



Energy Efficiency in the Built Environment

Learnings from Ground-breaking Work at the Empire State Building

ESRT
LISTED
NYSE

EMPIRE STATE
REALTY TRUST

PG & E March 28, 2014

A replicable model for energy optimization

Process for base buildings and tenants integrates stakeholder engagement, integrated timeline, comprehensive energy saving solutions and strong ROI

1 Identify opportunities

- 60+ energy efficiency ideas were narrowed to 17 implementable projects
- Team estimated theoretical minimum energy use
- Developed eQUEST energy model

2 Evaluate measures

- Net present value
- Greenhouse gas savings
- Dollar to metric ton of carbon reduced
- Calculated for each measure

3 Create packages

- Maximize net present value
- Balance net present value and CO₂ savings
- Maximize CO₂ savings for a zero net present value
- Maximize CO₂ savings

4 Model iteratively

- Iterative energy and financial modeling process to identify final eight recommendations

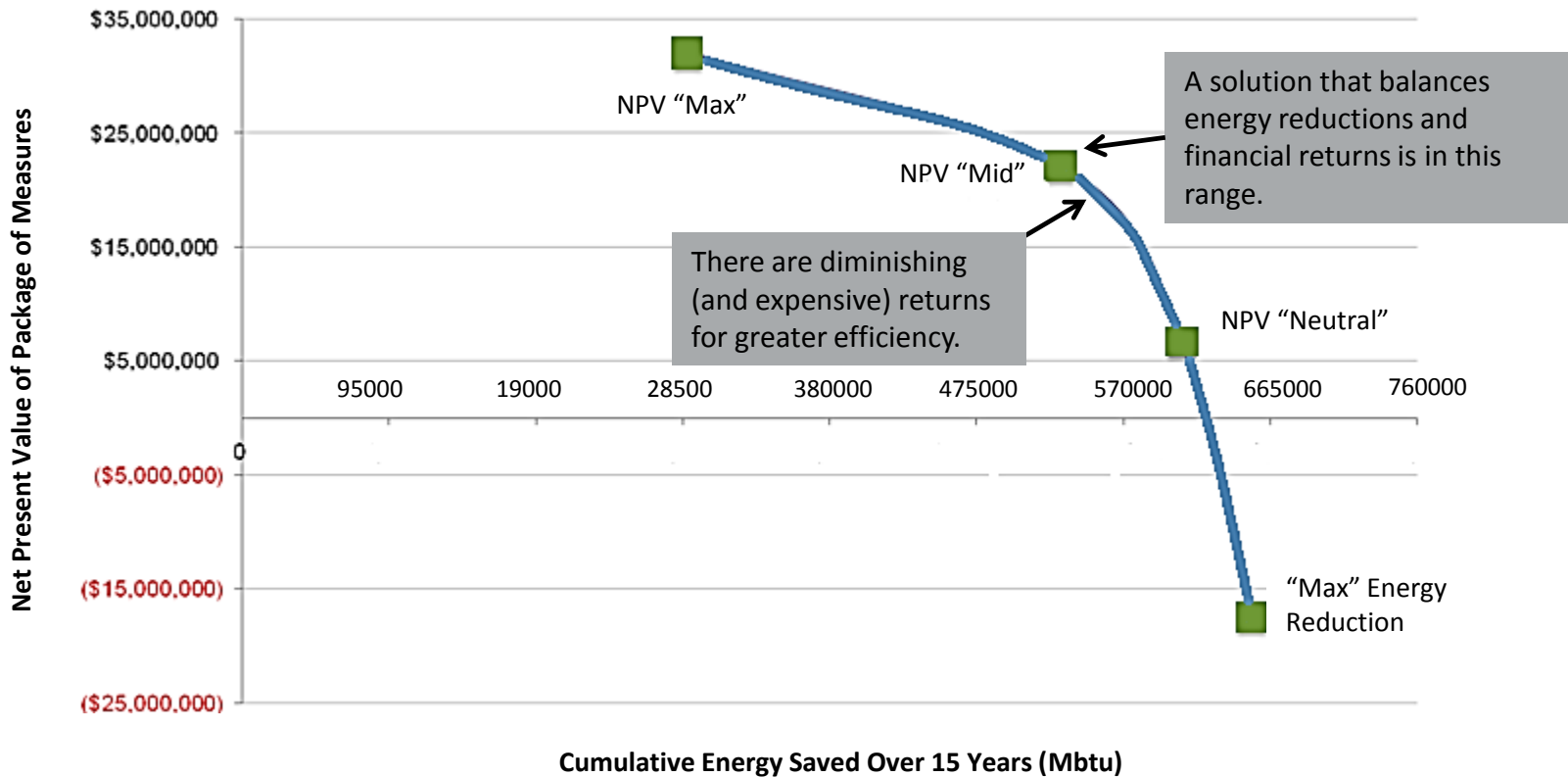
Motivation: Define the economics behind whole building energy efficiency retrofits and high performance tenant installations.

