



ENERGY STAR® Tools for Assessing Energy Usage

U.S. Environmental Protection Agency

*Kudret Utebay
The Cadmus Group, Inc.
May 8, 2008*

*Be a Leader –
Change Our Environment for the Better*



US EPA's ENERGY STAR[®] Overview

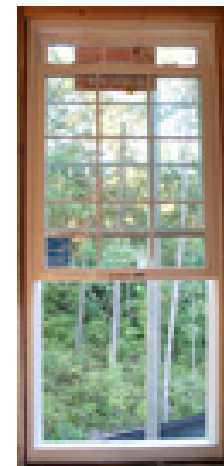
EPA can help you create a successful energy management program, reduce operating costs, and demonstrate environmental leadership.

What is ENERGY STAR?



- **A government-backed, voluntary program that protect the environment through superior energy performance.**
- **Recognized by more than 70% of all U.S. households.**
- **In 2007, prevented 40 million metric tons of greenhouse gas emissions and saved about \$16 billion on their utility bills.**

ENERGY STAR



Potential Impact

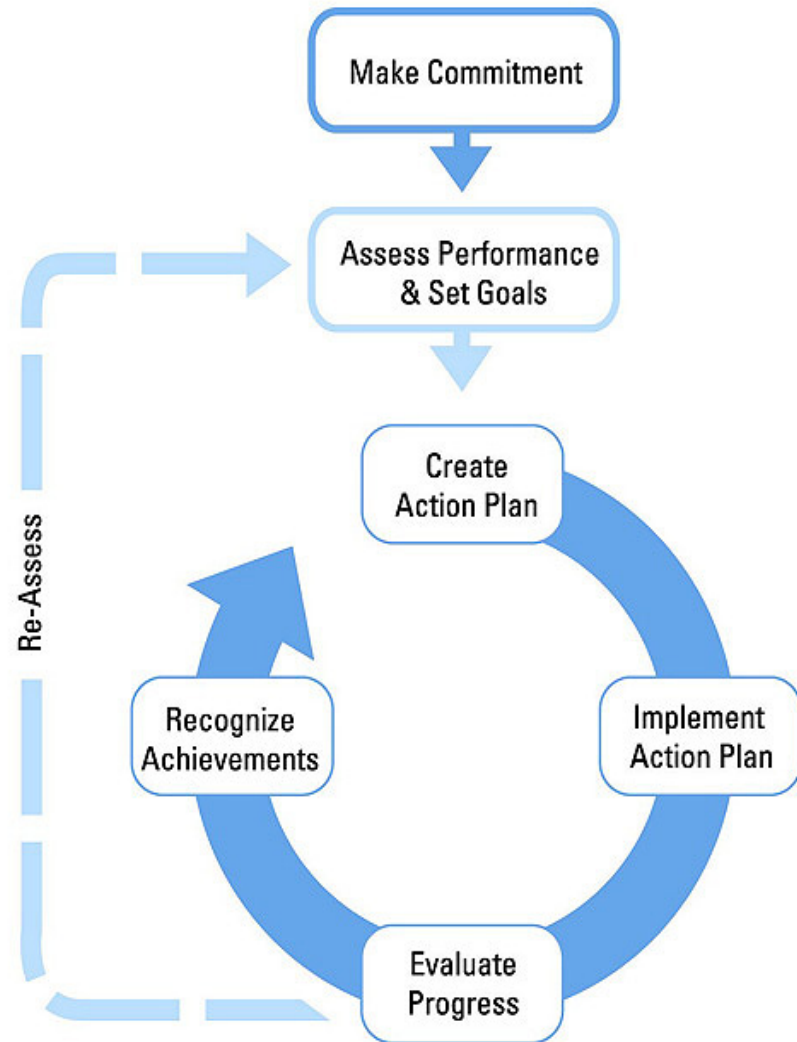


- Our governments, schools, and businesses spend billions annually on energy. **Typically, about 1/3 of this money is paid to utility companies unnecessarily due to energy inefficiency.**
- Instead, this money could be invested in energy efficiency which can improve the lighting, acoustics, thermal comfort, and indoor air quality creating a better working and learning environment.

