



# Designing Energy Efficient Buildings

Monthly Partner Web Conference  
February 18, 2009

Call-in number: 866 299 3188  
Conference Code 202 343 9965#

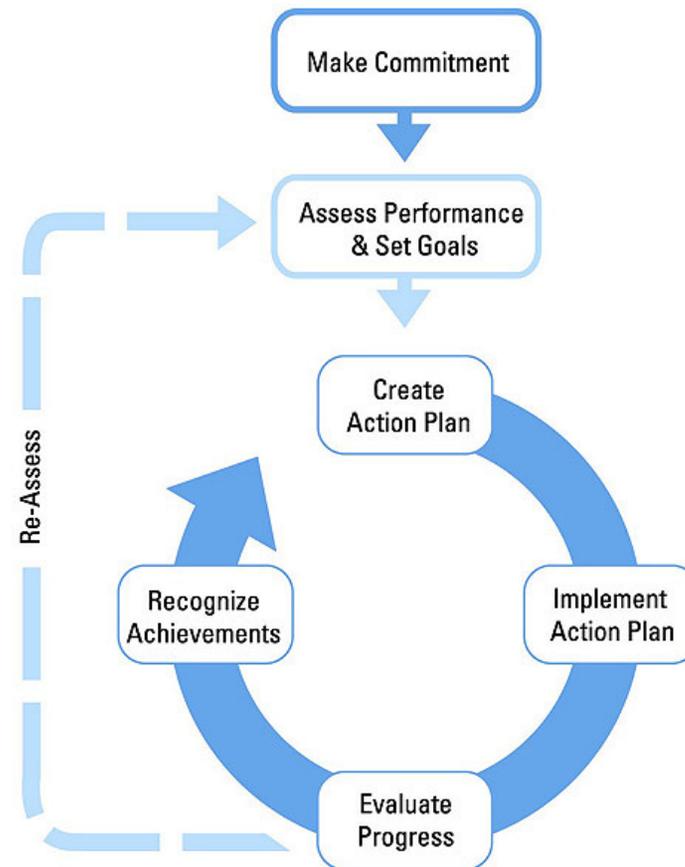


Learn more at [energystar.gov](http://energystar.gov)

# About The Web Conferences



- Monthly
- Topics are structured on a strategic approach to energy management
- Help you continually improve energy performance
- Opportunity to share ideas with others
- Slides are a starting point for discussion
- Open & interactive



# Web Conference Tips

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- Mute – To improve sound quality, all phones will be muted.
- Use # 6 to un-mute and \* 6 – to mute
- Presentation slides will be sent by email to all participants following the web conference.

# Today's Web Conference

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## Designing Energy Efficiency Buildings:

### New Westside Middle School

- Janet Lacy, Albuquerque Public Schools
- Julie Walleisa, Dekker/Perich/Sabatini

### Discovery Tower

- Adam Saphier, Trammell Crow Company
- Rives Taylor & Hal Sharp, Gensler

### ENERGY STAR Resources

- Karen Butler, US EPA ENERGY STAR

## Announcements

# Energy Efficient School Design: APS New Westside Middle School



Albuquerque Public Schools  
Dekker/Perich/Sabatini



## Overview

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### Speakers

1. Janet Lacy, AIA  
Albuquerque Public Schools (APS)

2. Julie Walleisa, AIA, LEED AP  
Dekker/Perich/Sabatini (D/P/S)

### Project

APS New Westside Middle School

- 170,000sf school
- Designed to Earn the ENERGY STAR
- Pursuing LEED Silver certification



## **APS Background**

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- **Largest district in NM, 34<sup>th</sup> largest in U.S.**
  - **94,900 students**
  - **168 schools totaling 14M sf**
- **Move to more sophisticated mechanical systems**
  - **Away from evaporative cooling & rooftop units**
  - **Toward 4-pipe, GSHP, etc.**
  - **Dealing with M&O challenges**
- **Districtwide energy programs**
  - **M&O Energy Conservation Program**
  - **ENERGY STAR**
  - **LEED certification**



# Westside Middle School Team Structure

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- **Design-Build**
  - **First for APS**
  - **Detailed RFP**
  - **2-stage selection process**
- **Team**
  - **Bradbury Stamm**
  - **Dekker/Perich/Sabatini**
  - **Yearout Mechanical**
  - **DKD Electric**



# Westside Middle School

- 1,200 students, grades 6-8
- 170,000sf, 2 stories
- 2 separate buildings: Academy and Gym
- Part of NW Education Corridor



## **Owner's Lessons/Conclusions**

- **Owner's Concerns:**
  - **Ability of large organization to participate in design-build, i.e.:**
    - **Create RFP criteria from loose design standards**
    - **Understand overlap of design and construction**
    - **Refrain from making changes after award**
- **Lessons Learned:**
  - **Do not prescribe mandatory LEED points**



## D/P/S Background

- 200+ person multidisciplinary firm
- Offices in NM, TX, NV
- 5 projects achieved Designed to Earn the ENERGY STAR in 2008



## D/P/S Background

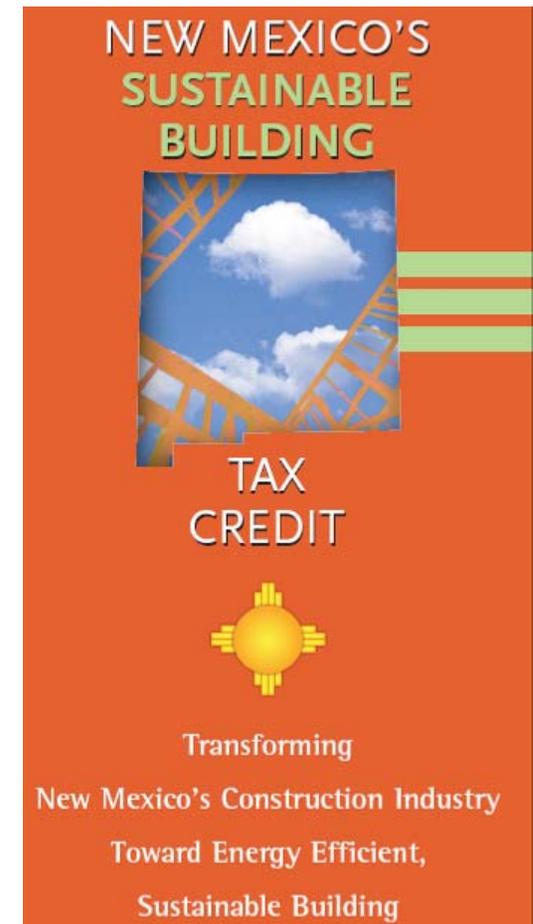
- **Jefferson Green earned ENERGY STAR in 2008 with a rating of 99**



