

Energy Efficiency in the Built Environment

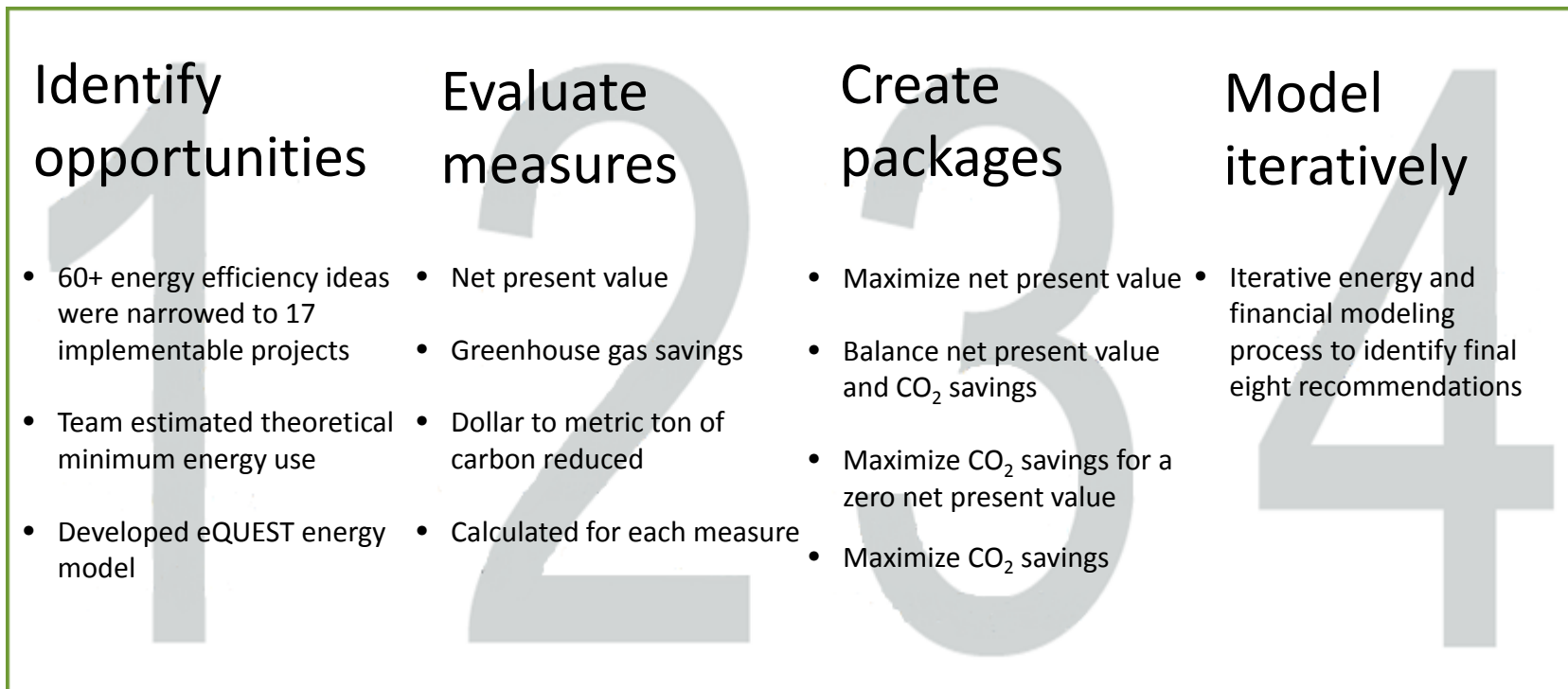
Learnings from Ground-breaking Work at the Empire State Building

ESRT
LISTED
NYSE

EMPIRE STATE
REALTY TRUST

A replicable model for energy optimization

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



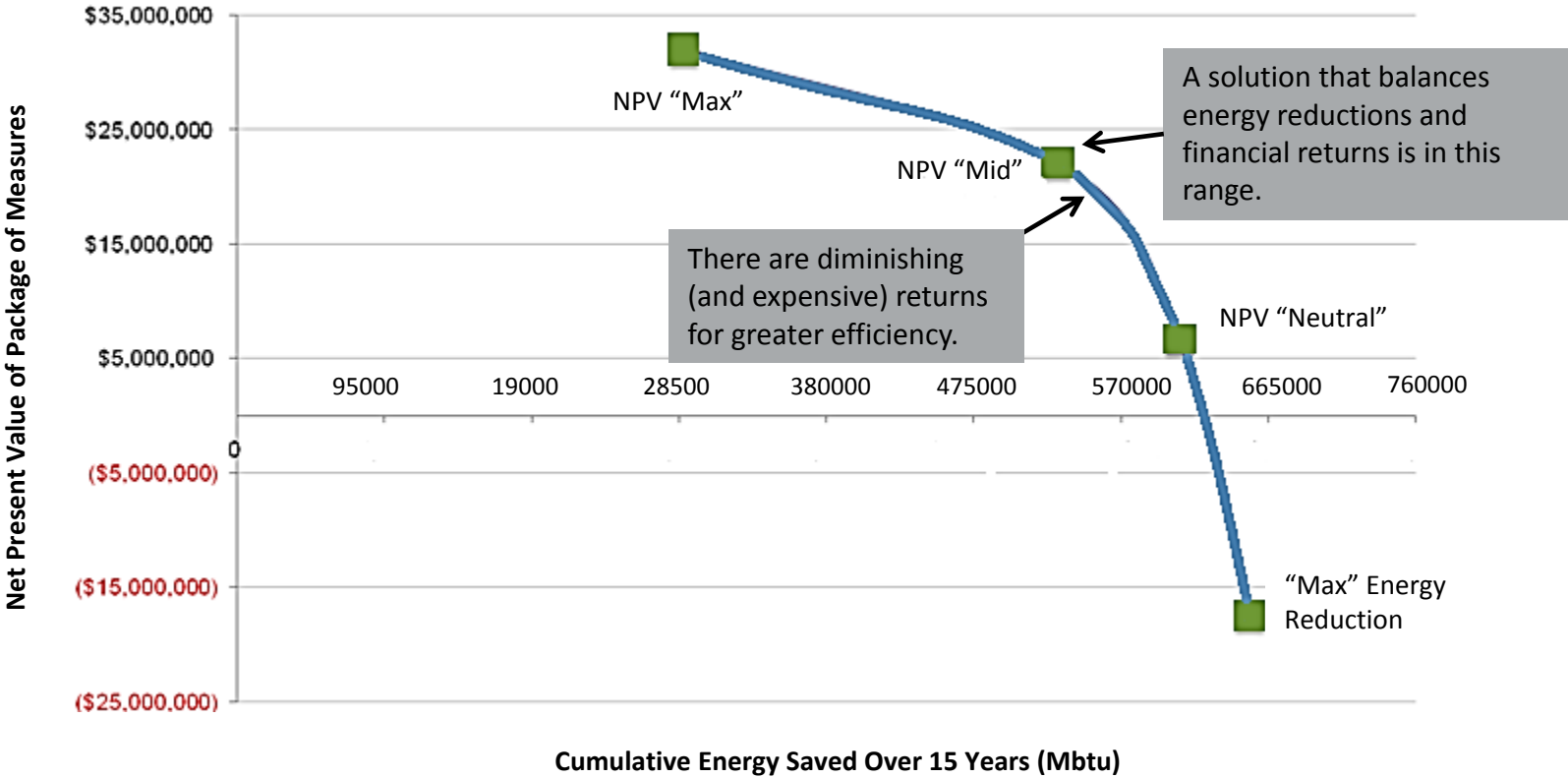
Motivation: Define the economics behind whole building energy efficiency retrofits and high performance tenant installations.