Superior Energy Management Approach



Based on the successful practices of ENERGY STAR partners, EPA has identified the key components for a successful energy management program.



Need for a Rating System for Buildings



Fuel Efficiency
MPG

Is 60 MPG high or low for an automobile?

Is 80 kBtu/SF/YR high or low for a building?

Statement of Energy Performance
EPA Rating

STATEMENT OF ENERGY PERFORMANCE
Margrave High School
Building ID: 107112
For 12-month Period Ending: January 31, 2004¹ Date SEP Generated: March 20, 2004

Margrave High School
2000 Hwy 26
Emporium VA 20929
Class Building Area: 311,369 SF
Year Built: 2002

Owner:
Caldwell Group
Contact: John Doe
1001 South First Main Drive
Suite 200
Arlington, VA 22209
(703) 281-0800

Facility Space Use Summary

Space Type	Area(SF)	Number of Students	Number of PCs	Cooling Percent
Computer Data Center	138	N/A	N/A	N/A
K-12 Schools	29,121	1,121	420	100

Site Energy Use Summary

Electricity (kBtu)	6,048,801	Professional Verification	John Doe
Propane (kBtu)	326,819	Site: 1001 South First Main Drive	
Natural Gas (kBtu)	0	Arlington, VA 22209	
Total Energy (kBtu)	6,375,620	(703) 281-0800	
		License Number: 123456789	State: VA

Results

Energy Performance Rating² (1-100): 54

Energy Intensity³

Site (kBtu/SF-y)	17
Source (kBtu/SF-y)	49.4

Emissions

CO ₂ (1000 Btu-y)	6,491
SO ₂ (1000 Btu-y)	366
NO _x (1000 Btu-y)	21

Energy Cost

Cost (\$/yr)	\$264,806
Intensity (\$/SF-y)	\$0.82

Indoor Environmental Criteria⁴

Indoor air pollution-controlled?	Yes
Asbestos ventilation provided?	Yes
Thermal conditions met?	Yes
Adequate illumination provided?	Yes

Notes: ¹ If the building is not a school, the owner must provide a written approval to warrant the use of this form. ² EPA's ENERGY STAR is a national effort to promote energy efficiency in buildings. ³ EPA's ENERGY STAR is a national effort to promote energy efficiency in buildings. ⁴ EPA's ENERGY STAR is a national effort to promote energy efficiency in buildings.



Source: EPA's ENERGY STAR is a national effort to promote energy efficiency in buildings. EPA's ENERGY STAR is a national effort to promote energy efficiency in buildings. EPA's ENERGY STAR is a national effort to promote energy efficiency in buildings.

Portfolio Manager - Benefits



- Manage Energy and Water Consumption for All Buildings
- Rate Your Energy Performance
- Set Investment Priorities
- Verify and Track

