



U.S. General Services Administration

The Impact of High-Performance Buildings

ISWG

Thursday, July 26

Don Horn, Office of Federal High-Performance Buildings



Does Sustainable Design Deliver?



GSA Public Buildings Service
Office of Applied Science
Applied Research

ASSESSING GREEN BUILDING PERFORMANCE

A POST OCCUPANCY EVALUATION OF 12 GSA BUILDINGS

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SUSTAINABILITY

2008

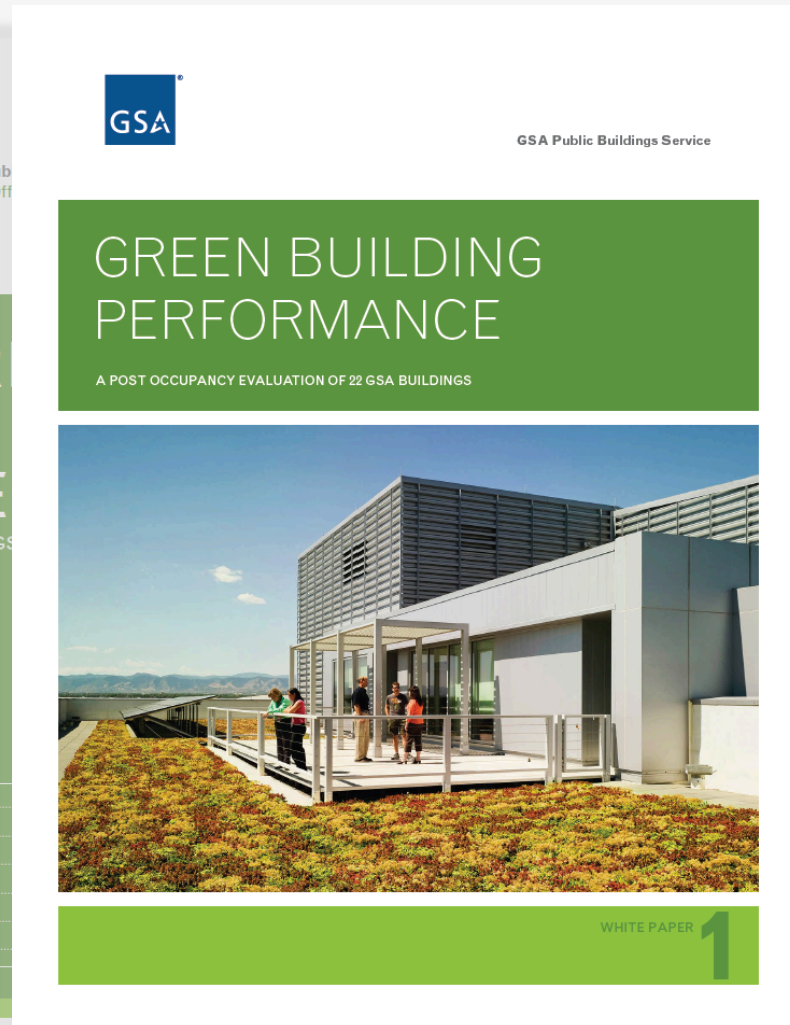
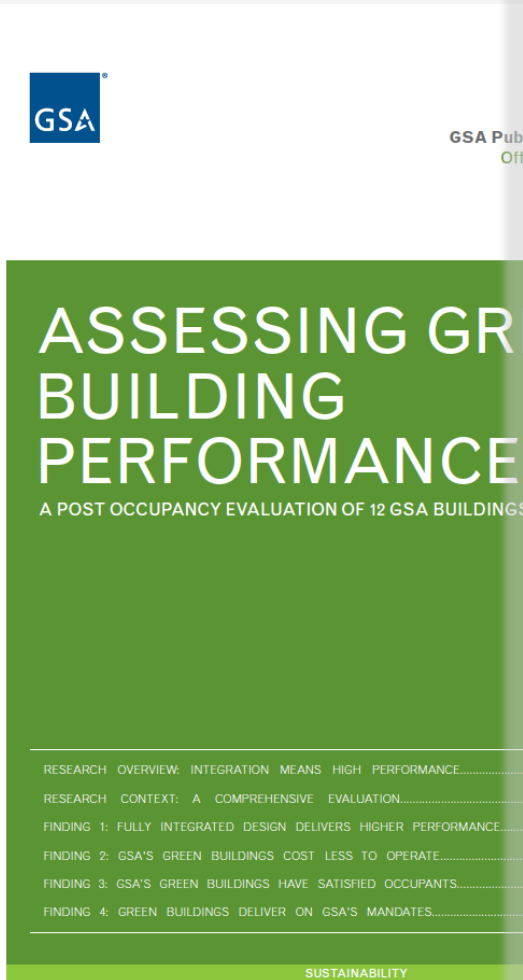
12 sustainably designed buildings

26% less energy use
13% lower maintenance costs

27% higher occupant satisfaction

33% fewer CO2 emissions

Does Sustainable Design Deliver?