## New Mexico Background

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- **50% energy savings required for:**
  - **Mandates for public buildings**
  - **Sustainable Building Tax Credit**
- **Target Finder or CBECS**
- **Energy modeling**
- **City of Albuquerque became an ENERGY STAR partner in 2008**

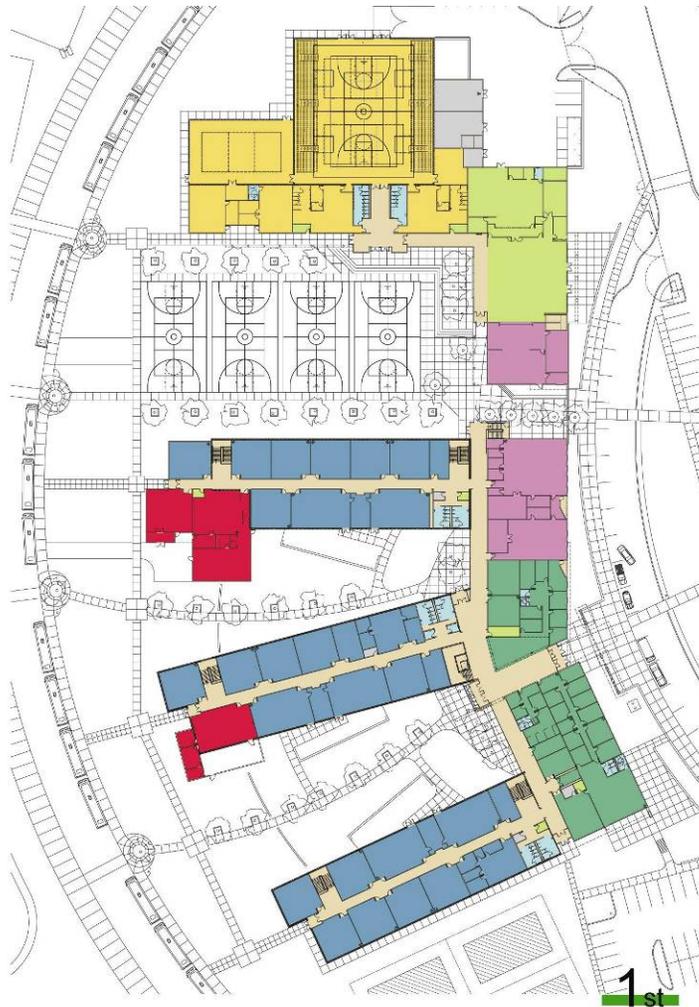




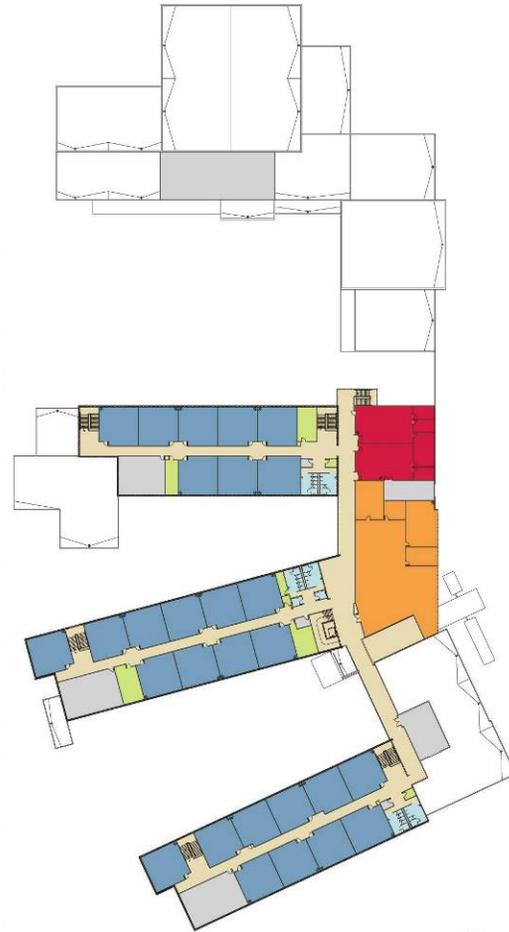
■ ■ Southeast Aerial View



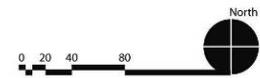
Southwest Aerial View



1<sup>st</sup>



2<sup>nd</sup>



**Legend**

- 1.1-1.3 Classrooms
- 1.4 Performance (Chorus, Band, Drama)
- 1.5-1.8 Classrooms
- 2.0 Library
- 2.2 Physical Education
- 3.0 Support
- 4.0 Administration
- Restrooms
- Utilities-Mechanical, Electrical, etc.
- Circulation



**Spatial Relationships**



Main Entry



Cafeteria



Main Lobby

## Energy Saving Features

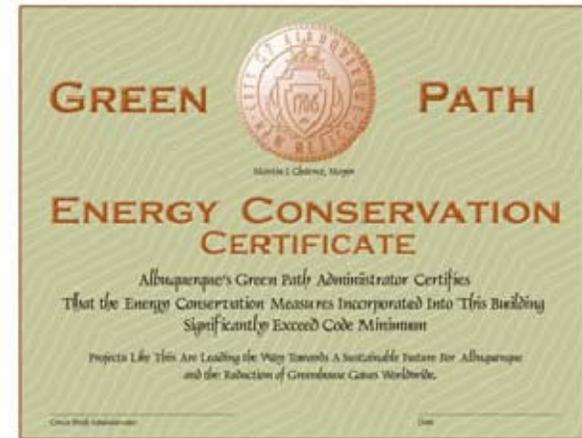
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- **RFP required:**
  - **21% energy savings over ASHRAE 90.1-2004**
  - **Aircuity system**
  - **4 pipe chiller and boiler system**
  - **Water cooled chillers**
  - **DDC control system**
  - **T8 (not T5) lamps**
  - **Daylight and occupancy sensors**
  - **ENERGY STAR appliances**