- 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

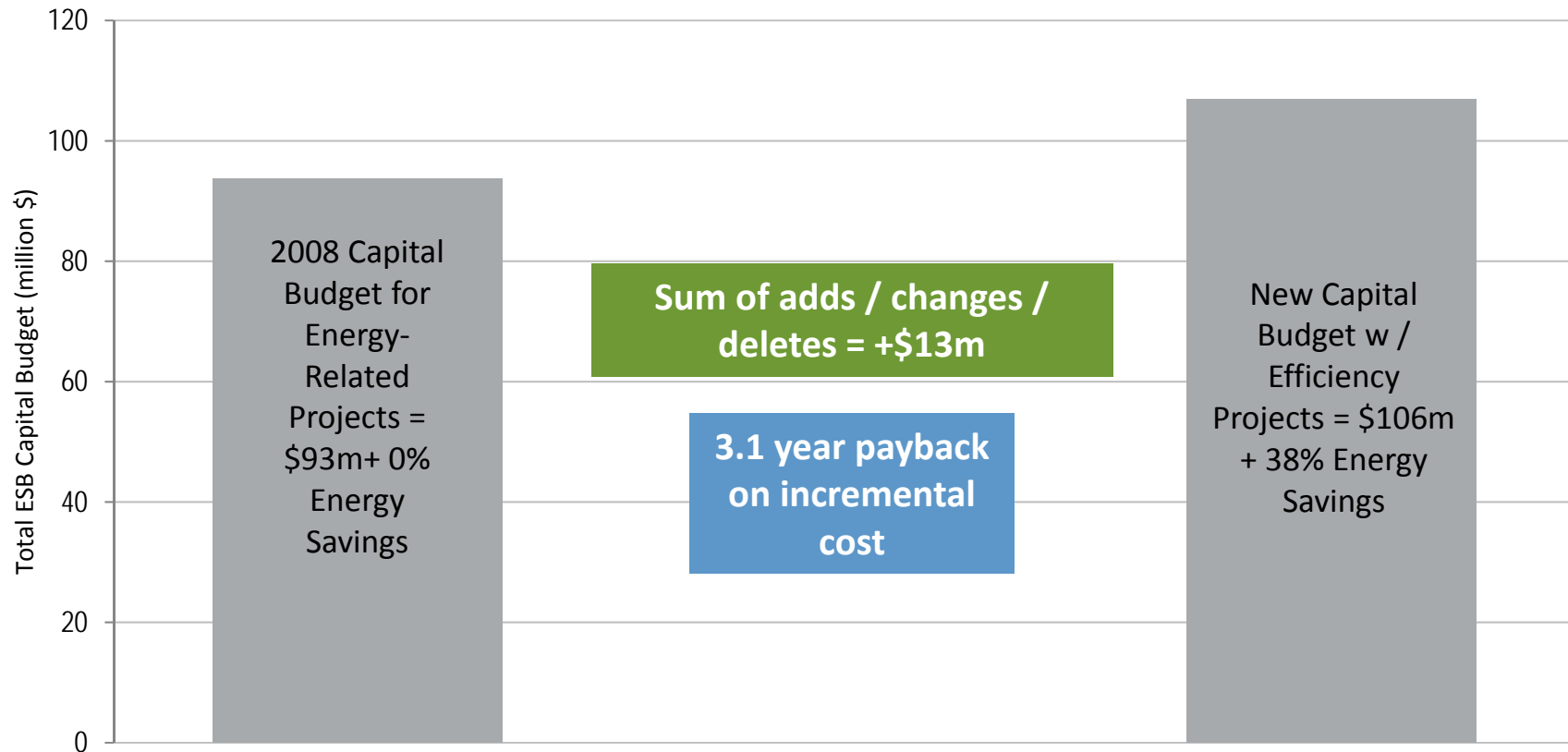
Clear quantifiable business case

15-Year NPV of Package versus Cumulative Energy Savings



Investment and Return

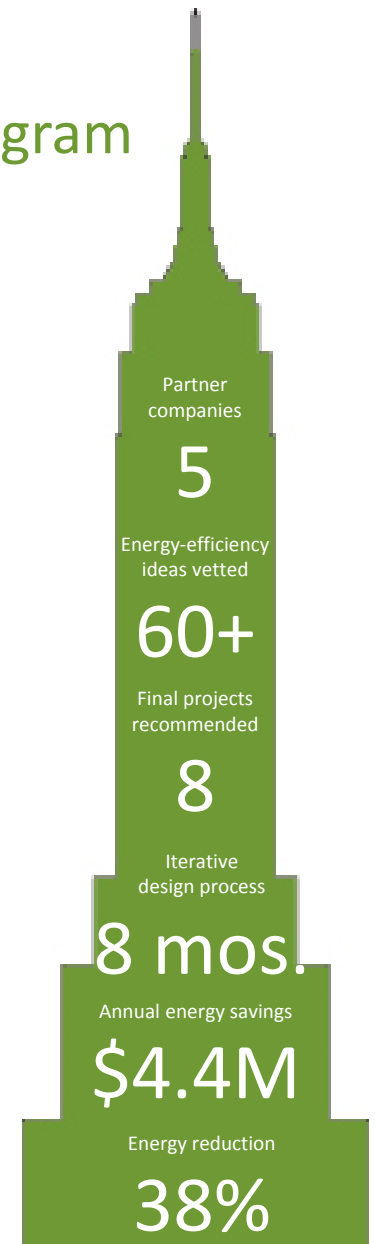
Capital Budget Adjustments for Energy Efficiency Projects



The Empire State Building

