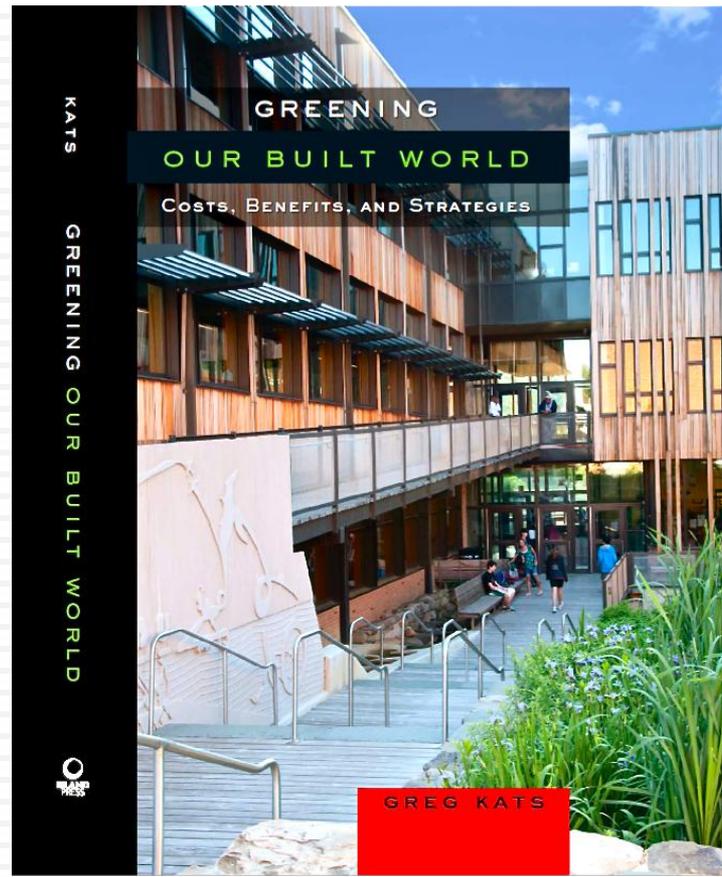


April 2012

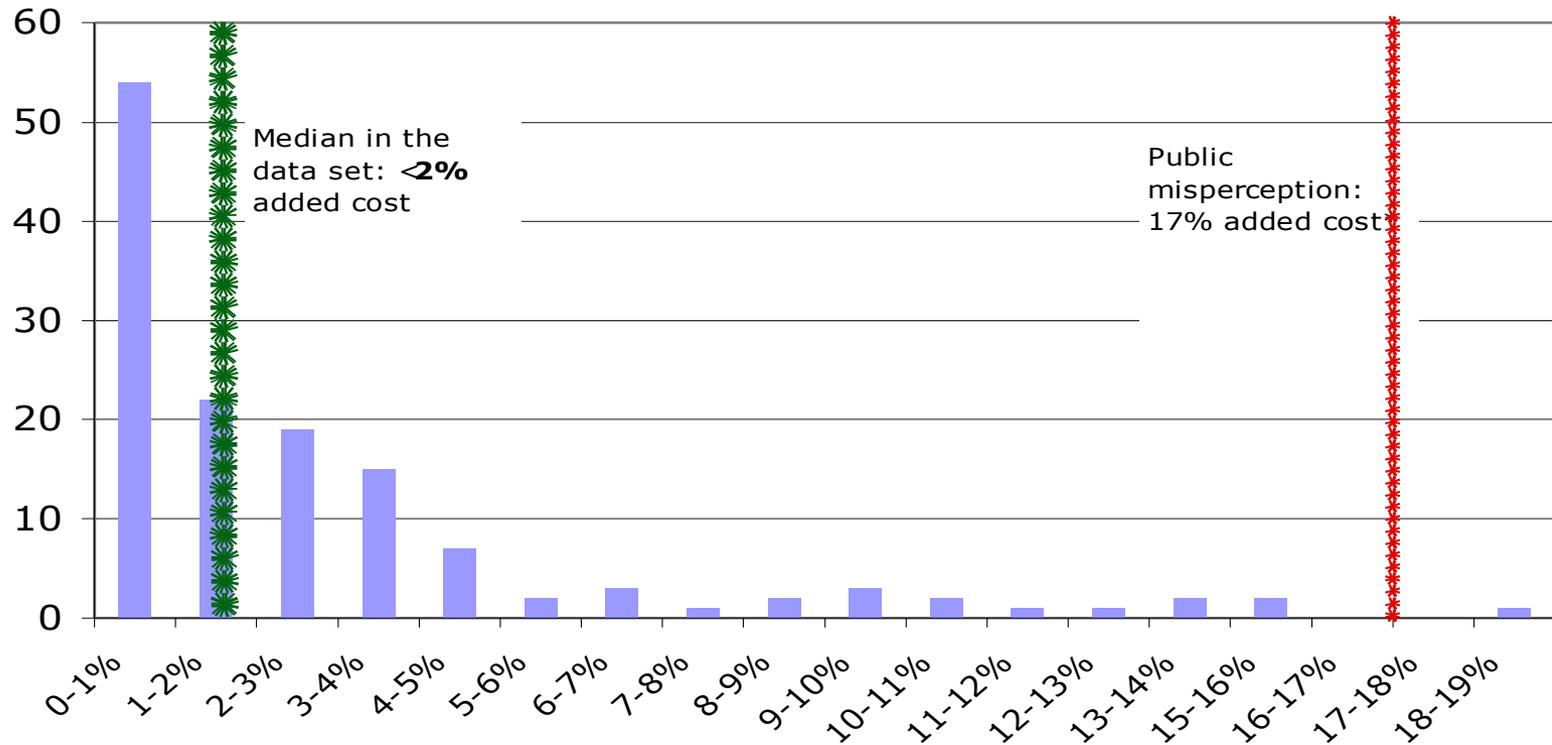
Energy Efficiency Financing and Related Firm  
Innovations Greg Kats, Capital E



# Big Perception Gap on Cost Effectiveness of Green Design

Source [Greening Our Built World](#)

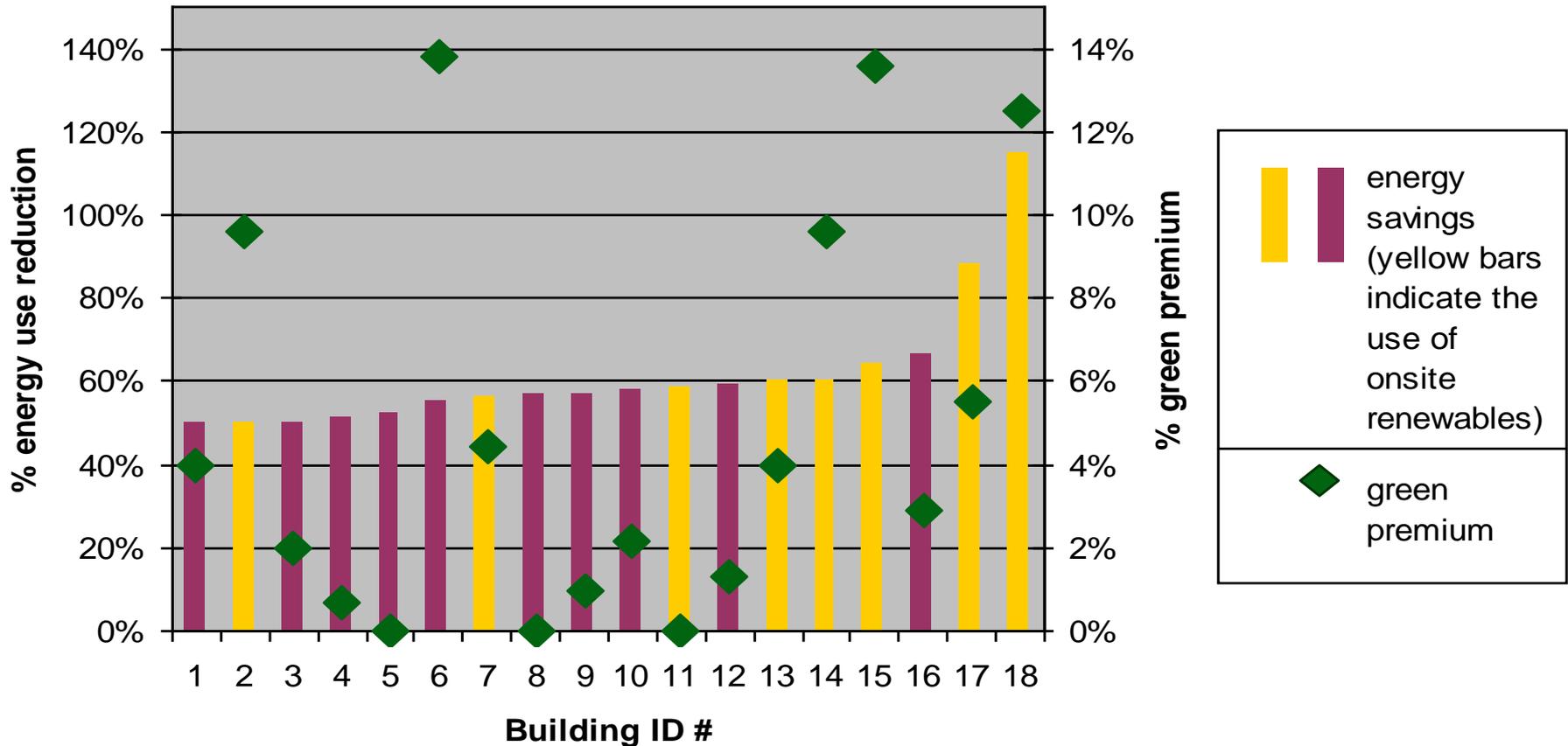
## Additional cost to build green: Evidence from 146 green buildings