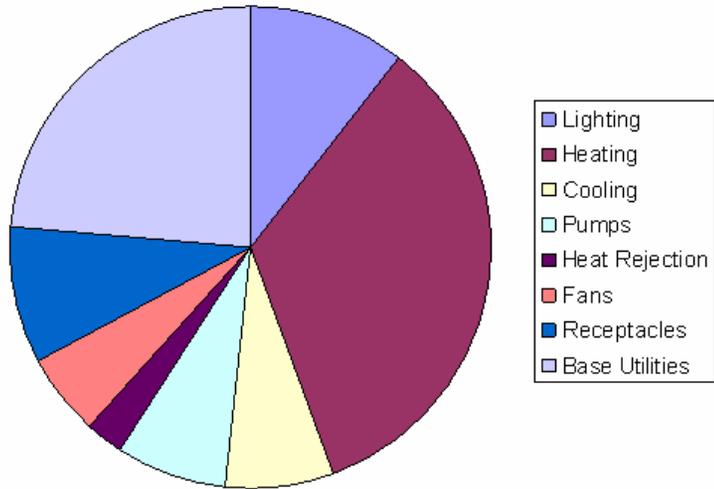
# Energy Saving Features

- **Fast-track schedule**
- **Green Path expedited review**
  - **LEED Silver with 6 EA points**
  - **Needed to get to 28% savings**
  
- **Other Energy Saving Features:**
  - **Improved insulation**
    - **R-38 roof**
    - **R-24 wall**
  - **White TPO membrane roof**
  - **Higher performing glazing**

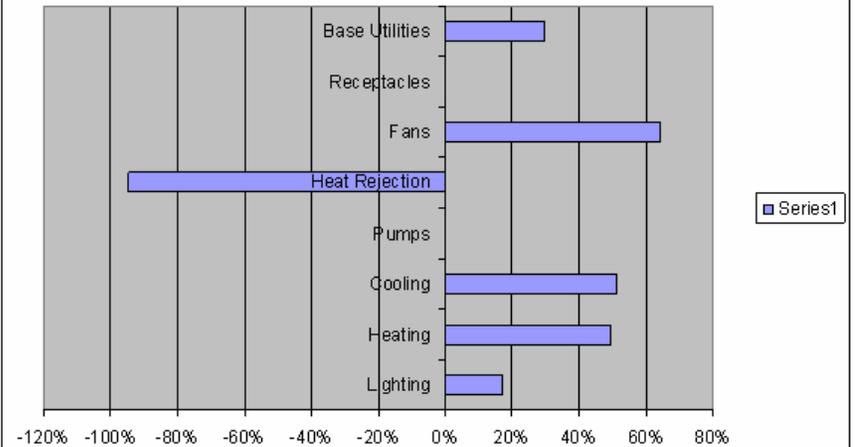


# Energy Use & Savings

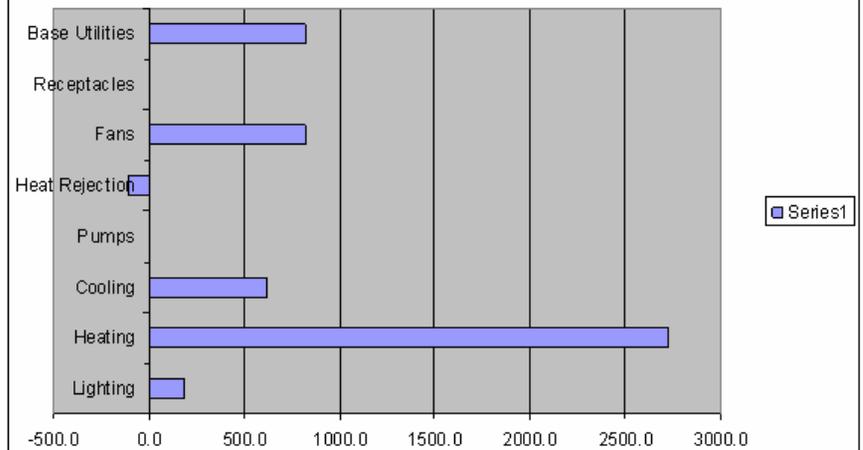
Projected Energy Use Breakdown



% Savings by Use



Energy Savings by Use



## Project Status

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- **38% energy savings over ASHRAE 90.1-2004**
- **Designed to Earn the ENERGY STAR**
- **EPA rating of 86**
- **Anticipating LEED Silver**
  
- **Construction completion June 2009**



## Lessons Learned

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- **4-pipe system allows for good acoustic control**
- **Water-cooled chiller boosts energy savings**
- **Glazing selection has biggest architectural impact on energy**
- **Design-build pros & cons**
  - **Good team might exceed performance goals while meeting budget**
  - **Difficult to work with multiple demands: LEED goal, energy savings goal, and detailed system requirements**
- **Fast track process complicates commissioning agent's review of systems**





DESIGNED  
TO EARN THE  
ENERGY STAR

The estimated energy performance for this design meets US EPA criteria. The building will be eligible for ENERGY STAR after maintaining superior performance for one year.



LEED Core & Shell  
Gold Pre-certification

# Discovery Tower



# Discovery Tower

## Owner:

TrammellCrowCompany / CBRE

## Design Team:

Architect

Gensler (Houston Office)

Structural Engineer

Haynes Whaley & Associates (Houston, Tx)

Mechanical, Electrical, and Plumbing Engineer

Wylie Consulting Engineers (Houston, Tx)

Civil Engineers

Walter P. Moore (Houston, Tx)

Landscape Architect

Office of James Burnett (Houston, Tx)

Lighting Consultant

Archiluce Intl (Atlanta, Ga)

Contractor

Gilbane Building Company





# Discovery Tower

- 29 Story Office Tower
- 27 Levels Office
- 2 Levels Lobby + Retail
- 2 Levels Basement Parking
- 910,600 Gross sf
- 844,700 Rentable sf



View of Discovery Tower overlooking Discovery Park



# Sustainable Development

## Why Trammell Crow Co. Develops Green

- Respect & preserve the environment
- Conserve energy, water, & non-renewable natural resources
- Create healthy and naturally lit indoor environments