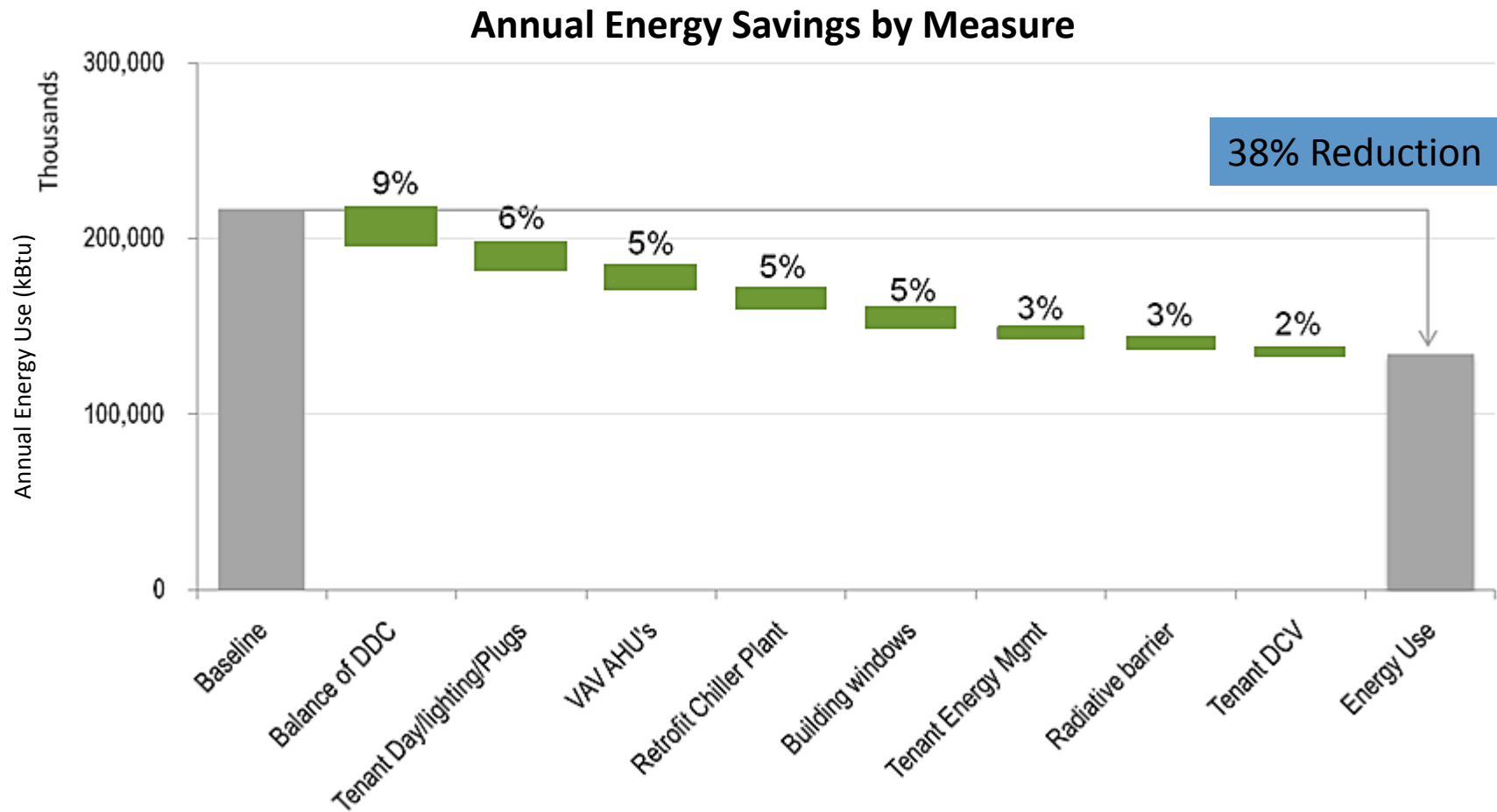
A groundbreaking energy and sustainability program

- Reduce energy use by 38 percent
- Annual savings of \$4.4M
- 3.1 year payback
- Energy Star 84
- Energy Performance Contract
- Quantifiable transparent results
- Serve as a model for owners of existing buildings
- Visit www.esbsustainability.com