Ratable Space Types



K-12 Schools



Offices



Hospitals



Supermarkets



Hotels

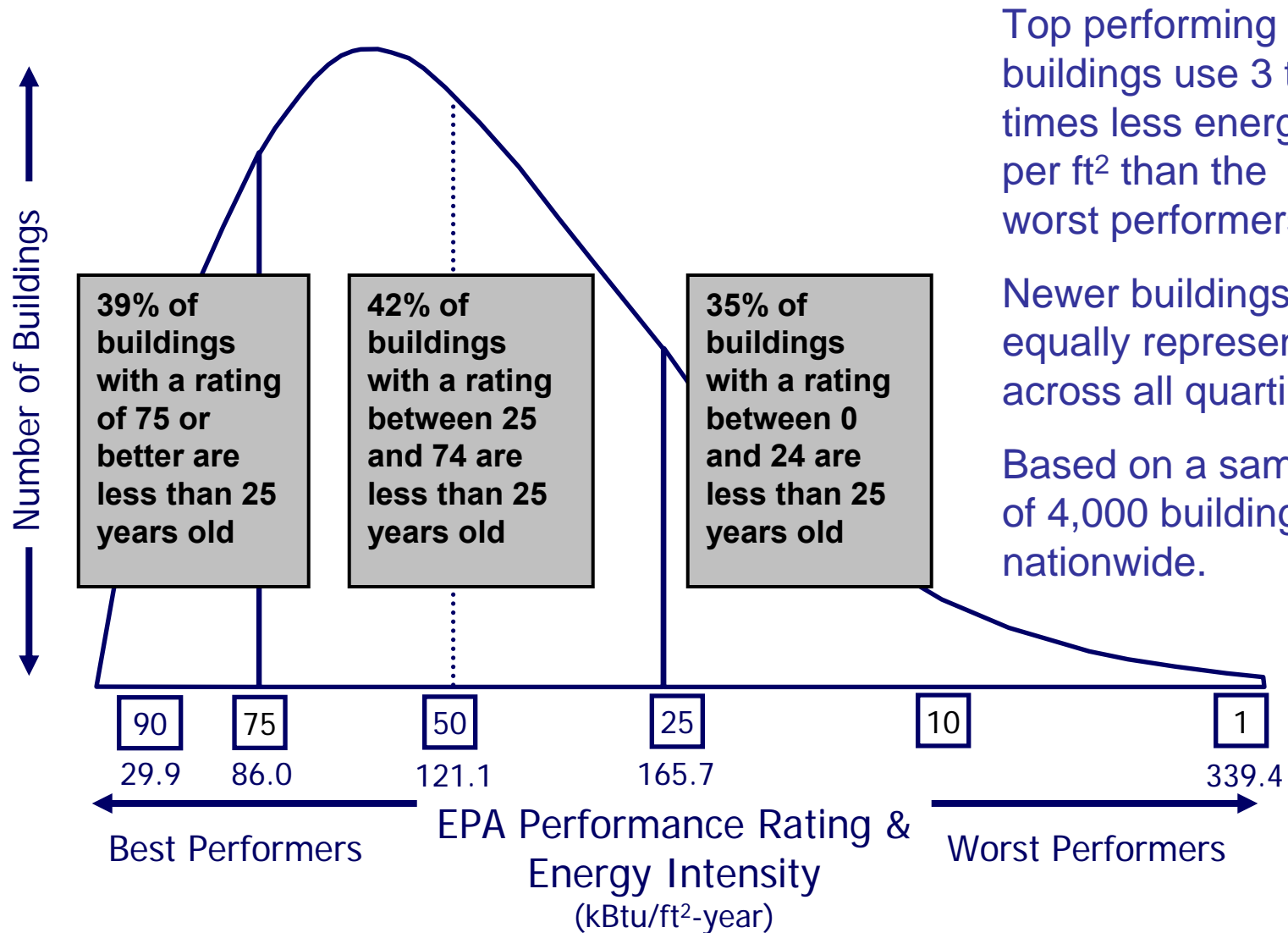


Med. Office Bldgs.



Others include: Warehouse, Residence Halls, Courthouses, Financial Centers, Retail Spaces, and Wastewater Plants

Energy Performance Gap



Technology ≠ Performance



- 60% of building fan systems oversized on average by 60% (EPA fan study)
- Chillers oversized 50% to 200% (Lawrence Berkeley National Laboratory)
- Improper installation and poor maintenance

Find Portfolio Manager



1. Go to:
www.energystar.gov

2. Click on:
Buildings and Plants

The screenshot shows the ENERGY STAR website homepage. At the top, there is a navigation bar with links for 'About ENERGY STAR', 'News Room', and 'FAQs', along with a search bar. Below the navigation bar is a banner for 'PROTECT OUR ENVIRONMENT FOR FUTURE GENERATIONS' featuring a child blowing a dandelion. The main content area is divided into several sections: 'PRODUCTS', 'HOME IMPROVEMENT', 'PARTNER RESOURCES', 'BUILDINGS & PLANTS', and 'NEW HOMES'. The 'BUILDINGS & PLANTS' section is circled in red, and a red arrow points to it from the instruction box on the left. The 'PARTNER RESOURCES' section includes a 'My Account Login' form with fields for 'Username:' and 'Password:', and a 'Sign In' button. At the bottom right, there is a link for 'Looking for Portfolio Manager?'.