- Create and communicate the business case
- Model investment and monitor and verify return
- Payback in a short period
 - Landlords
 - Tenants
- Better energy data and management
- Drive decision making based on economics
- Enhance competitive position
- High quality tenants and informed tenant advisors

Achieve financial return and energy reduction

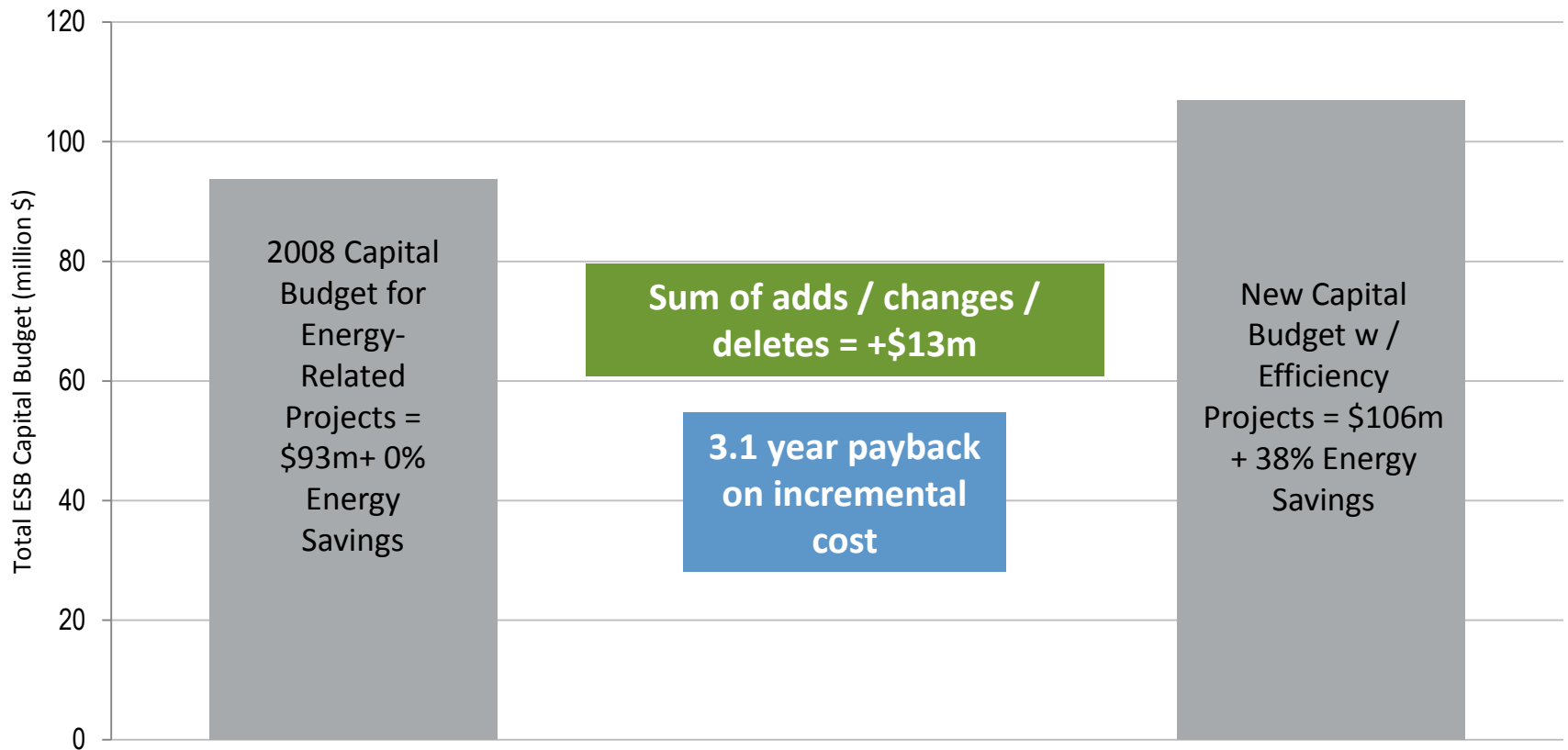
Clear quantifiable business case

15-Year NPV of Package versus Cumulative Energy Savings



Investment and Return

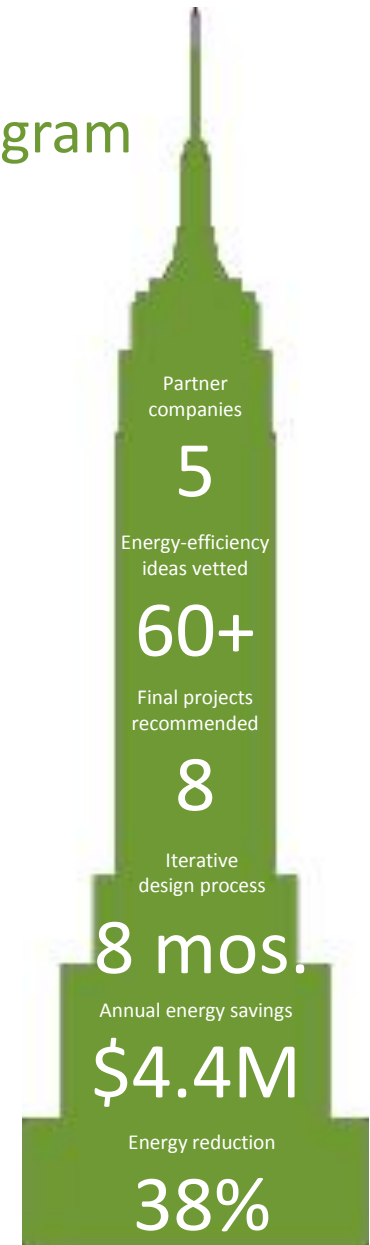
Capital Budget Adjustments for Energy Efficiency Projects



The Empire State Building

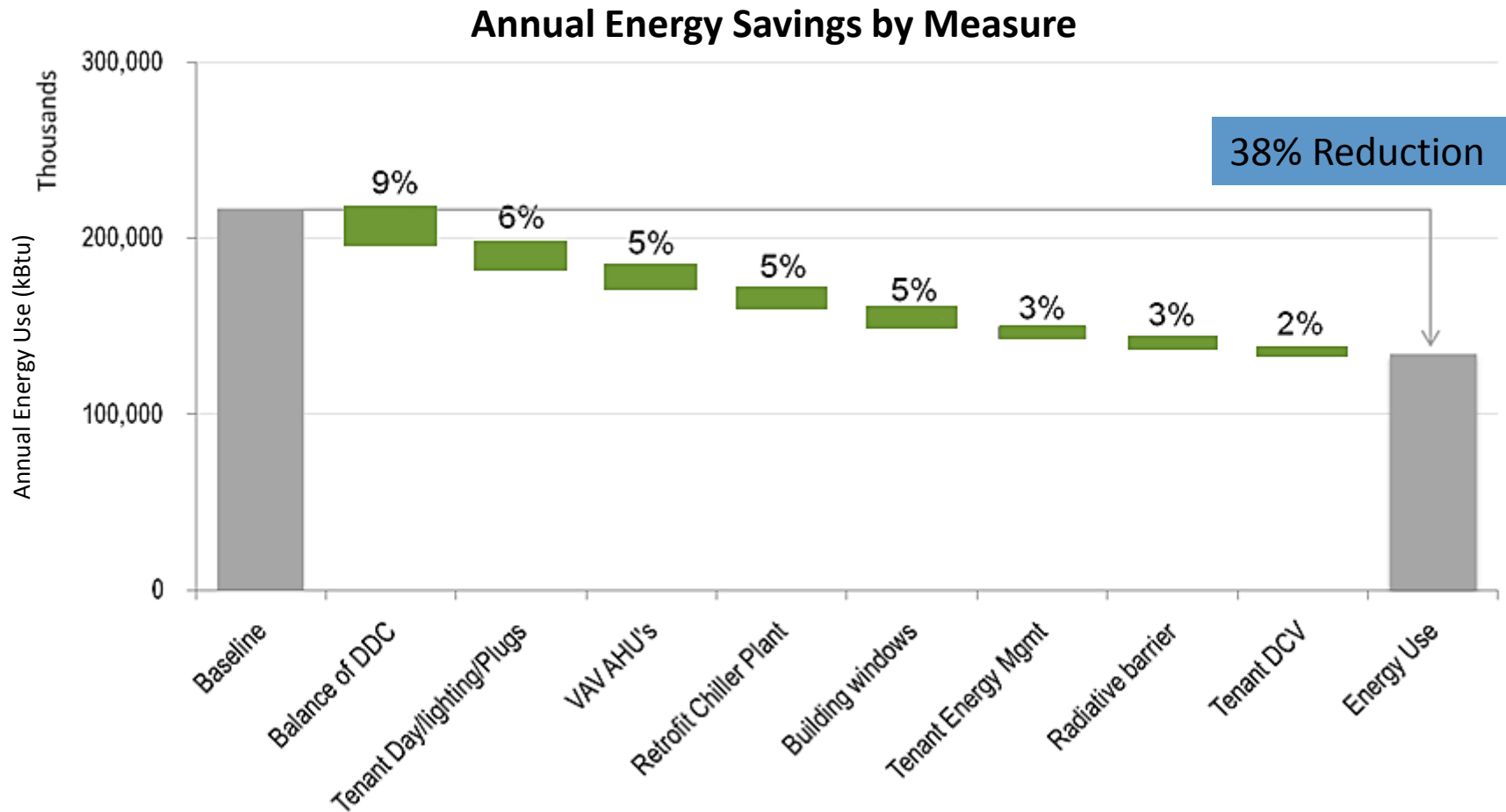
A groundbreaking energy and sustainability program

