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Meeting the Challenge: Strategies for Buildings

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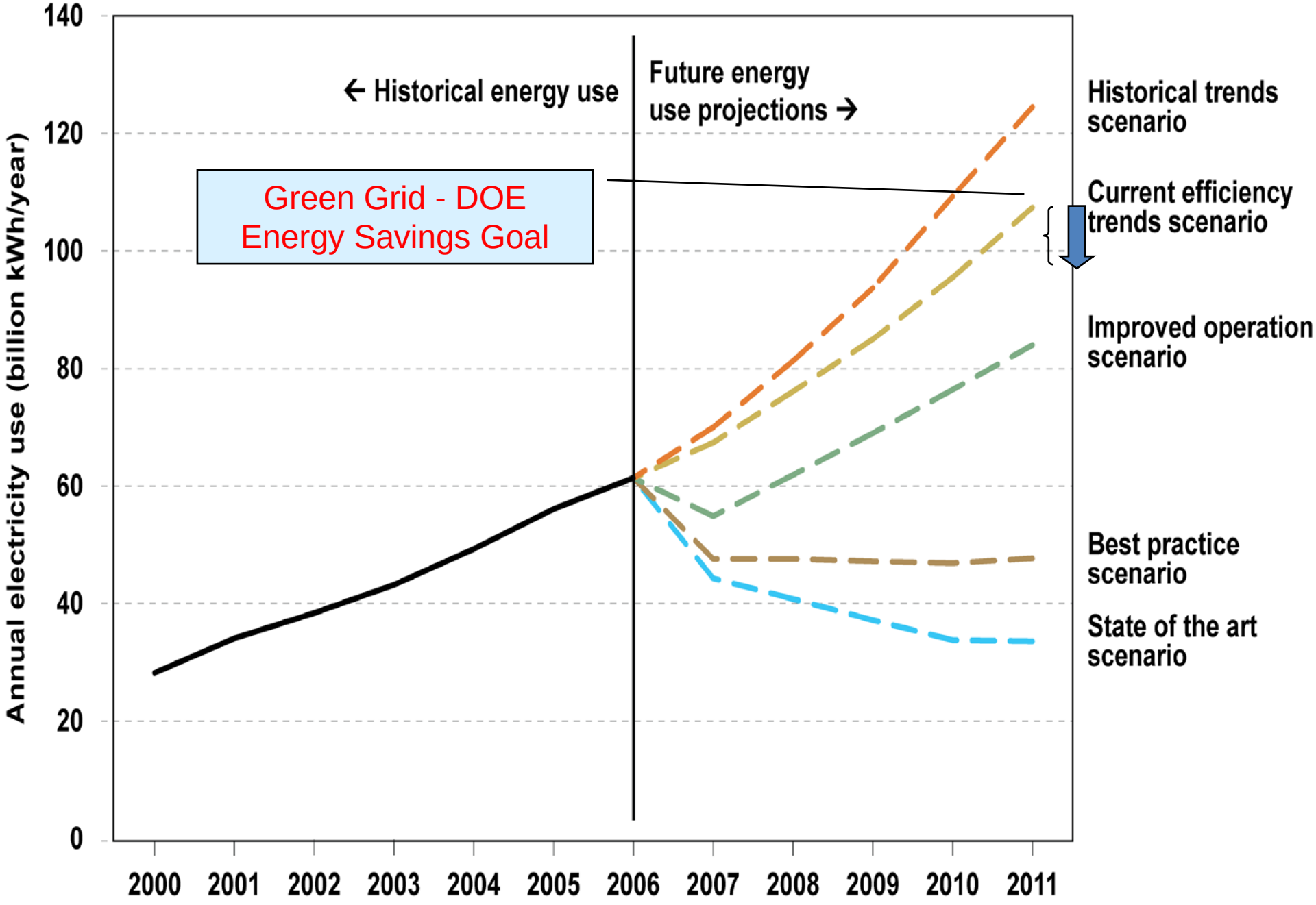
GHG Emissions – Scopes 1 & 2