# Benefits of Green Building



## Environmental Benefits

- Enhance and protect ecosystems
- Improve air and water quality
- Reduce solid waste
- Conserve natural resources

## Economic Benefits

- Reduce operating costs
- Enhance asset value and profits
- Optimize life-cycle economic performance
- Increase occupant productivity

## Health and Community Benefits

- Improve thermal and acoustic environments
- Enhance occupant comfort and health
- Minimize strain on local infrastructure
- Contribute to overall quality of life



# Sustainable Energy Strategies

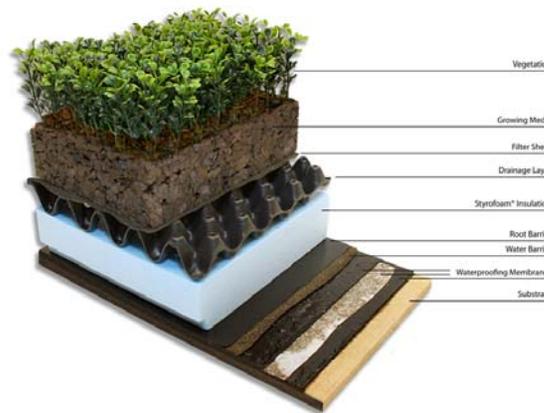
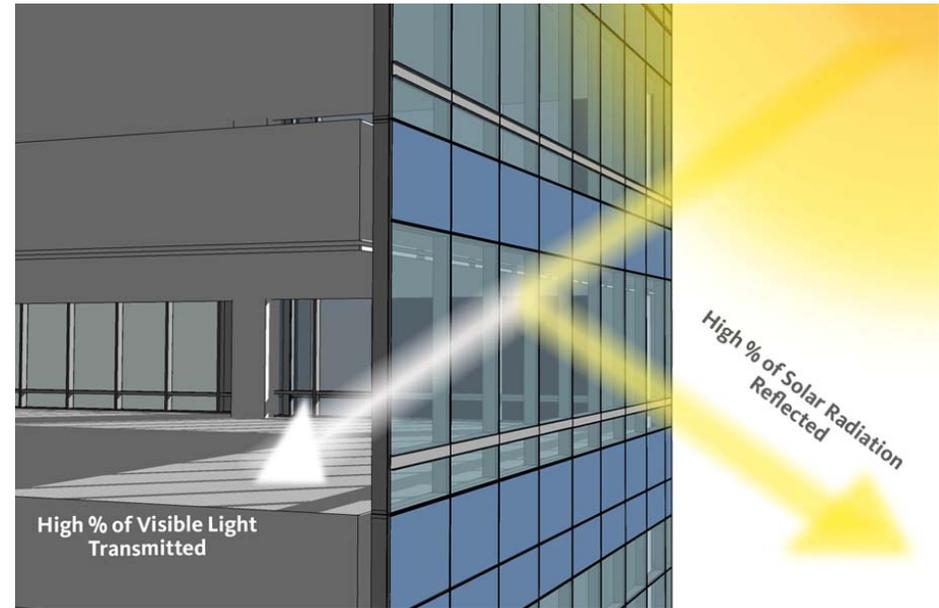
- An on site central plant with centrifugal chillers and a heat recovery enthalpy wheel are used to **conserve overall energy consumption**.
- Discovery Tower will have ten wind turbines installed at the top of the building that will provide both a source of **renewable electricity** and a visible element symbolizing the **commitment to sustainability**.
- The building was designed with high performance glazing to **reduce solar heat gain** while **maximizing views and daylighting** to the regularly occupied spaces.





# Sustainable Energy Strategies

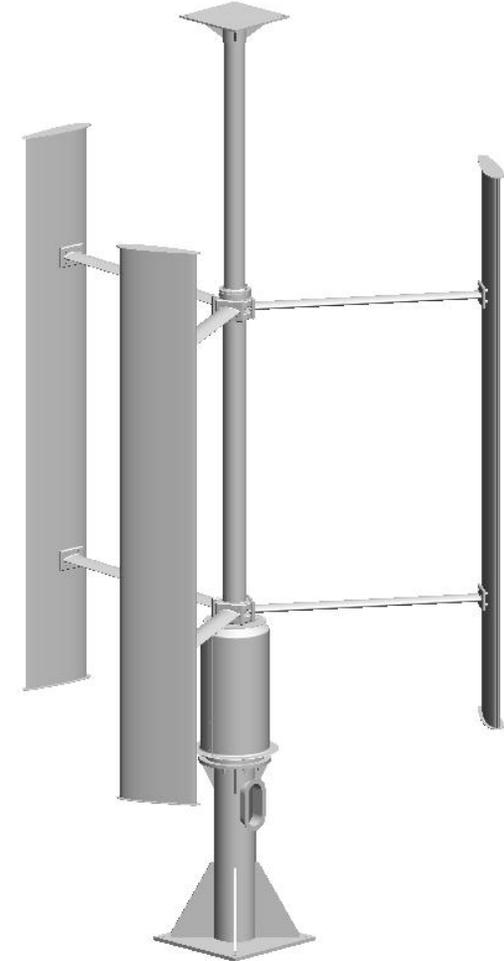
- Solar shades on the south elevation, and the east west building orientation, will further **reduce solar heat gain and glare**.
- A CO<sub>2</sub>-based, **demand controlled ventilation system** is utilized to control the amount of outside air brought into the building
- All interior and exterior lighting in public spaces have been assessed to find the best fixtures, **daylight harvesting** placement and power densities.
- A **green roof** as well as covered, stacked parking and highly reflective paving materials lead to **reduced heat island effects**.





