Jones Lang LaSalle

Real value in a changing world

New directions in energy and green buildings

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Increasing motivation to go green

Converging forces

Mass acceptance of global warming and climate change

Rising energy prices

Widely accepted green building standards

Emerging regulation

Possible cap-and-trade on GHG emissions

Employee pressures

Opportunity

Reduced operating costs

Improved productivity and quality

Talent recruitment and retention

Risk mitigation

Holistic view beyond buildings

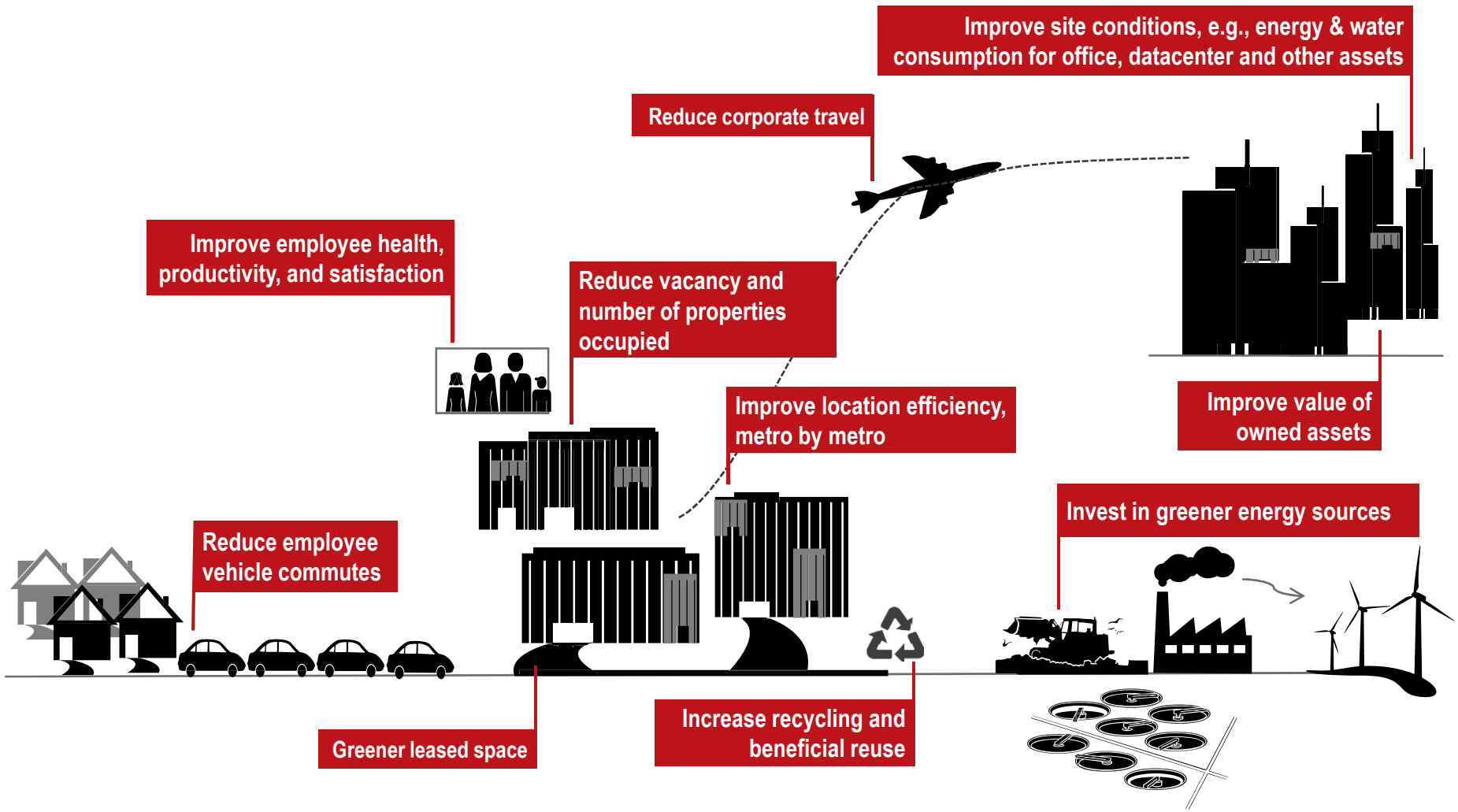
How and where people work

How they get to work

How your buildings are built

How your buildings are operated & maintained

Companies are thinking outside the building



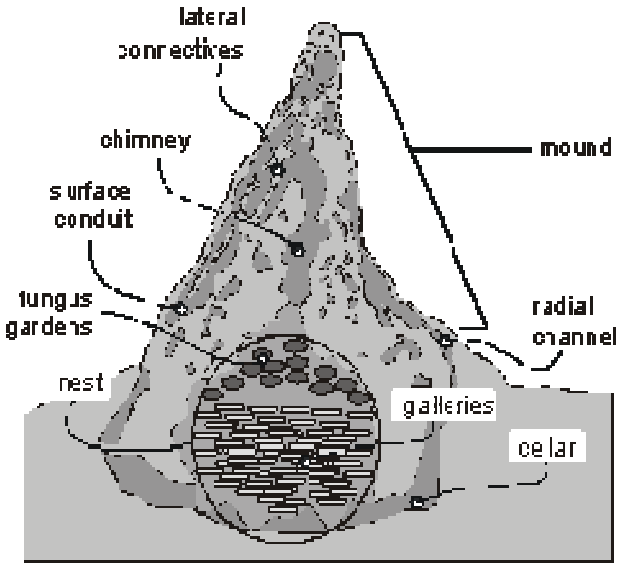
Innovations in technology

VS.

Switchable glass

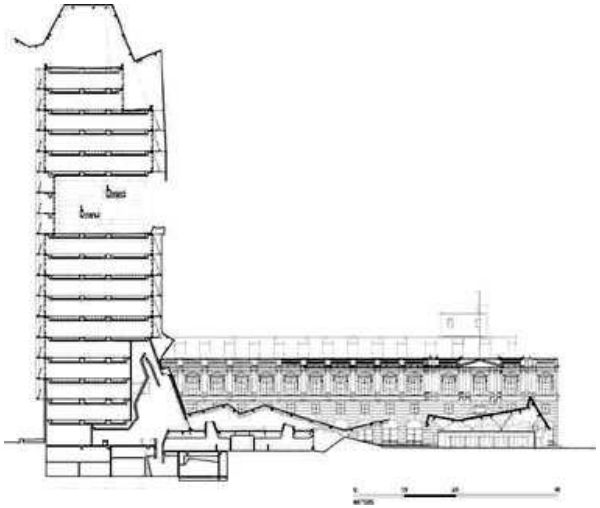
Biomimicry

Looking at the structure of termite mounds to create buildings which regulate their internal environment with no need for air conditioning.