- Baseline:
  - 2.4 million MtCO2 (FY 2008)
- Goal:
  - 28.6% Reduction by FY 2020 (FY 2008 baseline)
  - 28.7% from Buildings (Fleet Gets Worse)
- 99% of GSA's GHG emissions come from energy consumption in Federal buildings and leased space (FY 2010)

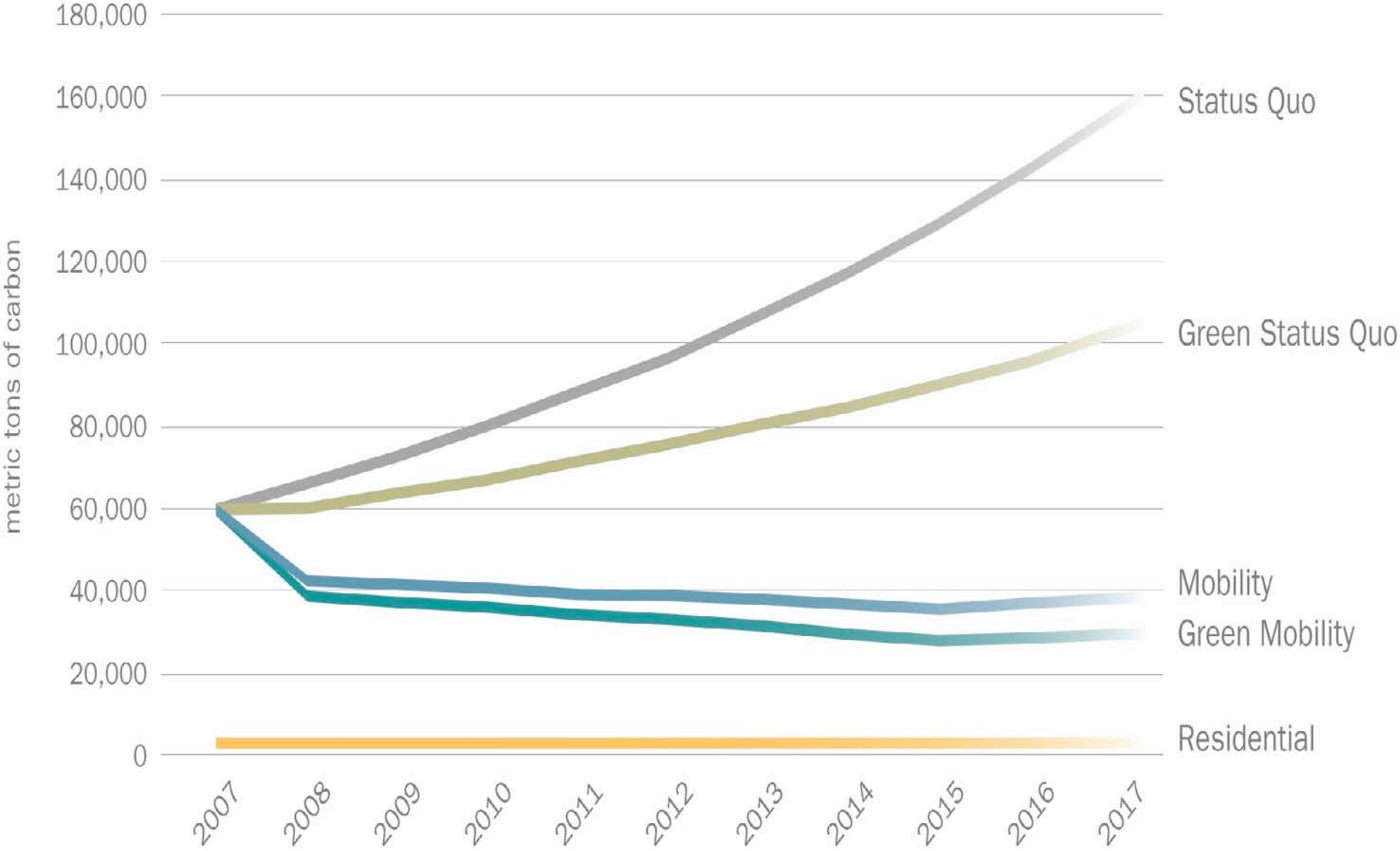
Scope 3: Data Needs

- Owner:
  - Travel
  - Commuting
  - T&D losses
  - Leased Assets
- Occupant:
  - What am I Using?
  - What is My Influence?
  - How Does My Performance Compare?



Source: Report to Congress on Server and Data Center Energy Efficiency Public Law 109-431" US EPA, August 2, 2007

Holistic Thinking—It's Not About the Building



Greening of Recovery Act Projects

- Minimum Performance Criteria To Transform Federal Buildings Into *High-Performance Green Buildings*.
- Based On Funding And Return On Investment:
  - Building Tune-up (Re- or Retro-Commissioning + Controls Improvements)
  - Lighting
  - HVAC Retrofit/Replacement
  - Renewable Energy Generation By Photovoltaic, Thermal Solar Or Wind
  - Roof Replacement with Solar, Cool or Planted Roofs; R-50 Insulation
  - Water Conservation Projects
- Established Geothermal And Lighting Technology Acceleration Programs.

Recovery Act Performance Results

- 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”

O L D + N E W = G R E E N ?

Existing Designs + New Goals = ISSUES

- How Do You Set Priorities?
- Triage Process
- Integrated Design
- New Technologies
- Design/Build Contracting Techniques
- Measurement Changes:
    - Process vs. End State
    - Budget & Schedule vs. Budget & Schedule & Green
    - Reliability of Modeling
    - Quality of Review Process
    - Ability To Apply Rigorous Life-Cycle Methods