# Sustainable Energy Strategies

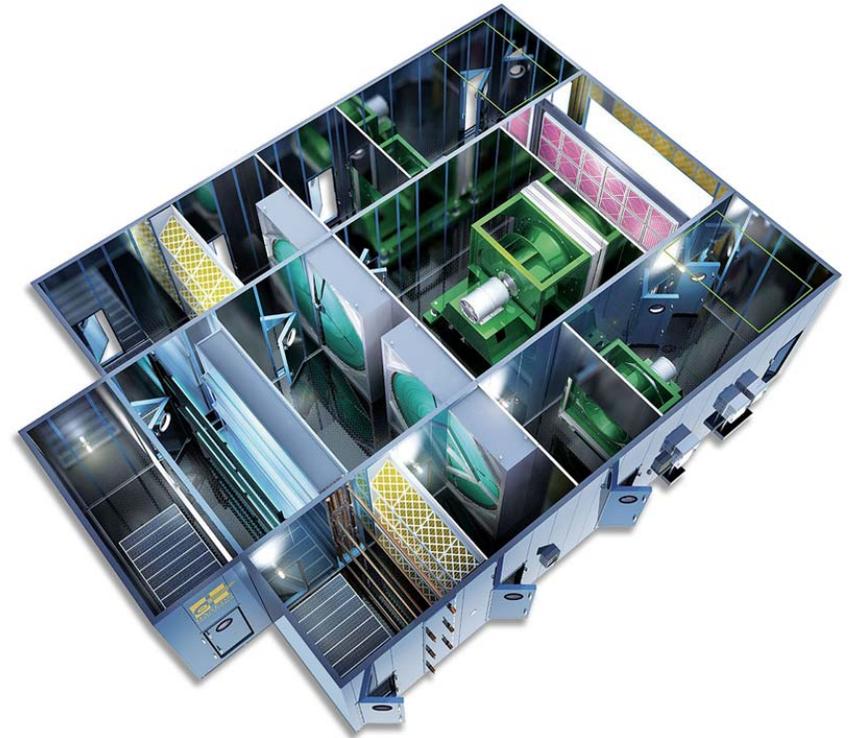
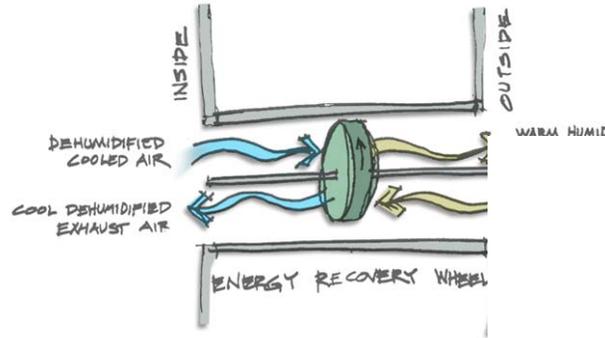
- One of the Tower design's most exciting features is the **wind turbine farm** on the roof. The location of wind turbines at this site is the most viable placement in downtown Houston. Due to its neighboring three-story convention center and Discovery Green Park, the southeastern area around the building will always have an unobstructed wind shed.
- The wind turbines are designed to produce approximately **1% of the building's energy needs**. A 16 mph average wind speed would provide a way to **light the building at night without having to purchase any electricity**.





# Heat Recovery Enthalpy Wheel

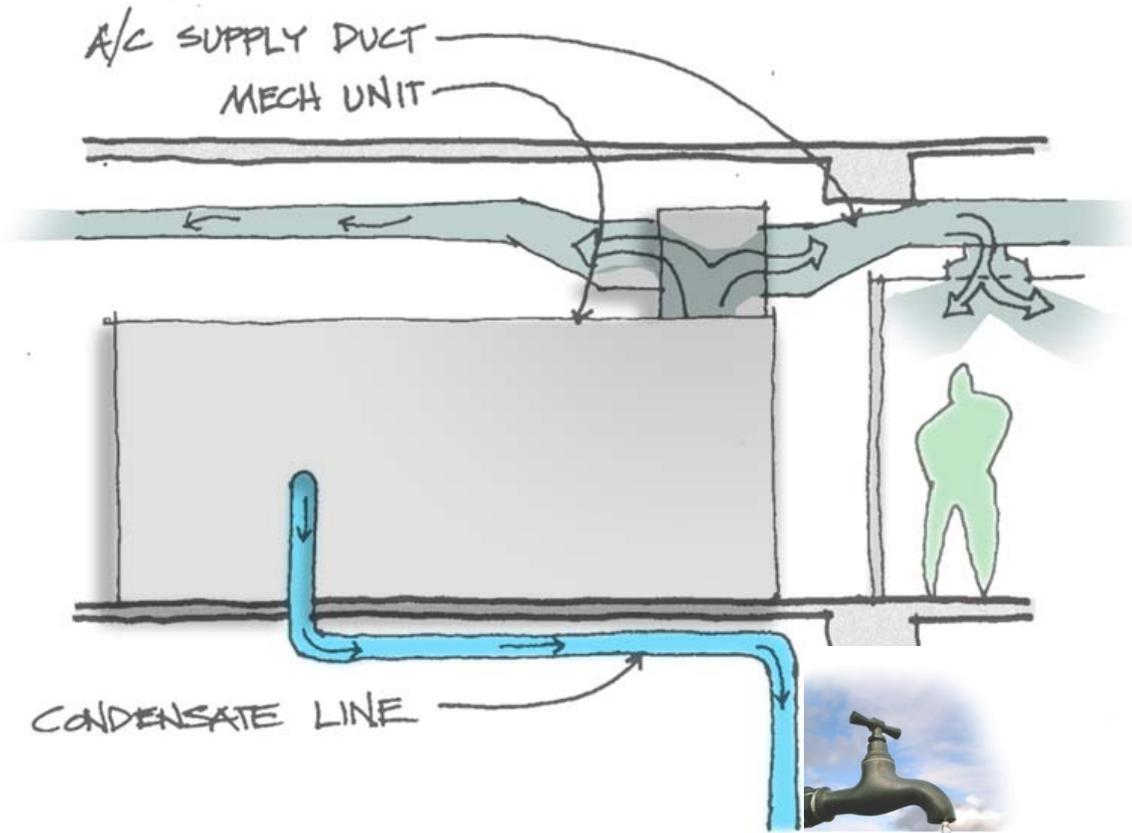
- Energy efficient features include a freestanding mechanical plant that will use the latest technology in pumps and cooling tower a highly efficient HVAC sy that will employ building management systems to accommodate changing weather and occupancy conditions, and mechanical ventilation systems that will use an Energy Recovery Wheel to harvest excess hot or cold air for purposes of normalizing the air temperature.
- These steps and others have earned the building a score of 99 (out of 100) for the “Designed to Earn Energy Star Awards”. It is projected that these design solutions will amount to an annual energy savings of \$294,500 or 12,915,000 kBtu and an annual reduction of approximately 2,382 pounds of carbon dioxide.