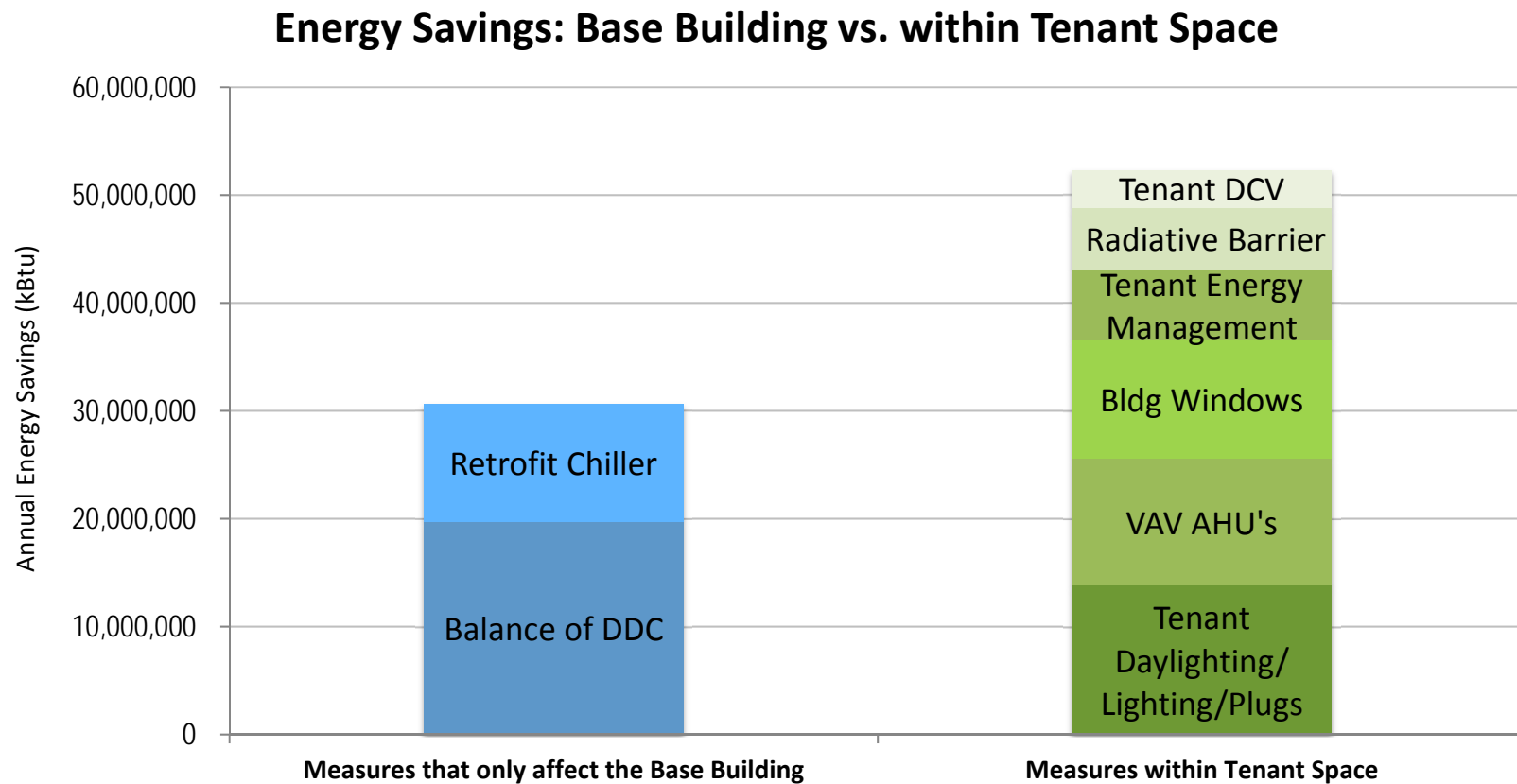
Integration of efficiency measures: Building Retrofit