\*2007 opinion survey by World Business Council for Sustainable Development

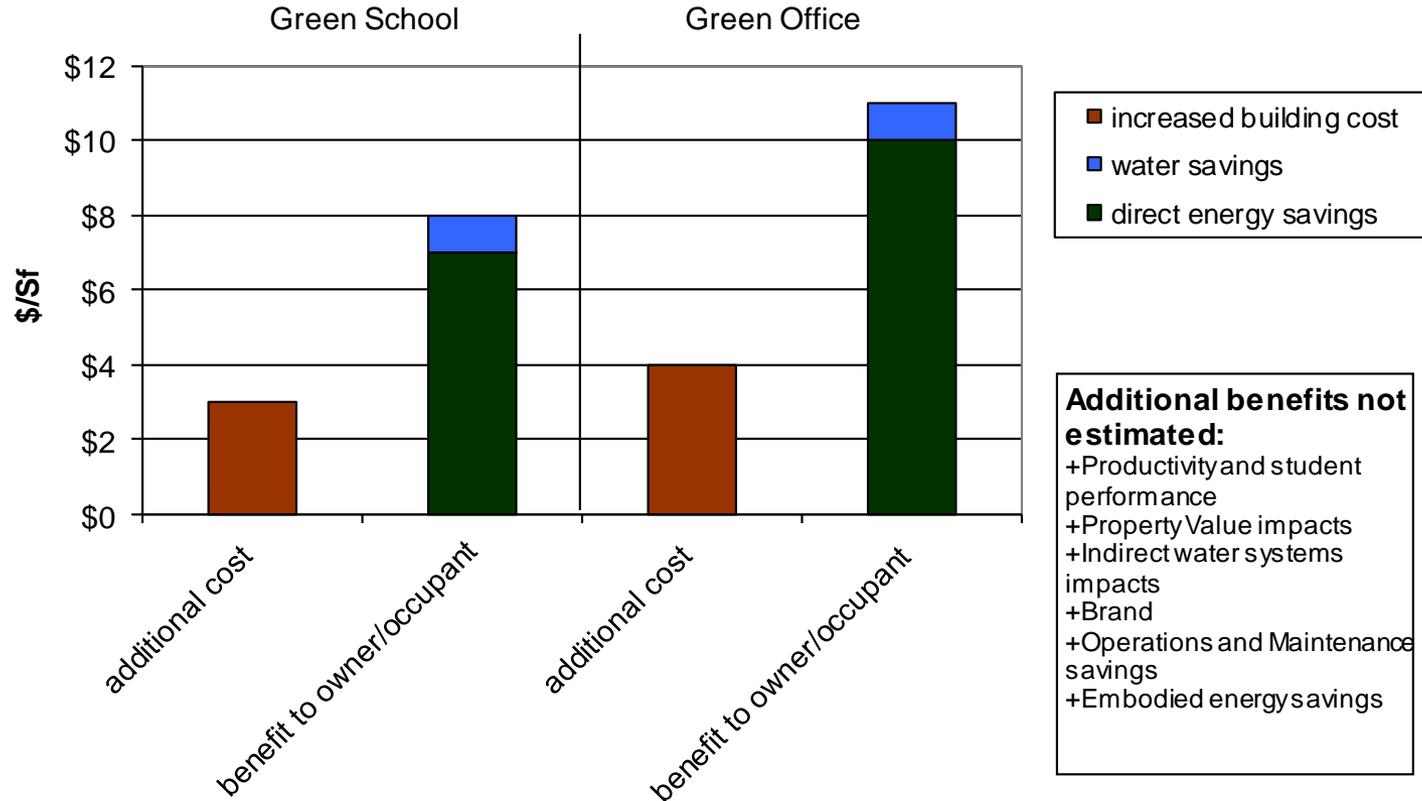
**Range of reported premiums**

# Advanced energy savings and green premium: 18 buildings from the study data set



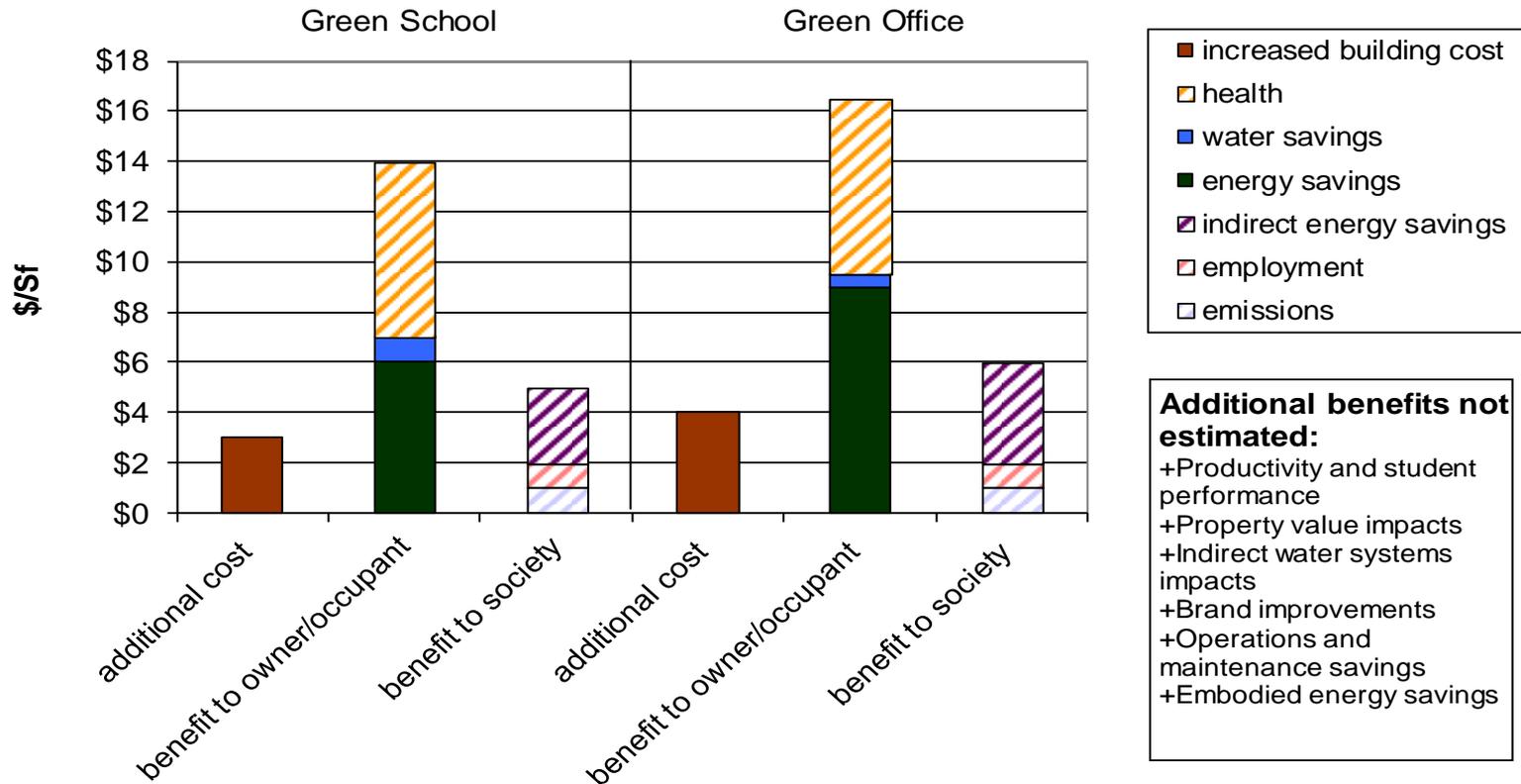
# Costs and Benefits: utility savings only