- Reduce energy use by 38 percent
- Annual savings of \$4.4M
- 3.1 year payback
- Energy Star 90
- Energy Performance Contract
- Quantifiable transparent results
- Serve as a model for owners of existing buildings
- Visit www.esbsustainability.com



Integration of efficiency measures: Building Retrofit

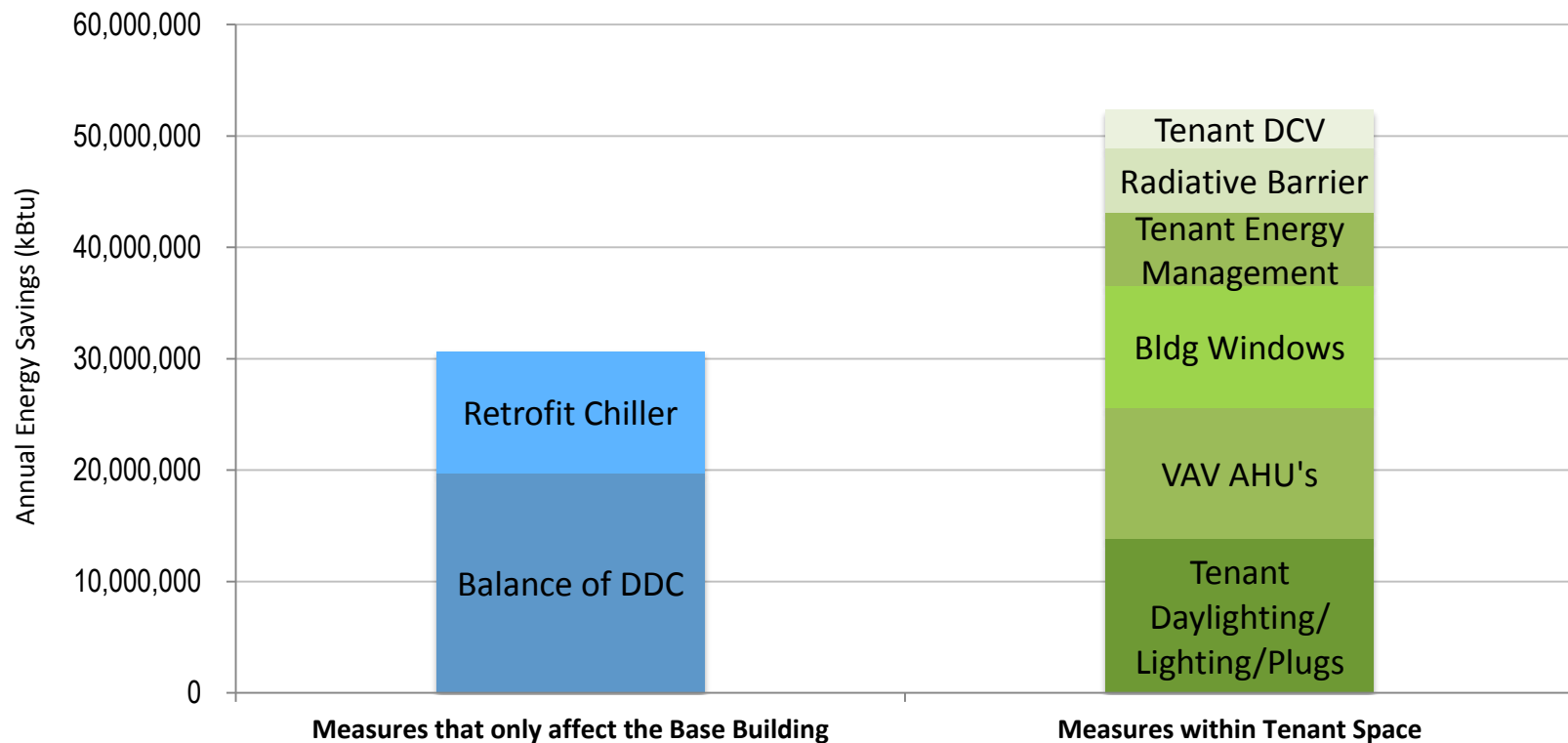
The key to the ESB process is integrating the right steps in the right order. There is no “silver bullet”, there are “silver buckshot” ...