EXAMPLE: ARRA PROJECT

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

EXAMPLES: "SHOVEL READY" PROJECTS

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

Washington, D.C.

After One Year…

Total Obligations (Contract Awards)
as of 3/31/10:

$4 billion, 400 million

Recovery Act: Standard Specs & Criteria

For:

- Lighting w/ & w/o Ceiling Replacement
- LEDs for Garages and Parking Lots
- Exit Stairway Lighting
- PV & PV Integrated Membrane Roof
- Planted Roof, Cool Roof
- Performance Criteria for Whole and Partial Building Modernization
- Lighting Controls
- Commissioning; Energy Audits
- Meters & Data Feeds from Meters
- Improvements to Existing Engineering Design, Generally

ALL Available on the Whole Building Design Guide

Land Ports of Entry

- Process Loads: E.g., 41% of site energy can be for lighting; Whole truck x-ray
- Climate
- Transportation Impacts of Business Processes—Link between Design and Operations
- Net Zero Goals:
  - high performance thermal envelope -super-insulation and performance glass;
  - high-efficiency HVAC systems;
  - energy-saving lighting systems;
  - ground-source heat pumps;
  - passive solar heating;
  - natural ventilation;
  - use of daylighting;
  - solar heated air
  - solar thermal water heaters.

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Only Then, Renewable Generation

- PV, Solar HW, Solar Concentrating, Solar Preheat, Wind, Biomass, Geothermal
- At 109 of the 119 sites:
  - renewable energy technologies can be cost-effective without financial incentives.
  - All cost effective renewable energy solutions = $17.7 million, 15%—30% of the total energy
    ROI = 11.8%;
    CO_2e = -24%

