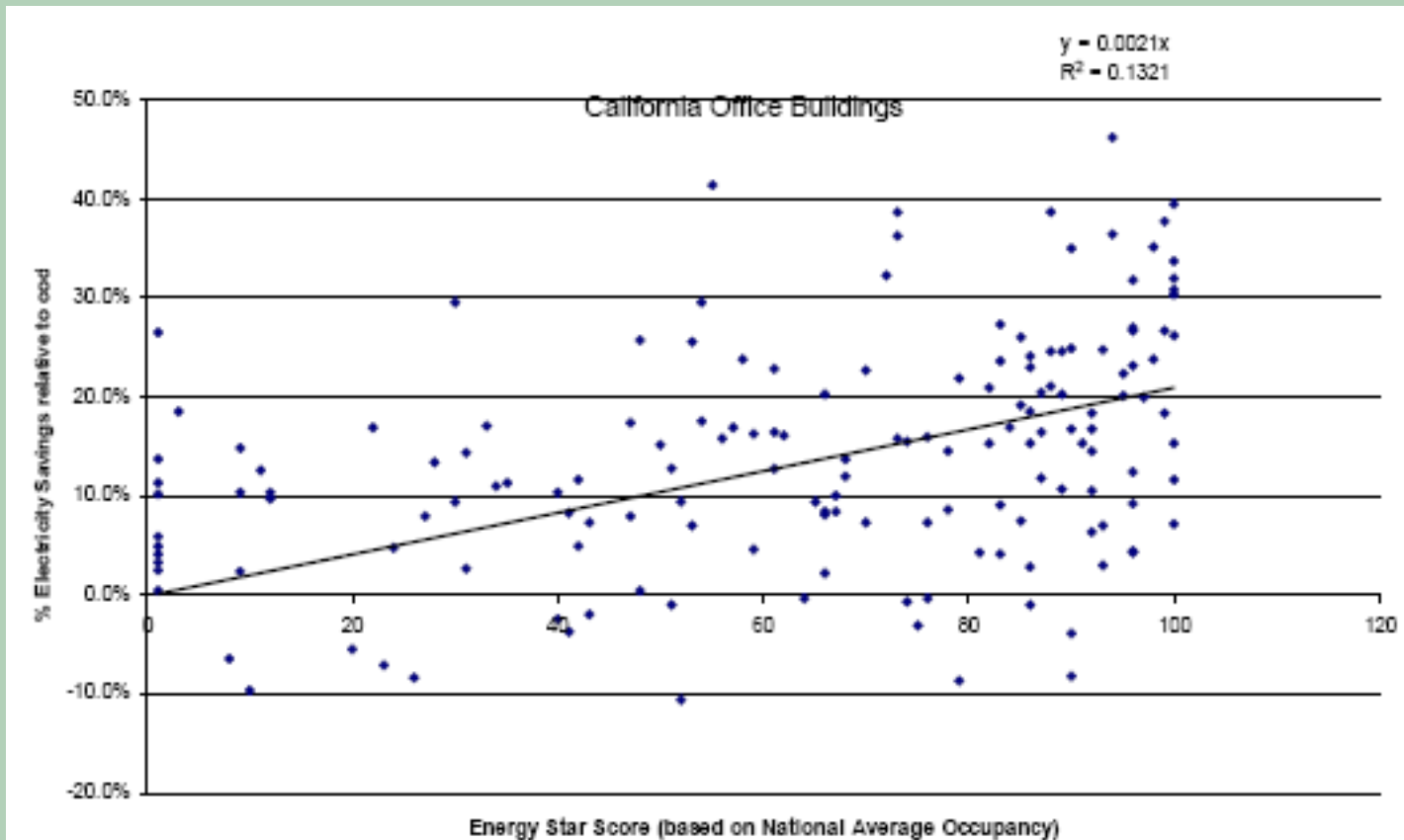
## Atlanta March 7-9

- Full bowl of Alphabet Soup
- Get a baseline/alignment
- Build the business case
- Improve operational performance
- Ramp up educational strategies
- Assemble technical solutions sets
- Carrots and sticks

# Energy Performance Baseline



# Measured vs. Modeled; Data Correlation



Source: NBI, California Board for Energy Efficiency, EPA

# Feedback on Energy Performance

NBI is developing a simplified Performance Verification Tool to provide performance feedback useful to utilities and building operators.

Much simpler than M&V, but robust analysis is possible

- Hourly Energy Use Data (Pulse Meter)
- Local Temperature Data
- Occupancy Characteristics

# Identify the 100 Best Performing Buildings in the Country



# Getting to 50

Advanced Buildings - Getting to Fifty



[Buildings Database](#)

[Lighting](#)

## Welcome to the home of *Getting to Fifty*™

This new resource is designed to help designers, architects, owners and contractors achieve their goals of truly high-performance buildings.

*The Energy Policy Act of 2005 (EPACT 2005)* provides tax incentives for buildings whose energy performance reaches or exceeds 50 percent above ASHRAE 90.1-2001. Commercial buildings entering service between January 1, 2006 and December 31, 2007 can realize a tax deduction of \$1.80 per square foot by saving energy with respect to lighting, HVAC, water systems. Significant savings can also be gained by saving individual elements. This is great news for designers, but how do you make it a reality on your project?



[www.advancedbuildings.net](http://www.advancedbuildings.net)

*That's where we come in.*

### Buildings Database

A great many projects have already approached or surpassed this high level of performance, but the task of tracking down who's done what, and with what result, can be cumbersome and time-consuming. The *Getting to Fifty* database streamlines your research efforts by providing a central online location for information on buildings that have successfully met that performance test.

### Lighting

Recognizing that lighting may provide the simplest path to significant energy savings, we've created detailed examples of how you can improve the efficiency of lighting in a variety of building types. EPAct specifically allows it to be considered as a separate system, offering a deduction of up to \$0.60 per square foot for lighting alone.

This website is continually evolving. Future additions will provide information on how to achieve additional savings in other areas, such as HVAC, envelope and hot water system design. Include us in your library of resources and check back often for updated tools and information.



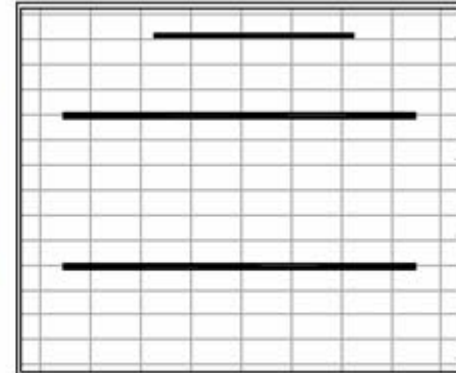
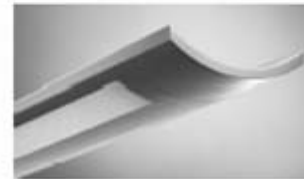
*Getting to Fifty* is brought to you by [New Buildings Institute](#). We encourage you to visit our other Advanced Buildings website, [www.poweryourdesign.com](http://www.poweryourdesign.com), to learn about our suite of technical publications and trainings aimed at reducing building energy usage and improving indoor environmental quality.