Find Portfolio Manager



**3. Click on:
“Portfolio
Manager”**

The screenshot shows the ENERGY STAR website interface. At the top, there is a navigation bar with links for 'About ENERGY STAR', 'News Room', and 'FAQs', along with a search bar. The main header features the ENERGY STAR logo and a banner for 'SUPERIOR ENERGY MANAGEMENT CREATES ENVIRONMENTAL LEADERS' by the U.S. Environmental Protection Agency. Below the header are several navigation buttons: 'Products', 'Home Improvement', 'New Homes', 'Buildings & Plants', and 'Partner Resources'. The 'Buildings & Plants' section is active, displaying a sidebar on the left with various categories like 'Guidelines for Energy Management', 'Tools & Resources Library', and 'Expert Help'. The main content area includes a 'Strategy' section with links to 'Guidelines for Energy Management', 'New Building Design', and 'Green Buildings and Energy Efficiency'. A 'Tools' section at the bottom highlights the 'Tools & Resources Library' and specifically mentions 'Portfolio Manager'. On the right side, there is a 'Quick Links' sidebar with a list of links, including 'Portfolio Manager Login', 'ENERGY STAR Challenge', and 'ENERGY STAR Leaders'. Two red boxes are drawn around the 'Portfolio Manager Login' link in the sidebar and the 'Portfolio Manager' link in the 'Tools' section. Red arrows originate from the text box on the left and point to these two links.

Use the Rating to:

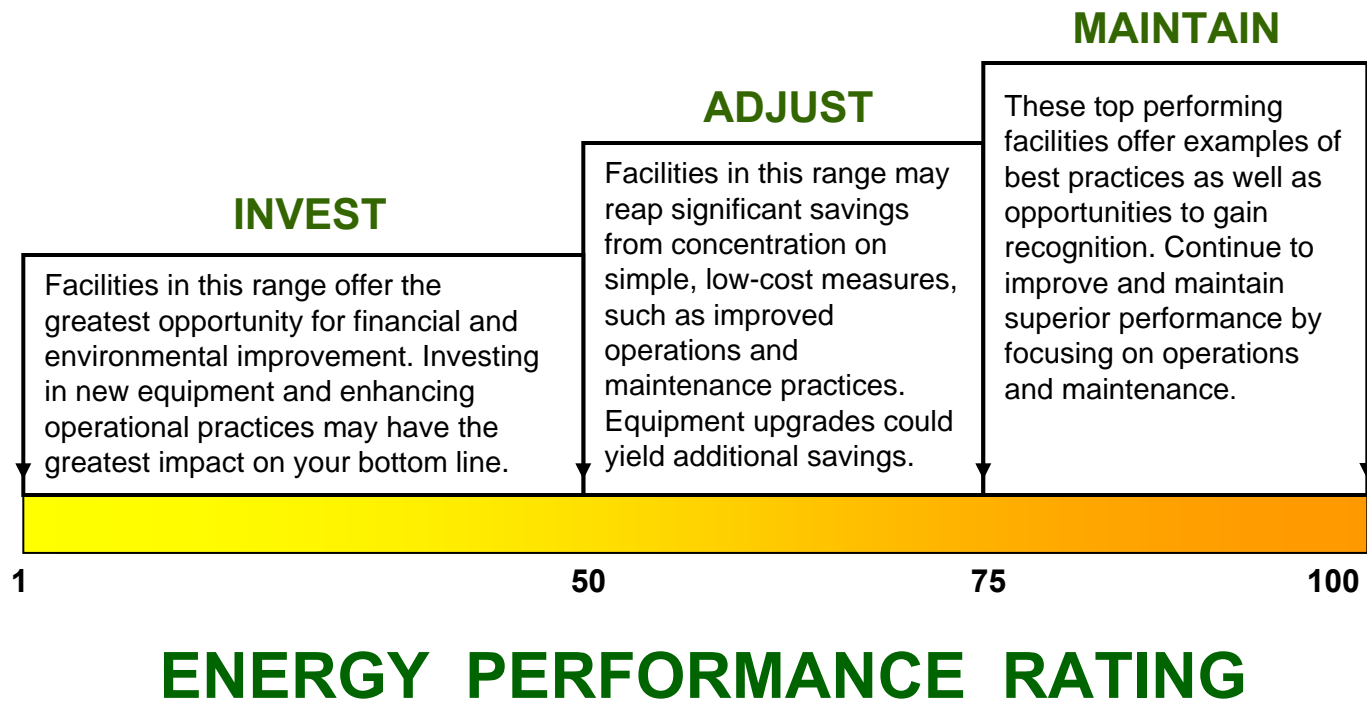


- Establish portfolio baseline, set goals, measure and track performance over time
- Verify gains from upgrade efforts
- Require specific rating gains from service providers in select building types such as office or warehouse

Rating Interpretation



Once you have established an energy performance baseline rating, you are ready to set improvement goals and create an action plan. The guide below can help you interpret the ratings and determine appropriate next steps.



Statement of Energy Performance



- **Objective:** The SEP can be generated for purposes other than applying for the ENERGY STAR Label
 - LEED-EB certification process
 - Real estate transactions
 - Maintaining a Facility Summary Report
- **Process:**
 - User selects time period of performance
 - Tool generates 1 page summary with energy use, cost, and emissions figures
 - Summary also included as second page when full SEP is generated to apply for the ENERGY STAR

Percent Energy Reduction



- **Objective:** Provide a metric to show a percent change in energy use over time
 - Creates tracking capability for all space types
- **Process:**
 - For non-ratable spaces the tool compares weather normalized source energy use between two periods and adjusts for any changes in square footage
 - For ENERGY STAR ratable space types, the tool compares energy use between two periods adjusting for changes in weather and business activity

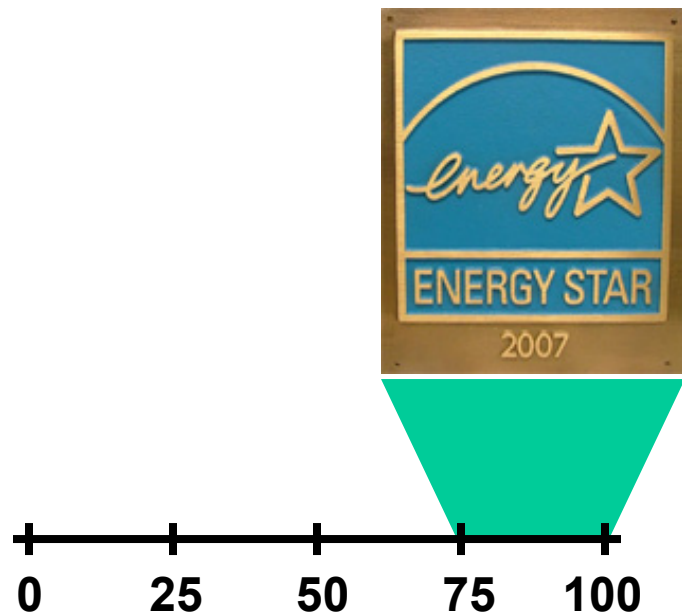
Automated Benchmarking



Allows utilities and energy info service providers to:

- Securely exchange building and utility data with the EPA ENERGY STAR program
- Leverage the ENERGY STAR rating within their own systems
- Reduce the burden on energy end users of benchmarking their energy performance

Apply for the Label!



Buildings in the top 25% nationwide are eligible to earn for the ENERGY STAR, provided they meet or exceed industry standards for comfort levels.



Are Your Projects...