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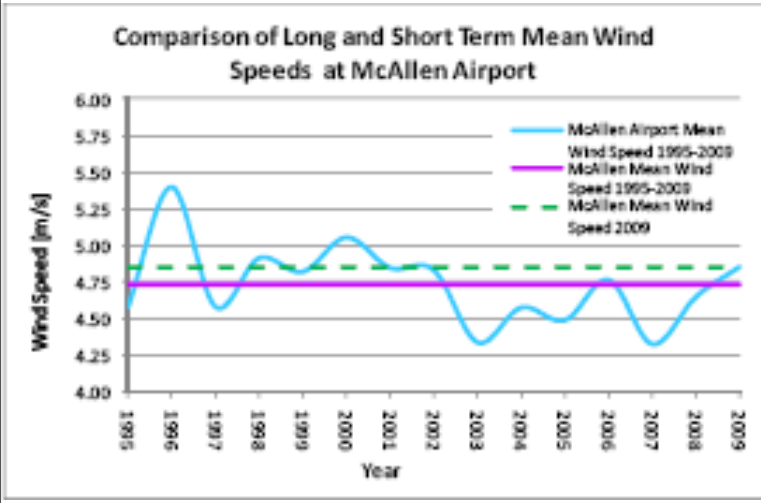
Wind