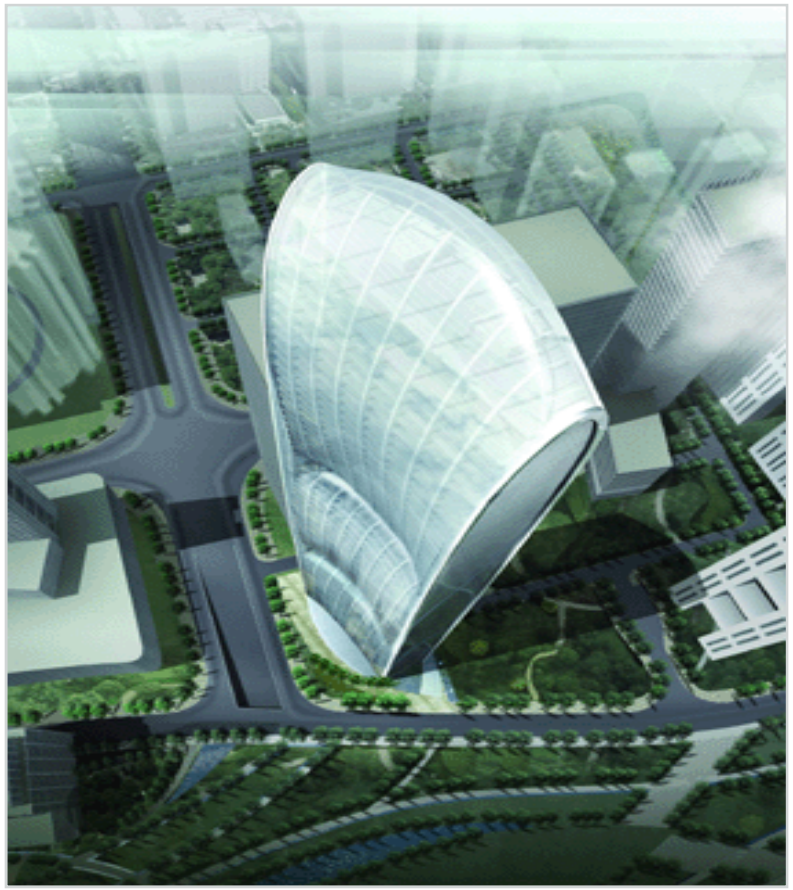


GSA Building – San Francisco

- Naturally Ventilated (A living skin)
- Skip Stop Elevators
- 85% Occupant Views
- 85% of Workspace Illuminated with Natural Light