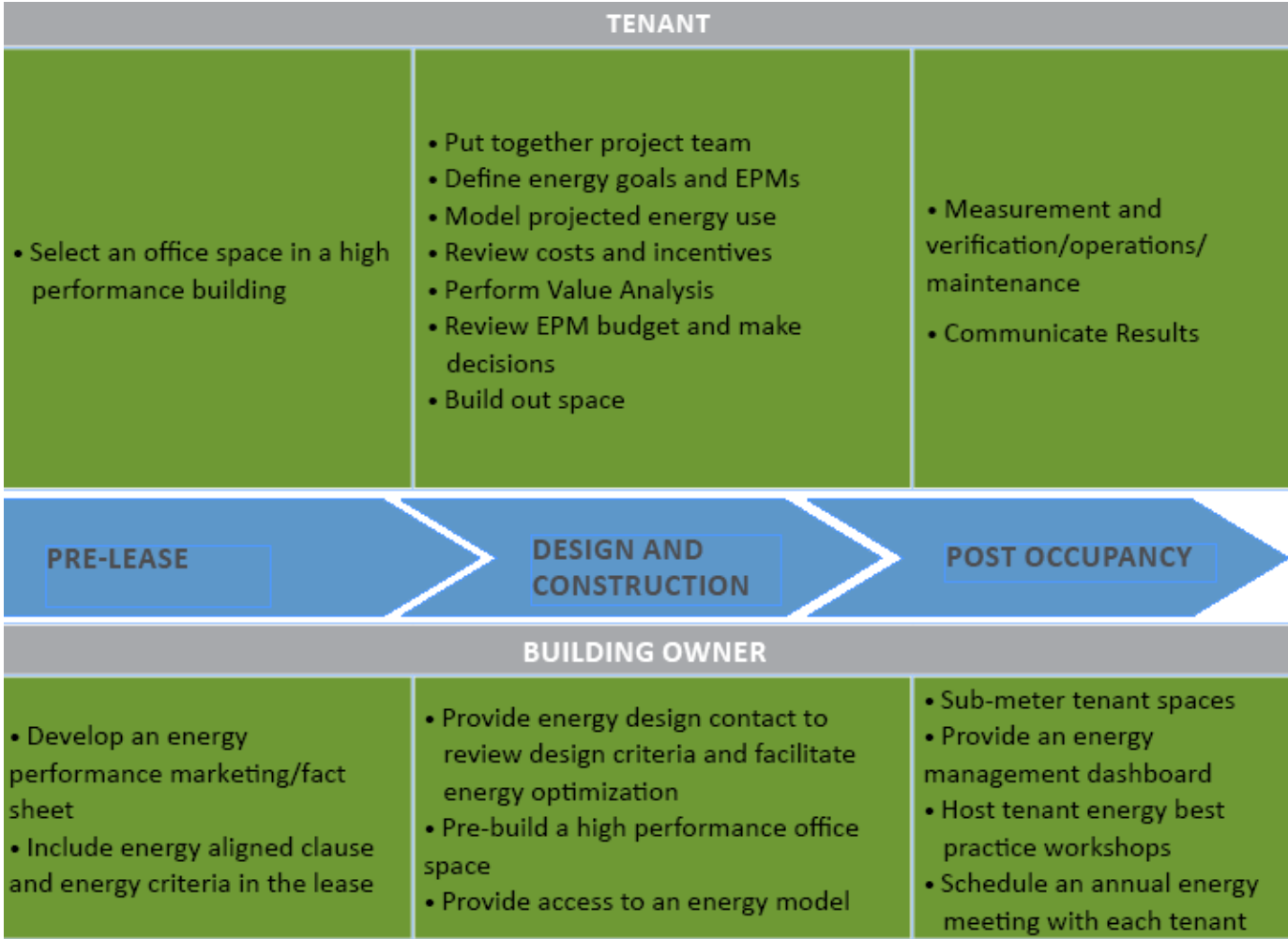
The business case for an integrated approach

