



GSA's High Performance Green Buildings: Practices & Lessons



GSA Office of Federal High-Performance Green Buildings

May 11, 2011

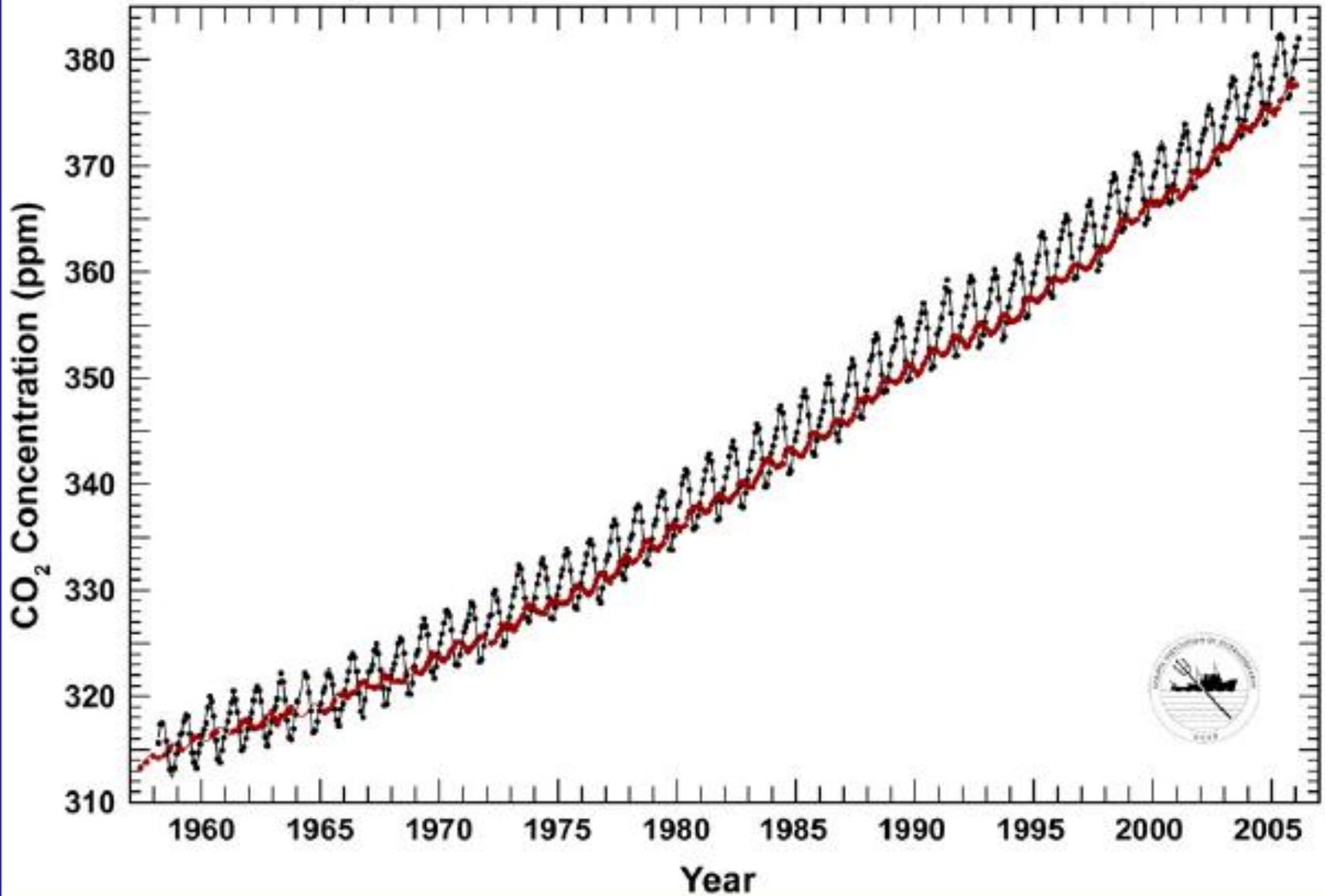
Nashville, TN

Michael Bloom

Mauna Loa Observatory, Hawaii and South Pole, Antarctica Monthly Average Carbon Dioxide Concentration

Data from Scripps CO₂ Program

Last updated February 2006



- 40% of Annual US Energy Use
- 30% of CO₂ Production
- 40% of Ozone Depletion
- 35% of Municipal Solid Waste
- 30% of Wood And Raw Materials Use
- 25% of Water Use
- 30%+ of Buildings Have Poor Indoor Air Quality
- & Most People Spend About 90% Of Their Time Indoors

Goal

Catalyze and facilitate the Federal government to operate more efficiently and effectively, and lead the marketplace to sustainability, by minimizing the Federal footprint through efficient use of energy, water, and resources, and by creating healthy productive workspaces.

Innovation, Operational Excellence & Customer Intimacy

Innovation



NOAA Operations Center, Suitland, MD

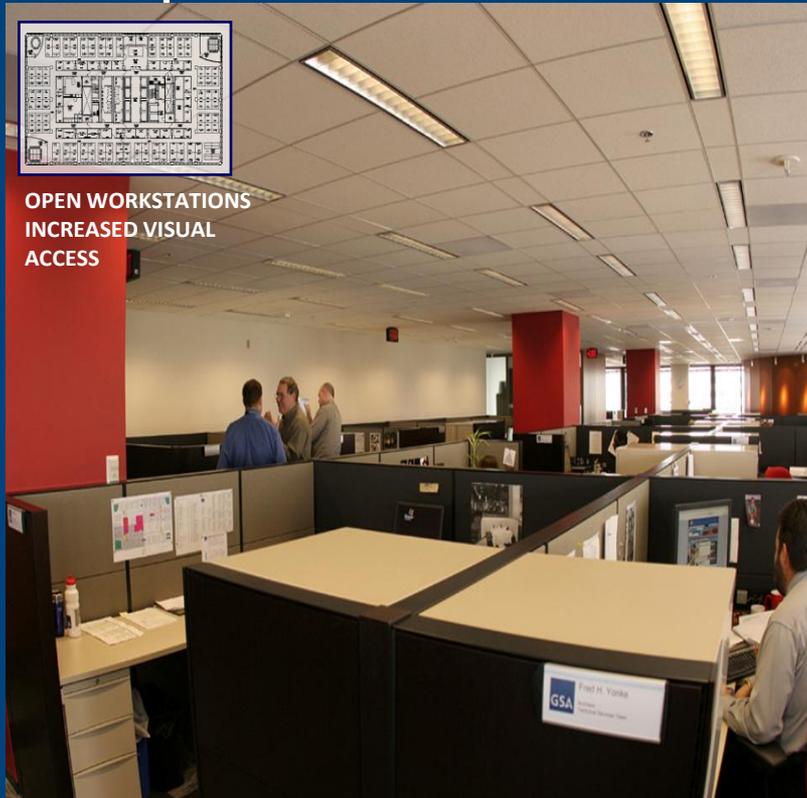
Goal:

Develop and test new technologies, practices and models that can lead the Federal government to a ***zero environmental footprint***

Sample Projects:

- High-Performance Building Demonstration project - Region 8 EPA HQ
- Energy sub-metering pilots
- National Academies of Science Report: “Levers for Change”
- Green roof benefits and challenges report

Operational Excellence



PBS Offices, GSA Great Lakes Region, Chicago, IL

Goal:

Develop strategies, standards, guidance and measures to improve operational performance and spur achievement of Federal and GSA sustainability goals

Sample Projects:

- Executive Order 13514 GHG Accounting for Leased Assets and Green Purchasing
- Federal Buildings Personnel Training Act
- ASHRAE 189.1 Green Building Standard

Customer Intimacy

Sustainable Facilities Tool Log On

SEARCH

LEARN PLAN EVALUATE IMPLEMENT SHARE MY PROJECTS

Learn

Home Sustainability Topics Regulations and Guidelines Did You Know Case Studies

What is Sustainability

Sustainability is best thought of as a process, rather than a thing. [US Executive Order 13423](#) states that sustainability "means to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations." In order to achieve such conditions, new ways of designing, constructing and operating buildings and facilities must be identified.

Did You Know?

Buildings are one of the heaviest consumers of natural resources and account for a significant portion of the greenhouse gas emissions that affect climate change. In the U.S., buildings account for 38% of all CO₂ emissions. Source: Energy Information Administration (2008). Assumptions to the Annual Energy Outlook.

Sustainable Facilities Tool, www.sftool.gov

Goal:

Build and maintain strong relationships with key customers, helping them understand and implement Federal sustainability mandates

Sample Projects:

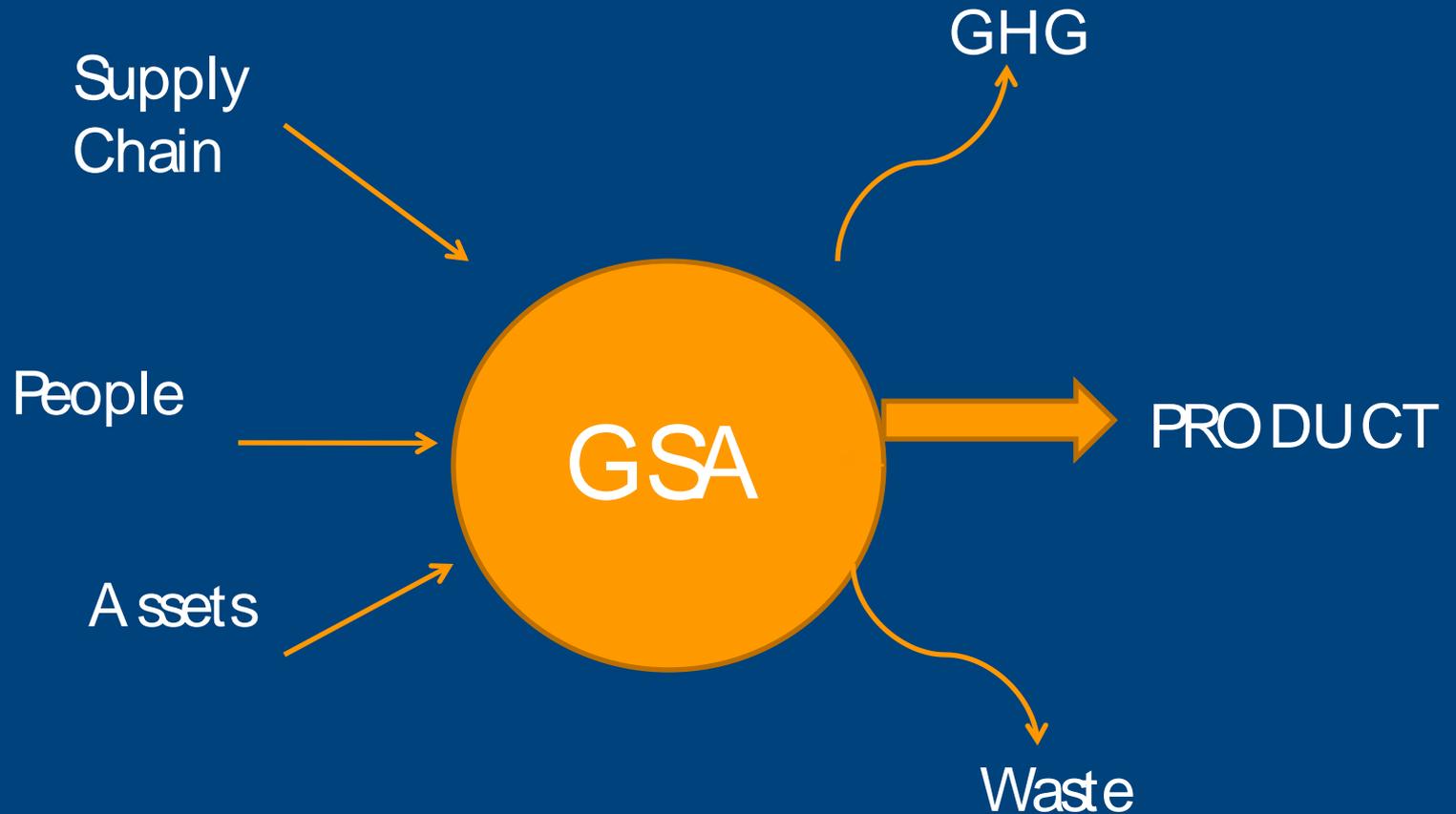
- Putting Energy Research into Practice
- Interagency Sustainability Working Group
- Green Building Advisory Committee
- Sustainable Facilities Tool

Executive Order 13514: Environmental, Energy & Economic Performance

- Measure, Manage, And Reduce Greenhouse Gas Emissions Toward Agency-defined Targets
- Scopes 1 & 2 *And* Scope 3 Targets
- 26% Water Reduction By 2020
- 50% Waste Diversion
- Net Zero By 2020
- Transit-oriented Design
- Fleet & Fuel Reductions
- Green Procurement

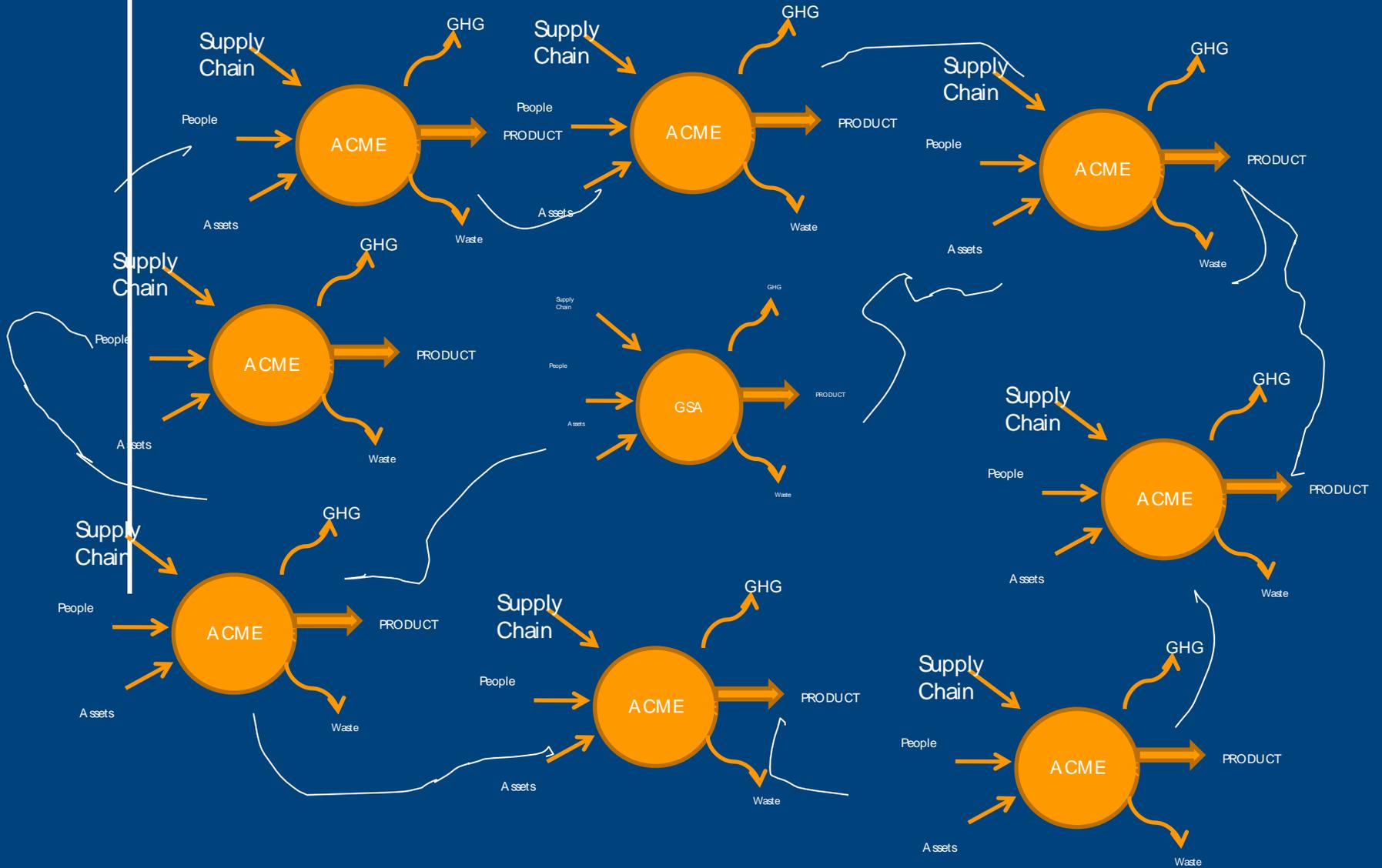
GSA

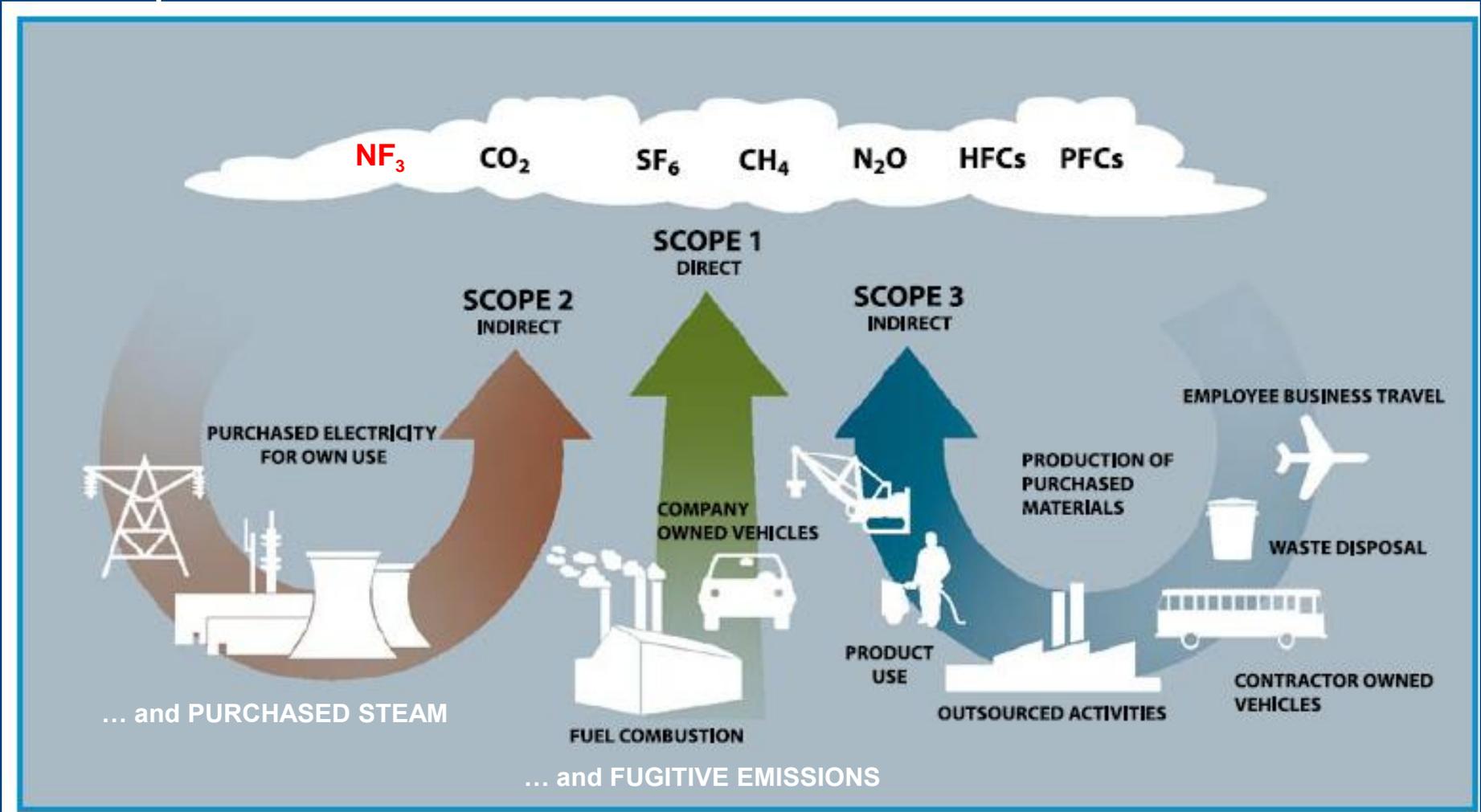
An Over-Simplified Model: Zero Environmental Footprint



$$(\text{Product} - \text{Waste} - \text{GHG}) \geq (\text{Supply Chain} + \text{People} + \text{Assets})$$