2011

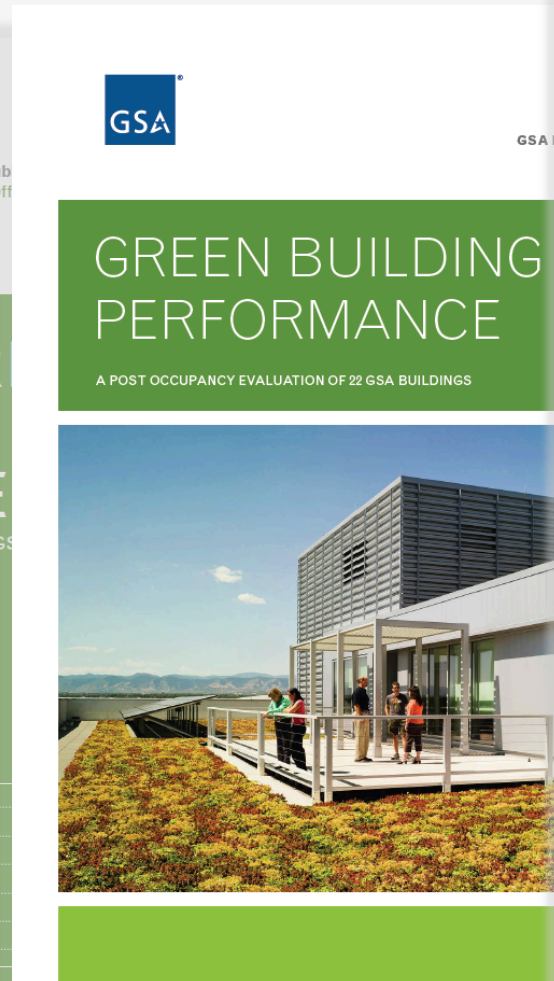
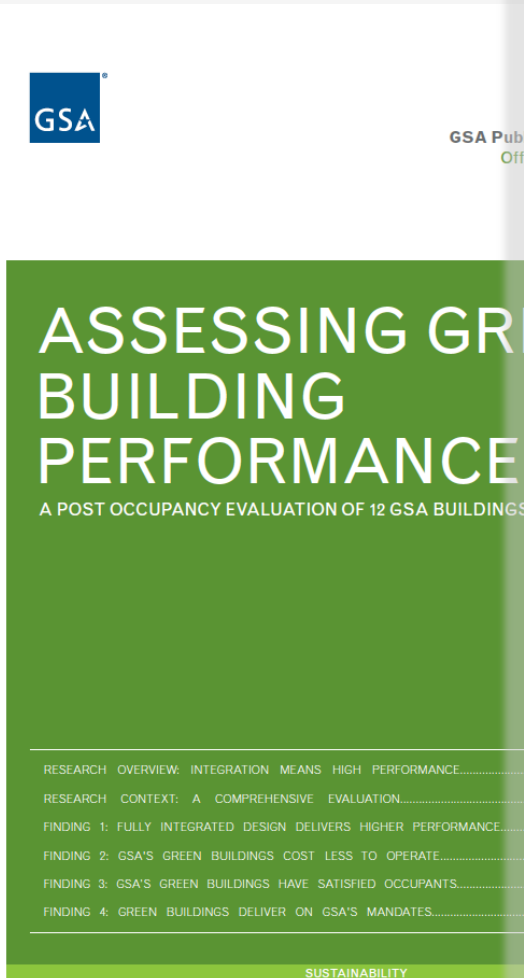
22 sustainably designed buildings

25% less energy use
19% lower operational costs

27% higher occupant satisfaction

36% fewer CO2 emissions

Does Sustainable Design Deliver?