More than half the savings exist within tenant spaces. To achieve deep energy savings, projects must develop a strategy for tenant spaces.

Energy Savings: Base Building vs. within Tenant Space



Lease Cycle Energy Optimization Process



The timeframe for each lease cycle phase will vary. A general estimate for pre-lease is one year or less, design and construction one to two years, and tenant lease terms ranging between 5 and 15 years. The value proposition to the tenant and building owner increases as the lease term increases.

Investment and Return: Coty

Build-Out (4 Floors)	
Leased Premises	159,335 sq. ft.
Modeled Energy Reduction	32%
Total Electricity Savings over Lease Term	6,300,000 kWh
<i>Incremental Implementation Cost (w/o incentives)</i>	<i>\$288,401</i>
<i>State Incentives (net of review and filing costs)</i>	<i>\$39,582</i>
<i>Energy Modeling Soft Cost</i>	<i>\$9,000</i>
Adjusted Incremental Implementation Cost	\$257,819 (\$1.62/ft ²)
Total Electricity Cost Savings over Lease Term	\$1,096,635
Present Value of Electricity Cost Savings over Lease Term	\$727,267
Net Present Value of Project Investment	\$447,093
Return on Investment (ROI) over Lease Term	182%
Annual Rate of Return	24%
Payback Period	4.0 years

Investment and Return: LFUSA

Phase 1 Build-Out (3 Floors)	
Leased Premises	137,400 sq. ft.
Modeled Energy Reduction	28%
Total Electricity Savings over Lease Term	3,273,780 kWh
<i>Incremental Implementation Cost (w/o incentives)</i>	<i>\$164,370</i>
<i>State Incentives (net of review and filing costs)</i>	<i>\$36,940</i>
<i>Energy Modeling Soft Cost</i>	<i>\$6,600</i>
Adjusted Incremental Implementation Cost	\$134,030 (\$0.98/ft ²)
Total Electricity Cost Savings over Lease Term	\$566,495
Present Value of Electricity Cost Savings over Lease Term	\$392,002
Net Present Value of Project Investment	\$257,972
Return on Investment (ROI) over Lease Term	192%
Annual Rate of Return	27%
Payback Period	3.5 years