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

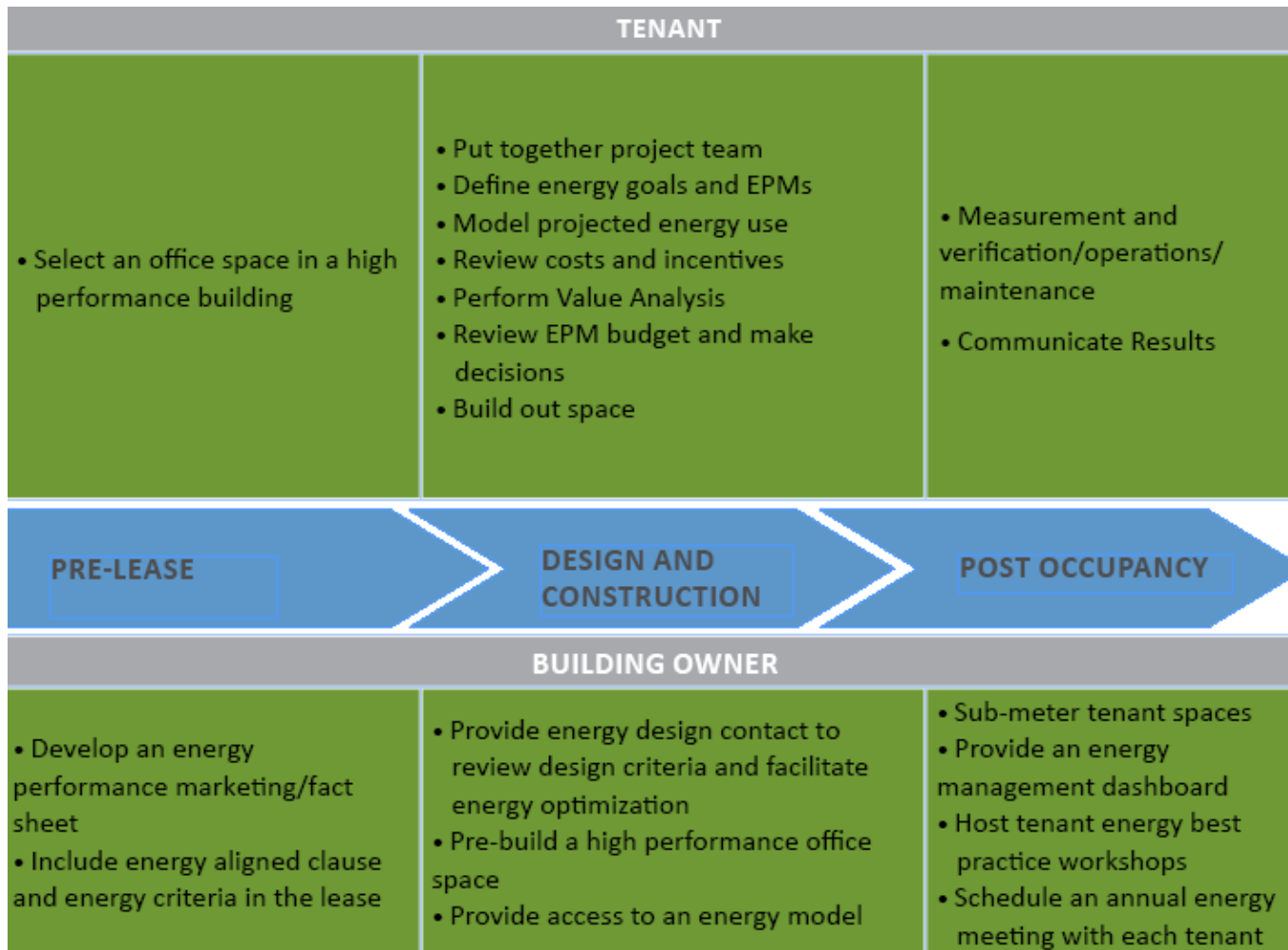


The business case for an integrated approach

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



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

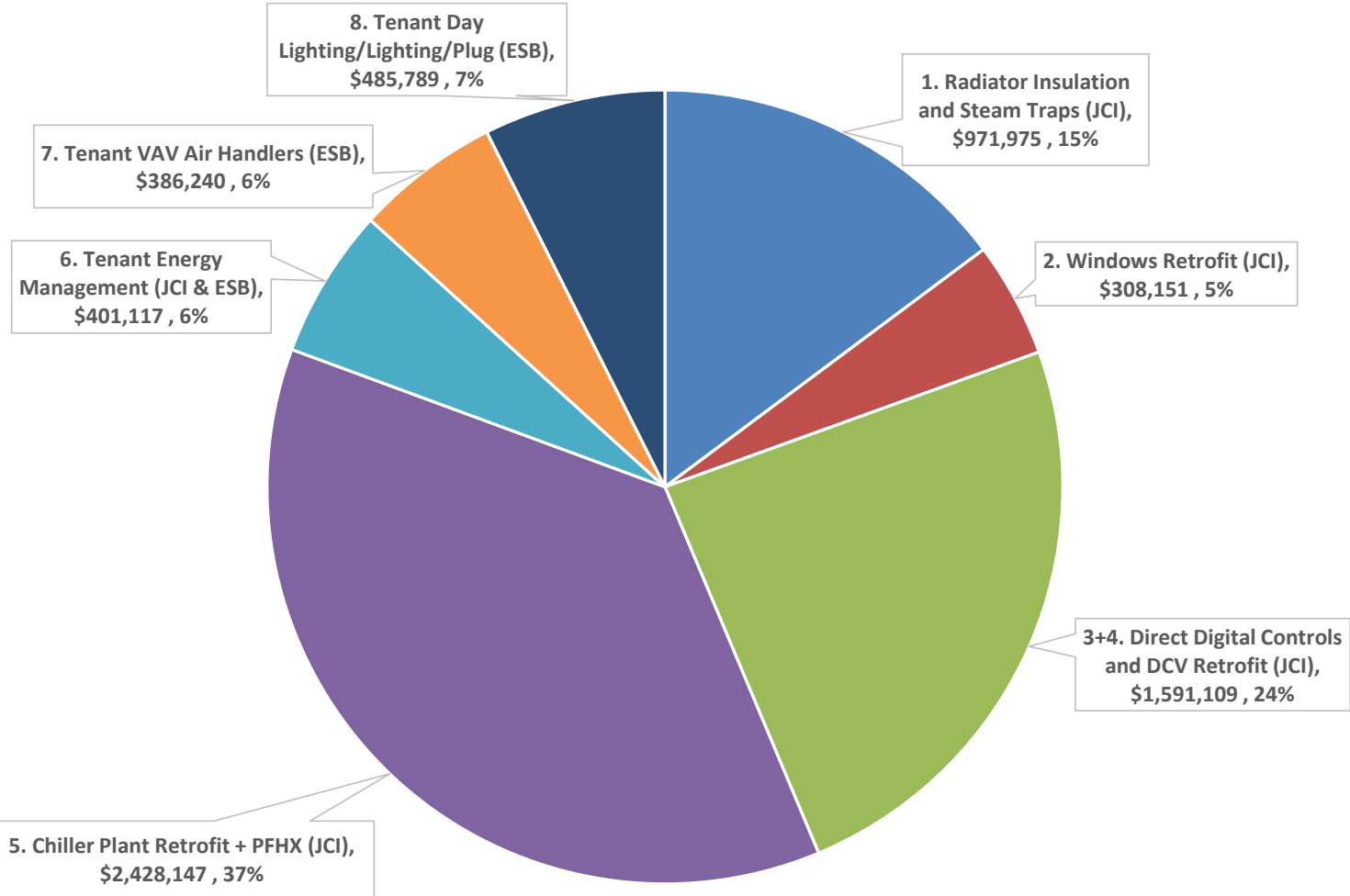
Investment and Return: LFUSA

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

2017 Performance: Sustainability Program

Sustainability Program ECM Savings in 2017



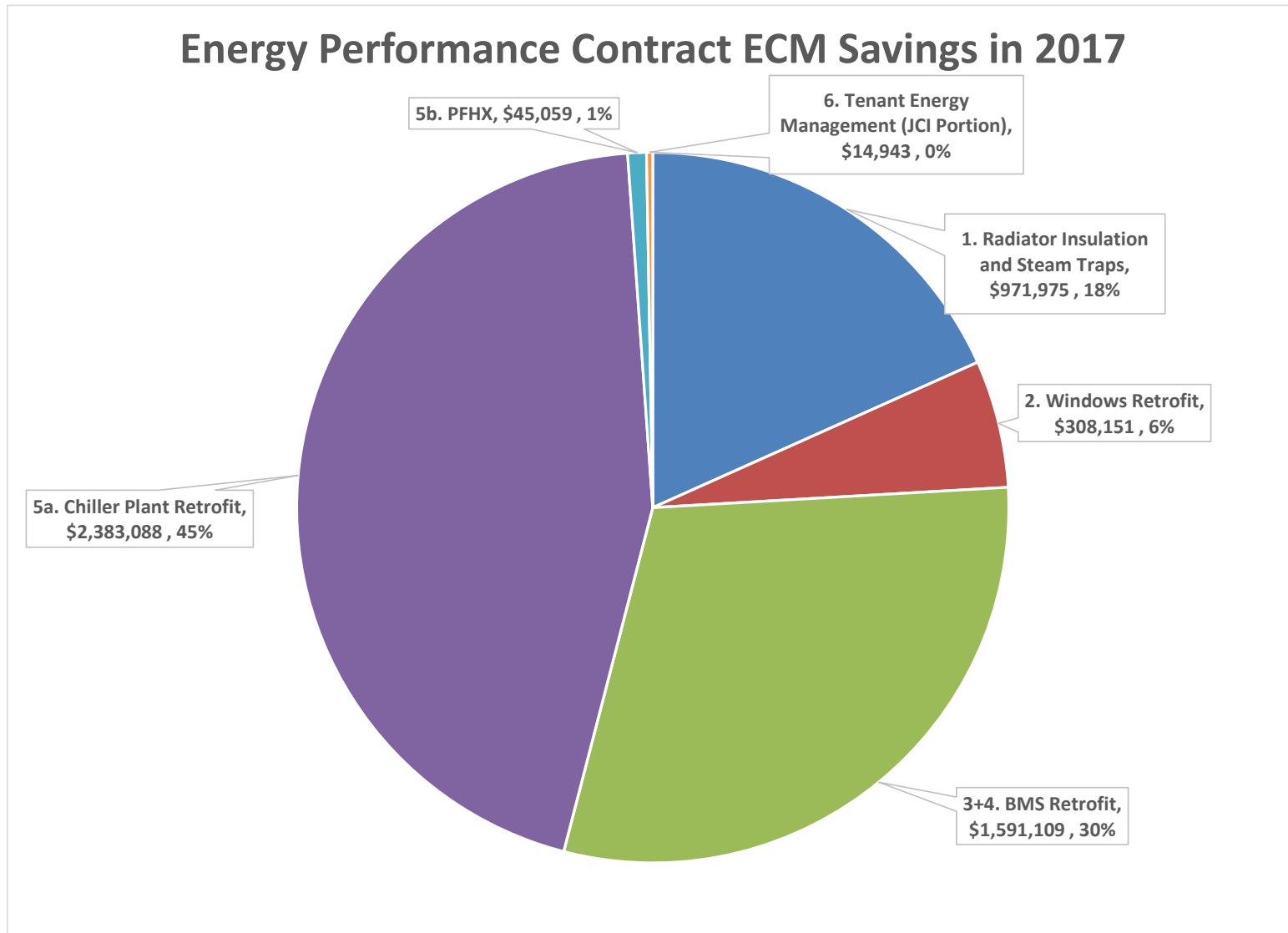
Measurement & Verification

2017 Sustainability Program Savings

ECM No. [A]	Energy Conservation Measure (ECM) [B]	2007 Projection [C]	2017 Target Savings [D]	2017 ECM Performance Savings [E]
1	Radiator Insulation and Steam Traps (JCI)	\$587,191	\$811,917	\$971,975
2	Windows Retrofit (JCI)	\$404,667	\$404,667	\$308,151
3+4	Direct Digital Controls and DCV Retrofit (JCI)	\$940,396	\$1,227,806	\$1,591,109