2018

100 high-performance buildings

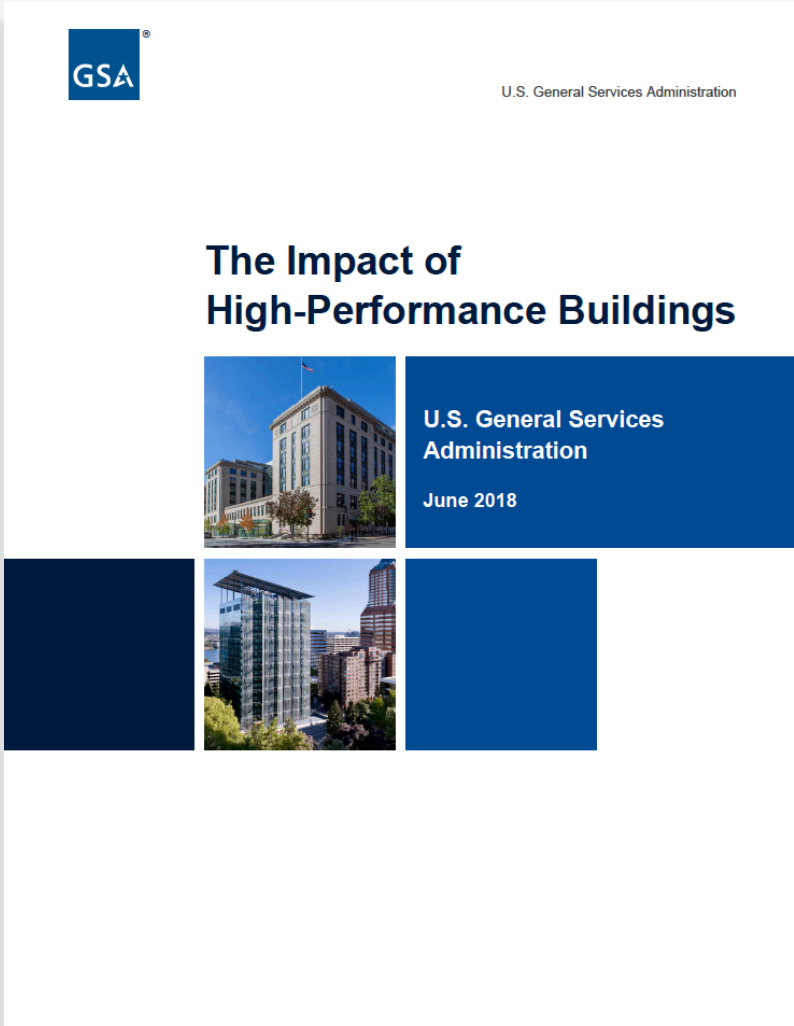
43% less energy use

35% less water use

10% lower building operating expenses

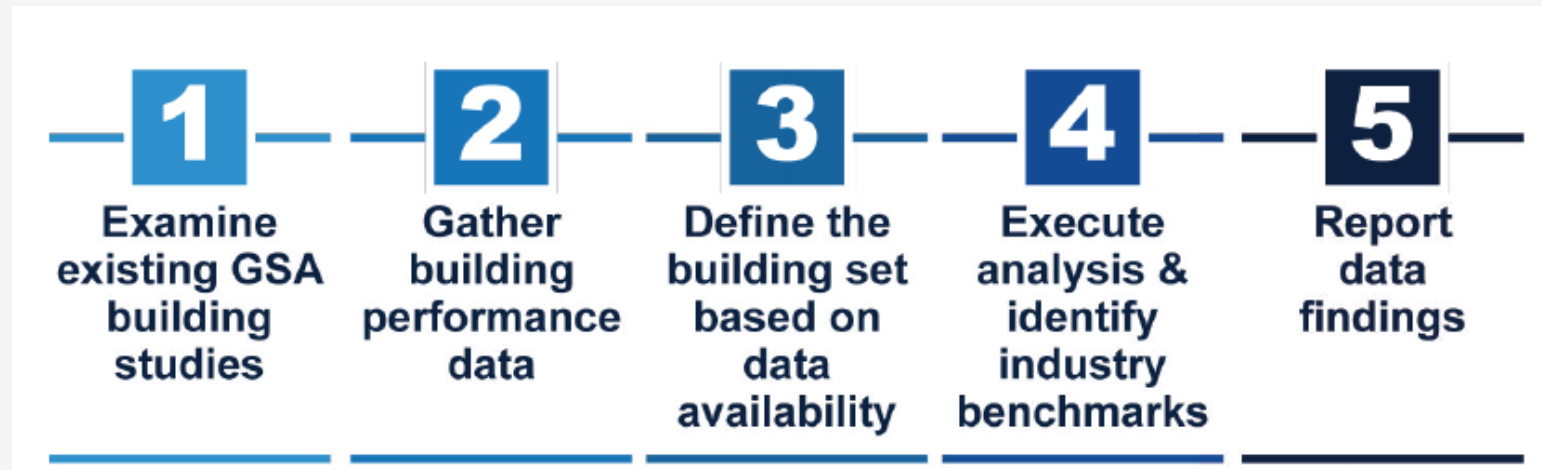
1% higher overall tenant satisfaction

The Impact of High-Performance Buildings








www.gsa.gov/impacthp

GSA's Approach



Performance Metrics

	Energy Efficiency	Annual energy consumption and costs <i>kBtu/GSF</i>
	Water Efficiency	Annual water consumption and costs <i>Gal/GSF</i>
	Building Operating Expenses	Annual building operating expenses including O&M, janitorial, & utility costs <i>Cost/RSF</i>
	Solid Waste Generation & Diversion	Annual waste and recycling amounts <i>Pounds/RSF</i>
	Tenant Satisfaction	Occupant satisfaction ratings for air quality, noise, temperature, cleanliness, light, and overall satisfaction

Data Sources

Energy Usage Analysis System (EUAS)

- GSA's system for utility billing information, including energy and water consumption data GSA's owned portfolio tracks billing and utility expenses based on the metering configuration of the building or project.

Financial Management Information System (FMIS)

- GSA's financial reporting system for building-related expenses.

Sustainable Operations and Maintenance Tool

- GSA's system for tracking buildings that meet the Guiding Principles for Existing Buildings, and for collecting the amount of solid waste generated and recycled for each GSA-owned building

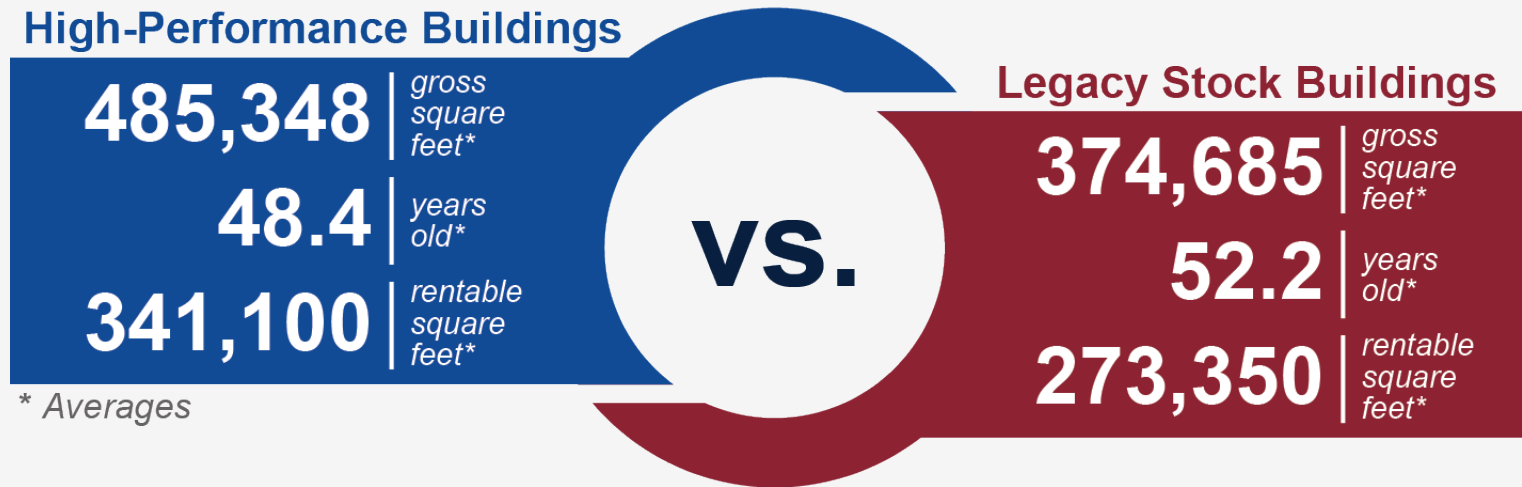
Real Estate Across the United States (REXUS)