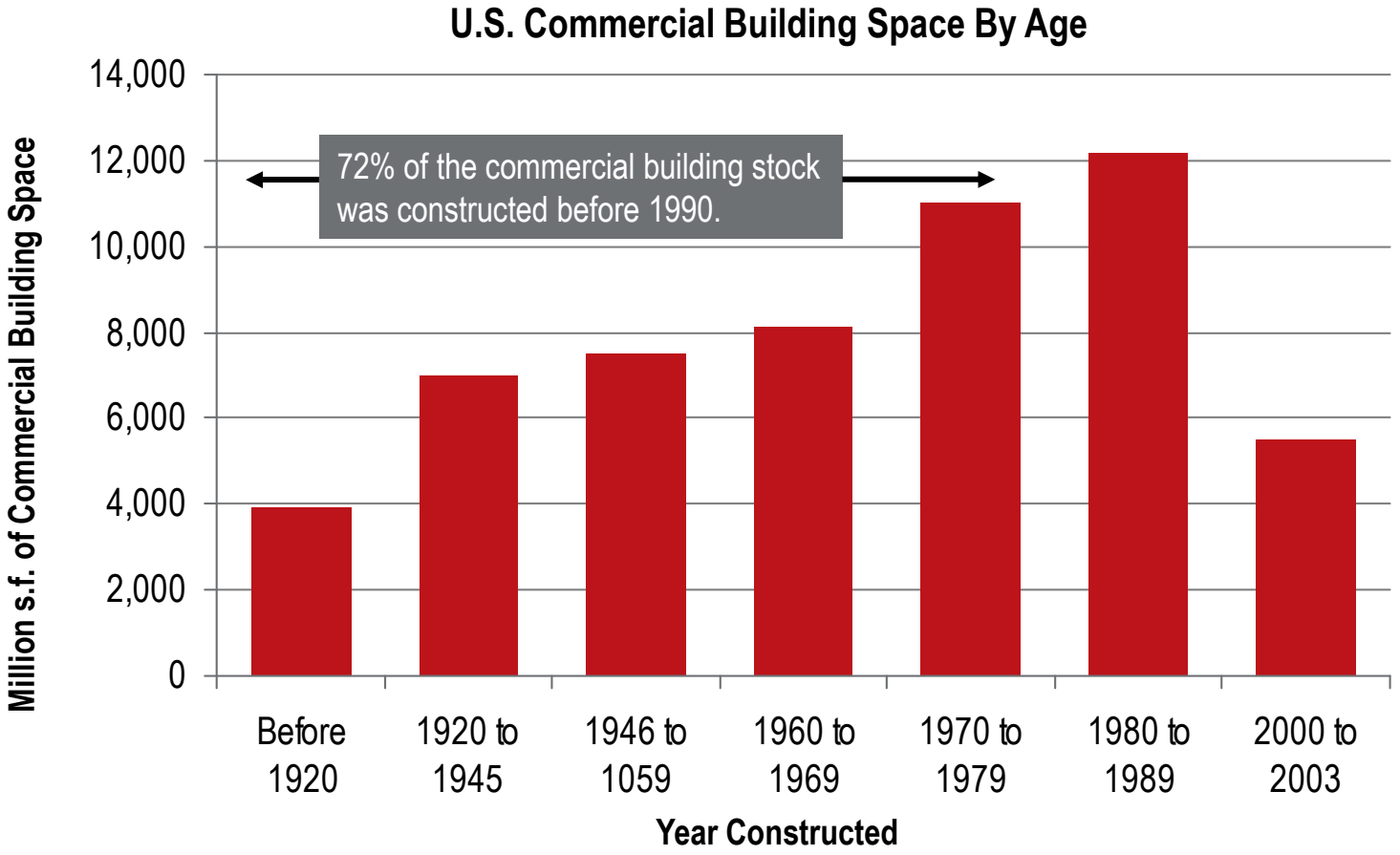


SOM building in China



Existing buildings are the majority

Nearly 75% of the U.S. commercial building stock is over 20 years old.



Source: EIA data - http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003pdf/c3.pdf

The new gold standard is green

The Empire State Building, an iconic, pre-war trophy office building, can catalyze change by cost-effectively reducing greenhouse gas emissions while attracting world class tenants.

Recognized throughout the world

3.8 million visitors per year

102 stories and **2.8 million** square feet

CO_2 emissions of **24,000 tons** per yr