**Costs and Benefits of Green Buildings:  
Present value of 20 years of estimated impacts based on study data  
set collected from recent green buildings**



# Costs and Benefits of Green Buildings

**Costs and Benefits of Green Buildings: Present value of 20 years of estimated impacts based on study data set and synthesis of relevant research\***



\*There is significantly greater uncertainty, and less consensus around

# All Building Types are Greening



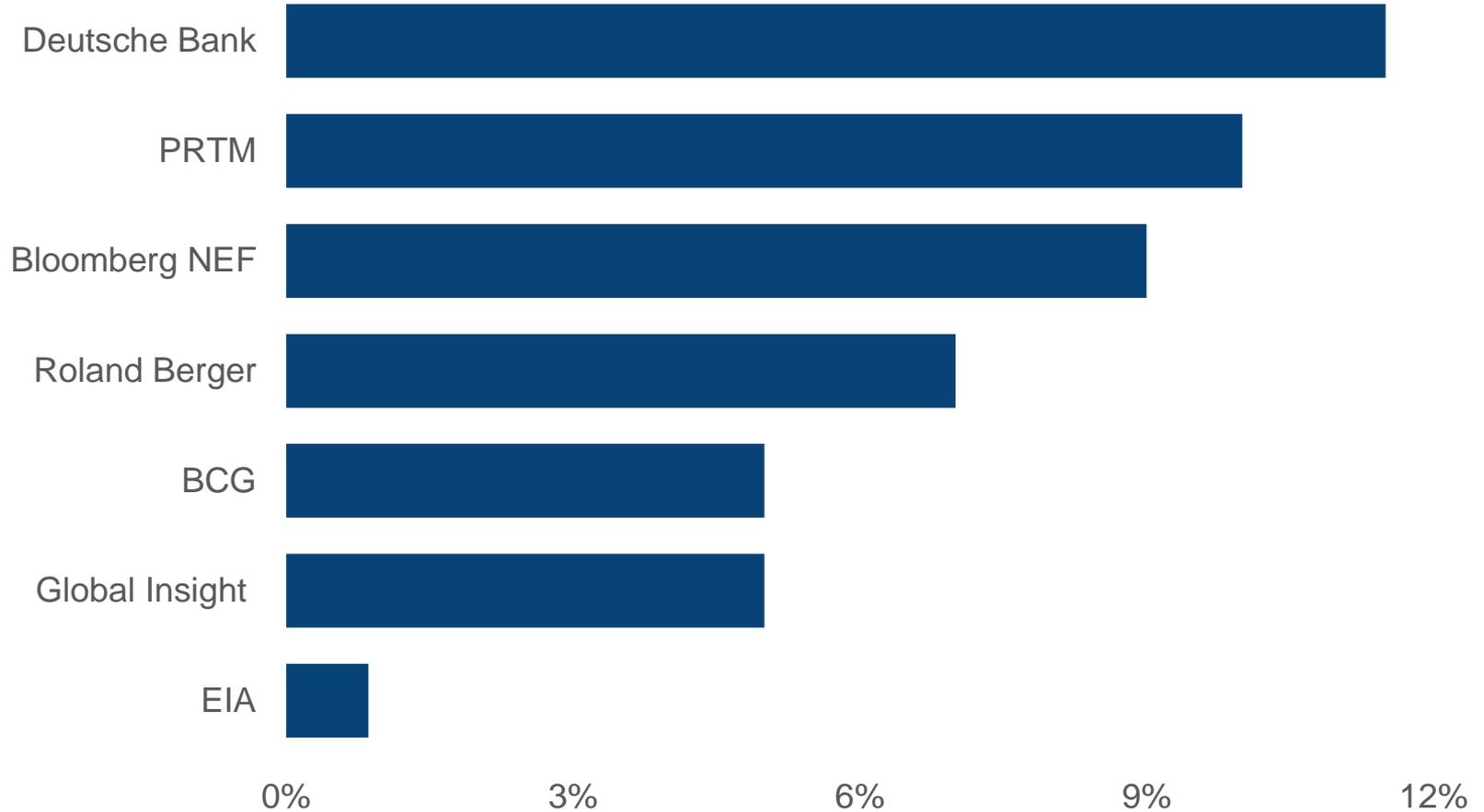
# Green Building Benefits: Increased Rent, Sales & Occupancy

<i>1<sup>st</sup> Quarter 2008</i>	<i>Non-LEED</i>	<i>LEED Certified Offices</i>	<i>Difference</i>	<i>% Change</i>
<i>Occupancy rates</i>	<b>88%</b>	<b>92%</b>	<b>4%</b>	<b>5%</b>
<i>Rent (\$/SF)</i>	<b>\$31</b>	<b>\$42</b>	<b>\$11</b>	<b>35%</b>
<i>Property value (\$/SF)</i>	<b>\$267</b>	<b>\$438</b>	<b>\$171</b>	<b>64%</b>

<i>1<sup>st</sup> Quarter 2008</i>	<i>Non-Energy star</i>	<i>Energy Star Offices</i>	<i>Difference</i>	<i>% Change</i>
<i>Occupancy Rates</i>	<b>88%</b>	<b>92%</b>	<b>4%</b>	<b>5%</b>
<i>Rent (\$/SF)</i>	<b>\$28</b>	<b>\$31</b>	<b>\$3</b>	<b>11%</b>
<i>Sale Price (\$/SF)</i>	<b>\$227</b>	<b>\$288</b>	<b>\$61</b>	<b>27%</b>

Source: CoStar analysis, 2008

# Forecast Ev And Phev Penetration In 2020 (United States)



# Need/Potential to Increase annual energy efficiency financing from \$20 billion to \$150 billion

- Double digit returns
- Engaging banks:scale
- Rigorous M&V
- Standardization
- PAA model extension
- @ [www.cap-e.com](http://www.cap-e.com)



## ENERGY EFFICIENCY FINANCING - MODELS AND STRATEGIES

*Pathways to scaling energy efficiency financing from  
\$20 billion to \$150 billion annually*

*UPDATED: OCTOBER, 2011*

*PREPARED BY CAPITAL E FOR THE ENERGY FOUNDATION*

*By Greg Kats, Principal Author,  
Aaron Menkin, Jeremy Dommu and Matthew DeBold*