- GSA's system for identifying physical building details including the building's name, property type, age, address, GSA Region, and gross square footage

Tenant Satisfaction Survey (TSS)

- GSA's process for capturing annual Federal Tenant Satisfaction Survey results by building and by tenant

Define the Building Set



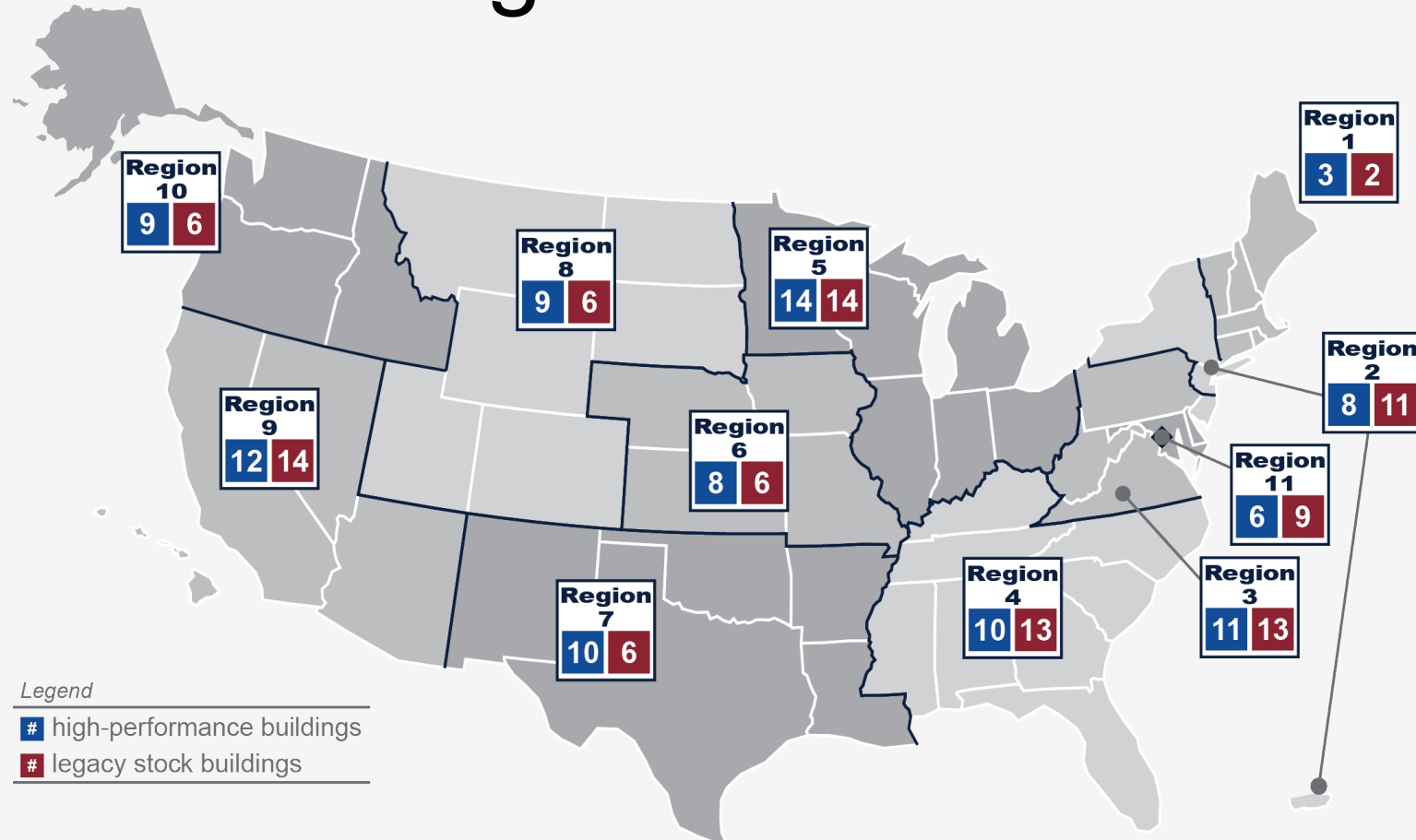
High-Performance Buildings

- Buildings that meet the Guiding Principles for Sustainable Federal Buildings

Legacy Stock Buildings






- Buildings that have not been upgraded to meet the Guiding Principles

Define the Building Set



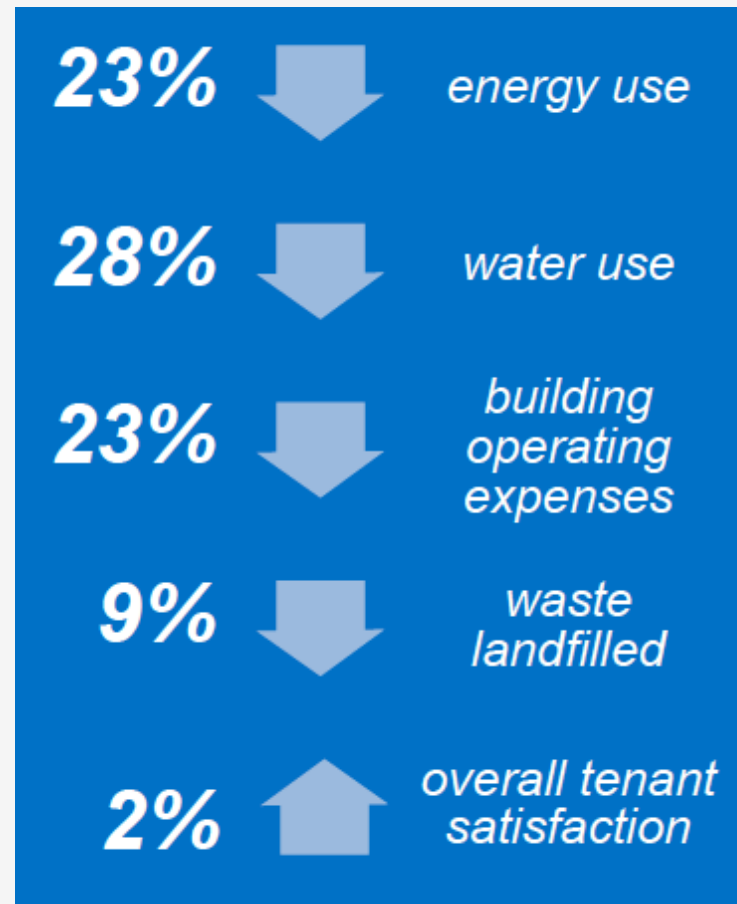
- Federally-owned, under GSA's management