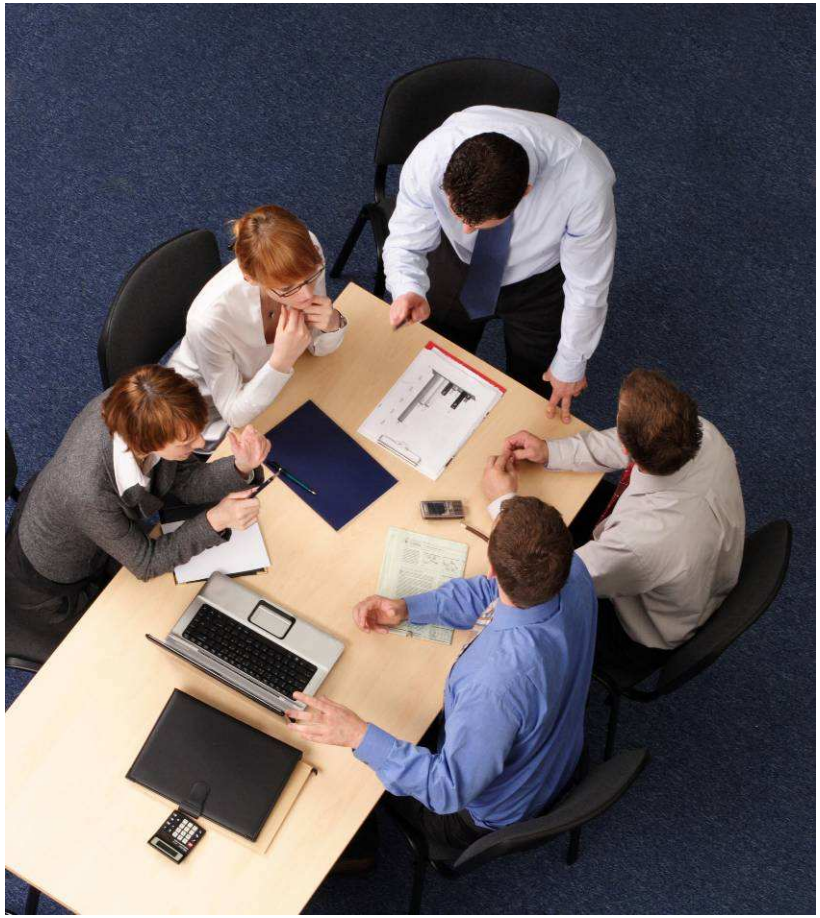
$11 million in annual energy costs

Peak **office building** demand of **9.5 MW**

88 kBtu per SF per yr for the office building

A new approach for optimal results

- Assemble a collaborative team of world-class sustainability and energy specialists
- Develop an optimal solution through a four phase iterative process and rigorous cost-benefit analysis
- Leverage industry leading tools and standards, and develop new ones:
  - LEED
  - Energy Star
  - Green Globes
  - eQUEST
  - Energy Modeling Tool
  - Sustainability Metrics Tool (GHG/CO2)
  - Financial Modeling Tool