### PARTNERS

*AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY (ACEEE)*

*APPRAISAL INSTITUTE*

*CITIGROUP*

*JPMORGAN CHASE*

*NATIONAL ASSOCIATION OF STATE ENERGY OFFICIALS (NASEO)*



### SUPPORTING ORGANIZATIONS

*PNC BANK*



MODEL NAME	BUILDING SECTOR				SOURCE OF PROGRAM FUNDS	PROGRAM ADMINISTRATOR	LOAN ORIGINATOR	REPAYMENT VEHICLE	PROJECT RISK PROFILE	MARKET ENABLING ACTION	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
	C	I	R	F/M								
<i>Energy Service Performance Contracting (ESPC)</i>	X	X		X	Private Debt and Equity  Utility Incentives	Third Party  Specialized Broker	Third Party  Specialty Investor  Special Purpose Entity (SPE)	Service Contract	<u>Performance Risk</u> - ESCO  <u>Recourse</u> - Assets Installed, Unsecured  <u>Financial Risk</u> - Lender, SPE	PPA Arrangements  Loan Guarantees  Loan Loss Reserve  Standardize M&V	Well established	LARGE
<i>Energy Services Agreements (ESA)</i>	X	X			Private Debt and Equity	Project Developer	Specialty Investors  Special Purpose Entity (SPE)	Terms of PPA or Service Agreement	<u>Performance Risk</u> - SPE  <u>Recourse</u> - Equipment Installed, Unsecured  <u>Financial Risk</u> - SPE, Investors	Enable public entities to use ESAs to finance EE projects.	Few examples	LARGE
<i>State/Municipal Loan Programs</i>	X	X	X		State/City Appropriations  Federal Grants  State/City Bond Financing  Tax Appropriations  Revolving Loan Fund	Government Agency  Government Funded Entity (GFE)	Government Agency  GFE  Local Bank	Loan Payments to GFE or Bank  Some programs such as cost sharing or grants require no pay back.	<u>Performance Risk</u> - Host  <u>Recourse</u> - Unsecured, Equipment Installed  <u>Financial Risk</u> - Host, City/State	Rate Buy Down  Preferential Terms  Federal Loan Guarantees  Loan Loss Reserve	Well established	LIMITED
<i>Sustainable Energy Utility</i>	X		X	X	Electric Bill Surcharge  Bonding Authority  Shared Savings	Sustainable Energy Utility	Sustainable Energy Utility	Shared Savings	<u>Performance Risk</u> - SEU, Building Owner  <u>Financial Risk</u> - SEU, State	Establish bonding authority for SEU setup nationally	Few examples	LARGE

# Scaling Energy Efficiency Financing

Based on collaborative work with 40+ organizations including Citigroup and JP Morgan, the financing models with the greatest potential to scale:

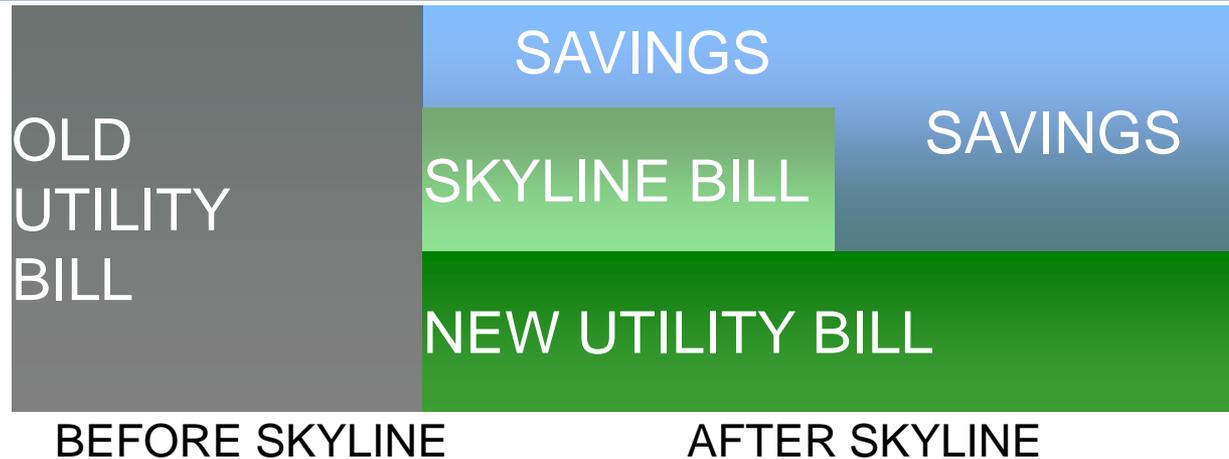
Energy Service Performance Contracting (ESPCs)
Energy Services Agreements (ESAs)
Sustainable Energy Utilities
Carbon Market Funding
Mortgage Backed EE Financing
Preferential Terms for EE/Green Buildings
Utility On Bill Financing
PACE Commercial

Source: "Energy Efficiency Financing: Models and Strategies", Capital E (October, 2011)

# New EE Service Models

- Extend PV PPA ownership models:
  - eliminates up front costs
    - EE, solar thermal, gshp
- SaaS business model
  - Cloud based
  - Software like growth rates possible
  - V Low capital costs
    - Building IQ/BWP
- Full delivery/BOS : Samba Solar
  - CRM platform - digitization
- Shift EE services to social media platforms
  - MyEnergy

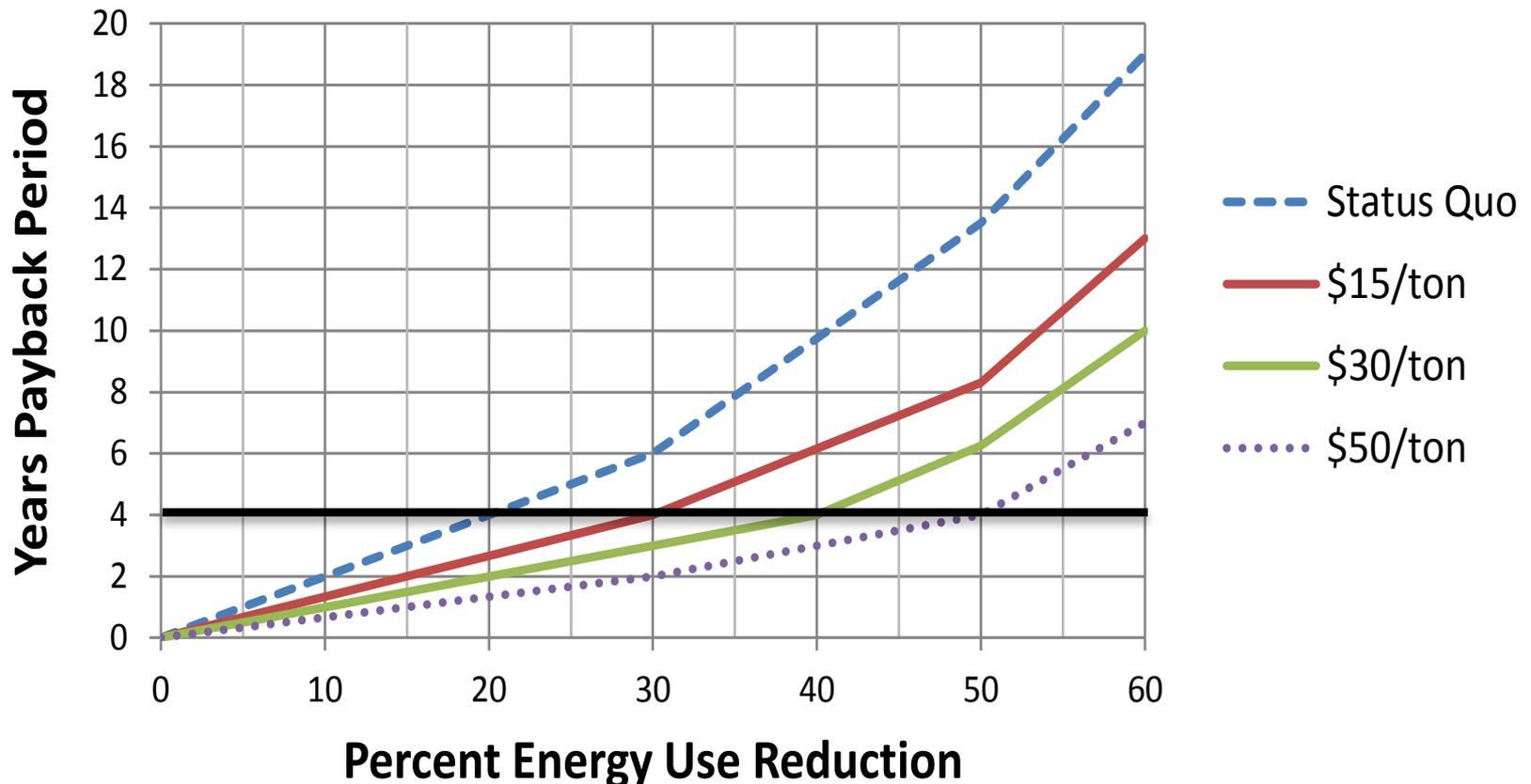
# SKYLINE GUARANTEES CUSTOMER SAVINGS THROUGH PRICE-INDEXED ENERGY



- Guaranteed energy savings as a service to mid-sized commercial sector
- Zero capital outlay and long term operating expense reduction
- Turnkey program: design, finance, install, maintain, monitor
- Ongoing energy savings and environmental reporting