5	Chiller Plant Retrofit + PFHX (JCI)	\$887,264	\$1,617,304	\$2,428,147
6	Tenant Energy Management (JCI & ESB)	\$386,709	\$416,060	\$401,117
7	Tenant VAV Air Handlers (ESB)	\$702,507	\$386,240	\$386,240
8	Tenant Day Lighting/Lighting/Plug(ESB)	\$940,862	\$485,789	\$485,789
	TOTAL	\$4,839,596	\$5,349,784	\$6,572,529

Measurement & Verification

2017 Performance: Energy Performance Contract



Measurement & Verification

2017 EPC Savings

ECM No. [A]	Energy Conservation Measure (ECM) [B]	Contract Savings [C]	2017 Target Savings [D]	2017 ECM Performance Savings [E]
1	Radiator Insulation and Steam Traps	\$587,191	\$811,917	\$971,975
2	Windows Retrofit	\$404,667	\$404,667	\$308,151
3+4	BMS Retrofit	\$940,396	\$1,227,806	\$1,591,109
5a	Chiller Plant Retrofit	\$731,183	\$1,524,048	\$2,383,088
5b	PFHX	\$146,081	\$93,256	\$45,059
6	Tenant Energy Management (JCI Portion)	\$29,886	\$29,886	\$14,943
	TOTAL	\$2,839,404	\$4,091,581	\$5,314,326