Process of elimination

Identify Opportunities

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

Evaluate Measures

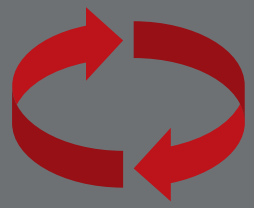
- Net present value
- Greenhouse gas savings
- Dollar to metric ton of carbon reduced
- Calculated for each measure

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

Model Iteratively

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

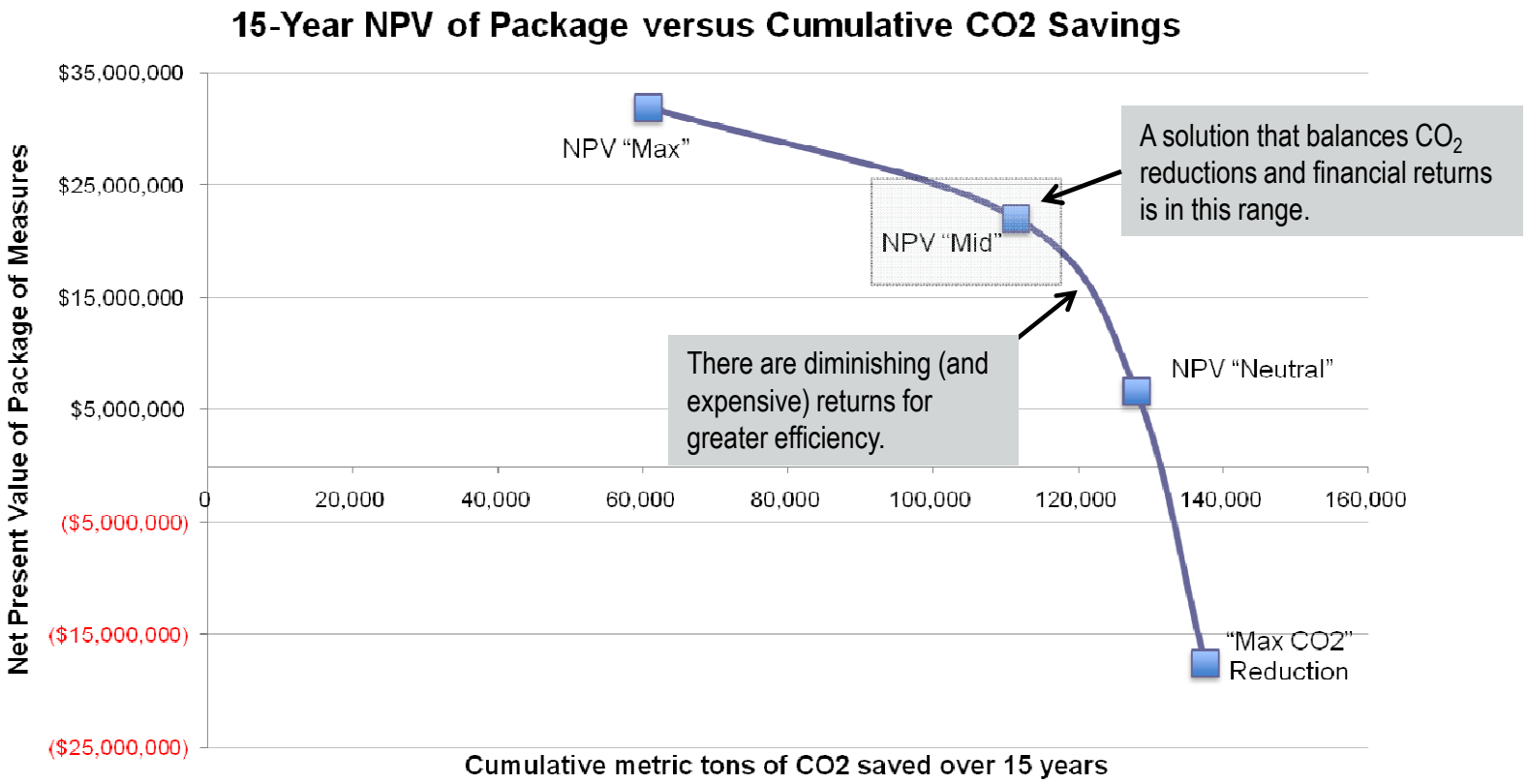


Methodology

Phase I: Inventory & Programming	Phase II: Design Development	Phase III: Design Documentation	Phase IV: Final Documentation
Key Outputs:			
• Baseline Capital Projects Report: $244 • Projected JCI performance contract budget: $27m	• Baseline Energy Benchmark Report ($11.3m annual energy cost without broadcasting)	• Tenant Initiatives (pre-builts, design guidelines, energy management) Report • Tuned eQUEST model	• Model (eQUEST, financial, GHG) outputs • Integrated Sustainability Master Plan Report (including Energy Master Plan)

Key findings

ESB can achieve a high level of CO_2 and energy reduction cost-effectively.