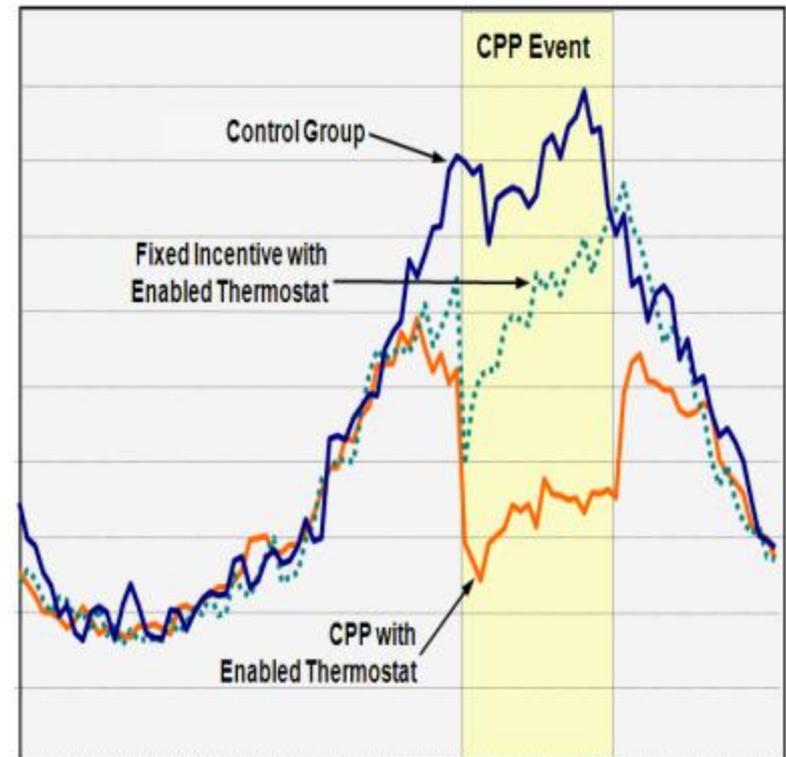
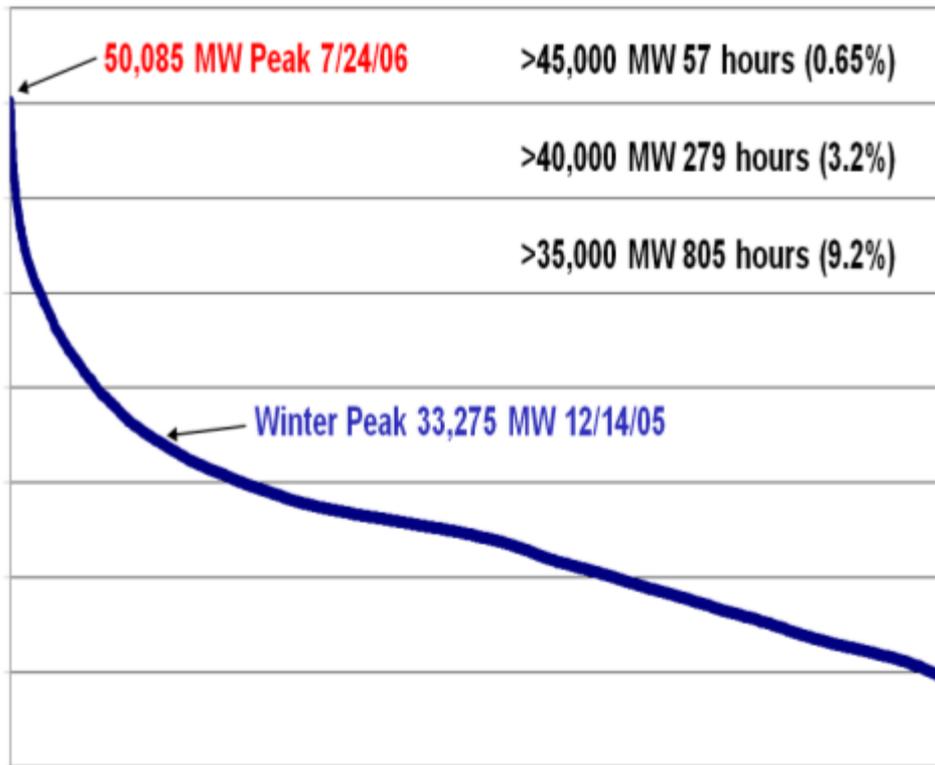
# California CO2 Cap and Trade: Capturing the financial benefits

## CO<sub>2</sub> to EE Model: Illustrative Impact



# Eliminating Peaking Power and T&D should drive huge investments

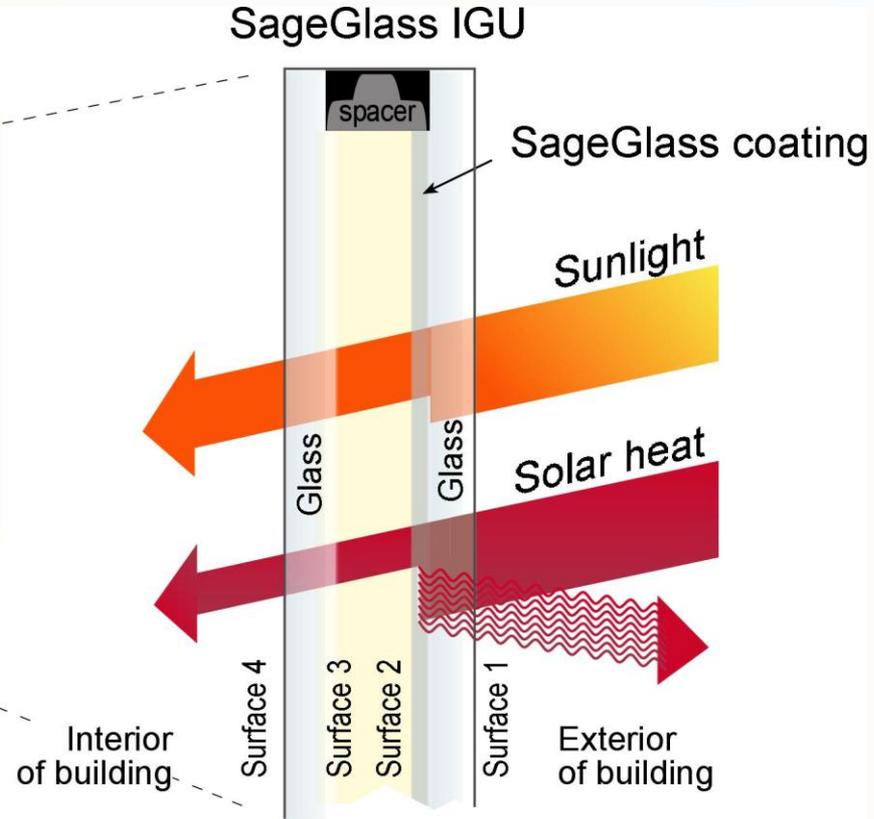
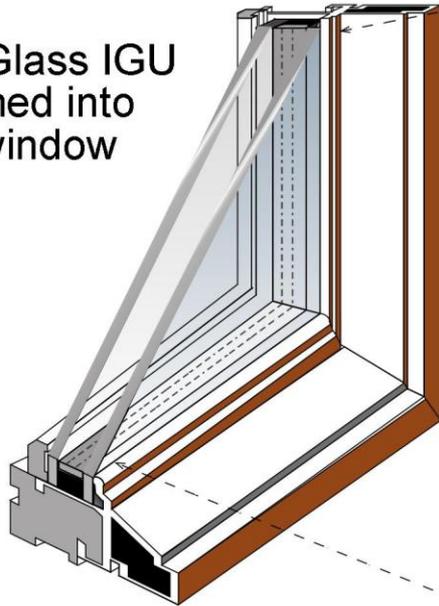
## Berkeley Wireless Research Center