# Sustainable Water Strategies

- Instead of using valuable filtered city water, all **landscape irrigation** for the green roof, plaza, and street-level trees will be **harvested from** the building's air conditioning **dehumidification condensate**.
- Given the building's relatively small roof surface area, **condensate harvesting** proved to be a much more effective option than rainwater harvesting in this case.
- Additional **water reduction** will be achieved through the use of **low flow fixtures** such as dual flush toilets and sensor/handless faucets.





# Results

## Conservation of Resources

- Electricity: **20%** more efficient
- Water: Over **40%** more efficient
- Other: All projects used local materials and recycled construction waste and all will have recycling programs during operation

## Indoor Atmosphere

- Light, bright, and healthy working environments
- Pedestrian orientated outdoor environments
- Results are: increases in employee productivity, attraction and retention with decreases in absenteeism and healthcare costs



# Discovery Tower Lobby View From McKinney





ENERGY STAR – Commercial Building Design

Karen P. Butler

# It's the Buildings'...



- ENERGY CONSUMPTION=
- BURNING FOSSIL FUELS=
- CO<sub>2</sub> EMISSIONS=

**GLOBAL CLIMATE CHANGE**

# Industry Goals

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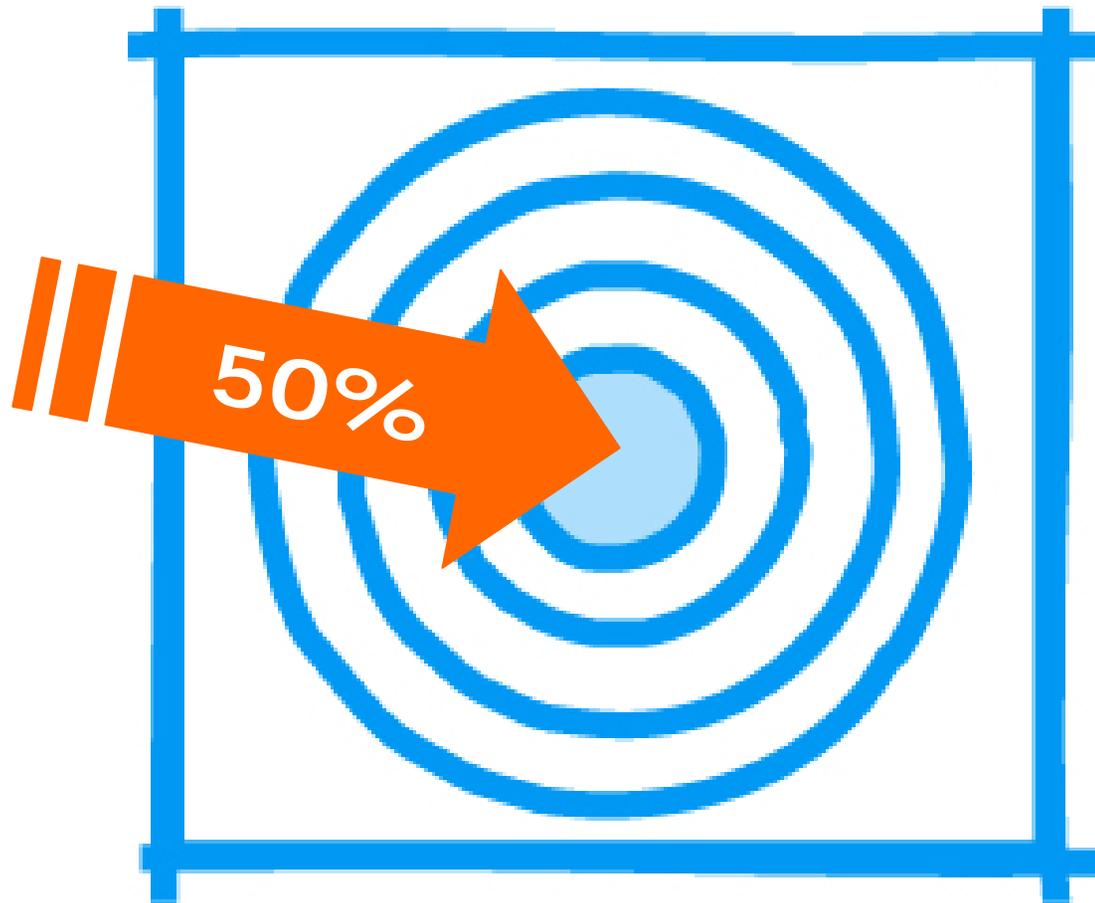


– Industry leaders are working together to set aggressive targets.

- 2030 Challenge
- AIA
- USGBC
- BOMA
- **EPA ENERGY STAR**



# of What?

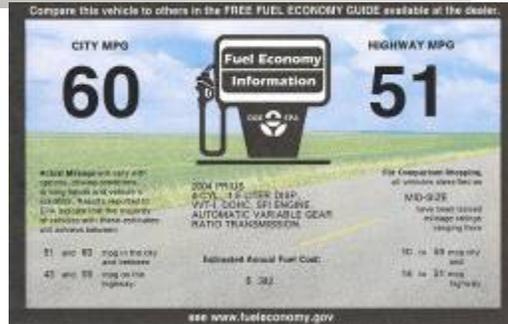


# EPA Performance Ratings



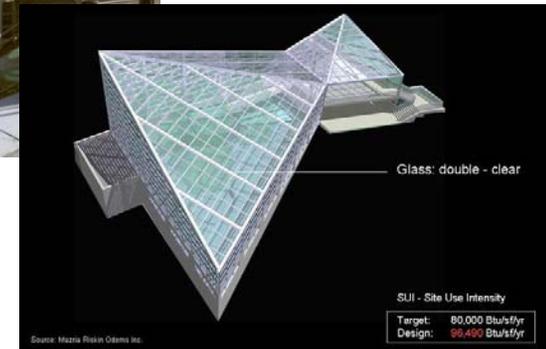
## Fuel Efficiency

MPG



## Energy Performance Rating

kBtu/sf/yr



# Target & Design Rating



TARGET FINDER

PRINT
 FREQUENTLY ASKED QUESTIONS
 CONTACT US
 HELP

[Return to ENERGY STAR Web site](#) > Target Energy Performance Results

## Target Energy Performance Results

NOTE: Values are 97% electricity and 3% other energy source. The Target & Top 10% energy use for this facility are calculated based on fuel mix of input estimated energy use.