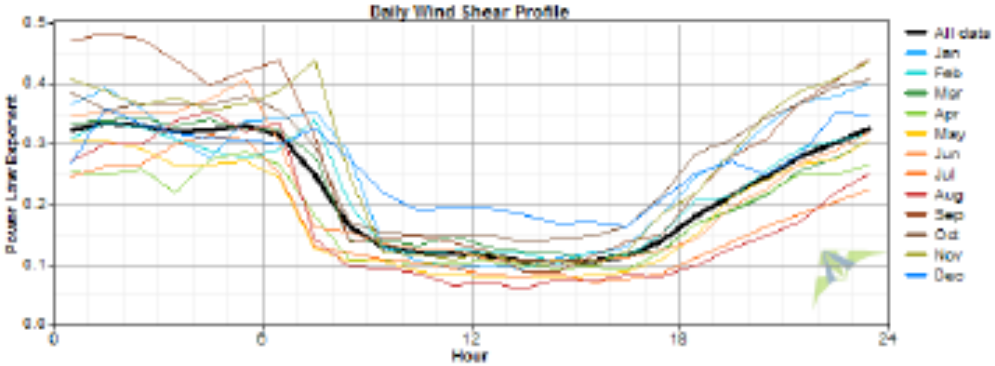


Figure 13 Daily Wind Shear Profile by Month

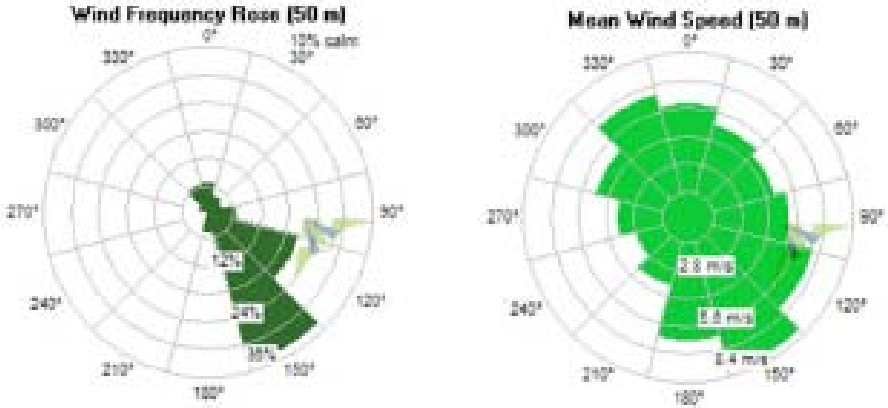


Figure 9 Wind Frequency and Wind Speed Rose at Donna TX for Jan 1 – Dec 31, 2

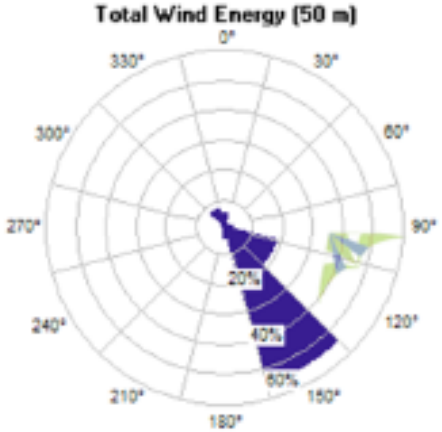


Figure 10 Wind Power Density Rose at Donna TX for Jan 1 – Dec 31, 2009

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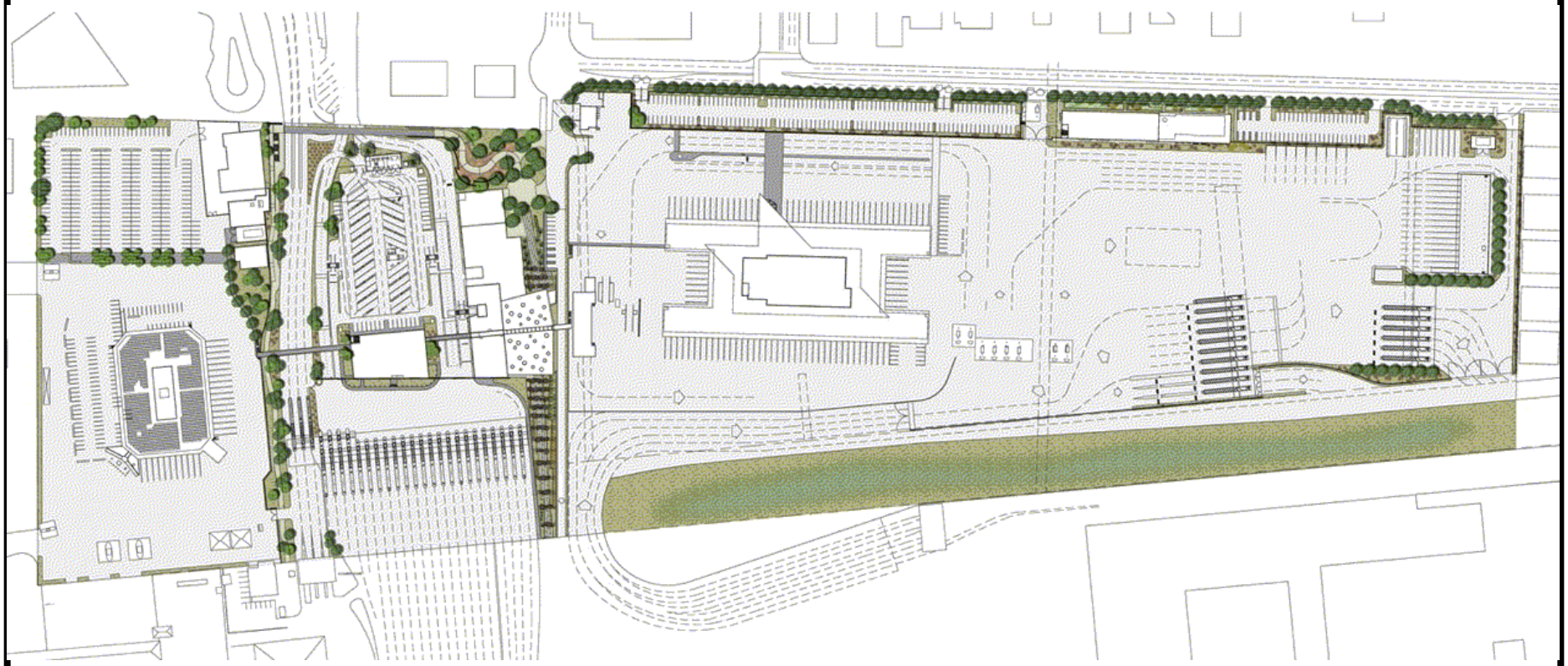
Otay Mesa