- Office building, courthouse, or combination
- Complete FY 2015 - 2017 data for each metric

Benchmarks

	Energy Efficiency	Energy Information Administration (EIA) Commercial Buildings Energy Consumption Survey (CBECS) 2012
	Water Efficiency	ENERGY STAR® Portfolio Manager 2012
	Building Operating Expenses	Building Owners and Managers Association (BOMA) Experience Exchange Report (EER)
	Solid Waste Generation & Diversion	[Not Tracked]
	Tenant Satisfaction	Center for the Built Environment (CBE) Occupant Indoor Environmental Quality Survey 2015

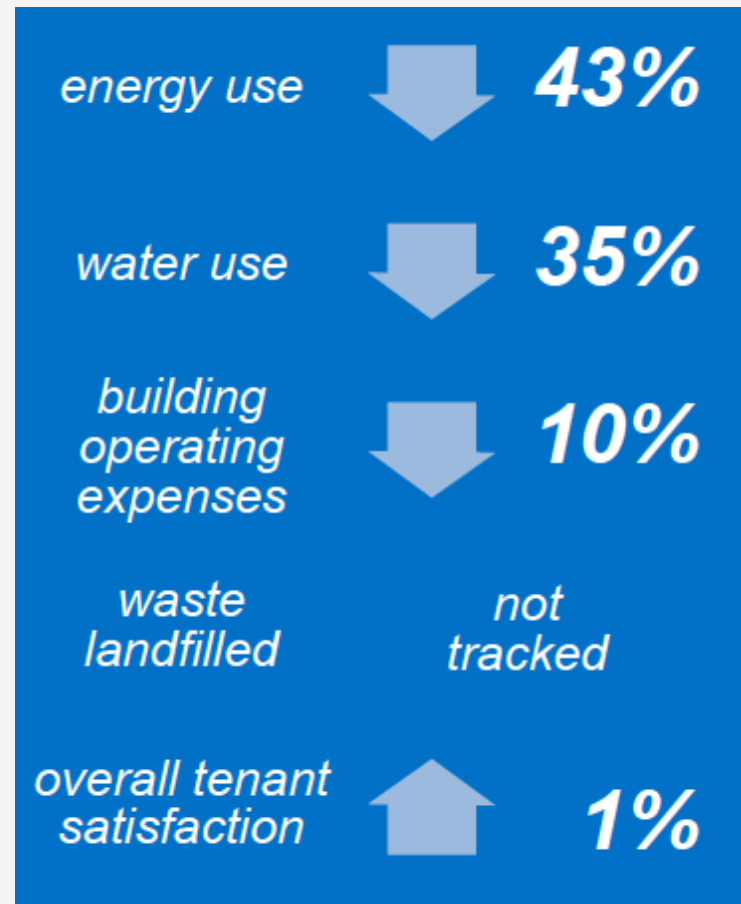
Key Findings

Compared to legacy stock buildings,
GSA's high-performance buildings show:



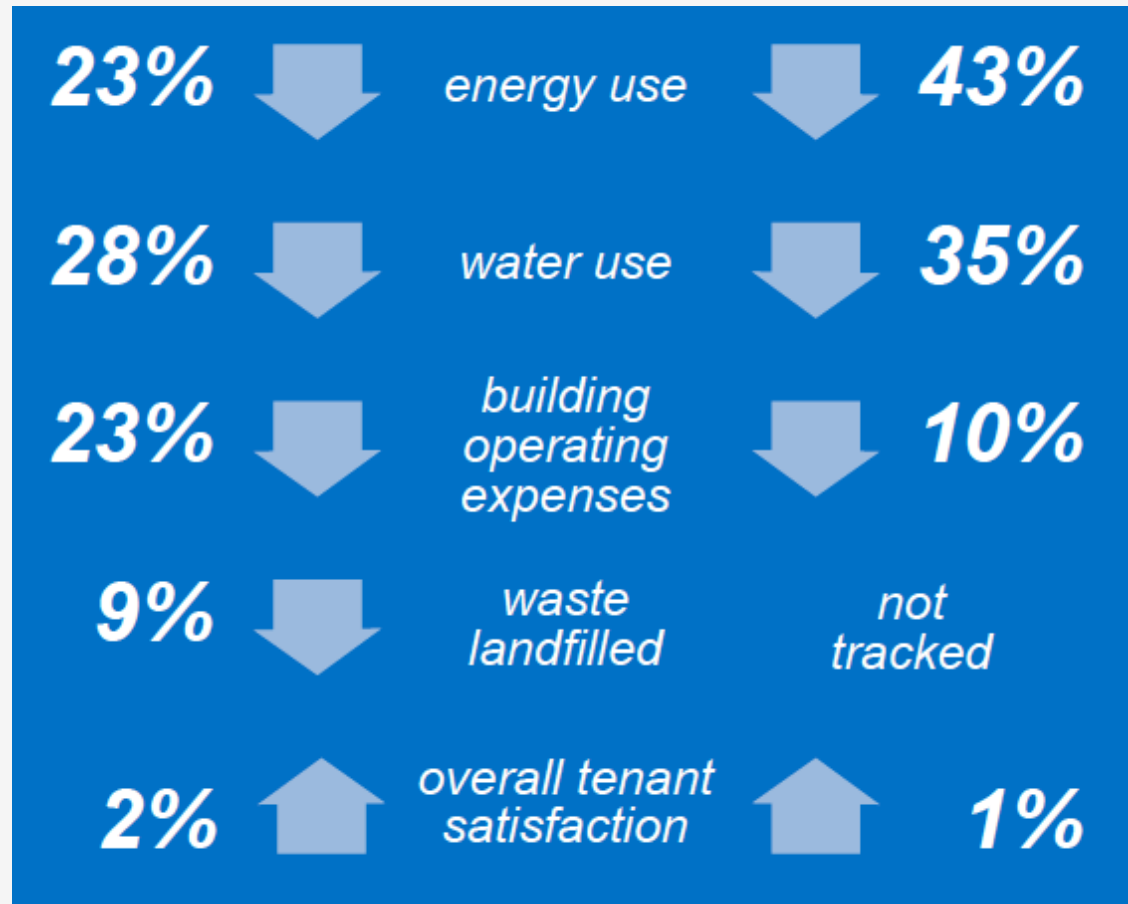
Key Findings

Compared to industry benchmarks,
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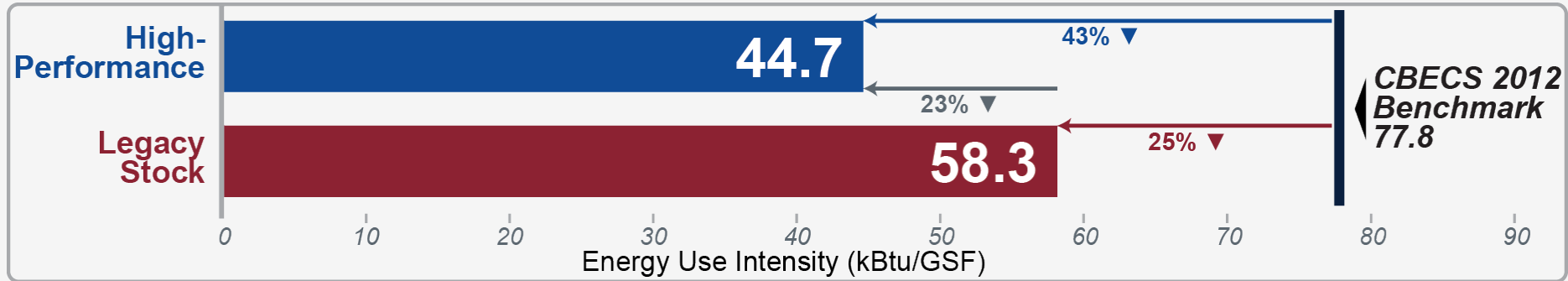


Key Findings

Compared to legacy stock buildings: Compared to industry benchmarks:



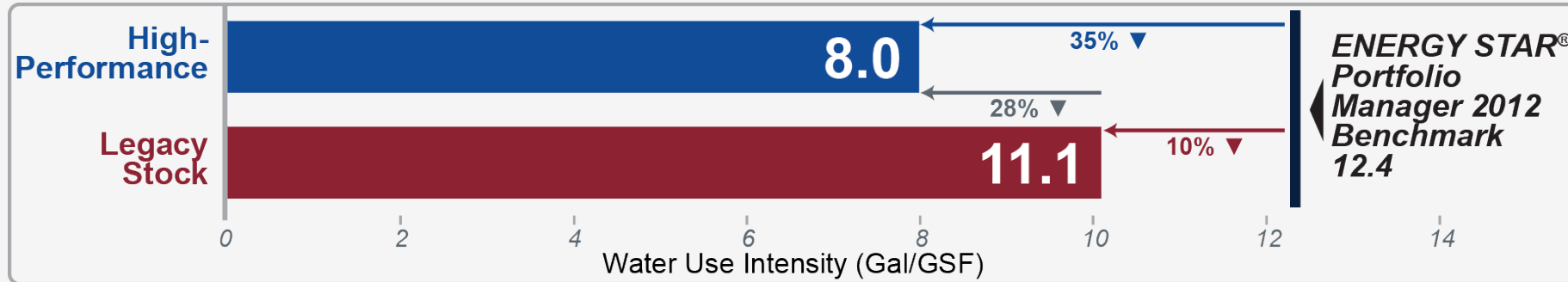
Energy Efficiency



Wayne Aspinall Federal Building & Courthouse
Grand Junction, CO

- 1918 building renovated in 2013
 - variable refrigerant flow HVAC
 - LED lights w/ sensors & dimmers
 - thermally-enhanced envelope
 - geothermal heat pump
 - rooftop photovoltaic system
- EUI is 15 kBtu/GSF

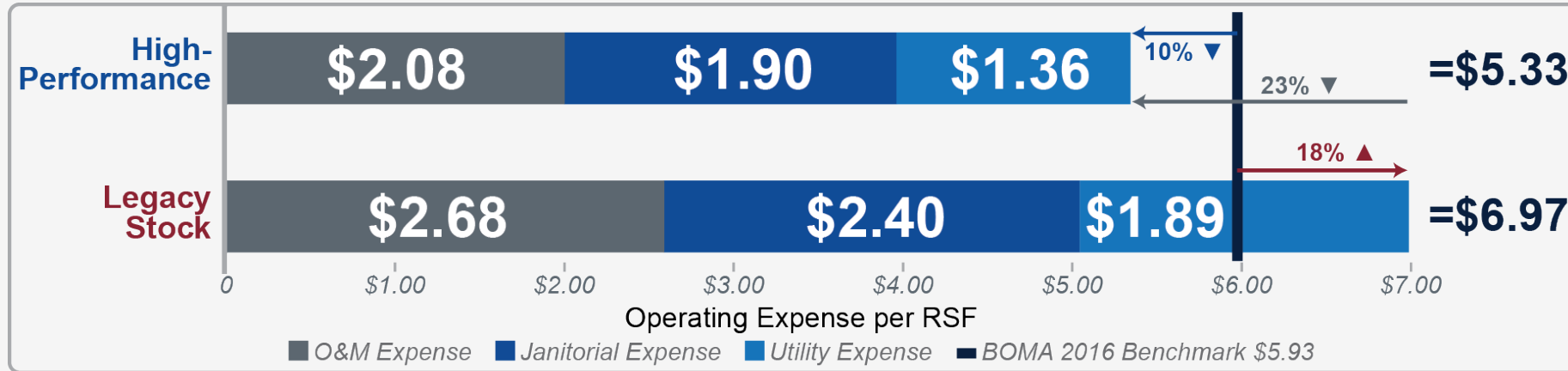
Water Efficiency



Federal Center South Seattle, WA

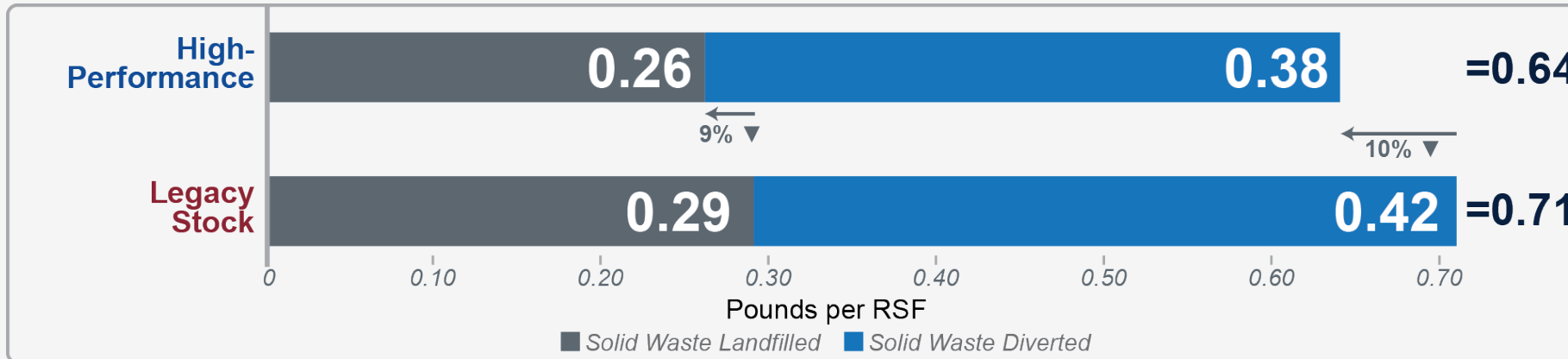
- Rainwater capture in a 25,000 gallon cistern
 - used for toilet water, process water, and irrigation
- High-efficiency bathroom fixtures
- WUI is 5.1 gallons per GSF

Building Operating Expenses



High-performance buildings cost
 \$0.60 less/RSF in O&M expenses,
 \$0.50 less/RSF in janitorial expenses
 \$0.53 less/RSF in utility expenses
 compared to legacy stock buildings