The design **achieved** a rating of 75 or higher:

**APPLY for "Designed to Earn the ENERGY STAR"**

Target Energy Performance Results (estimated)			
Energy	Design	Target	Top 10%
<a href="#">Energy Performance Rating (1-100)</a>	85	93	90
<a href="#">Energy Reduction (%)</a>	38	50	45
<a href="#">Source Energy Use Intensity (kBtu/Sq. Ft./yr)</a>	197.2	160.7	176.5
<a href="#">Site Energy Use Intensity (kBtu/Sq. Ft./yr)</a>	60.3	49.2	54.0
<a href="#">Total Annual Source Energy (kBtu)</a>	10,391,481.2	8,468,881.1	9,299,444.9
<a href="#">Total Annual Site Energy (kBtu)</a>	3,179,600.0	2,591,320.1	2,845,457.2
<a href="#">Total Annual Energy Cost (\$)</a>	\$ 124,395	\$ 101,380	\$ 111,323
Pollution Emissions			
<a href="#">CO2-eq Emissions (metric tons/year)</a>	454.5	370.4	406.7
<a href="#">CO2-eq Emissions Reduction (%)</a>	38%	50%	45%

# Document Energy Design Intent



SCALE 1" = 20'-0"

01 KEY PLAN

NO SCALE

18 NOVEMBER, 2002

COMPOSITE PLAN

REVISIONS

NO.	DATE	DESCRIPTION
1		ISSUED FOR PERMIT
2		ISSUED FOR PERMIT
3		ISSUED FOR PERMIT
4		ISSUED FOR PERMIT
5		ISSUED FOR PERMIT
6		ISSUED FOR PERMIT
7		ISSUED FOR PERMIT
8		ISSUED FOR PERMIT
9		ISSUED FOR PERMIT
10		ISSUED FOR PERMIT

**GENERAL PLAN NOTES**

2 HOUR SEPARATION U.L. NO. 1-400  
1 HOUR SEPARATION U.L. NO. 1-405  
AND U-400  
1 HOUR RATED SMOKE PARTITION

**FIRE RATINGS LEGEND**

--- 2 HOUR SEPARATION U.L. NO. 1-400  
- - - 1 HOUR SEPARATION U.L. NO. 1-405  
AND U-400  
- · - · - 1 HOUR RATED SMOKE PARTITION

**NOTES**

1. PLAN INDICATES THE PROPOSED LOCATION OF ALL EXISTING AND NEW WALLS, PARTITIONS, DOORS, WINDOWS, AND CEILING. ALL WALLS AND PARTITIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE IBC AND ALL OTHER APPLICABLE CODES.
2. ALL WALLS AND PARTITIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE IBC AND ALL OTHER APPLICABLE CODES.
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DESIGNED TO EARN THE ENERGY STAR

The estimated performance for US EPA criteria. See eligible for ESR requirements for one year.

**PROTOTYPE HIGH SCHOOL**

DESIGNED TO EARN THE ENERGY STAR

DESIGNED TO EARN THE ENERGY STAR

OMB No 2010-0347

**STATEMENT OF ENERGY DESIGN INTENT**  
September 11, 2007

**FACILITY INFORMATION**

**Facility Name and Location**  
United States 20902

**Facility Characteristics**  
Office (General) 50,000 Sq. Ft.  
Total Gross Floor Area 50,000 Sq. Ft.

**Design Energy (kBtu)<sup>1</sup>**  
Electricity 3,284,275  
Natural Gas 938,364

**DESIGN ENERGY PERFORMANCE RESULTS**

	DESIGN	ENERGY STAR
<b>Energy</b>		
EPA Energy Performance Rating (1 - 100)	76	75
Percent Energy Reduction (%) <sup>2</sup>	28	26
Site Energy Use Intensity (kBtu/sq.ft)	84.5	86.2
Total Annual Site Energy (kBtu)	4,222,639	4,311,848
Total Annual Energy Cost (\$)	\$ 1,105,769	\$ 1,125,130
<b>Pollution Emissions (1000 lbs/yr)</b>		
CO <sub>2</sub>	2,151	2,176

**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.



# ENERGY STAR Challenge



Gensler



## Discovery Tower Houston, TX

- \* Energy Use Intensity (EUI) = 119.9 kBtu/sf/yr
- \* Percent CO<sub>2</sub> Reduction = 66%
- \* ENERGY STAR Design Rating = 99

- Annual Savings Statistics  
(compared to an average building EPA rating of 50)
- \* Energy Savings = 221,070,025 kBtu
  - \* CO<sub>2</sub> Savings = 13,816.1 tons CO<sub>2</sub>