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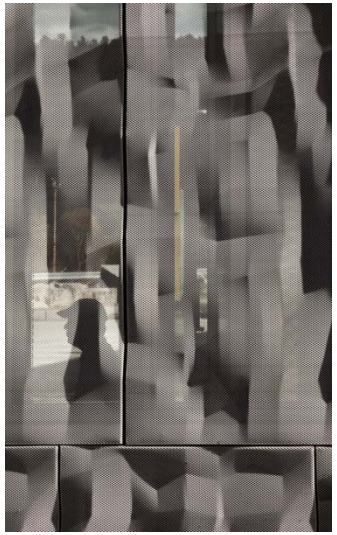
Otay Mesa Living Machine

Calais Industrial Park LPOE

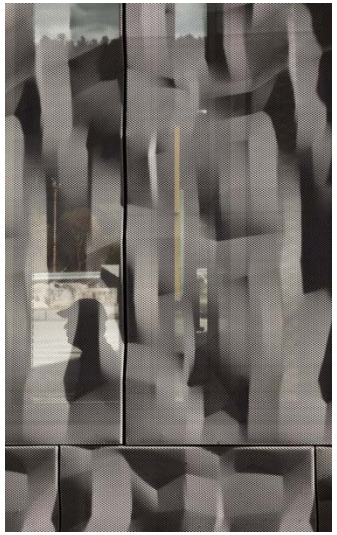
Robert Siegel Architects



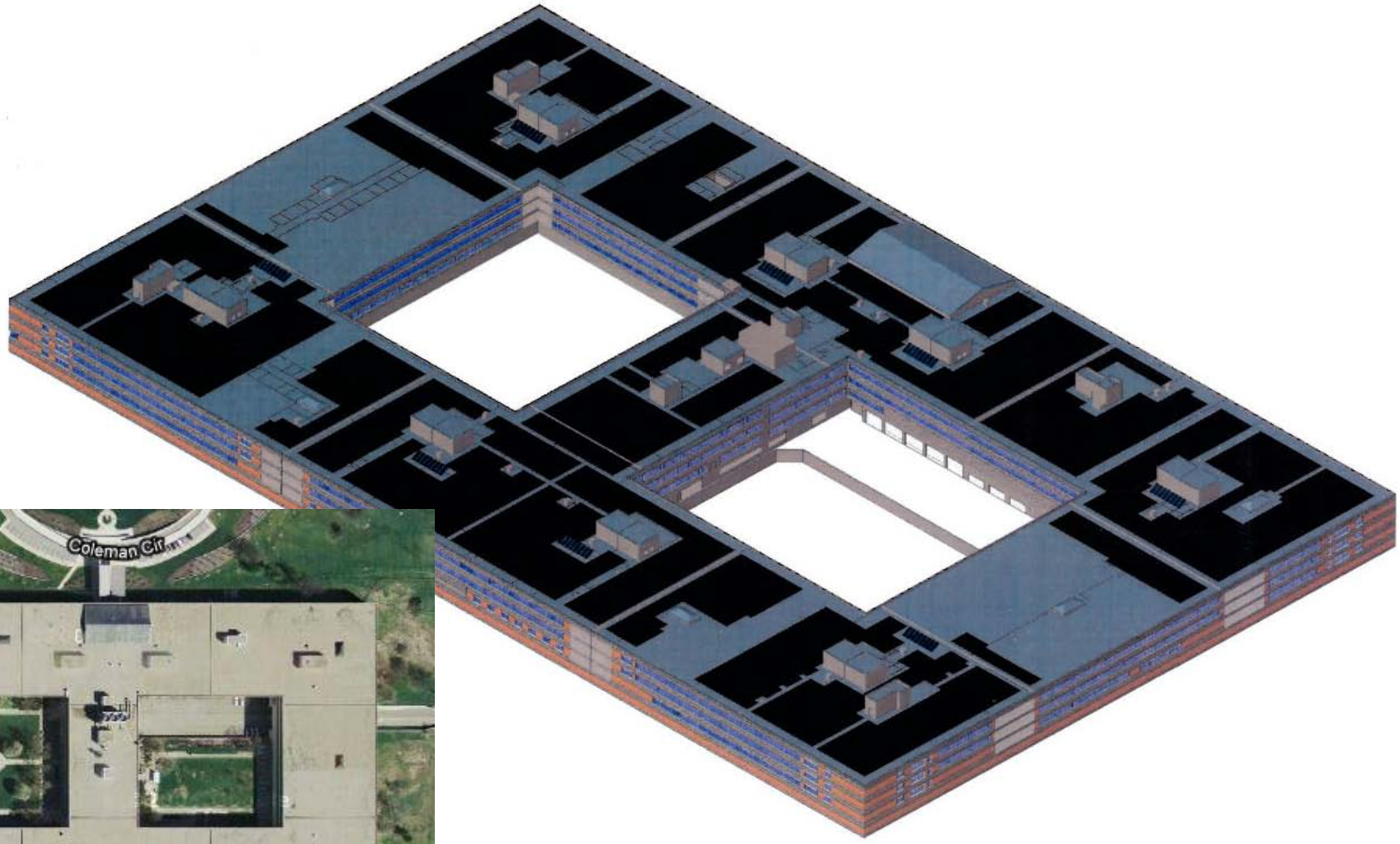
Jackman, ME

Calais Industrial Park LPOE

Robert Siegel Architects

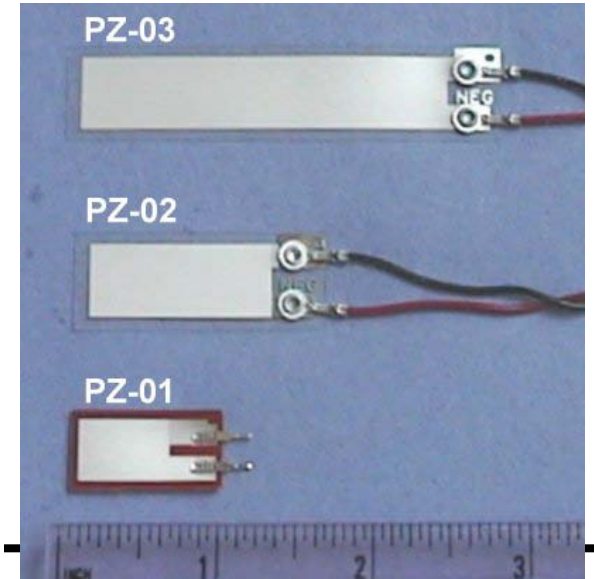