# Lighting in GT50

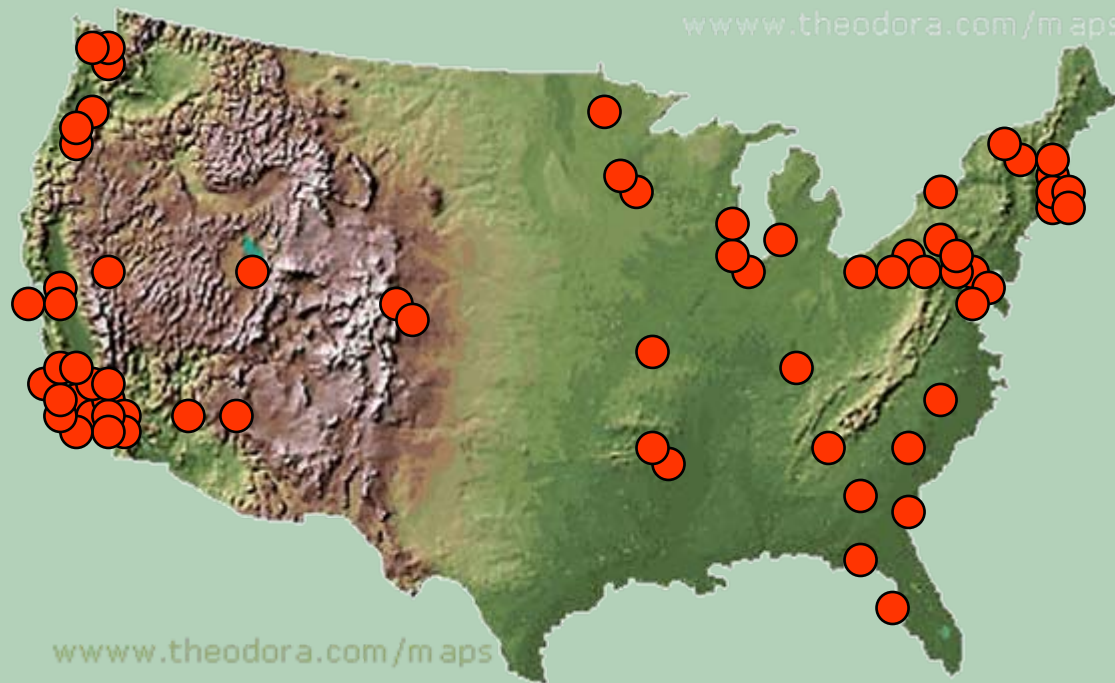
## Design Criteria:

- Ceiling Height: 10'-0"
- IES Recommendation: 30 - 50fc
- Calculated Light Level: 43fc
- Uniformity: 3.6 : 1
- ASHRAE LPD: 1.5 w / s.f.
- Actual LPD: 0.89 w / s.f.
- Base Energy Savings: 41%
- Deduction: \$0.60 / s.f.

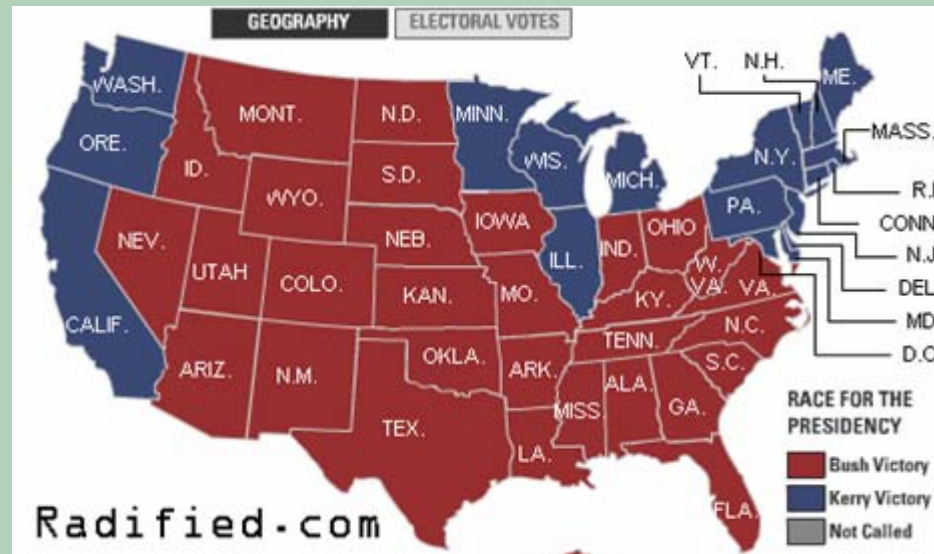
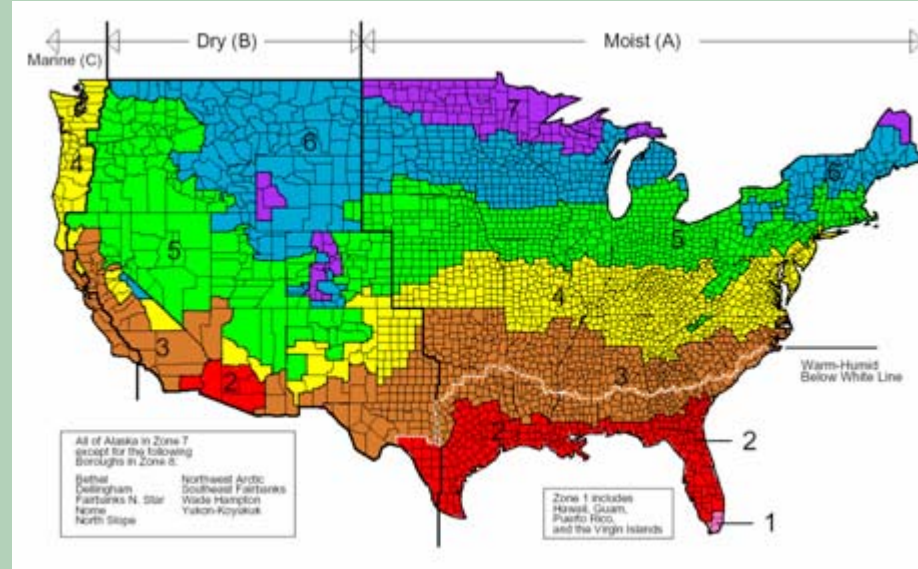
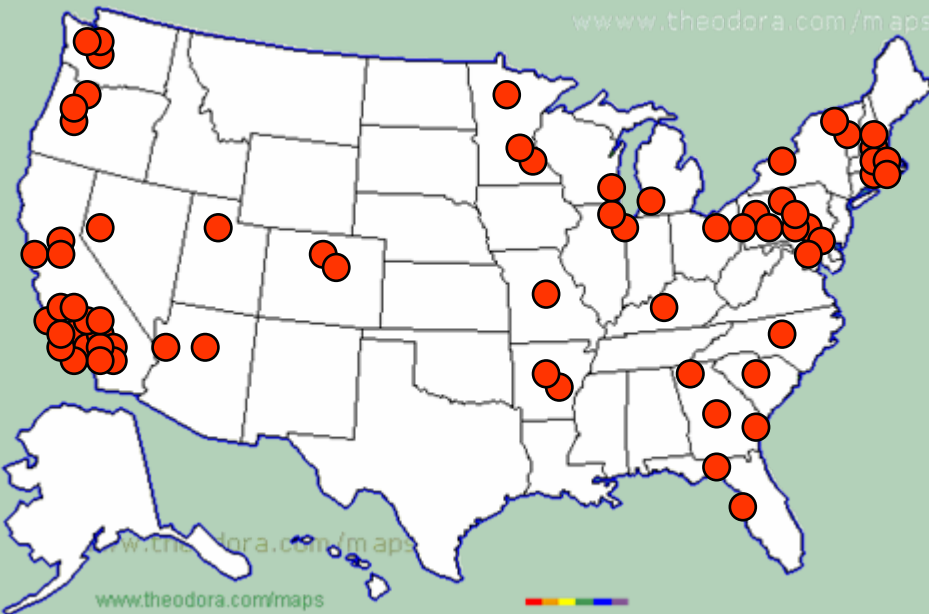