# Targeting Peak Load: SageGlass®

## Clear State

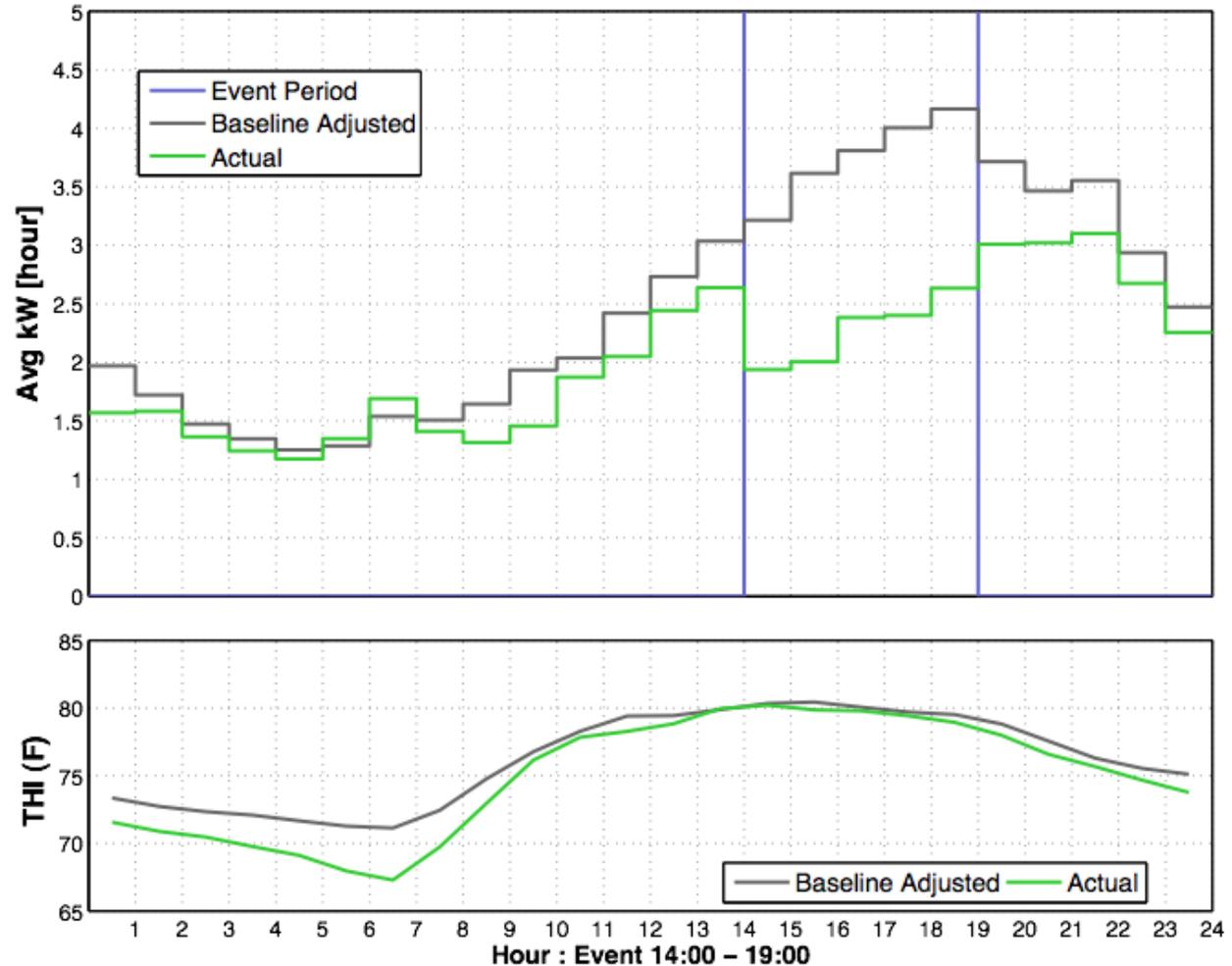
SageGlass IGU  
framed into  
a window



# Tendrill Demand Response Performance

- Average peak reduction = 1.50 kW over 5 hour event period
- 35 households in study
  - ▣ Established 14-weekday historical baseline data prior to critical day

Instance 1 Mean (35 Homes) : Demand Response : Event 20100820



# Net Zero Building

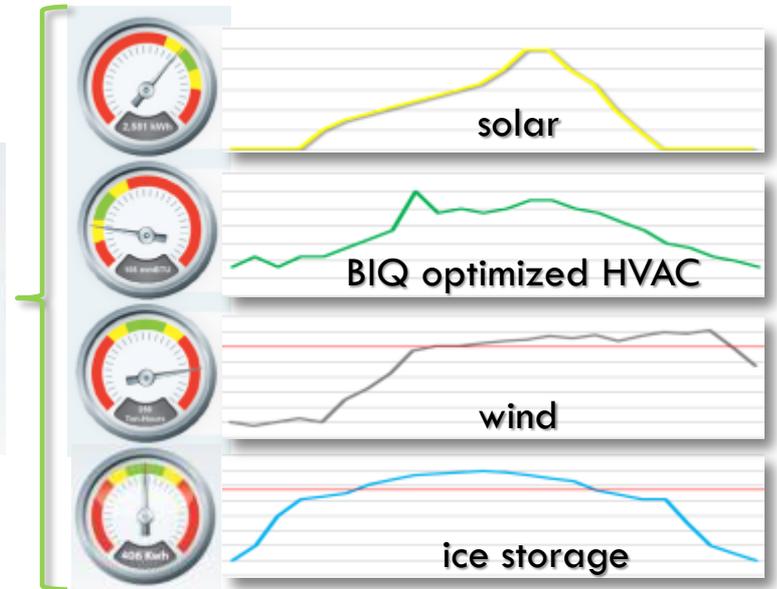
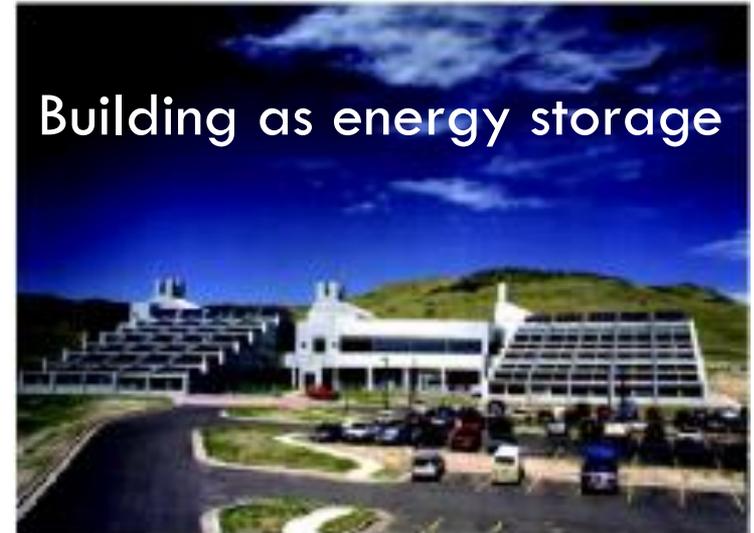
**By load shifting and intelligently adjusting interior temperatures, BuildingIQ optimizes HVAC operations, balancing :**

- reduced energy usage/cost
- maintained or improved occupant comfort
- maximized DR event performance

**In net zero buildings this strategy:**

- uses the building's thermal mass as energy storage to balance volatile renewable sources
- forecasts and adjusts timing of peak HVAC loads to match renewable power supply