Emmett Bean—4 Solar Comparison



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

Technology: Green Proving Ground



Scope 3: Leased Building Assets

- 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

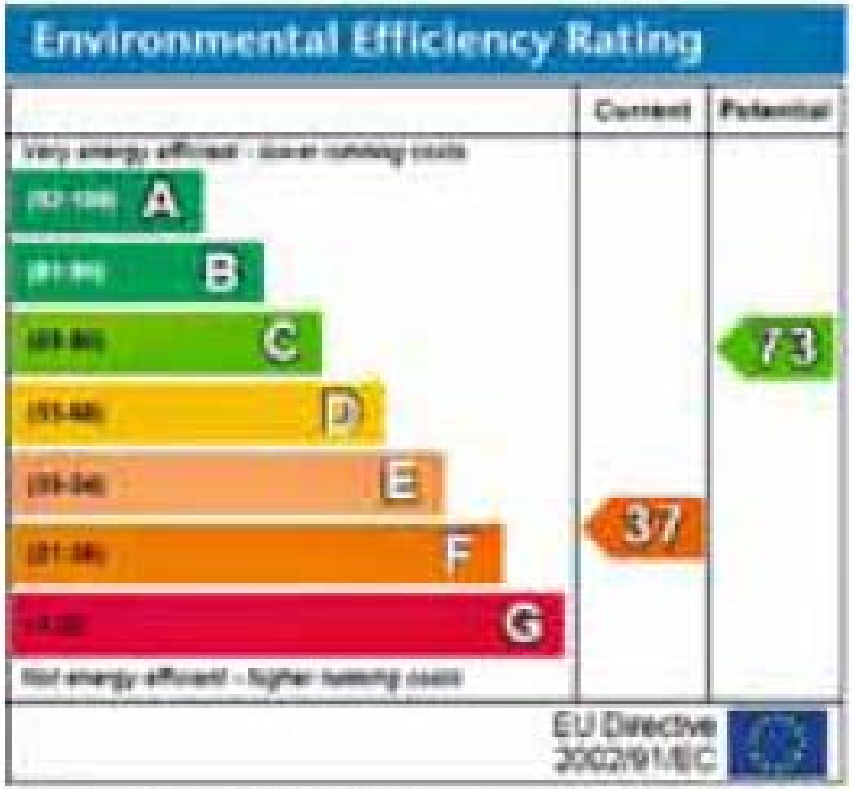
- Upcoming Requirement Pursuant To EISA – December 2010
  - Federal Leases Over 10,000 SF, With A Few Exceptions, Must Be In ENERGY STAR® Labeled Buildings.