Fixture Type		Typical Fixture Wattage	Min Area Per Fixture for 40% savings	Typical Fixture Cost	Fixture Cost / Min s.f.
2x4 Recessed Parabolic (3) F32T8		90 w	100 s.f.	\$80 - \$160	\$0.80 - \$1.60
2x2 Recessed Lensed (2) F24T5HO		52 w	57 s.f.	\$150 - \$200	\$2.63 - \$3.50
Direct / Indirect Linear (2) F32T8		60 w	67 s.f.	\$125 - \$250	\$1.87 - \$3.73
Indirect Linear (1) F54T5HO		59 w	66 s.f.	\$150 - \$300	\$2.27 - \$4.55

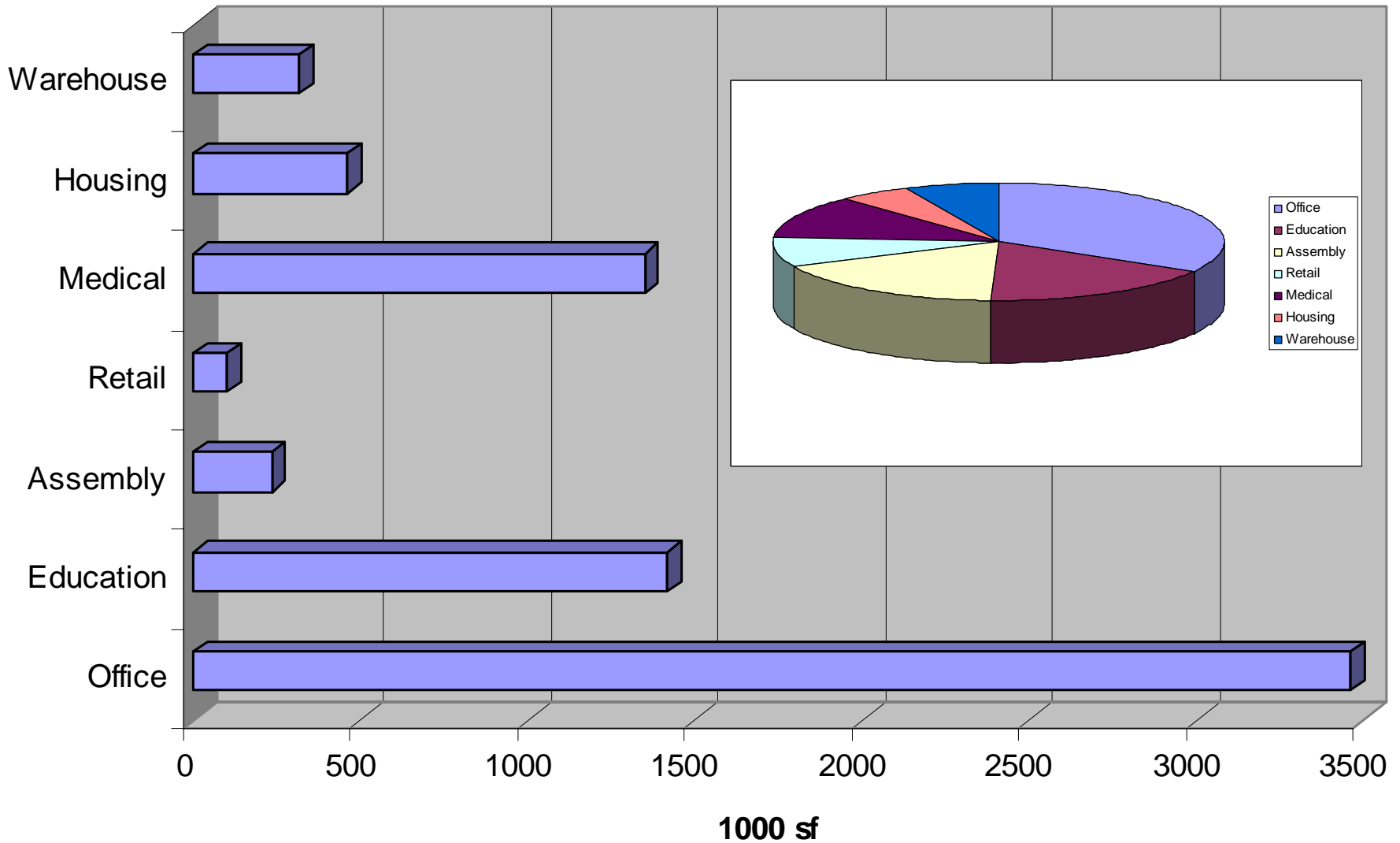
# GT50 Project Distribution



# Patterns of Project Distribution

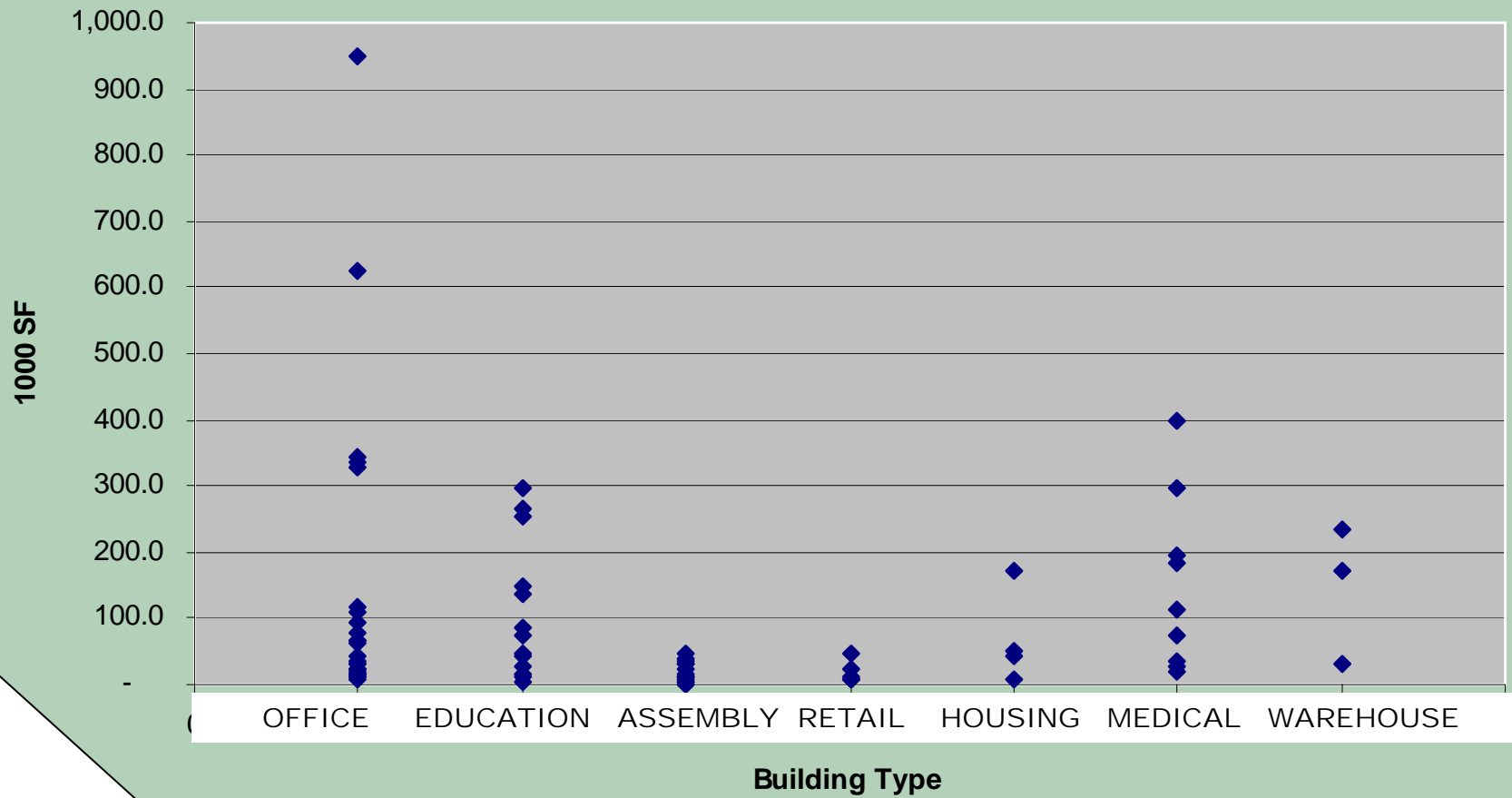