EPA Contributions



EPA's building energy performance rating system, Target Finder

- Set target for a relative energy performance rating, or
- Set target for percent energy reduction
- Determine energy use intensity (kBtu/sf) corresponding to target

Target Finder





About ENERGY STAR • News Room • FAQs • **KIDS** Search **Go**

ENERGY STAR [Products](#) [Home Improvement](#) [New Homes](#) [Buildings & Plants](#) [Partner Resources](#)

[Home](#) > [Buildings & Plants](#) > [Tools & Resources Library](#) > [Commercial Building Design](#) > **Target Finder**

Buildings & Plants

- Guidelines for Energy Management
- Tools & Resources Library
- Expert Help
- Commercial Building Design
 - Challenge: Architects
 - Integrated Energy Design Guidance
 - Target Finder**
 - Designed to Earn the ENERGY STAR
 - Design Projects
 - Training Sessions
- Green Buildings

Getting Started for...

- Commercial Real Estate
- Corporate Real Estate
- Government
- Healthcare
- Higher Education
- Hospitality
- Industrial

Target Finder



EPA's Target Finder tool helps architects and building owners set aggressive, realistic energy targets and rate a building design's estimated energy use. Use the tool to achieve Designed to Earn the ENERGY STAR, and participate in the ENERGY STAR Challenge. ([Learn how architects can take the ENERGY STAR Challenge](#)).

[2003 CBECS National Average Source Energy Use and Performance Comparisons](#) (45KB) provide national energy performance averages for building types not available for an EPA rating. The results are not normalized for climate, building size, occupancy, or other activities that may affect energy use.

About Target Finder

Target Finder and data from the U.S. Department of Energy (DOE) Energy Information Agency's 2003 Commercial Buildings Energy Consumption Survey (CBECS) helps you establish energy targets for [Architecture 2030](#) adopted by the [American Institute of Architects](#) and the [U.S. Conference of Mayors](#).

The energy use intensity (EUI) generated by Target Finder reflects the distribution of energy performance in commercial buildings derived from 2003 CBECS. The reviewed data inputs were found to be the same...

2007 Challenge Projects



« prev | next »

Seneca Hall
Bergmann Associates
ENERGY STAR Rating: 88
Annual Energy Savings: 2,374,000 kBtu
Annual CO₂ Savings: 350,000 lbs

[View Project Board](#)

Quick Finder

- [Portfolio Manager Login](#)
- [Target Finder](#)
- [ENERGY STAR Challenge](#)
- [ENERGY STAR Leaders](#)
- [Earn the ENERGY STAR](#)

Target Finder



Target Finder

*** REQUIRED**

Select a target rating and/or compare your Design Energy to the target

1. Facility Information

*Zip Code	<input type="text" value="10705"/>	Facility Name	<input type="text" value="Office Building"/>
City	<input type="text" value="Yonkers"/>	State	<input type="text" value="New York"/>

2. Facility Characteristics

*Select Space Type(s) for this project

Office (General)

Delete

*Gross Floor Area	*Occupants	*Number of PCs	*Operating Hours/Week
<input type="text"/> Sq. Ft.	<input type="text"/>	<input type="text"/>	<input type="text"/> Hours

Computer Data Center

Delete

*Gross Floor Area	*Operating Hours/Week
<input type="text"/> Sq. Ft.	<input type="text"/> Hours

Target Finder



2. Facility Characteristics

*Select Space Type(s) for this project

[Space Types]

[Space Types]

--- Primary Space Types ---

	*Number of PCs	*Operating Hours/Week
Office (General)	<input type="text"/>	<input type="text"/> Hours

Office (Bank Branch)

Office (Courthouse)

Office (Financial Center)

K-12 School

Hotel (Economy and Budget)

Hotel (Midscale w/o Food and Beverage)

Hotel (Midscale w/Food and Beverage)

Hotel (Upscale)

Hotel (Upper Upscale)

Medical Office

Residence Hall/Dormitory

Supermarket/Grocery

Warehouse (Refrigerated)

Warehouse (Unrefrigerated)

--- Secondary Space Types ---

Other

Computer Data Center

Garage

Open Parking Lot

Swimming Pool

*Choose the design target and select "View Results" to display associated energy use for the target.