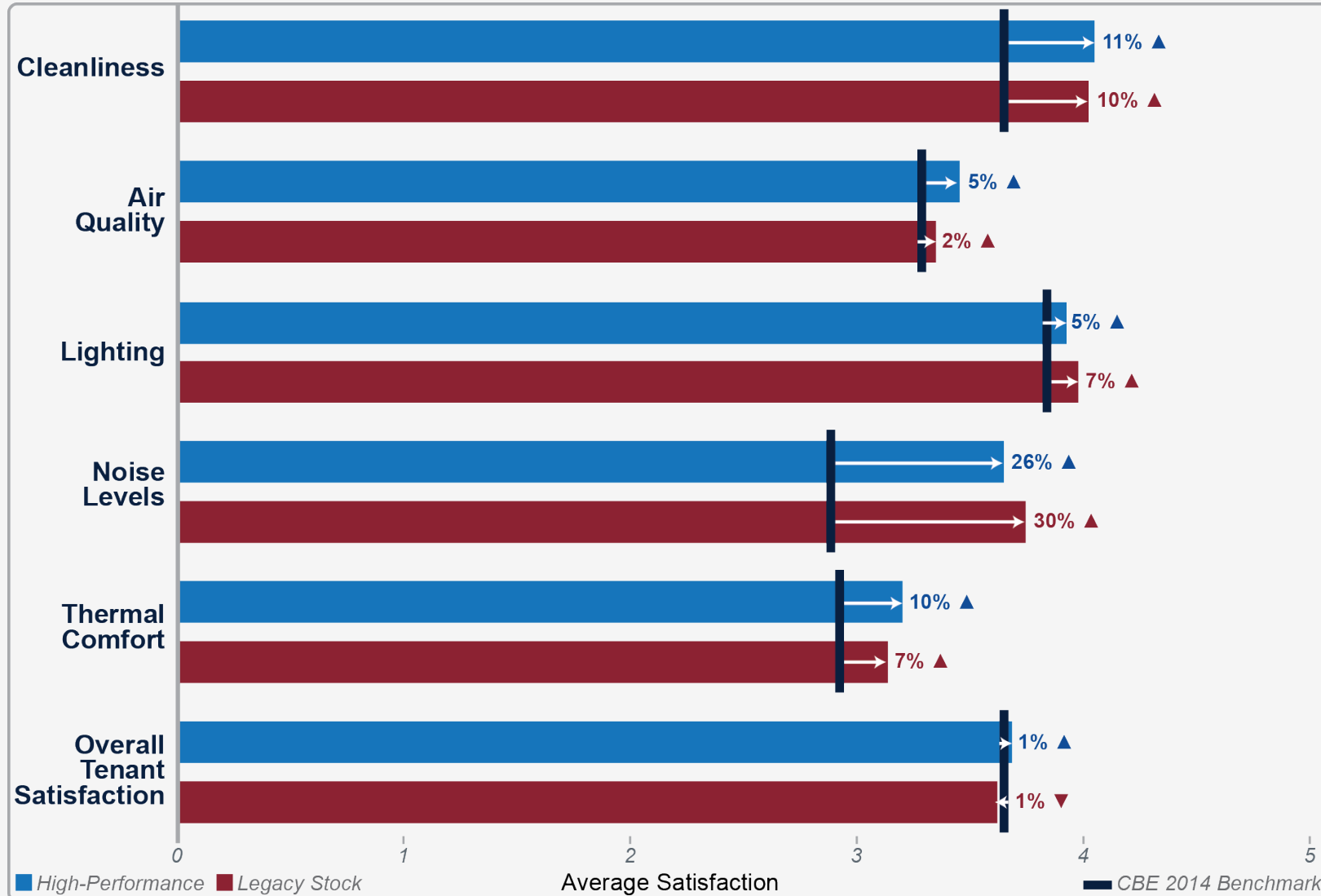
Solid Waste Generation & Diversion



Edward Roybal Federal Building Los Angeles, CA

- Increased waste diversion rate from 31% to 80% in 5 years
 - implemented a food waste and organics composting program
- Generates revenue from recycling supports tenant agency programs
- Diverted 80% of total solid waste in FY16

Tenant Satisfaction



GSA Headquarters Washington, DC

- 1917 building renovated in 2013
- Glazing glare control
- Occupant thermal comfort systems
- Individually controlled thermal zones
- Daylight harvesting control system
- Operable windows linked to room-specific ventilation systems

High-Performance Buildings Save Money

Performance Metric	Current Actual Cost (200 buildings)¹¹	Projected Cost if All 200 Buildings were High-Performance¹²	Potential Additional Savings in Legacy Stock Buildings
Energy	\$105,206,021	\$92,304,650	\$12,901,371
Water	\$10,090,138	\$8,626,759	\$1,463,379
Building Operating Expenses	\$287,876,172	\$257,624,529	\$30,251,644
Solid Waste	\$440,341	\$422,359	\$17,982
<i>Total</i>	\$403,612,962	\$358,978,297	\$44,634,376

Recommendations

In deciding which upgrades will best maximize performance on each measure, GSA recommends that decision makers:

- Examine the existing conditions and performance of buildings to identify opportunities for improvement
- Maintain a portfolio-wide approach to reducing excess costs of lower performing buildings
- Prioritize improvement opportunities according to net present value, savings to investment ratio, and net operating income
- Leverage external financing wherever possible, such as ESPC and UESC

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