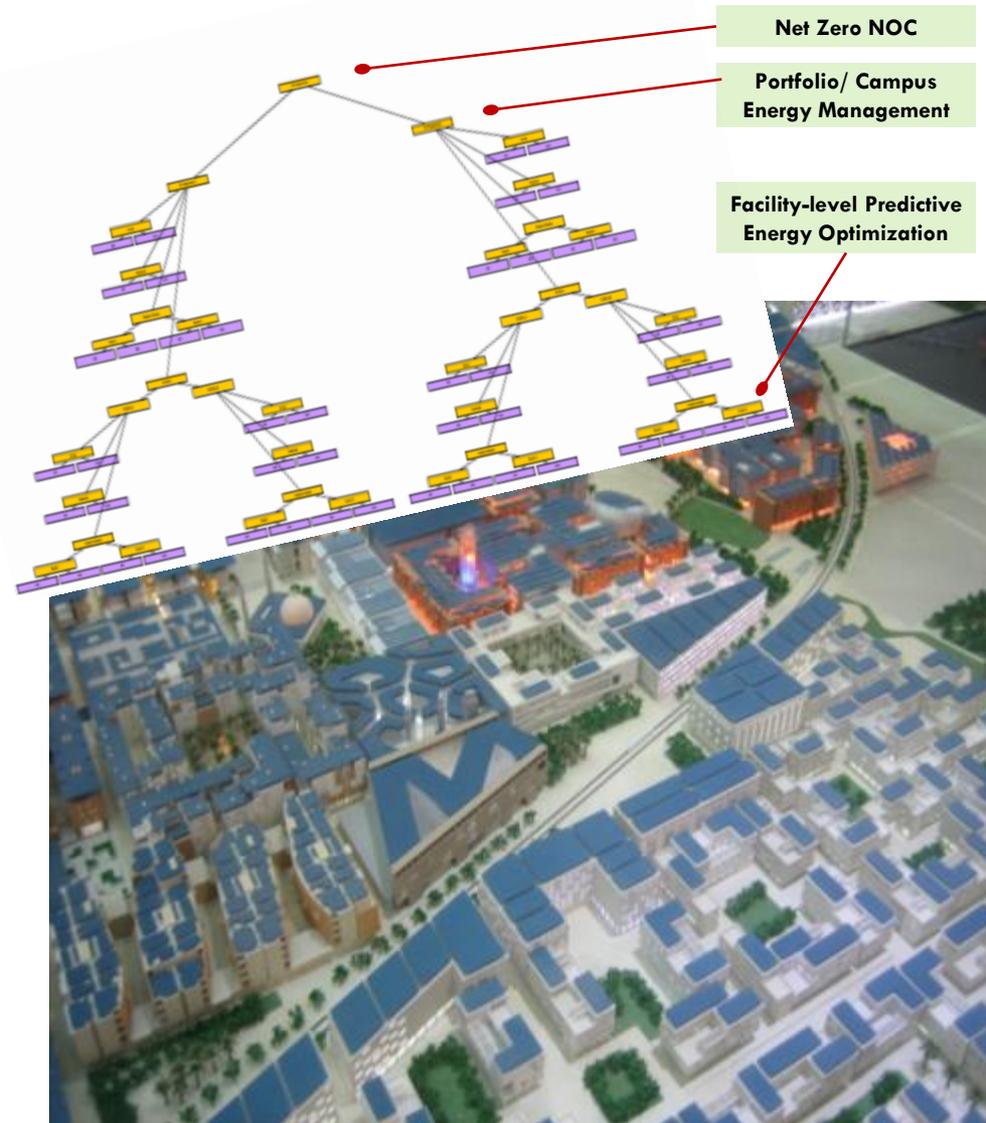
zero



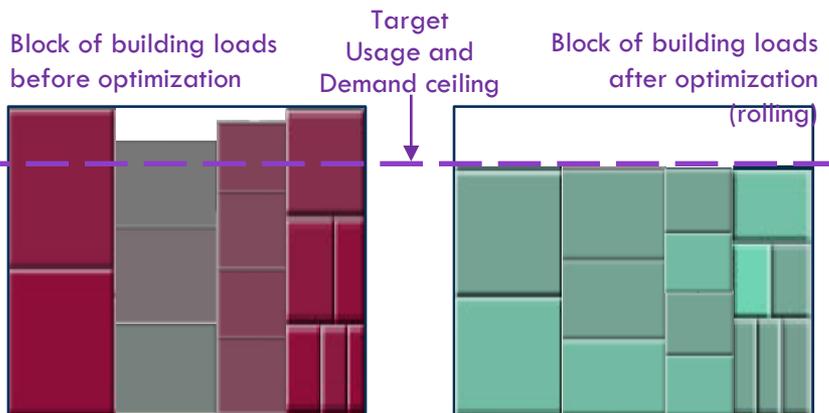
# Levelized District Optimization

Use predictive energy optimization in 2 ways:

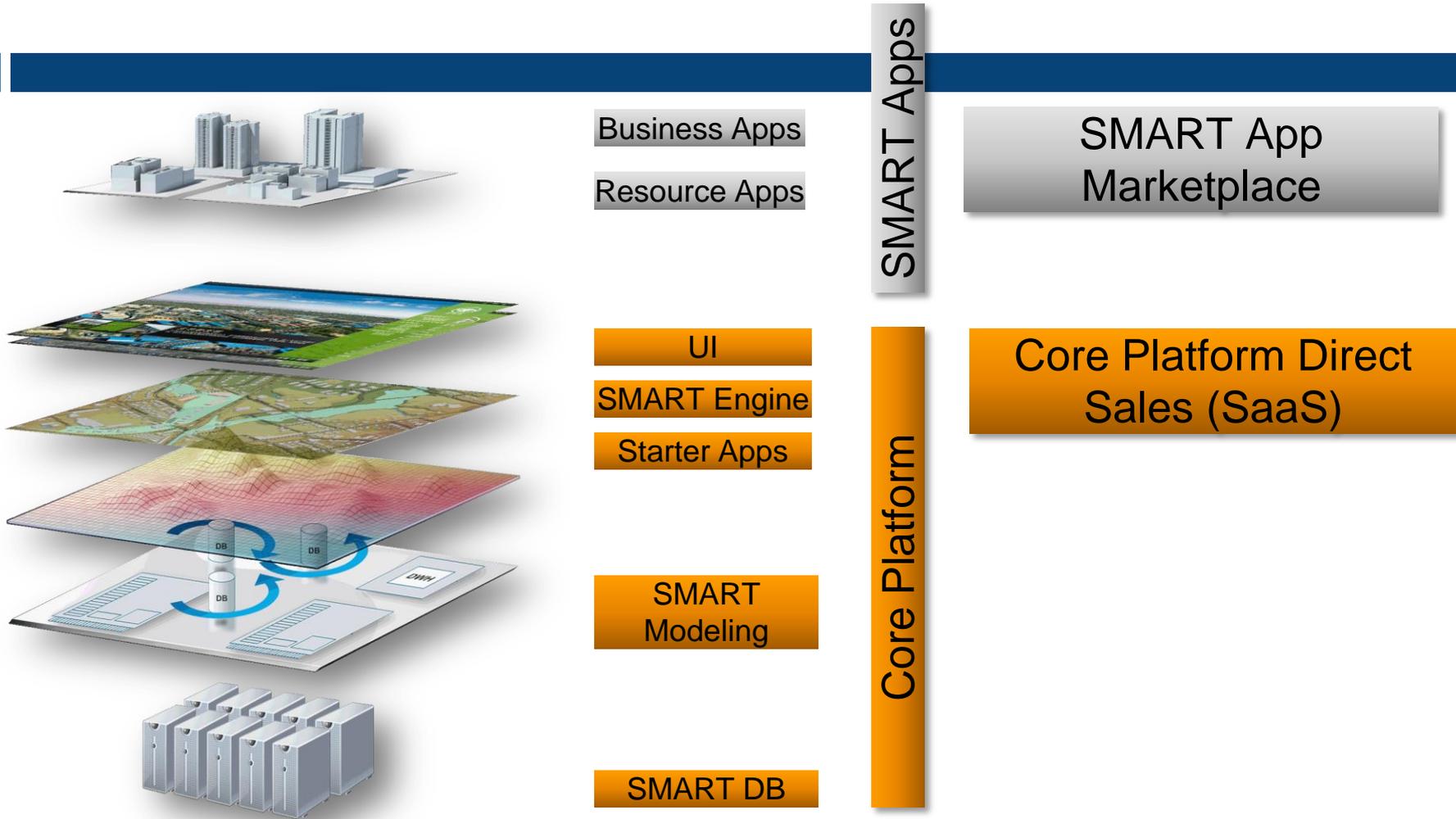
- **At District Level: DemandCenterIQ and ManagerIQ form a Net Zero NOC that:**
  - predicts and analyzes DR capacity and energy storage capacity to aggregate
  - electronically dispatches DR using OpenADR.
- **At Facilities level: BuildingIQ:** provide operational and analytical oversight on entire portfolio and campus – from predictive, real-time, historical perspectives.