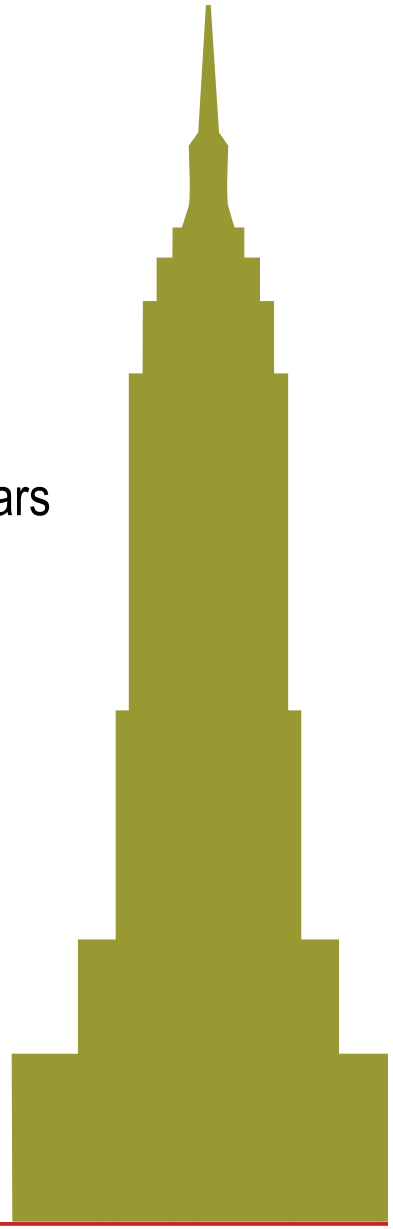
Eight select improvements for the greatest impact

- **Window Light Retrofit**: Refurbishment of approximately 6,500 thermopane glass windows, using existing glass and sashes to create triple-glazed insulated panels and dramatically reduce summer heat load and winter heat loss.
- **Radiator Insulation Retrofit**: Introduction of insulation behind radiators to reduce heat loss and more efficiently heat the building perimeter.
- **Tenant Lighting, Daylighting and Plug Upgrades:** Introduction of improved lighting designs, daylighting controls, and plug load occupancy sensors in common areas and tenant spaces to reduce electricity costs and cooling loads.
- **Air Handler Replacements**: Replacement of air handling units with variable frequency drive fans to allow increased energy efficiency in operation and improved comfort for individual tenants.
- **Chiller Plant Retrofit:** Reuse of existing chiller shells while removing and replacing "guts" to improve chiller efficiency and controllability, including the introduction of variable frequency drives.
- **Whole-Building Control System Upgrade**: Upgrade of existing building control system to optimize HVAC operation as well as provide more detailed sub-metering information.
- **Ventilation Control Upgrade:** Introduction of demand control ventilation in occupied spaces to improve air quality and reduce energy required to condition outdoor air.
- **Tenant Energy Management Systems**: Introduction of individualized, web-based power usage systems for each tenant to allow more efficient management of power usage.

The results

The plan is projected to:

- Reduce energy use by up to 38 percent, an annual savings of $4.4M
- Reduce carbon emissions by 105,000 metric tons over the next 15 years
- Be funded through energy and operational savings
- Be complete within two years
- Serve as a model for owners of existing buildings



Innovations

- *Right steps in the right order* – holistically approach all building systems
- Utilize existing tools and create new ones
- Transparently demonstrate how a retrofit can cost-effectively achieve 35 percent energy savings to serve as an model for existing buildings
- Design a pre-built office suite to showcase the link between base-building and tenant space improvements in accelerating a building's progress towards sustainability goals

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