Inter-Related Webs





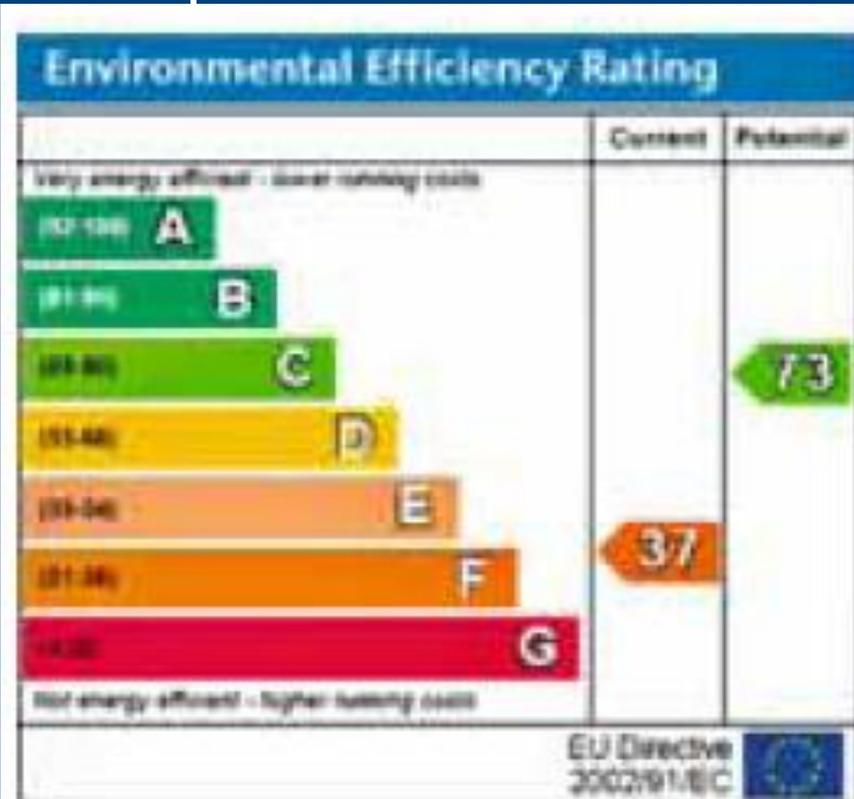
- Electricity and steam purchases
- Fuel use
- Fugitive emissions, as available (refrigerants, etc.)
- Scope 3 data
 - Employee travel
 - Commuter travel
 - Contractor emissions
 - Waste disposal
 - Supply Chain, etc

- What am I Using?
- What is My Influence?
- How Does My Performance Compare?

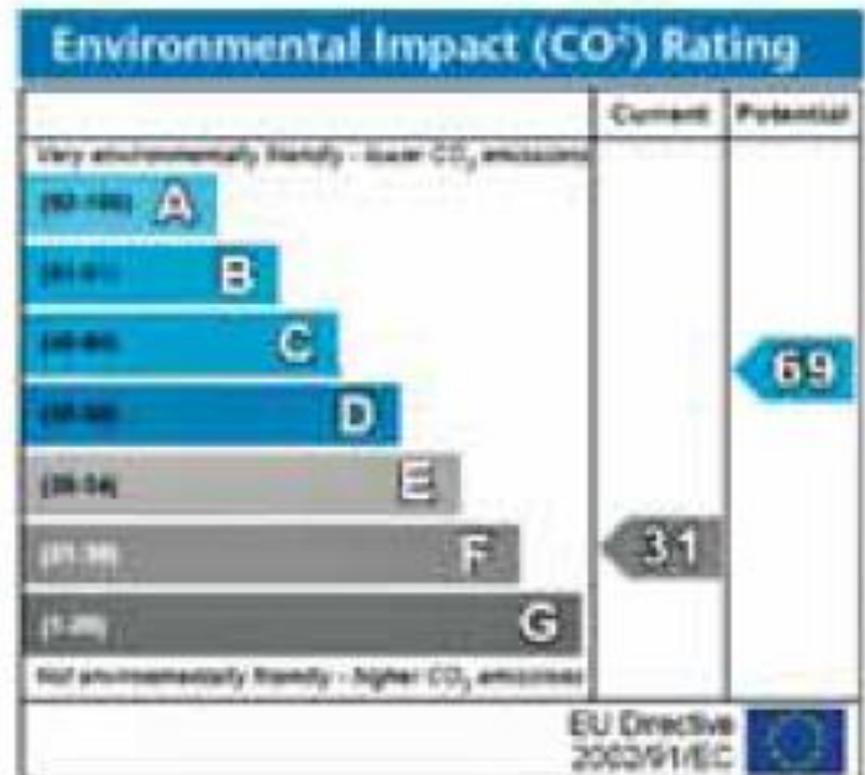
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Measurement

- Energy Intensity
- Fuel Source
- LEED
- Building
- Organization
- GHG Emissions
- Fuel Result
- LEEP
- Portfolio
- Enterprise...Country

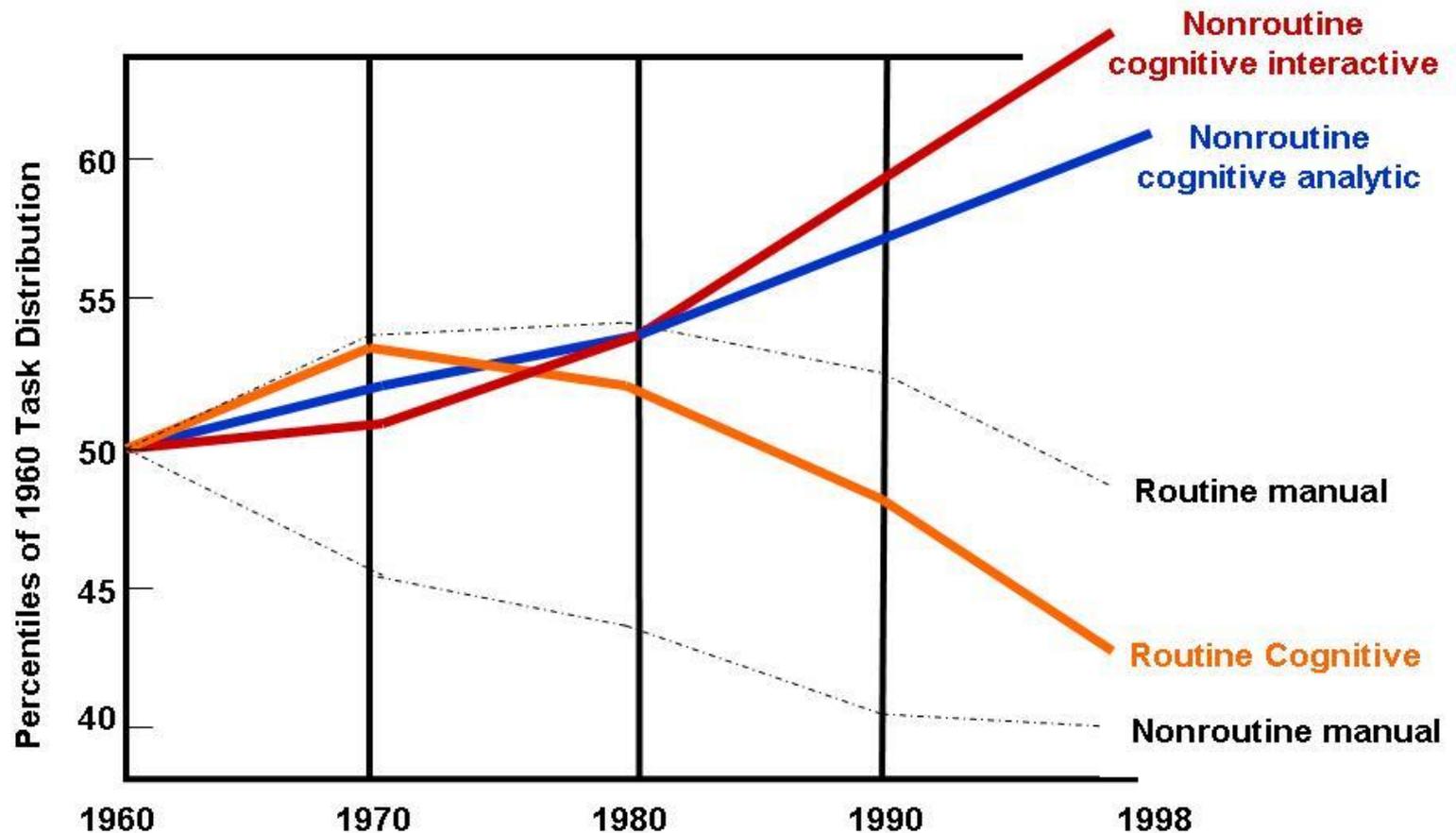


The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills will be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Changing World of Work



What if the Office Were More Like the New Zoo?