## Rolling Optimized Reserves

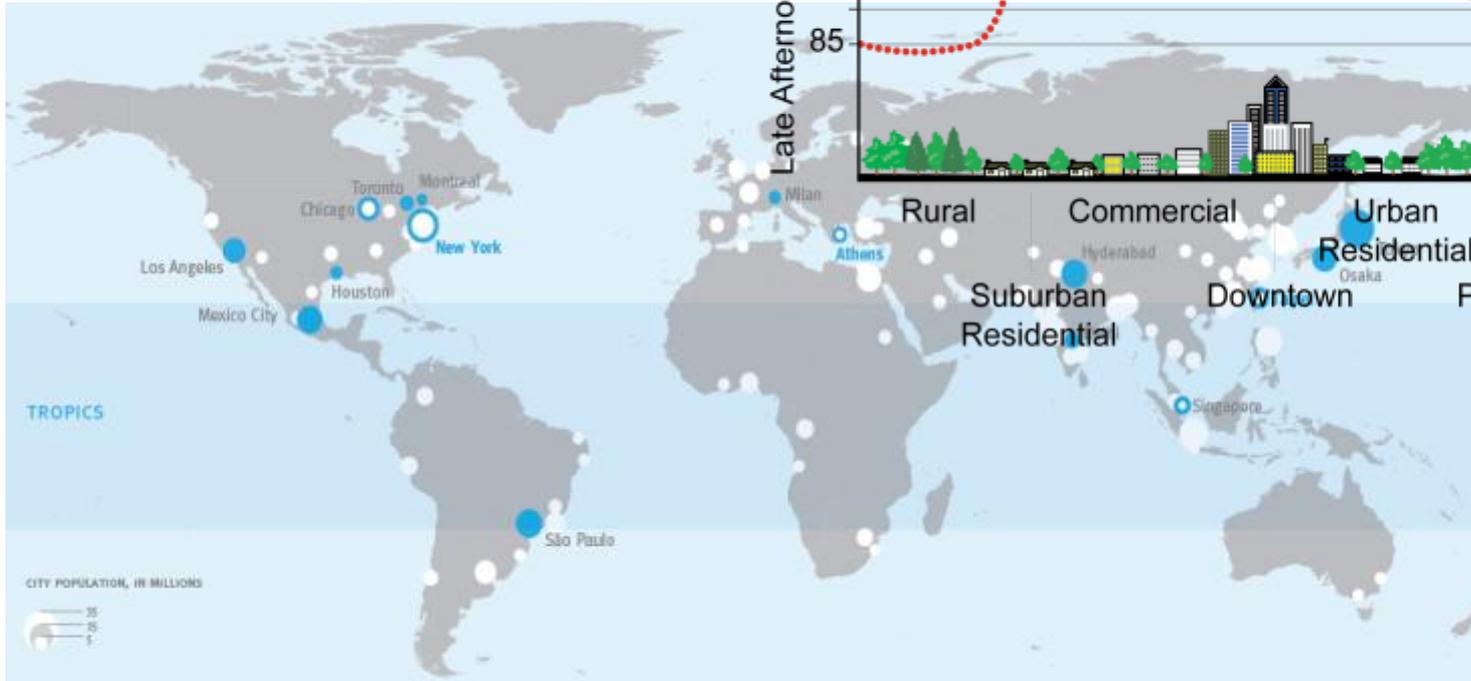


# Greening Cities: SCREAMPOINT

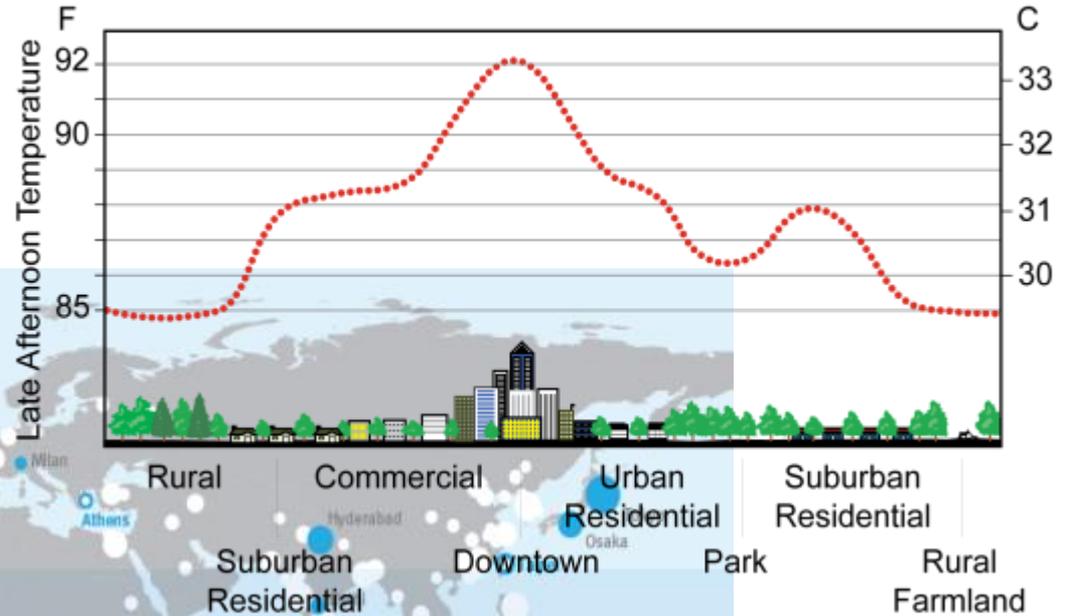


# Cool Cities: GCCA Network

[www.globalcoolcities.org](http://www.globalcoolcities.org)



### Sketch of an Urban Heat-Island Profile



# Green Building Performance Database:

[www.gbdata.org](http://www.gbdata.org) (screenshot only for now)

Resources Links About Us Project Location Map Login Username Password

Contributors Platinum Contributors Sponsors Funders Create New Data Contributor Profile

## Green Building Database

- Contribute data easily through a standard template.
- Search the database for projects with similar criteria.
- Create graphs, charts and other visuals based upon your search
- Use the data to make decisions on developing green buildings

% Energy Use Reduction	Number of Buildings
0-10%	5
11-20%	15
21-30%	30
31-40%	35
41-50%	15
51-60%	10
61-70%	5
71-80%	2
81-90%	1
91-100%	1

The Green Building Database is the product of a collaboration between a number of groups, including Capital-E, the National Association of State Energy Officials (NASEO), the National Association of Energy Service Companies (NAESCO), the Sustainability Roundtable, the U.S. Department of Housing and Urban Development (HUD), the U.S. General Service Administration (GSA) and Enterprise Community Partners.

Contribute Data

Search the Database

← Featured Project Featured Project Featured Project Featured Project Featured Project Featured Project →

# Thank you!

- [www.globalcoolcities.org](http://www.globalcoolcities.org)
- [www.cap-e.com](http://www.cap-e.com)
- [gkats@cap-e.com](mailto:gkats@cap-e.com)
- Re: [gbdata.org](http://gbdata.org)  
[mdebold@cap-e.com](mailto:mdebold@cap-e.com)