Measurement & Verification

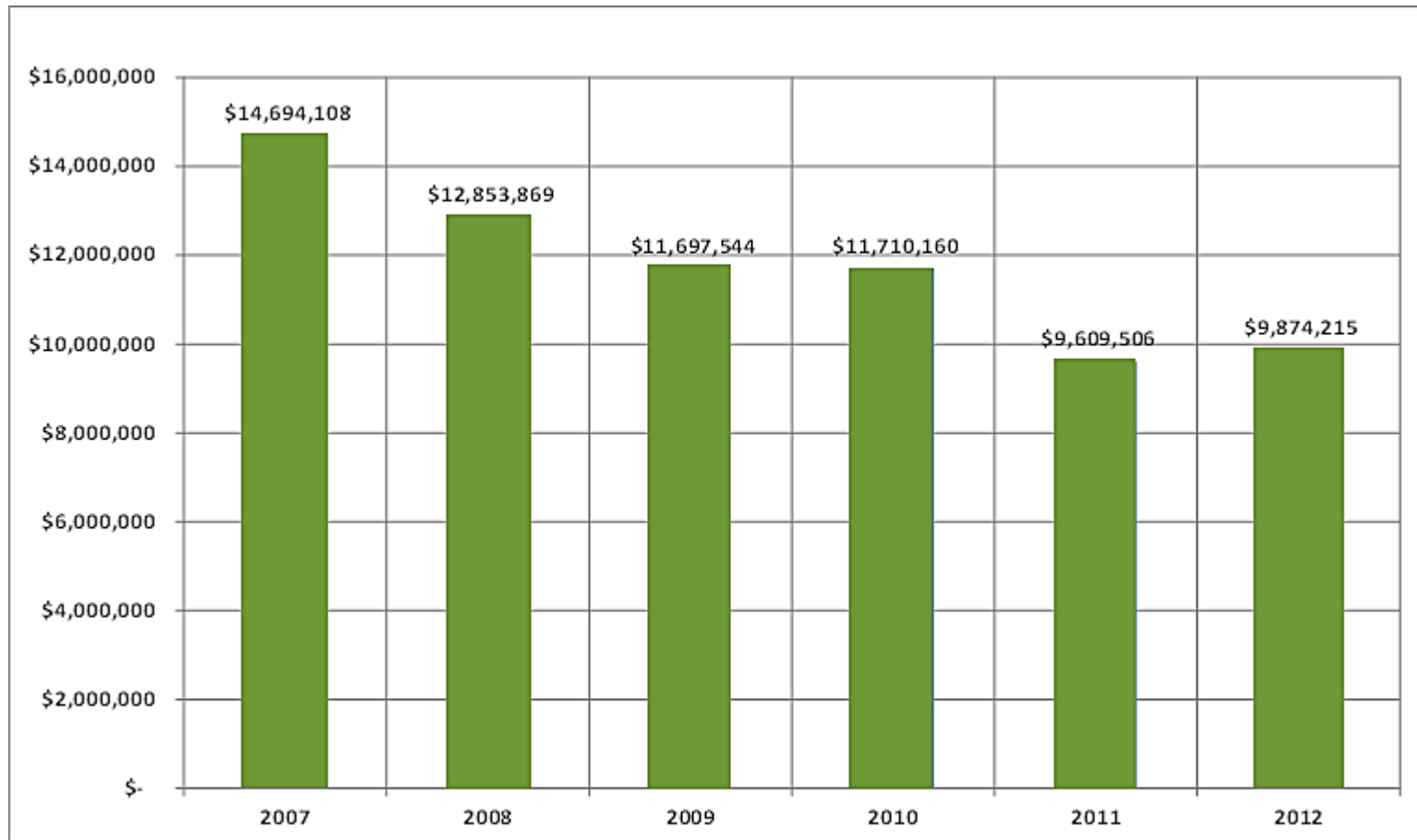
2012 Project Savings

No.	Energy Conservation Measure [A]	Contract Guaranteed Savings (Unadjusted, from 2007 Contract) [B]	PY Target Guaranteed Savings (After 2012 Baseline Adjustment) [C]	PY ECM Performance Savings (Using 2012 Measurements) [D]
1	Windows Retrofit	\$338,508	\$361,629	\$391,648
2	Radiator Insulation and Steam Traps	\$491,191	\$496,887	\$558,255
3	BAS Retrofit	\$774,388	\$771,345	\$929,871
4	Chiller Plant Retrofit	\$611,641	\$527,851	\$446,904
5	Tenant Energy Management	\$25,000	\$25,755	\$0
	TOTAL	\$2,240,728	\$2,183,466	\$2,326,678