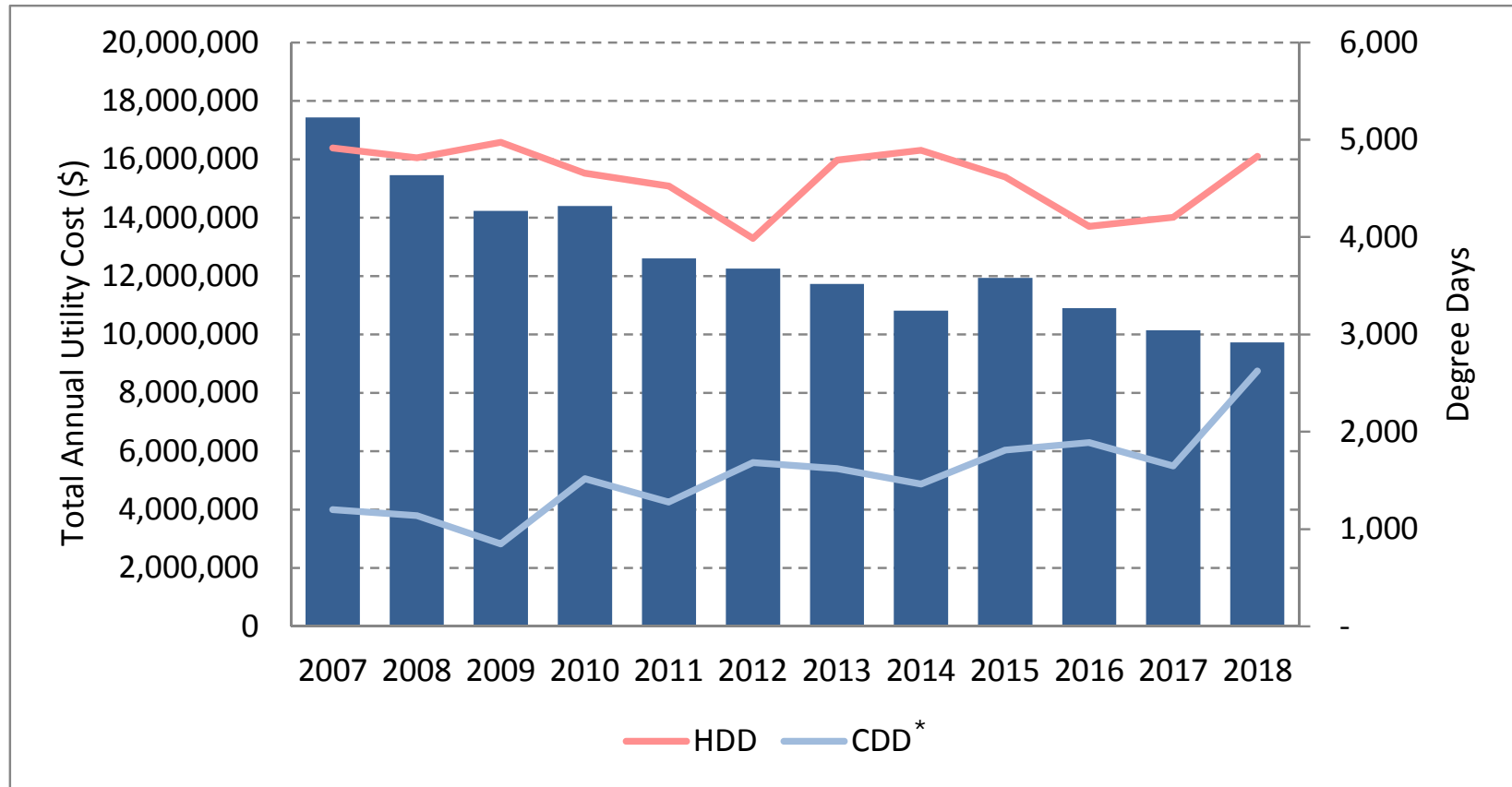
Measurement & Verification

YOY EPC Savings Summary

Performance Year	Target Savings	ECM Performance Savings
Construction Period	\$0	\$1,167,942
2011	\$2,294,818	\$2,406,936
2012	\$2,183,466	\$2,326,678
2013	\$2,369,462	\$2,855,350
2014	\$2,660,405	\$3,063,491
2015	\$2,722,750	\$3,239,246
2016	\$2,610,791	\$3,237,007
2017	\$4,091,581	\$5,314,326
Total	\$18,933,273	\$23,610,976

Measurement & Verification

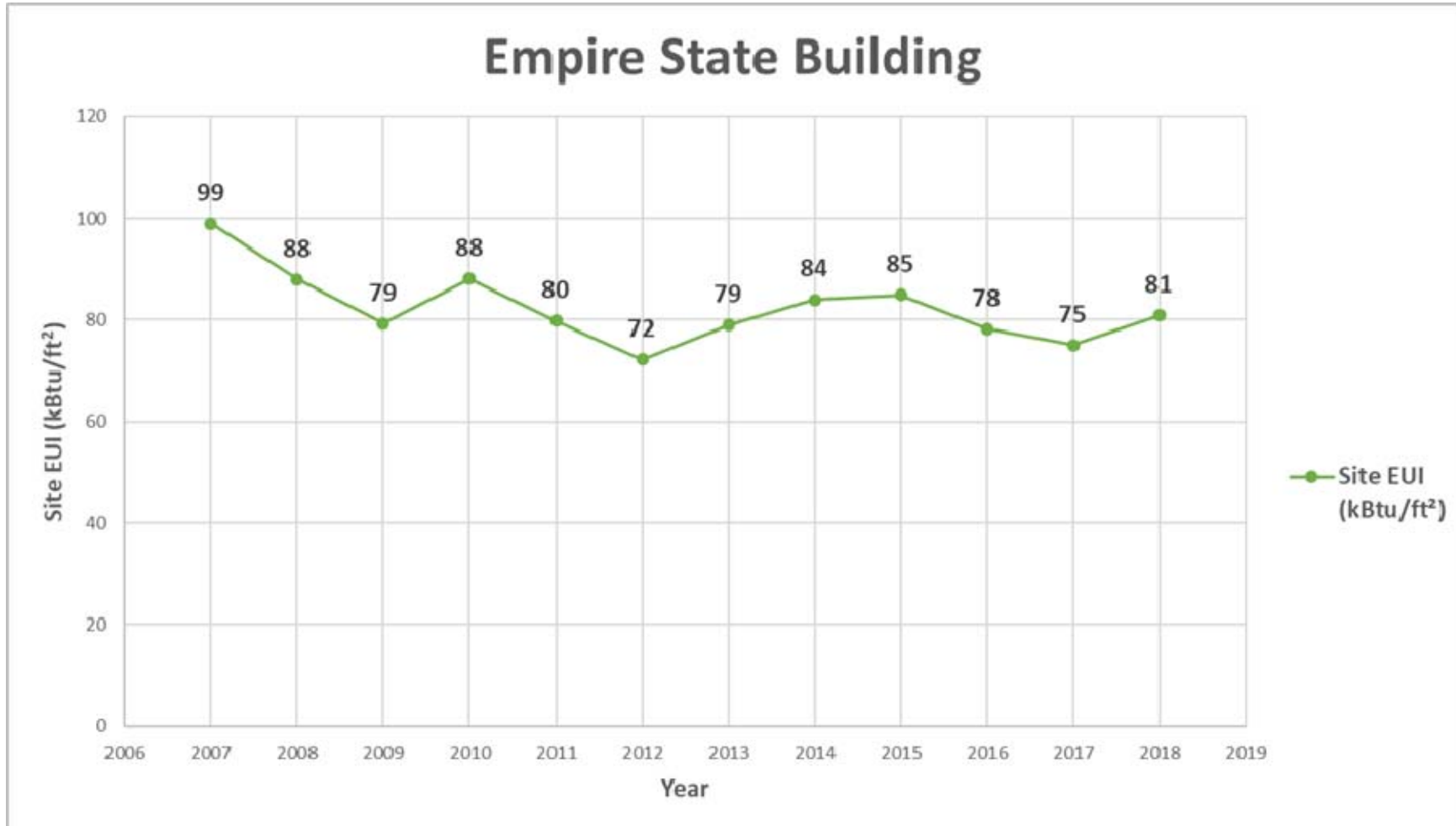
Reduction in ESB's 2007 Baseline Electric Utility Costs During Performance Periods