- How do you measure?
  - Net Leases
  - Sub-metering by Tenant, By Subsystem (Lighting, Plug Load)

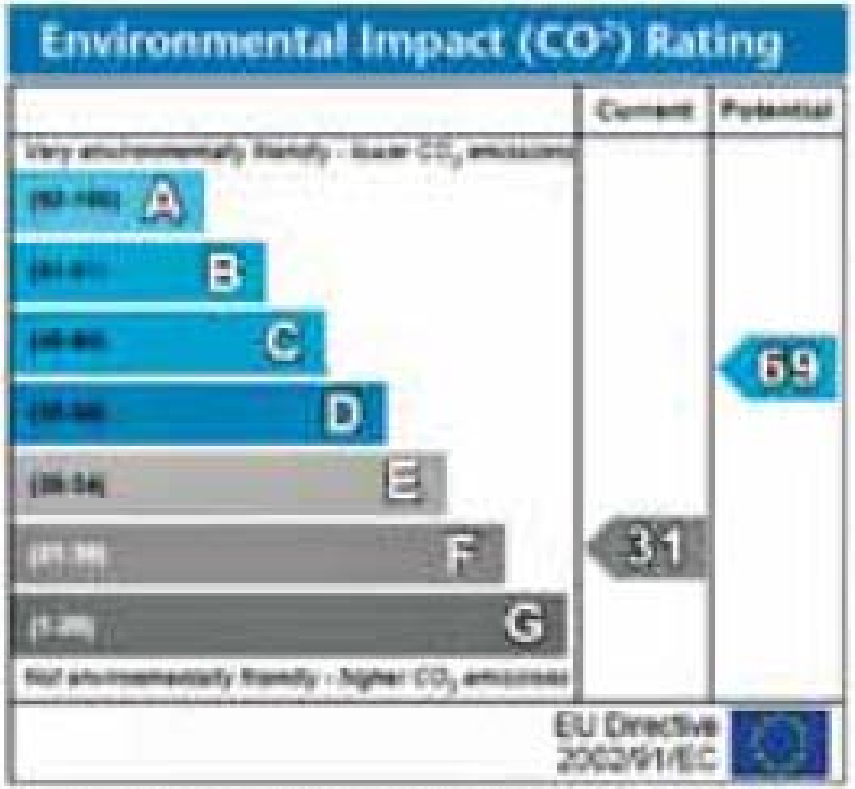
Measurement

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

Disclosure



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 (CO_2) emissions. The higher the rating the less impact it has on the environment.