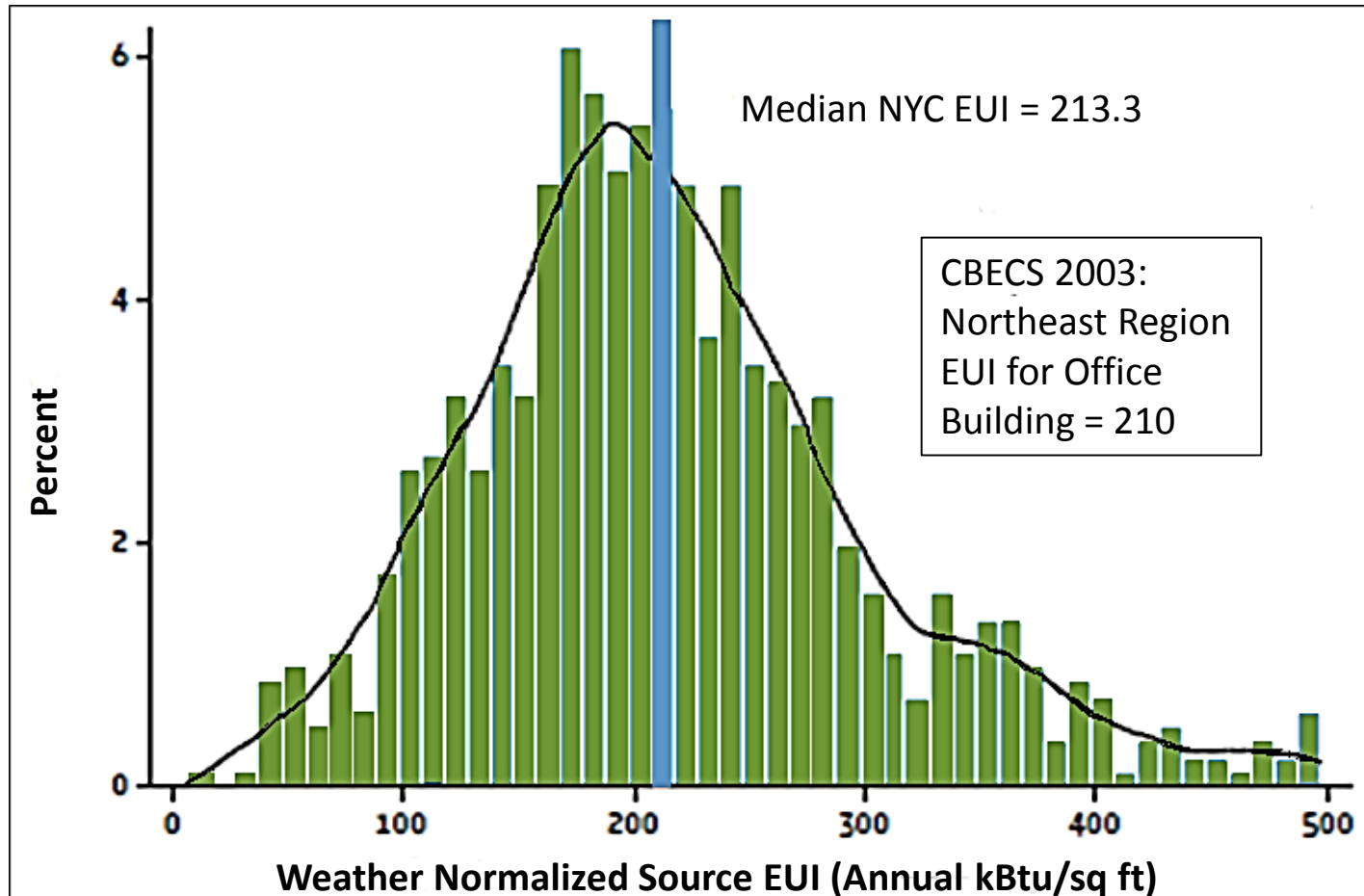
Measurement & Verification

Reduction in ESB's 2007 Baseline Electric Utility Costs During Performance Period

YOY Electric Utility Costs



Median NYC Office Building EUI ↓ 213.3, ESB EUI ↓ 71



Value of Energy Efficiency versus “Green”

Energy Optimization

Quantifiable metrics

Transparent analysis

Guaranteed savings

Measurable payback and ROI

Reduce loads

Reduce energy usage

Optimize system efficiency

Reduce operating costs

M&V

Green

Renewable, recycled content,

reused and local materials

Indoor air quality

Recycling

Water efficiency

Green cleaning

Integrated pest management

Access to daylight and views

Improved comfort

Other Sustainability Metrics

Bicycle racks

Showers

Water features

Plant walls

Employee engagement

Carbon disclosure

REC's

Ergonomic workstations

Preferred parking: low emission vehicles



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