# GT50 Project Types (by SF)

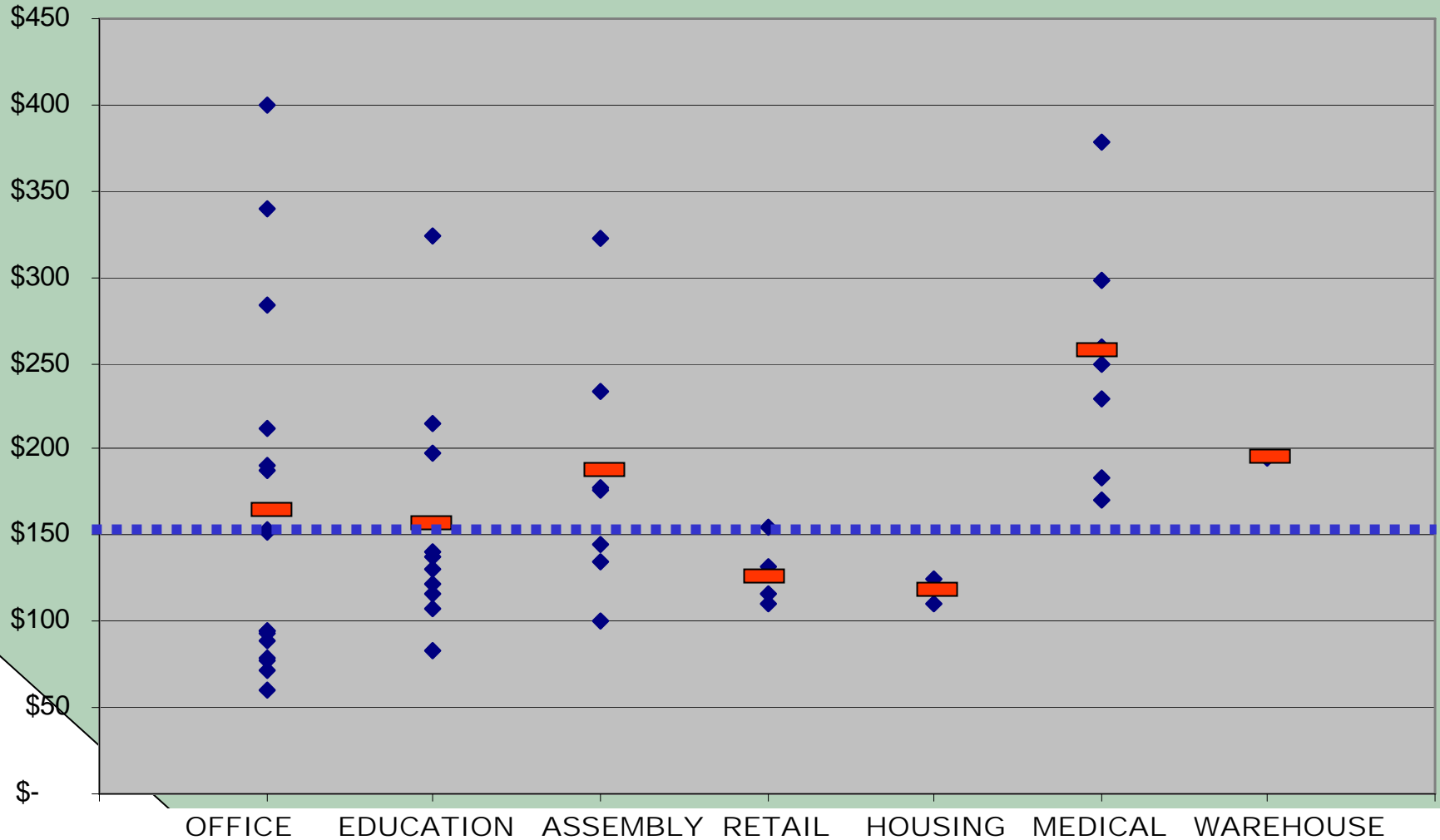


# Distribution by Size

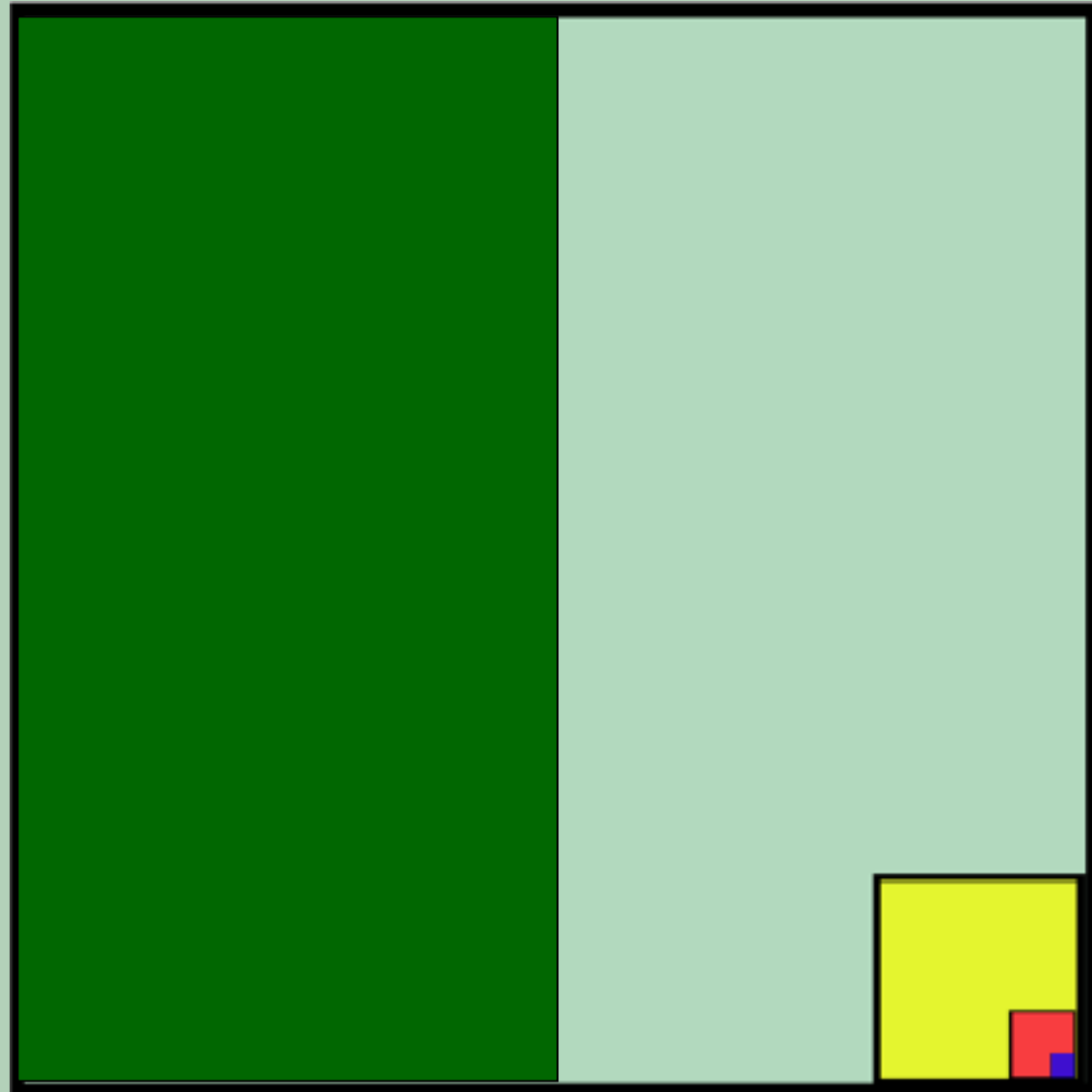
Size 1000's SF



# Cost per Square Foot



# Market Penetration



# Technologies

- **Daylighting**-Design to enhance daylighting; incorporation of controls to reduce lighting energy use
- **Controls**-Varied interpretations, including CO<sub>2</sub>-controlled ventilation, M&V, etc.
- **Increased Insulation**-exceed code, improved air-tightness
- **HVAC Efficiency**-increased beyond code



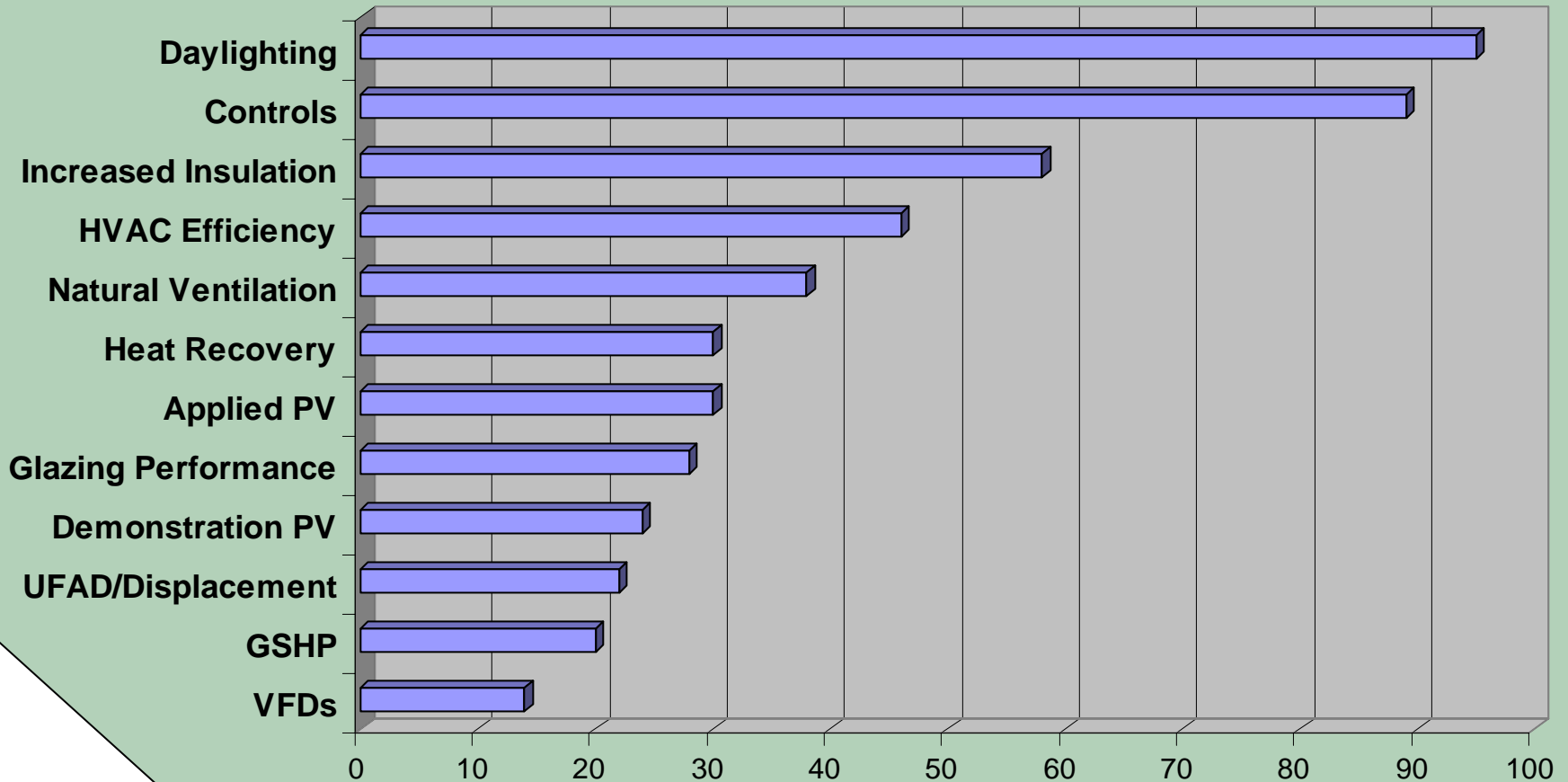
# Technologies

- **Natural Ventilation**-varied interpretations; design-intensive fully engineered systems to operable windows with cross-flow or high-low configurations
- **Heat Recovery**
- **Glazing Performance**
- **Applied PV**-Serves at least 10% of load
- **Demonstration PV**-less than 10% of load

# Technologies

- **UFAD**-Distinction between displacement and underfloor not consistent
- **GSHP**-ground or water source heat pumps
- **VFD**-variable frequency drives
- **Other Elements**-Mass, night flushing, evaporative cooling, etc.

# Technologies in GT50



# GT50 Case Studies



# Cambria Office Building



■	Daylighting
■	Controls
■	Increased Insulation
□	HVAC Efficiency
□	Natural Ventilation
■	Heat Recovery
■	Applied PV
■	Glazing Performance
□	Demonstration PV
■	UFAD
■	GSHP
□	VFD
■	Other Elements

- 36, 000 sf Office, State Agency
- Ebensburg, Pennsylvania
- Construction cost: \$103/sf
- Completed: 2000
- LEED Gold

# Cambria Office Building

- Daylit with interior light shelves, exterior shading, controls
- UFAD served by GSHP
- LPD of 0.75 w/sf with extensive controls
- Separate ventilation system with heat recovery
- PV supplies 28% of power
- High performance envelope eliminated perimeter heating
- Fully commissioned per BCA standards

Photos by Robb Williamson



# Cambria Office Building

- Post-occupancy study to verify performance; 40% better than ASHRAE 90.1
- Annual energy use 40 kBtu/sf
- Peak energy use (summer) 2.5 W/sf



# Clackamas High School

■	Daylighting
■	Controls
■	Increased Insulation
■	HVAC Efficiency
■	Natural Ventilation
□	Heat Recovery
□	Applied PV
■	Glazing Performance
■	Demonstration PV
□	UFAD
□	GSHP
■	VFD
■	Other Elements

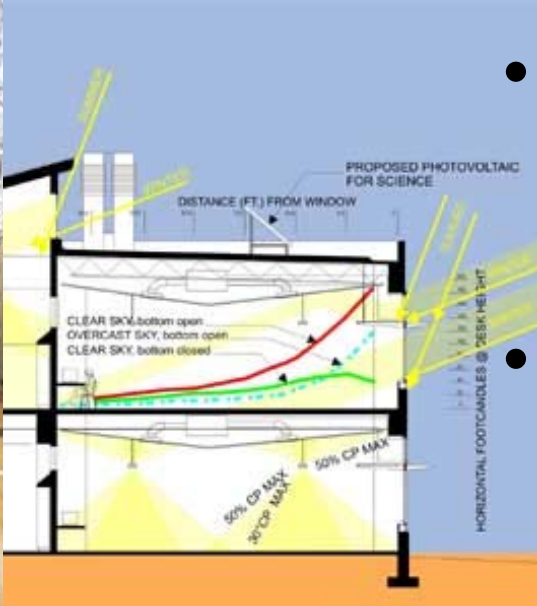
- 265,000 sf
- Clackamas, Oregon
- \$117/sf (excluding land)
- Completed April 2002
- Energy savings est. \$69,000/yr (+40% over ASHRAE)



Boora Architects, CBG, Interface



# Clackamas High School



- Daylit with interior light shelves, exterior shading, controls
- Natural ventilation with mechanical dampers in stack spaces; limited AC
- VFDs and other mechanical performance enhancements
- Fully commissioned

# Artists for Humanity Epicenter

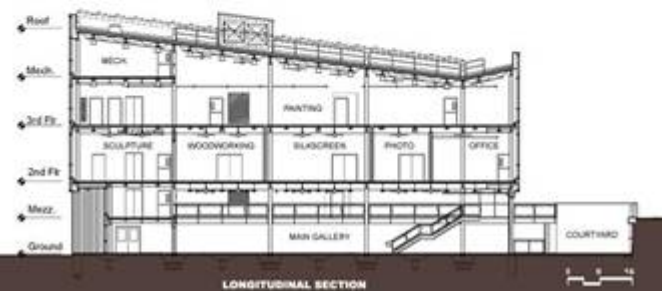
- Boston, MA
- LEED Platinum
- Completed in 2004
- \$208/sf, including PV
- 23,500 sf Assembly, etc.

■	Daylighting
■	Controls
■	Increased Insulation
□	HVAC Efficiency
■	Natural Ventilation
■	Heat Recovery
■	Applied PV
■	Glazing Performance
□	Demonstration PV
■	UFAD
■	GSHP
■	VFD
□	Other Elements



# Epicenter

- 80% better than ASHRAE 90.1
- 35% energy from Photovoltaics
- Natural and Night ventilation, no AC
- Daylit, with dimming controls
- Low connected lighting load



- Photos by Richard Mandelkorn

# Lillis Business Complex

■	Daylighting
■	Controls
□	Increased Insulation
□	HVAC Efficiency
■	Natural Ventilation
□	Heat Recovery
■	Applied PV
■	Glazing Performance
□	Demonstration PV
□	UFAD
□	GSHP
□	VFD
■	Other Elements

- Business School Building
- U of O, Eugene, Oregon
- Completed September 2003
- LEED Silver
- 137,346 sf, at \$217/sf
- 41% better than ASHRAE 90.1



SRG Architects, Balzhiser and Hubbard, Benya

# Lillis Business Complex



- BIPV integrated in glazing as shading device
- Natural Ventilation in most spaces
- Extensively daylit with sophisticated controls

# Zion Visitor Center



- Zion National Park, Utah
- 7,600 sf Interpretive Center
- Completed in May 2000
- 70% better than ASHRAE 90.1



# Zion Visitor Center

■	Daylighting
■	Controls
■	Increased Insulation
□	HVAC Efficiency
■	Natural Ventilation
□	Heat Recovery
■	Applied PV
■	Glazing Performance
□	Demonstration PV
□	UFAD
□	GSHP
□	VFD
■	Other Elements

- Passive Evaporative Cool towers
- Daylighting
- Photovoltaics
- Trombe wall
- Natural ventilation



# Case Studies

Photo: Magnus Stark



IEUA Hdqtrs.  
66% over T-24  
Platinum

Photo: Marvyn Rand



Clearview Court.  
100% PV  
gas microturbine w/HR

Photo: Tim Street-Porter



NRDC Hdqtrs.  
55% over T-24  
Platinum



# Case Studies

Photo: Enrico Davostini



White Rock Op Ctr.  
55% over ASHRAE

Photo: Kevin Beswick



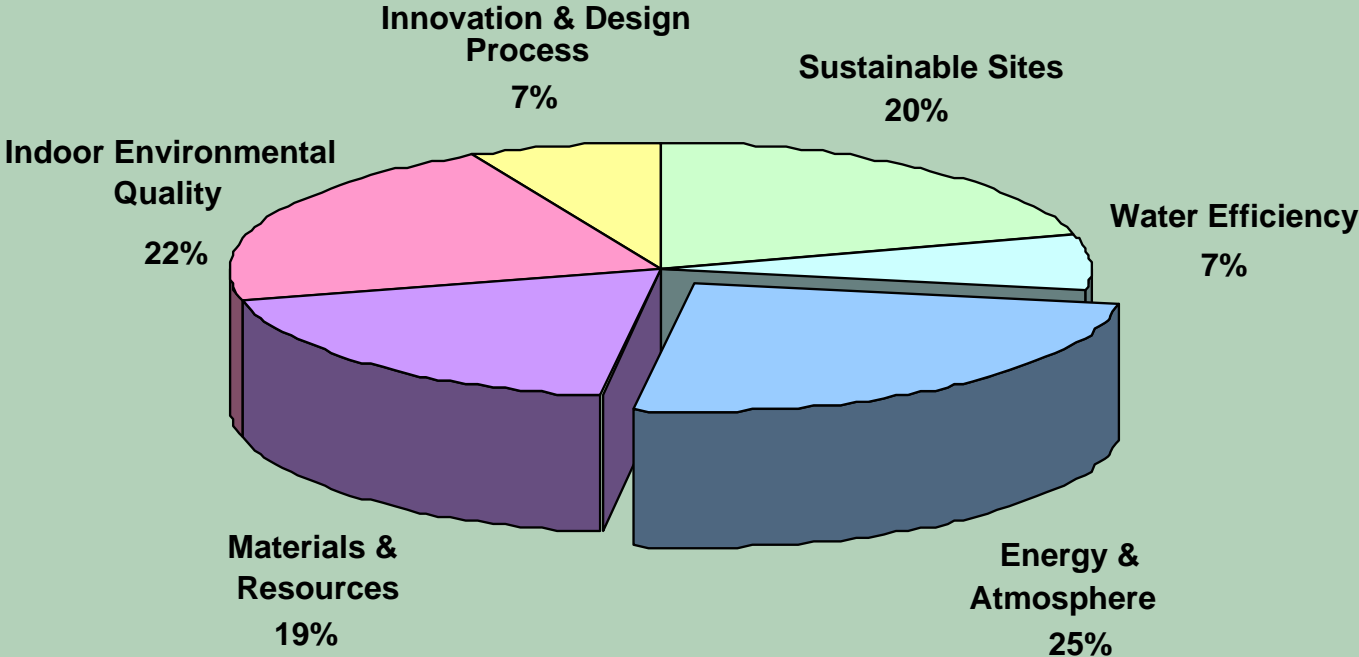
Herman Miller  
40% over ASHRAE  
LEED Gold

Photo: Charlie Johnson

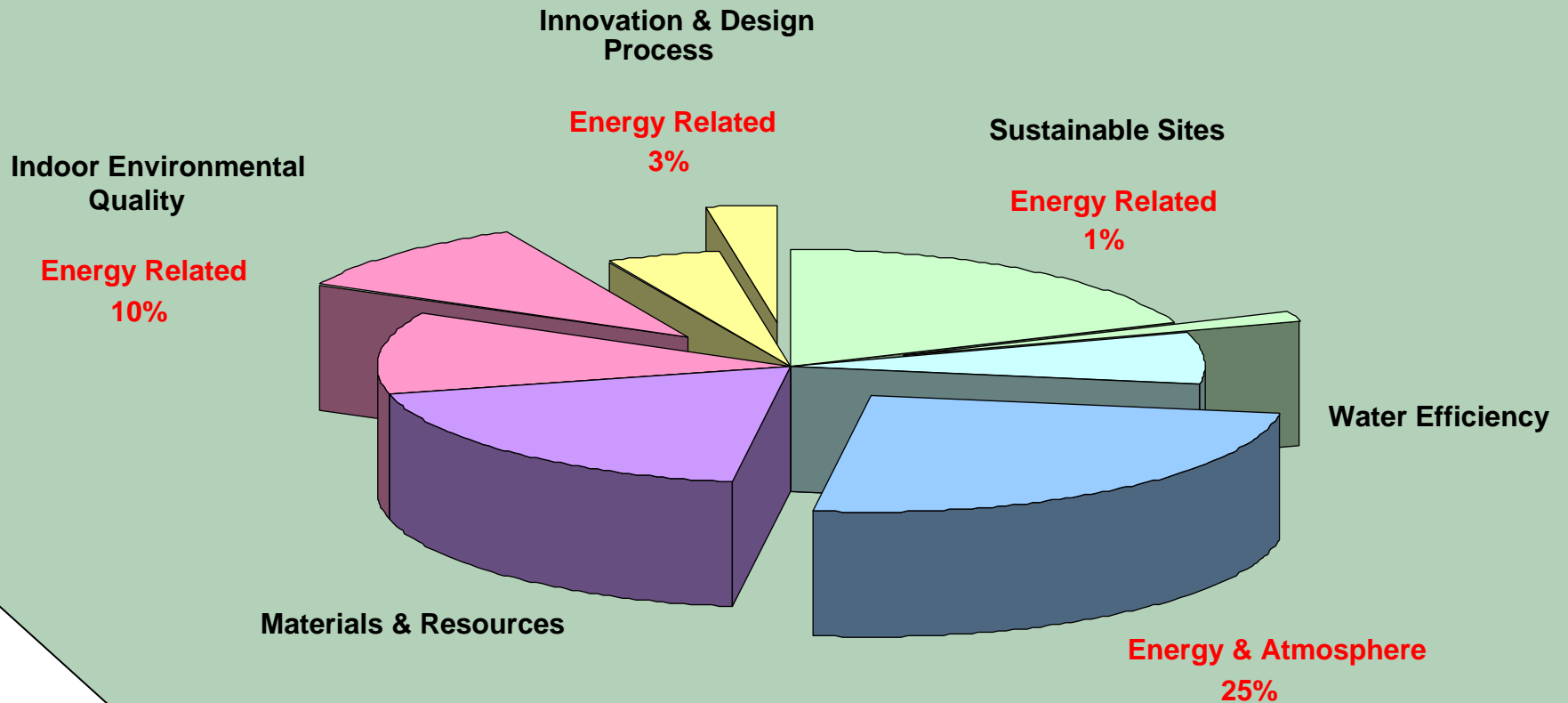


Sokol Blosser Winery  
57% over ASHRAE  
LEED Silver

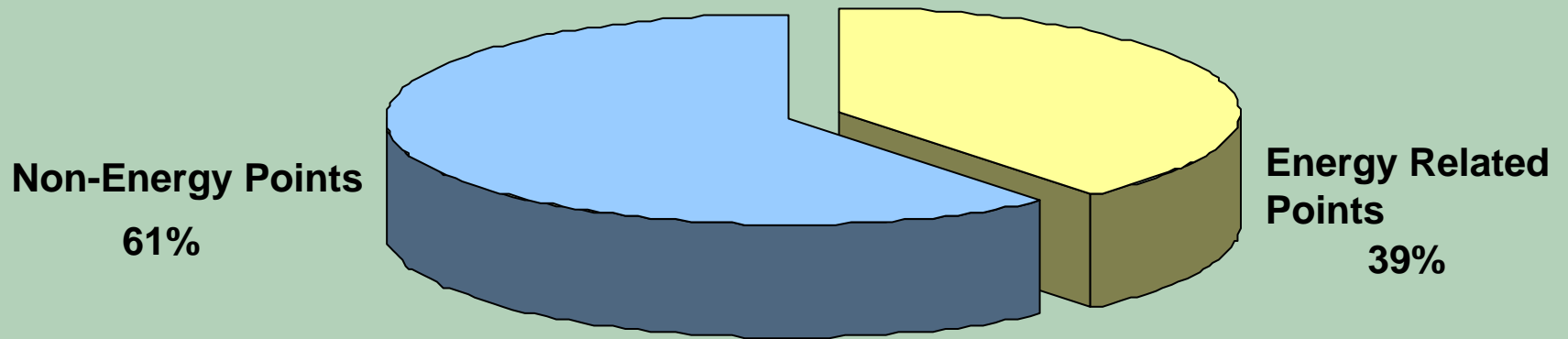
# LEED Credit Distribution



# Energy Related Credits



# Combined Energy Credits



# NBI Currently Reviewing Energy Use of LEED Buildings

- 83% of LEED NC buildings get 2 or more EA1 points
- Design savings estimate of 30%+ beyond ASHRAE 90.1-2001
- Platinum buildings 40%+
- Study on actual energy performance will be available ???

# Advanced Buildings Core Performance

- Focuses on the 90% of commercial buildings that are smaller than 50,000 square feet.
- Provides technical guidance without the expense and uncertainty of modeling
- State-of-the-Shelf Program
- Designed as a DSM program, with training, marketing and technical support
- Recognized by the U.S. Green Building Council

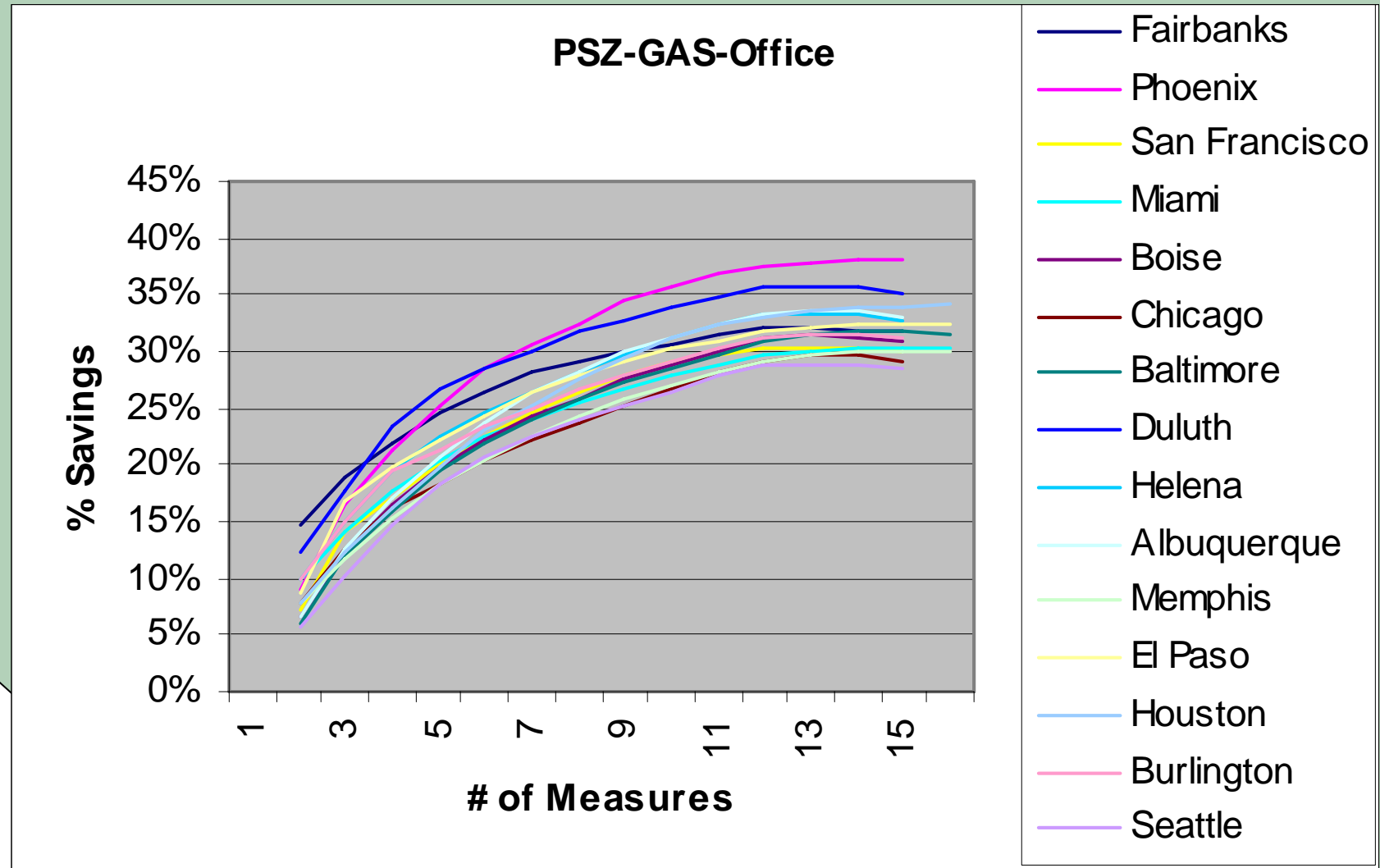
# Advanced Buildings Core Performance

Major Analysis Protocol to support program revisions compared to ASHRAE 90.1-2004 prescriptive requirements.

Three building prototypes, 3 to 5 system variants each, 20 measures applied to each baseline in 15 climate zones to determine measure ranking with respect to energy performance.

Top ranked measures become part of program.

# ABv2 Performance Across Climate





# NBI Initiatives

- Ongoing research, technical, and implementation support for GT50
- Participating in LEED 3.0 development process
- Advanced Lighting Guidelines
- Advanced Building Guidelines to provide practical design assistance for advanced energy performance
- Building Performance Review Protocol
- Technology Research in Fault Detection Diagnostics, Indirect Evaporative Cooling Systems, etc.
- Committee and program participation with USGBC, ASHRAE, AIA, DOE and EPA energy programs

# Web Resources

- [www.advancedbuildings.net](http://www.advancedbuildings.net)
- [www.betterbricks.com](http://www.betterbricks.com)
- [www.eere.energy.gov/buildings](http://www.eere.energy.gov/buildings)
- [www.usgbc.org](http://www.usgbc.org)