*heating degree days/cooling degree days

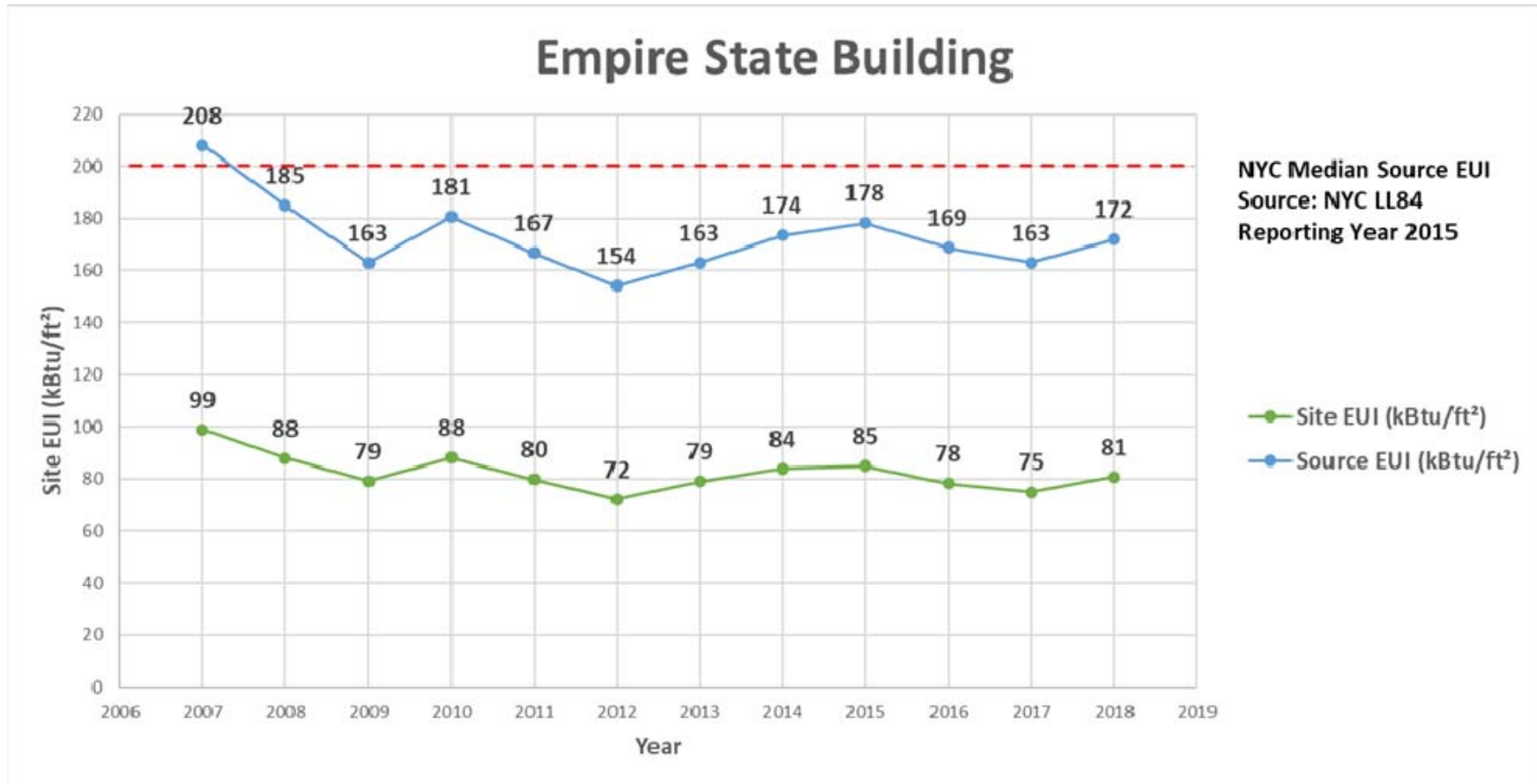
Results That Matter

ESB Energy Usage Index (EUI)



Median NYC Office Building EUI: 172

ESB EUI: 81



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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