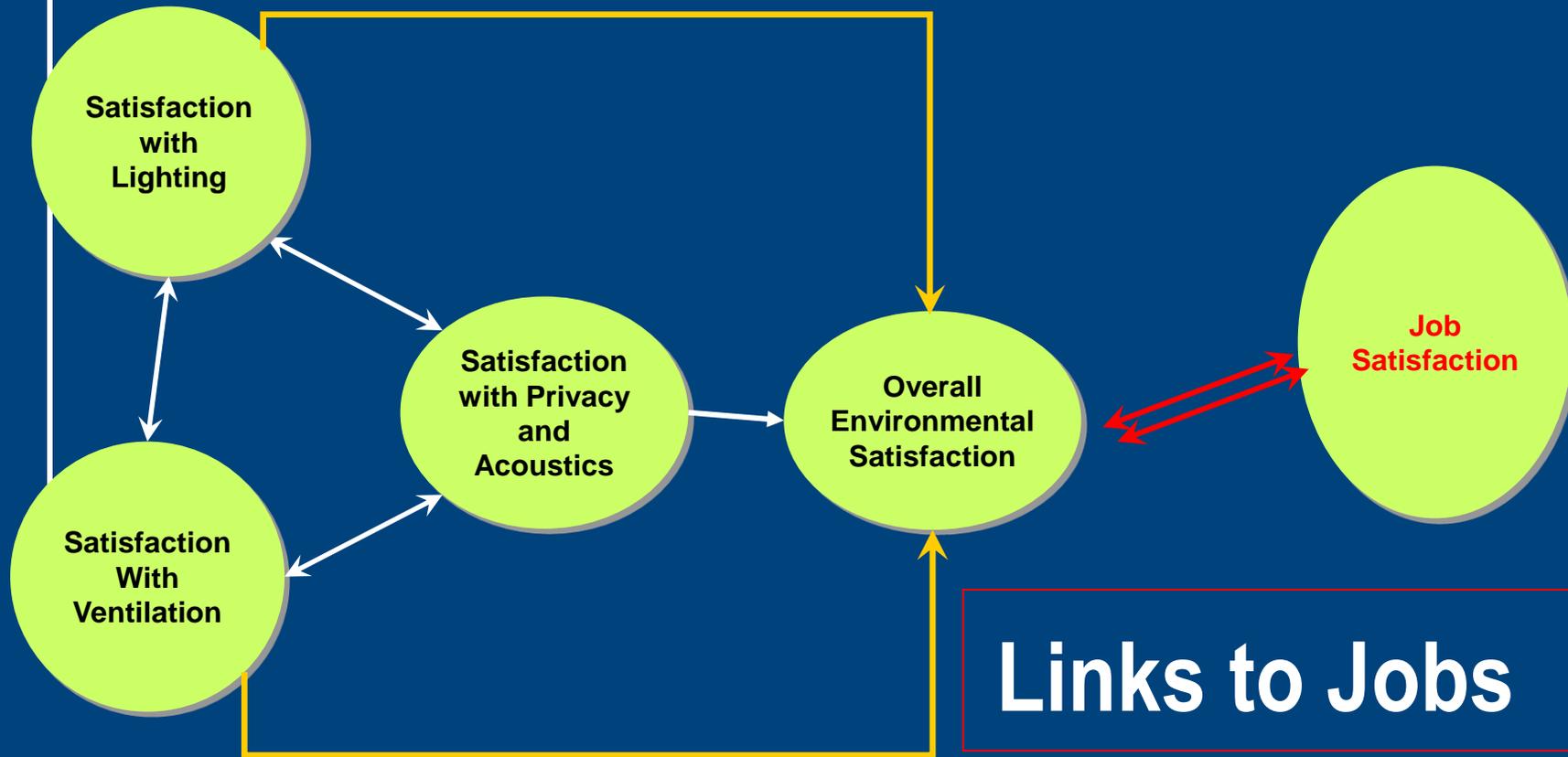


Credit: Judith Heerwagen

Principles of the New Zoo

- Look Beyond Survival to Well-being
- Design for Emotional and Psychological Well Being As Well As Function
- Understand the Animal's Naturally Occurring Behaviors and Needs
- Give the Animal More Control Over Its Behaviors and Environment

Links to Job Satisfaction

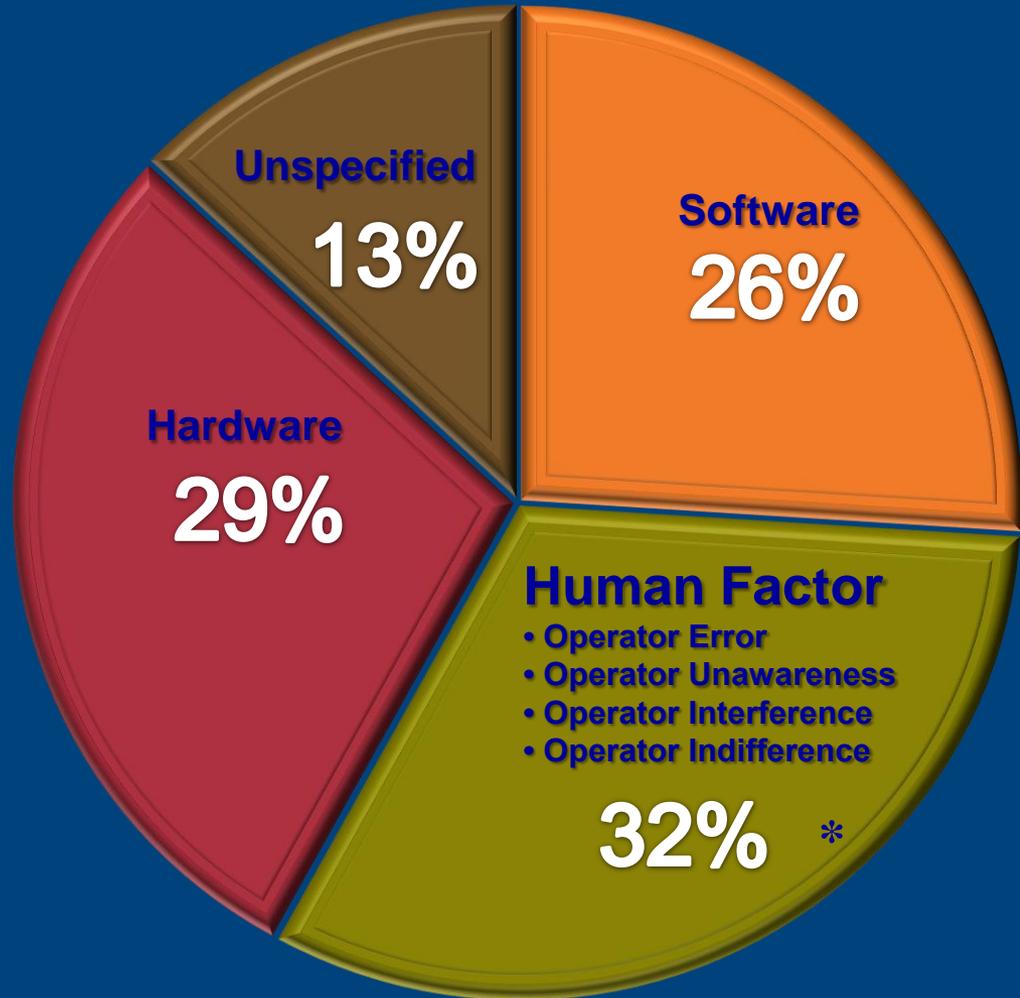


Targeted Opportunities!

**Hardware &
Software
(Technology)**

**Behavior
(People)**

**Operational
“unawareness”
(Buildings)**



Work Is What You Do, Not Where You Are: Mobile Work

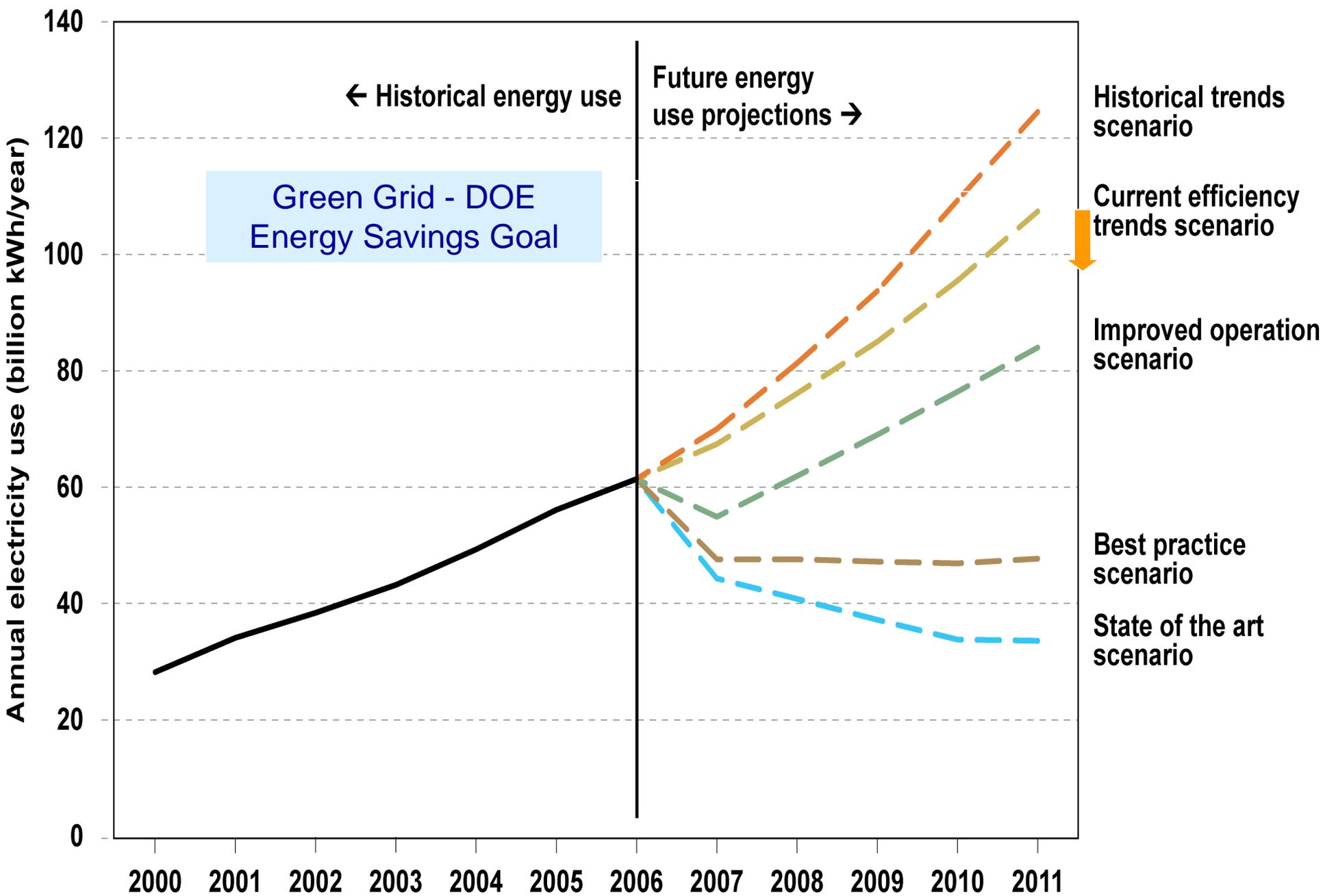


Context:

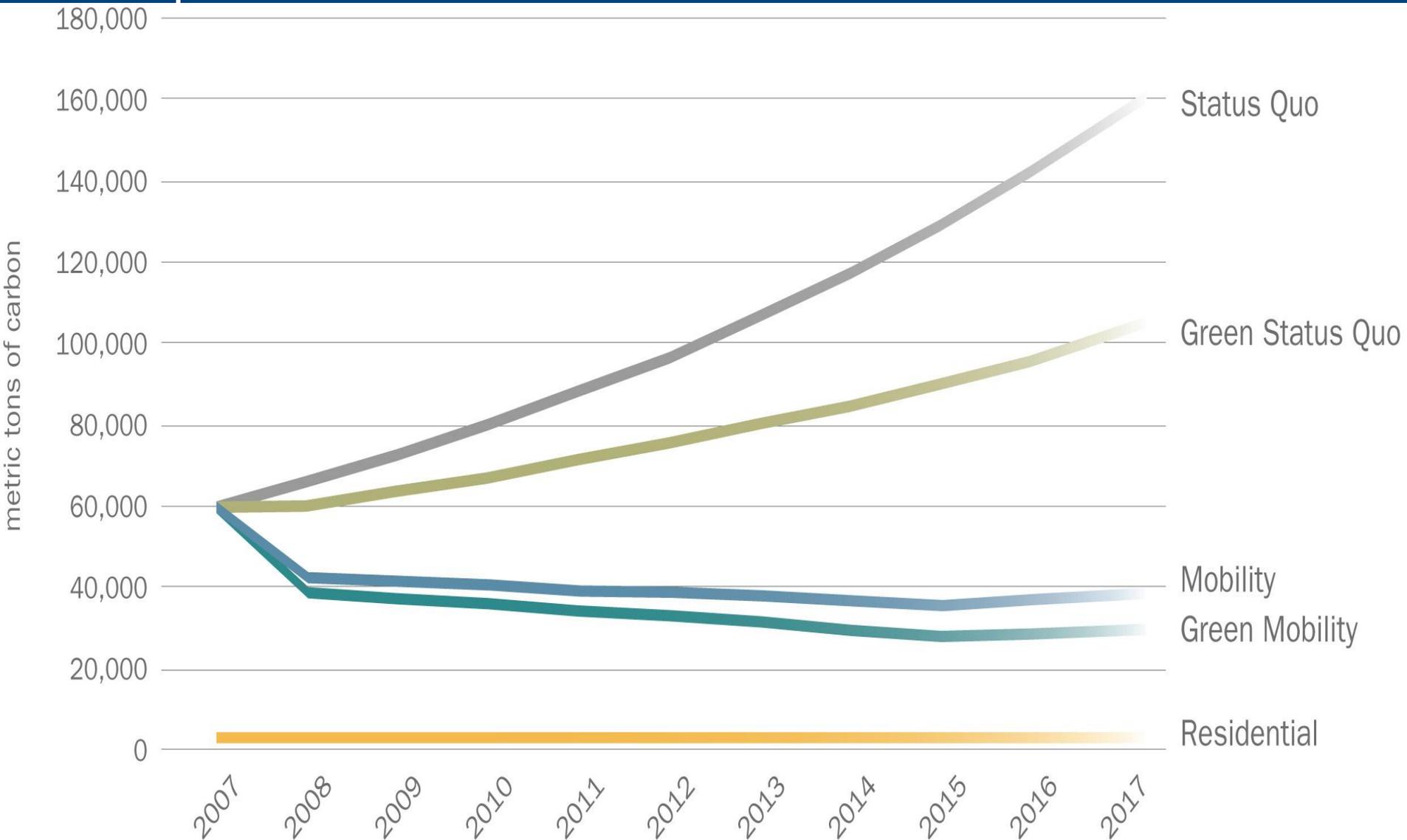
- Executive Order 13514: the need for an integrated strategy to reduce environmental impacts
- Presidential Memorandum: Disposing of unneeded Federal real estate
- New Ways of Working – mobile, internet based, adaptive

Opportunity:

- reduce environmental impacts
- cut costs
- improve space use
- create more effective ways of working—individually and in teams



Holistic Thinking—It's Not About the Building



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American Recovery & Reinvestment Act

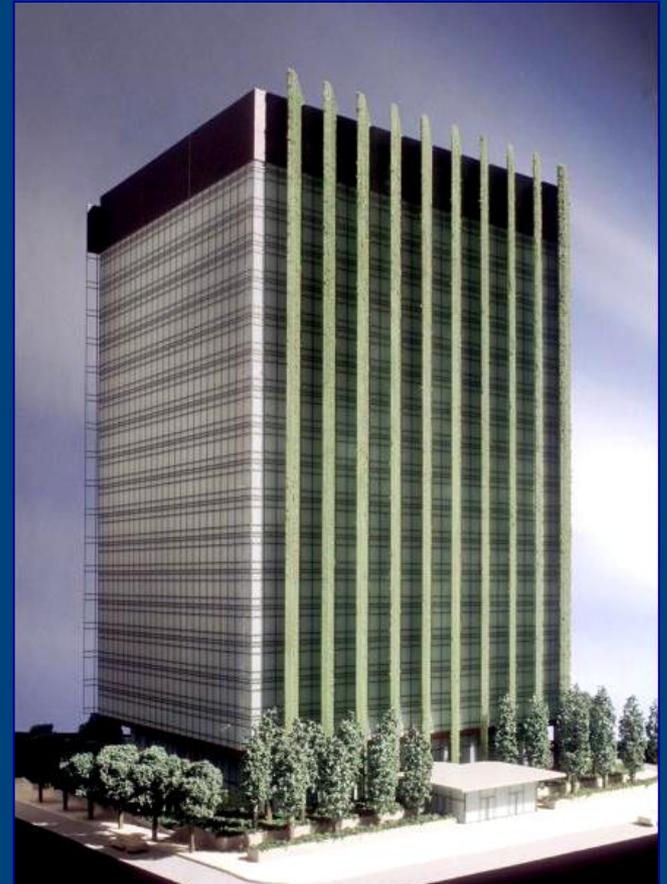
- \$5.5 Billion
- \$4.5 Billion for Existing Buildings
- 261 Projects; 50 States, 2 Territories & DC
- Jobs
- High-Performance Green Buildings

Broad Range of Opportunities and Challenges

- 1975 Federal Building
- Never Upgraded

Plan:

- Updating Cutting Edge 'Green' Design
- \$133 M from Recovery Act
- Full Building Modernization
- High Aims for Sustainability and Curb Appeal
- Construction procurement underway



Broad Range of Opportunities and Challenges

- Historic 1917 Building
- Last Upgraded in 1935

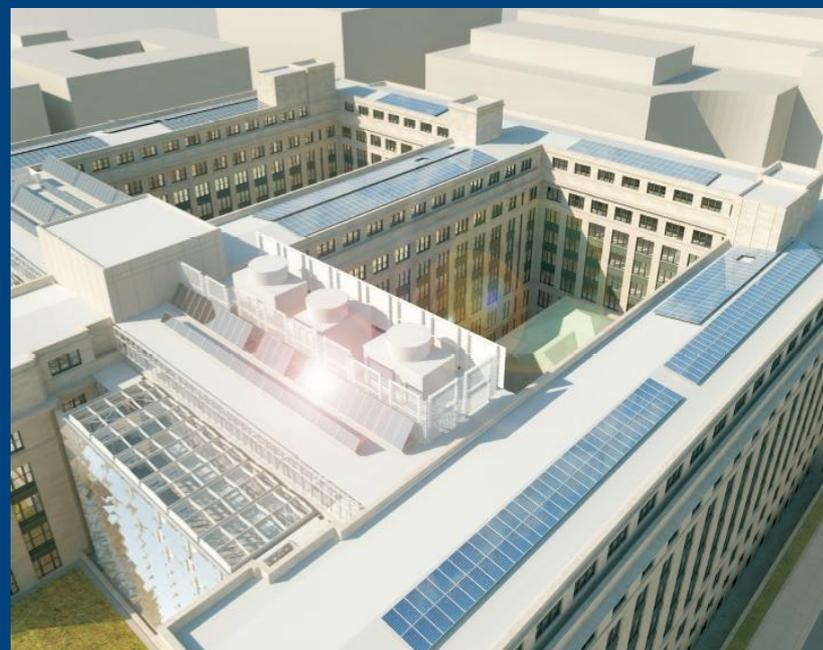
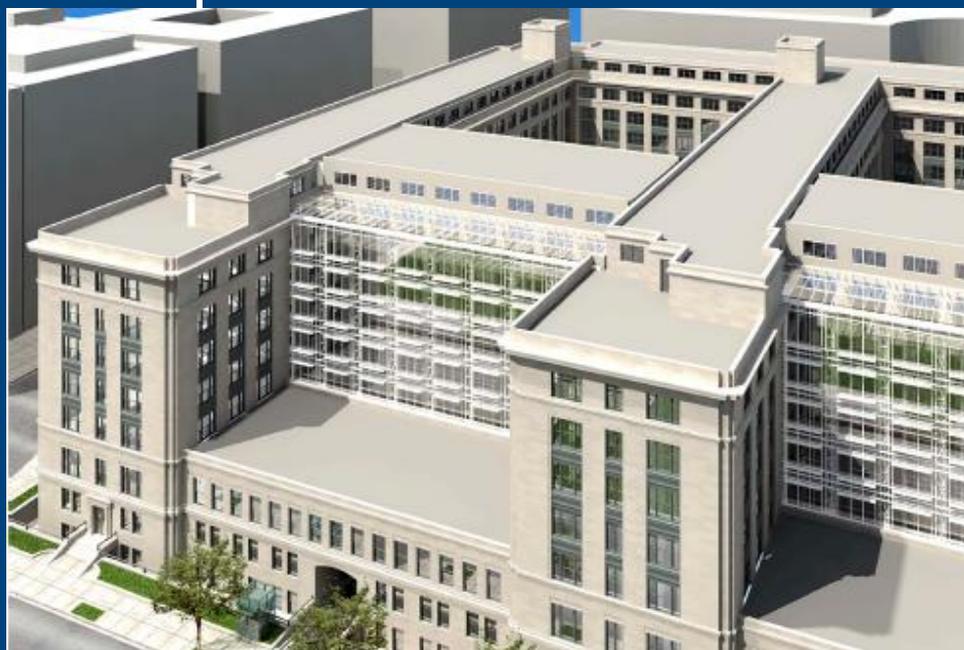
Plan:

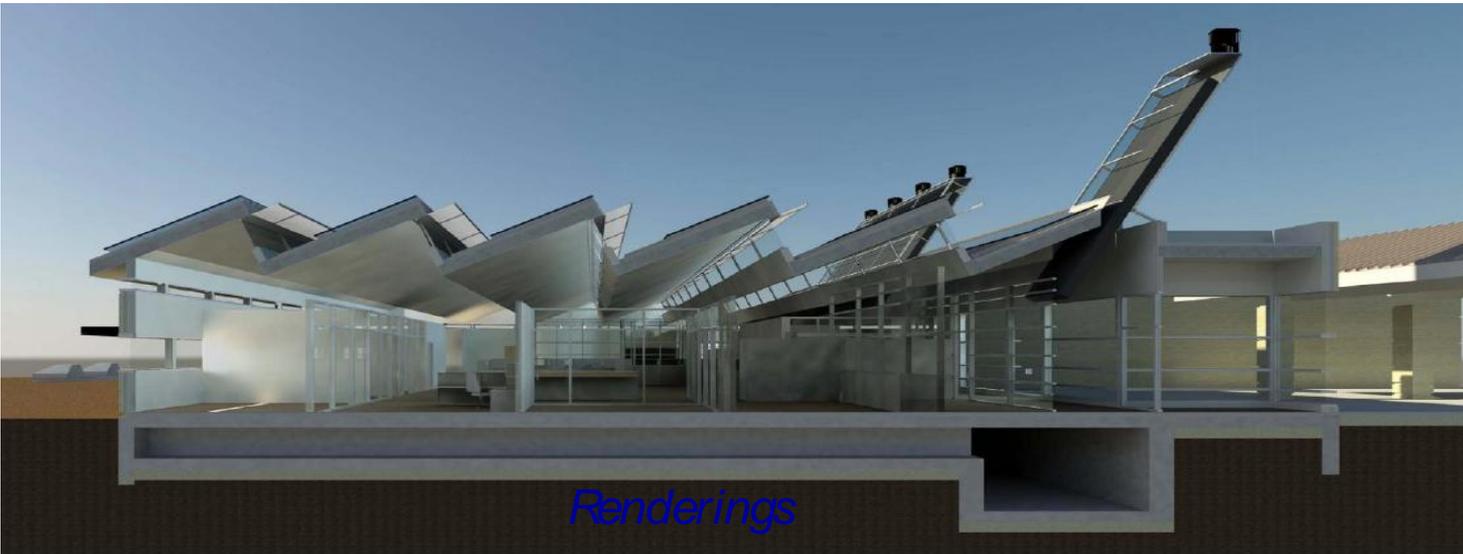
- Modernization with Infill
- \$161 M from Recovery Act, as Phase I
- Must Redesign for Energy Goals
- Future Funding Needed for Phase II



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1800 F Renderings



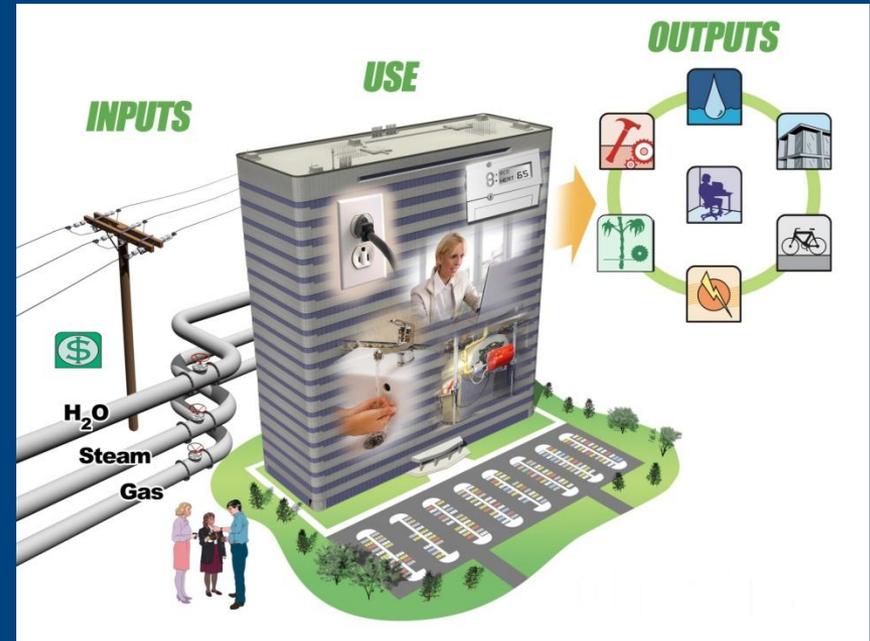


- Standard Specifications & Scopes
- Performance Results
- Metering & Sub-Metering by Sub-System
- Change to Tenant Sub-Metering?
- Commitments Are Visible (*Transparency*)
- Performance Will Be Tracked & Published
- “Proving Ground”

***ALL Available on the Whole Building Design
Guide***

POE: Industry Standard Metrics Collected, Normalized, and Analyzed

- Water
- Energy
- Maintenance & Operations
- Waste Generation & Recycling
- Occupant Satisfaction
- Occupant Commute



GSA

Results: Green Buildings Perform Better & Cost Less

	Phase 2	Phase 1
 Domestic water use	- 11%	
 Energy use	- 25%	- 26%
 Operating costs	- 22%	- 13%
 General building satisfaction	+ 21%	+ 27%
 CO ₂ equivalent emissions	- 34%	- 33%

- **Leased Construction Requirements**
 - *Meet the Same Requirements as for Federal Construction*
- **Leased Space**
 - Sample Green Lease Clauses For Sustainable Fit-out (In Draft Today)
 - Designed To Achieve The Guiding Principles Application To Existing Buildings
- **Upcoming Requirement Pursuant To EISA – December 2010**
 - Federal Leases Over 10,000 SF, With A Few Exceptions, Must Be In ENERGY STAR® Labeled Buildings.

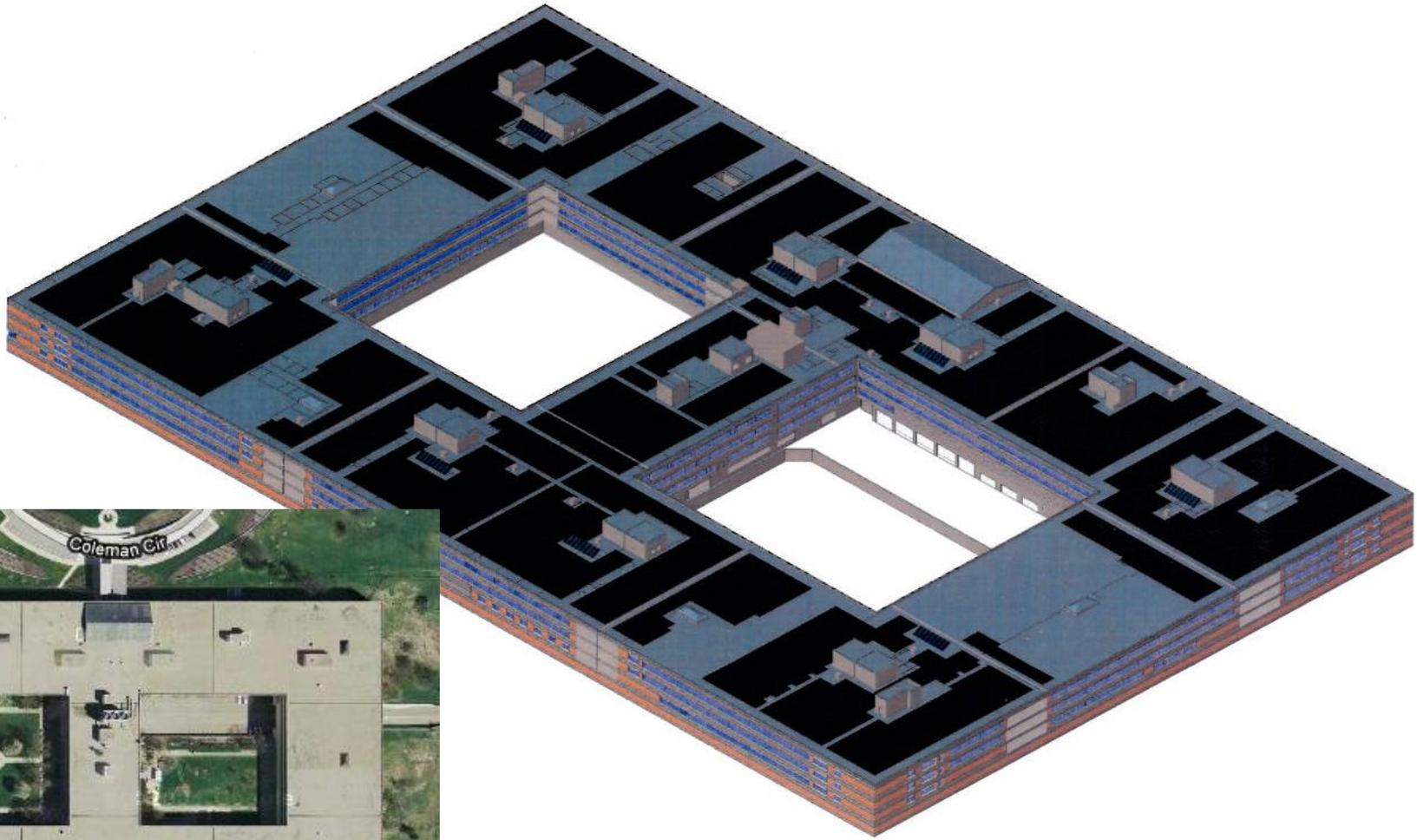
Education & Awareness

- Engaging Tenants In Sustainable Office Practices:
 - Space Utilization Requirements
 - Improvements in Workplace Effectiveness
 - Use Of Power Management Features In Electronic Equipment
 - Participation In Recycling Programs
 - Sub-Metering of Tenant Uses
 - Shared Incentives
 - Increased Measurement (e.g., Waste)
- Initiatives To Provide Tenants With Data And Recommendations To Increase Environmental Efficiency

- Geothermal
- Light
- Controls
- Envelope
- Wind
- Solar
- Roofs
- Natural Ventilation



GSA Emmett Bean—4 Solar Comparison



① ELECTRICAL ROOF ISOMETRIC VIEW
Scale: N.T.S.

What's Next?

- How Will Energy Savings Performance Contracts Deliver Net Zero Retrofits?
- Levers for Change
- Simple Steps to Apply What We KNOW from Research Completed
- Integrated Project Delivery
- Sustainable Facilities Tool



A one-stop portal to empower any government or private sector user to identify and prioritize cost-effective green building strategies that will lead to improved environmental performance in small building projects.