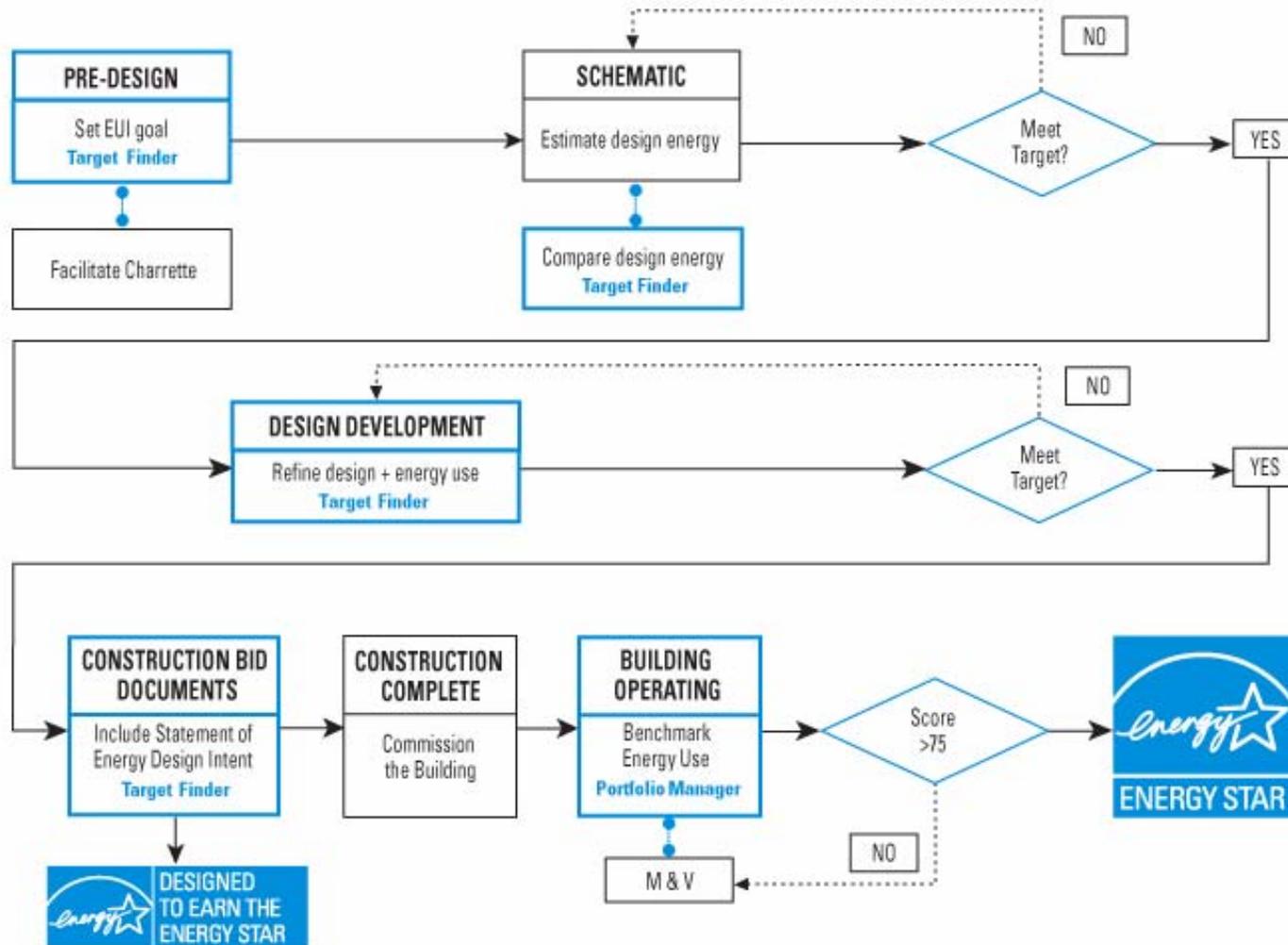
- Pre-certified LEED Gold for Core & Shell
- 30-story office building with pedestrian plaza
- Site Adjacent to new 12-acre Urban Park
- Space on first floor for potential retail tenants
- 10 Building Integrated Wind Turbines on roof
- High efficiency glazing reduces energy loads
- Energy Recovery Wheel reduces energy consumption
- Salvaging 75% of construction waste
- Landscaping irrigation supplied by Air Conditioning Condensate
- Procuring 30% of materials from regional sources, both extracted and processed within a 500-mile radius



Projects that achieve a rating of 75 or higher

Projects that meet AIA Sustainable Practice and Architecture 2030 goal

# Start to Finish: ENERGY STAR



# New Employee Communication Resources



- Bring Your Green To Work Posters
- Employee Tip Cards
- Earth Day Gift Package

[www.energystar.gov/publications](http://www.energystar.gov/publications)

**Bring Your GREEN TO WORK**  
with ENERGY STAR®

The small steps you take at work to save energy can make a big difference in the fight against global warming.

**monitor/computer**  
Enable power management settings so they automatically enter a low-power mode when not in use.

**desk lamp**  
Replace the bulbs in desk lamps with ENERGY STAR qualified bulbs.

**power strip**  
Use a power strip as a central "turn off" point when you are done using office equipment to completely disconnect the power supply.

**cellphone**  
Unplug electronics when not in use.

**you**  
Create a green team with your co-workers to help save energy and reduce office waste.

Take a virtual tour at [energystar.gov/work](http://energystar.gov/work) and see what else you can do.

ENERGY STAR® is a U.S. Environmental Protection Agency program helping businesses and individuals fight global warming through superior energy efficiency.

EPA

**Bring Your GREEN TO WORK**  
with ENERGY STAR®

Learn how you can make many of the same green choices at work as you make at home to save energy and fight global warming with help from EPA's ENERGY STAR program.

- 1 Give It a Rest**  
Use the ENERGY STAR power management settings on your computer and monitor so they go into power save mode when not in use. Also use a power strip as a central "turn off" point when you are using equipment to completely disconnect the power supply.
- 2 Unplug It**  
Unplug electronics such as cell phones and laptops once they are charged. Adapters plugged into outlets use energy even if they are not charging.
- 3 Light Up Your Work Life**  
Replace the light bulbs in your desk lamp with an ENERGY STAR qualified bulb. It will last up to 10 times longer and use about 75 percent less energy. Turn off the lights when you leave, especially at the end of the day.
- 4 Let It Flow**  
Keep air vents clear of paper, files, and office supplies. It takes as much as 25 percent more energy to pump air into the workspace if the vents are blocked.
- 5 Team Up**  
Create a Green Team with your co-workers, help build support for energy efficiency in your workplace, and reduce office waste. Set a goal to make your building an ENERGY STAR qualified building.

Learn More at [energystar.gov/work](http://energystar.gov/work)

ENERGY STAR® is a U.S. Environmental Protection Agency program helping businesses and individuals fight global warming through superior energy efficiency.

ENERGY STAR



# Announcements

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- Feb. 23 @ 2 PM - Laboratory Benchmarking Initiative ([energystar.webex.com](https://energystar.webex.com))
- March 3 @ 2 PM – Industrial Lighting Standard Briefing ([energystar.webex.com/meeting](https://energystar.webex.com/meeting))
- March 4 @ 2 PM – Motor Energy Management ([energystar.webex.com](https://energystar.webex.com))

# 2009 Web Conferences



<b>Month</b>	<b>Topic</b>
January	ENERGY STAR Update
February	Designing Energy Efficient Buildings
March	Datacenter Energy Management
April	Disclosing and Communicating Energy Performance Leading Energy Management Programs – The ENERGY STAR Partners
May	Or the Year
June	Solar Strategies
July	Engaging Sites With Performance Data
August	Lighting Technology & Strategies
September	TBA
October	Energy and GHG Management
November	TBA
December	No web conference



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- Thank you