Space Type



2. Facility Characteristics

*Select Space Type(s) for this project

[Space Types]

Office (General)

*Gross Floor Area	*Occupants	*Number of PCs	*Operating Hours/Week
<input type="text" value="50000"/> Sq. Ft.	<input type="text" value="300"/>	<input type="text" value="300"/>	<input type="text" value="55"/> Hours

Computer Data Center

*Gross Floor Area	*Operating Hours/Week
<input type="text" value="5000"/> Sq. Ft.	<input type="text" value="168"/> Hours

3. The Target ¹

Target Rating

Energy Reduction Target

Or

*Choose the design target and select "**View Results**" to display associated energy use for the target.

Design Target



3. The Target ¹

Target Rating

Energy Reduction Target

80

Or

Select

*Choose the design target and select "**View Results**" to display associated energy use for the target.

4. Estimated Design Energy

Use results from energy analysis and enter total estimated energy for the design. Select "**View Results**" to compare Estimated Energy Use to your Target.

Energy Source	Units	Estimated Total Annual Energy Use ²	Energy Rate (\$/Unit)
Electricity	kWh		\$0.10
Natural Gas	therms		\$0.80

¹Target Rating is the EPA energy performance rating 1 – 100 scale. A 75 or higher denotes ENERGY STAR. Energy reduction target is the percent reduction for a similar building's average energy consumption or the equivalent of an EPA Rating of 50.

²Annual Energy Use – the fuel mix percentage is determined from DOE-EIA. The Electric % is typical of the area designated by zip code. Natural gas is used as 2nd energy source. The defaults for percentage of energy use by fuel type will be displayed at top of Results page.

Clear Form

View Results

Energy Performance Results



NOTE: Assumptions are 76% electricity and 24% % Natural Gas. The Target & Top 10% energy use for this facility are calculated based on the typical fuel mix in the zip code specified.

[View Statement of Energy Design Intent](#)

Target Energy Performance Results (estimated)			
Energy	Design	Target	Top 10%
Energy Performance Rating (1-100)	N/A	80	90
Energy Reduction (%)	N/A	27	39
Source Energy Use Intensity (kBtu/Sq. Ft./yr)	N/A	210.2	174.8
Site Energy Use Intensity (kBtu/Sq. Ft./yr)	N/A	82.7	68.8
Total Annual Source Energy (kBtu)	N/A	11,558,261.7	9,614,388.0
Total Annual Site Energy (kBtu)	N/A	4,547,619.7	3,782,798.9
Total Annual Energy Cost (\$)	N/A	\$ 110,317	\$ 91,764
Pollution Emissions			
CO2 Emissions (1000 lbs/year)	N/A	1,066.1	886.8
CO2 Emissions Reduction (%)	N/A	27%	39%

Target Rating



*** REQUIRED**

Select a target rating and/or compare your Design Energy to the target.

1. Facility Information

*Zip Code Facility Name
City State

2. Facility Characteristics

*Select Space Type(s) for this project.

[Space Types]

K-12 School

Delete

*Gross Floor Area	*Number of Students	*Number of PCs	*Operating Hours/Week	*Cooking Facility	*% Air-Conditioned	*% Heated	*Months	*Ventilated
<input type="text"/> Sq. Ft.	<input type="text"/>	<input type="text"/>	<input type="text"/> Hours	<input type="radio"/> Yes <input type="radio"/> No	100 <input type="text"/>	100 <input type="text"/>	12 <input type="text"/>	<input type="radio"/> Yes <input type="radio"/> No


Energy Modeling



- Obtaining final energy estimates needed for Target Finder
 - Use comprehensive design and simulation program
 - Input schedules – not use defaults
 - Input equipment efficiencies – not use defaults
 - Conduct simulation – determine whole building energy use
 - Determine energy use of domestic hot water, exterior lighting, elevators, etc.

Statement of Energy Design Intent





STATEMENT OF ENERGY DESIGN INTENT
September 18, 2006

FACILITY INFORMATION

Facility Name and Location
Edison Office Center
Edison, NJ - United States 08620

Facility Characteristics
Computer Data Center 5,000 Sq. Ft.
Office (General) 50,000 Sq. Ft.
Total Gross Floor Area 55,000 Sq. Ft.

Design Energy (kBtu) ¹
Electricity 2,953,060
Natural Gas 1,591,000

Building _____
Owner/Company _____
Address _____
Contact Name _____
Phone _____
Email _____

DESIGN ENERGY PERFORMANCE RESULTS

Energy	DESIGN	ENERGY STAR
EPA Energy Performance Rating (1 - 100)	86	75
Percent Energy Reduction (% ¹²)	34	23
Site Energy Use Intensity (kBtu/sf/yr)	82.6	96.4
Total Annual Site Energy (kBtu)	4,544,888	5,300,161
Total Annual Energy Cost (\$)	\$ 83,570	\$ 97,467
Pollution Emissions (1000 lbs/yr)		
CO ₂	1,650	1,914

PROFESSIONAL VERIFICATION

Licensed Architect/Engineer
Prepared By _____
Firm Name _____
Address _____
Phone _____
Email _____

Architect of Record (if different from above)
Name _____
Firm Name _____
Phone _____
Email _____

Professional Stamp
Signature & Date

The facility was designed and specified to meet the Design Energy performance calculations shown on this Statement of Energy Design Intent.

¹ Target Finder uses data from "actual" performing buildings, therefore all energy use including plug, process, and all non-regulated loads, fuel sources and equipment specified in design must be included. An incomplete design energy use profile could result in a high but inaccurate rating.

This document was generated from Target Finder, an EPA tool located on the ENERGY STAR Web site, www.energystar.gov. Page 1 of 2

- Documents performance
- **Design and ENERGY STAR**
 - EPA Rating
 - Energy Performance Rating
 - Percent energy reduction
 - Total annual energy use (kBtu/sf/yr) (site/source)
 - Total annual energy cost
 - Greenhouse gas emissions

ENERGY STAR and the LEED® Green Building Rating System™



- LEED-NC
- LEED-EB
- LEED for Schools

LEED-NC



LEED-NC EA Prerequisite 2

Establish minimum level of energy efficiency for building

- ASHRAE 90.1 – mandatory & prescriptive requirements

LEED-NC EA Credit 1

Achieve increasing levels of energy performance above baseline

- Option 1 – whole building energy simulation

LEED for Schools



LEED for Schools EA Prerequisite 2: Minimum Energy Performance

- ASHRAE 90.1 – mandatory & prescriptive requirements
- Projects must establish an Energy Performance Rating goal for the facility design using EPA's Target Finder rating tool

Portfolio Manager



LEED-EB v.2.0 Reference Guide

Energy & Atmosphere prerequisite 2: Minimum Energy Performance

Summary:

Any building type eligible for the ENERGY STAR rating must earn a minimum score of 69 in Portfolio Manager. The Statement of Energy Performance, generated by the tool, must be submitted to demonstrate compliance. Those building types ineligible for the ENERGY STAR rating must demonstrate energy performance equivalent to the rating through calculations.

LEED EB: Operations and Maintenance EA Points



ENERGY STAR Rating	LEED for Existing Buildings Points	Percent Above National Average (for non-ENERGY STAR Space Types)	LEED for Existing Buildings Points
65	N/A	15%	N/A
67	1	17%	1
69	2	19%	2
71	3	21%	3
73	4	23%	4
75	5	25%	5
77	6	27%	6
79	7	29%	7
81	8	31%	8
83	9	33%	9
85	10	35%	10
87	11	37%	11
89	12	39%	12
91	13	41%	13
93	14	43%	14
95+	15	45%	15

For More Information



Visit www.energystar.gov

E-mail buildings@energystar.gov

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