Targeted User Community:

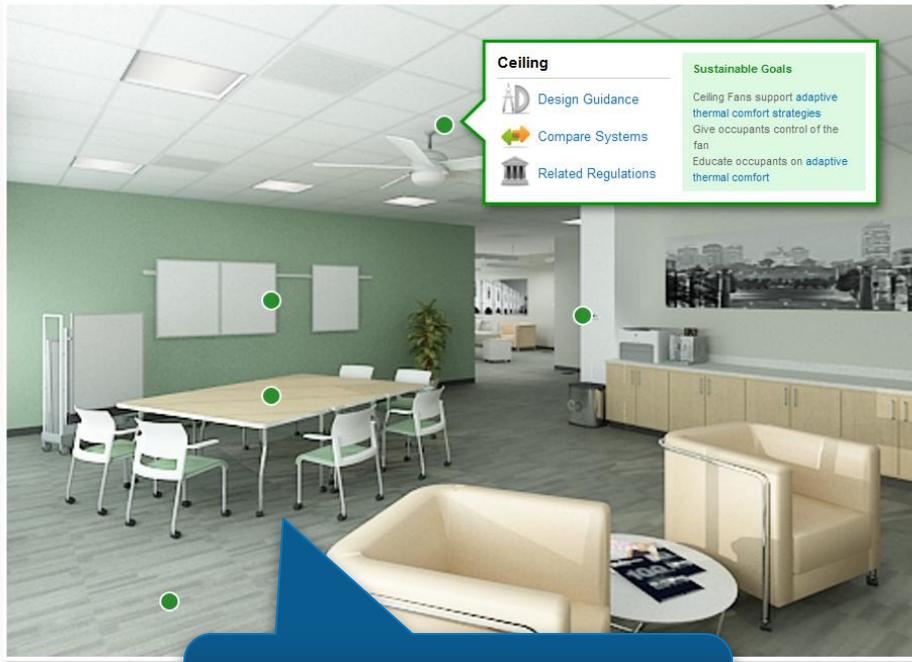
- Facility Managers
- Realty Specialists
- Project Managers from Governmental Agencies
- Private Sector Developers

Open Teaming Space

Teaming spaces are designed to foster collaboration and innovation with tools for information sharing, easy to reconfigure work surfaces where groups can spread out the work, and vertical surfaces for making work visible. Seating is agile and passively ergonomic; to move around the space easily and comfortably. Configure space with privacy screens to surround team members and allow them to brainstorm freely without disrupting others. Energy savings are maximized through the use of occupant sensors for powering down lamps and temperature when movement is not detected and automatic lighting controls for light dimming based on time of day and available daylight.

Click on a hotspot to learn sustainable strategies and compare materials for that system

Change View



3-D Interactive Walkthrough of Office Interiors

Key Features:

- Valuable resources for **sustainable building principles and concepts**
- **3-D interactive walkthrough** of office interiors & **material comparisons**
- **Sustainable metrics, essential regulations & guidelines**, and case studies
- **Take-away checklist** for tracking sustainable design
- **Intuitive and easy-to-navigate** user interface

Open Teaming Space

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Click on a hotspot

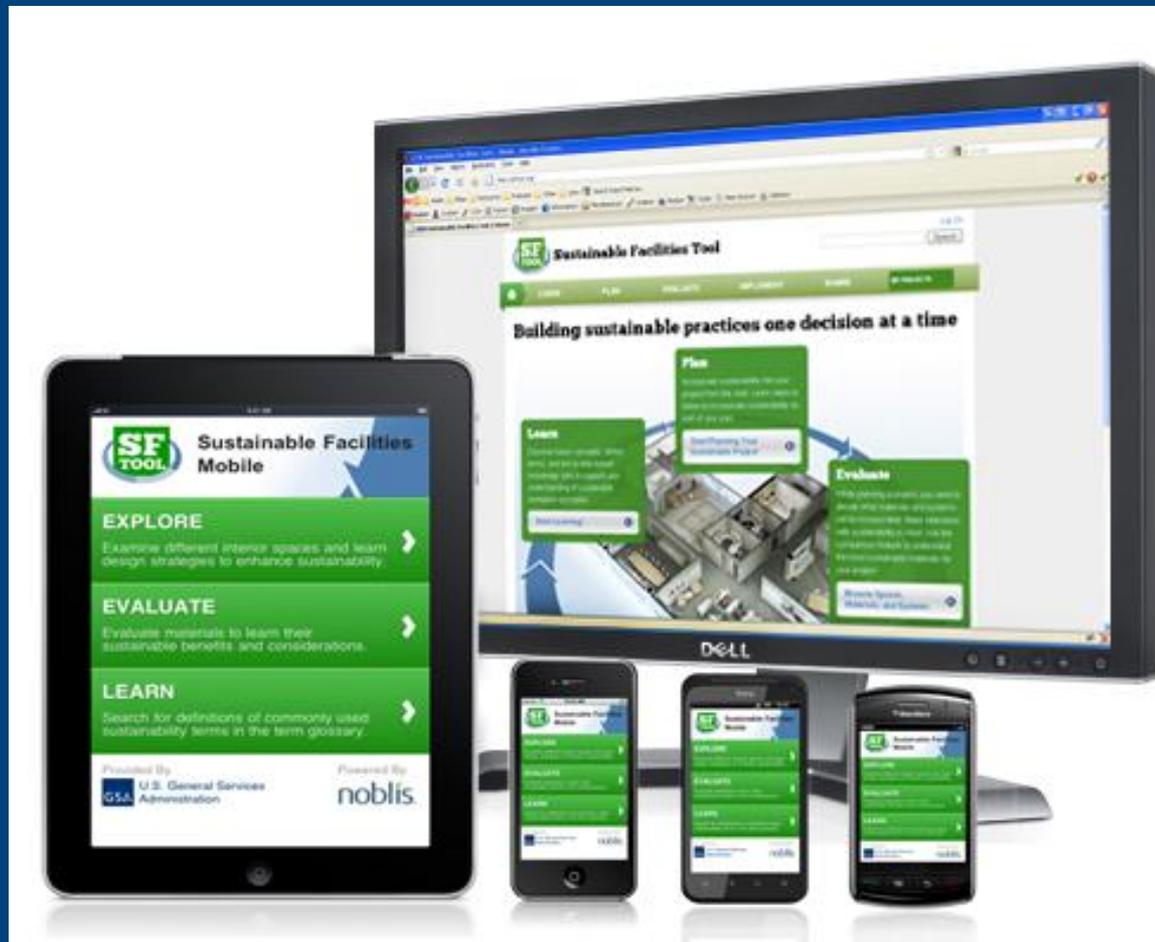
	Wood Flooring	Cork	Bamboo
Description	There are many different species of wood and types of wood flooring including reclaimed , suppressed , and wood from responsibly managed forests .	Cork flooring is made from the by-product of cork oak trees. The bark can be stripped without introducing damage to the tree.	Bamboo is a grass that has a short growth cycle and continues to grow after it is cut without replanting or cultivating. Durability is dependent upon the maturity of the bamboo. Bamboo provides for extremely durable commercial grade floors when fully mature, usually 8-10 years.
IEQ	Wood Flooring	Cork	Bamboo
Pollutants	✔ Does not retain pollutants, easy to clean	✔ Does not retain pollutants, easy to clean	✔ Does not retain pollutants, easy to clean
VOC - Binders, Adhesives, Finishes	ⓘ VOC emitting products are used during finishing of material or system. Ensure that low-VOC finishes are used. Use nails or staples to install.	ⓘ VOC emitting products are used during production , installation and finishing of material or system. Ensure that low-VOC adhesives, binders and finishes are used.	ⓘ VOC emitting products are used during production and finishing of material or system. Ensure that low-VOC binders and finishes are used. Use nails or staples to install.
Ergonomics	✖ Wood flooring is hard and therefore does not provide ergonomical benefits.	✔ Consider installing in areas of the building where occupants primarily stand, such as a mail room, security, or possibly break room to help alleviate foot pain as cork can naturally compress and absorb pressure.	✖ Bamboo is a hard material that does not provide ergonomic benefits
Acoustical	✖ May contribute to noise pollution	✔ Provides acoustical benefits due to over 100,000 cells per cubic inch which absorb and so	✖ May contribute to noise pollution
Air Quality, Maintenance	ⓘ Typically requires waxing and buffing, and may require sanding and refinishing. Look for low VOC products.	ⓘ Re	

Comparison feature provides benefits and considerations for each option selected

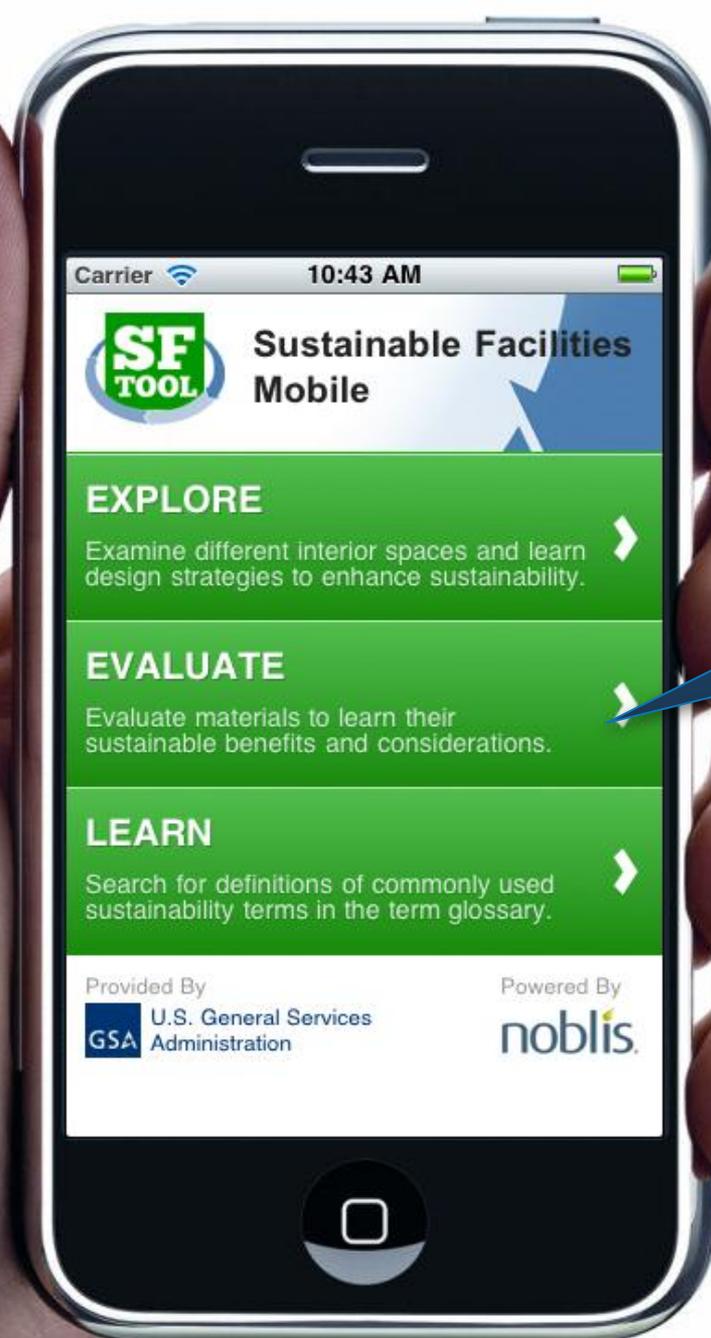
Key Benefits:

- Empowers decision-making for **sustainable goals & objectives** to meet the Guiding Principles
- Promotes the use of **energy efficient, sustainable design** and **environmentally preferable materials** in renovations, alterations & leases
- Enhances skill sets to assess **green leases & architect/design team deliverables**
- **Supports green practices** throughout the life of a facility

- Provides decision-making resources optimized for your hand-held device
- Increases public accessibility to SF Tool resources
- Free to all users



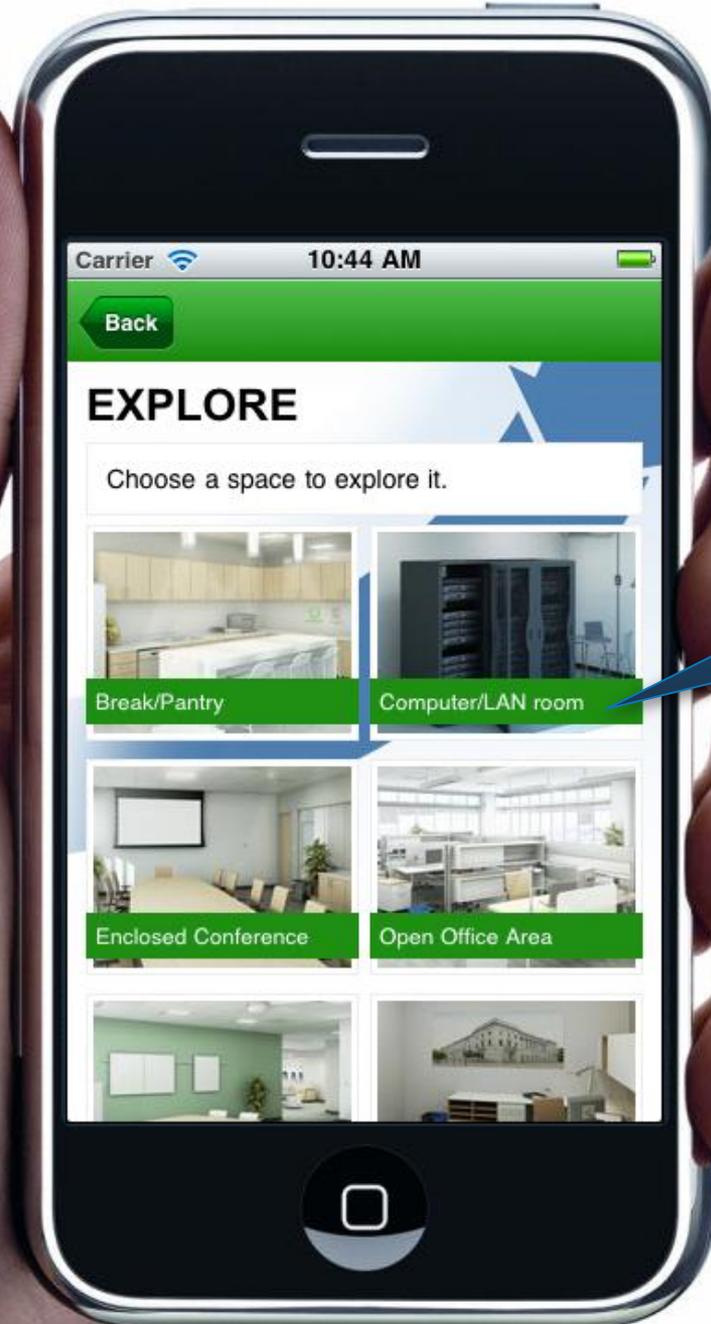
SF Mobile Home



Application interface is optimized for touch-enabled operations, allowing for quick and intuitive navigation

Explore

Interior Space Types



Explore up to 10 office space interiors to learn context-specific sustainable strategies

Federal Buildings Personnel Training Act of 2010

Jobs: O & M, Energy Management, Safety and Design; Skill Sets including Sustainability, Water efficiency, Safety, Performance Measurement.

- Core Competencies
- Key Jobs
- Certification
- Training Curriculum

Achieving High-Performance Federal Facilities

- The National Academies recently released expert panel report “*Achieving High-Performance Federal Facilities: Strategies and Approaches for Transformational Change*”
 - Commissioned by GSA’s Office of Federal-High Performance Green Buildings
- Calls for bold thinking and specific reforms to transform Federal facilities into high-performance green buildings

Why the Report Matters

- **We can't get from the status quo to sustainability with incremental steps**
 - We've taken some of the easy steps already
 - Need to identify and target *levers* to spur transformative change
- **Meet ambitious goals to green Federal buildings set by Congress and the White House**
- **Need to Lead: The Federal government was an early adopter of green building – we need to spur the market again, to more profound change.**

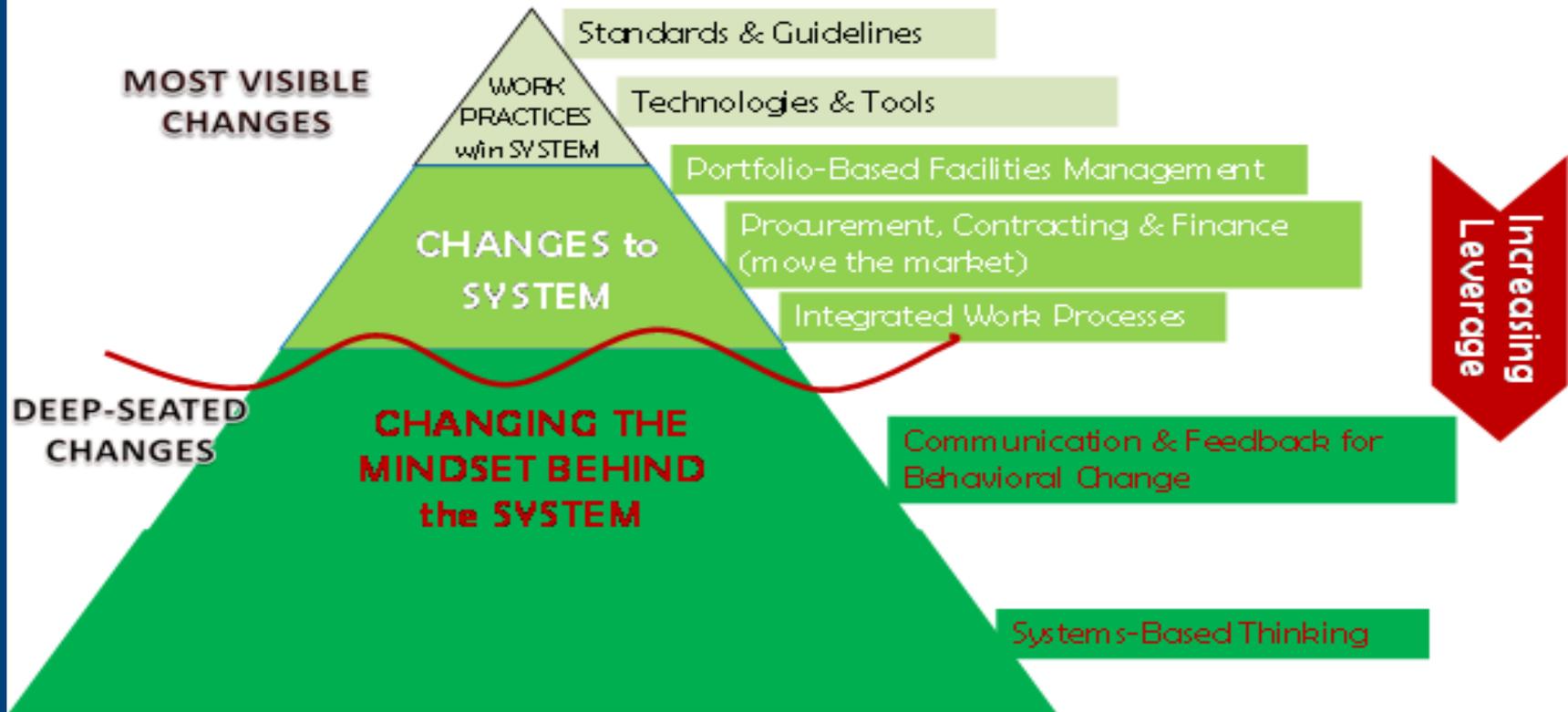
Challenges and Barriers

- Excess facilities that siphon off constrained resources
- The federal budget process
- Segmented processes that sub-optimize resources
- Lack of alignment between reporting requirements & performance measurement systems
- Perceived higher costs of building “green”
- Workforce skills & training
- Deploying innovative technologies for high-performance buildings on a widespread basis
- Gaps in knowledge on a range of topics & technologies

Levers for Change

1. Systems-Based Thinking
2. Portfolio-Based Facilities management
3. Integrated Work Processes
4. Procurement, Contracting, and Finance
5. Communication and Feedback for Behavioral Change
6. Standards and Guidelines
7. Technologies and Tools

The Levers & Systems Thinking



Strategic Goal

Create a clean energy economy that will increase our Nation's prosperity, promote energy security, protect the interests of taxpayers, and safeguard the health of our environment.

Contact & Sources

- Kevin Kampschroer & Michael Bloom
Office of Federal High-Performance Green Buildings, US GSA



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- wbdg.org

- SFTool.gov

- N A S Report: