

ENERGY STAR®

Update Webinar: IT Equipment and Data Centers



April 18, 2007

Agenda



- **General Program Introduction**
 - Stuart Brodsky, *US Environmental Protection Agency*
- **Report to Congress & Process for Server Specification Development**
 - Andrew Fanara, *US Environmental Protection Agency*
- **Whole Building Approach & Implications**
 - Alexandra Sullivan, *US Environmental Protection Agency*
- **Next Steps for Whole Buildings**
 - Stuart Brodsky, *US Environmental Protection Agency*

Web Conference Tips



- You should be seeing the slides to the left and participant and chat windows to the right.
- Mute Phone when listening: *6
- Chat feature
- Hold & music – If your phone system has music-on-hold, please don't put the web conference on hold
- Presentation slides will be sent to all participants following the web conference

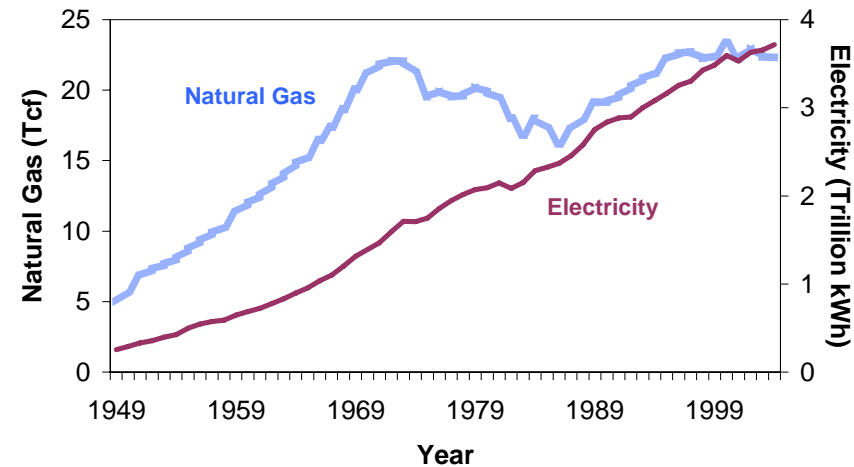
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Today's Energy Challenges

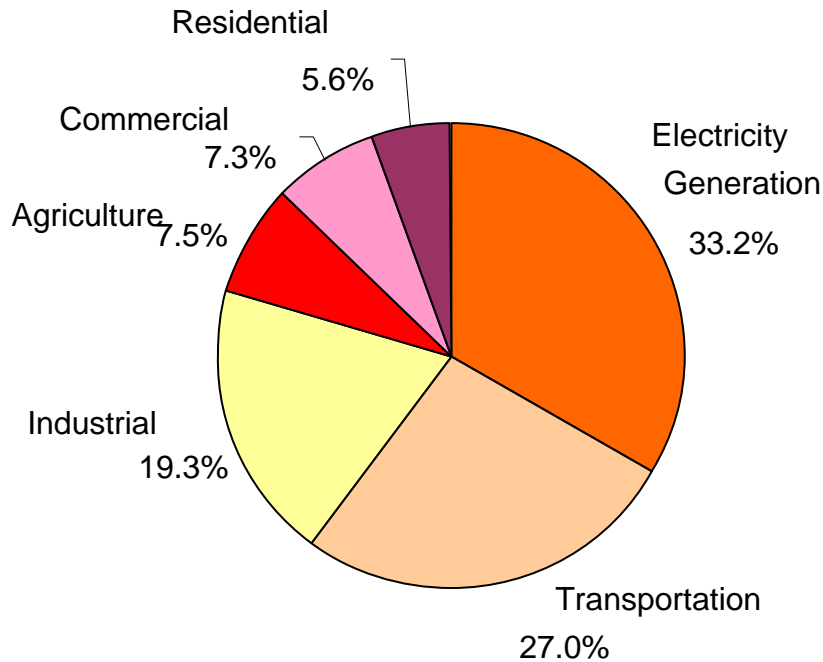
- **Energy demand is growing**
- **Rising utility bills**
- **Increasing generation costs**
 - Gas and coal prices
 - Building cleaner generation
- **Carbon risk**
- **Reliability issues**
- **Natural gas prices increasing / volatile**
- **Pending large transmission and generation investments in uncertain investment world**



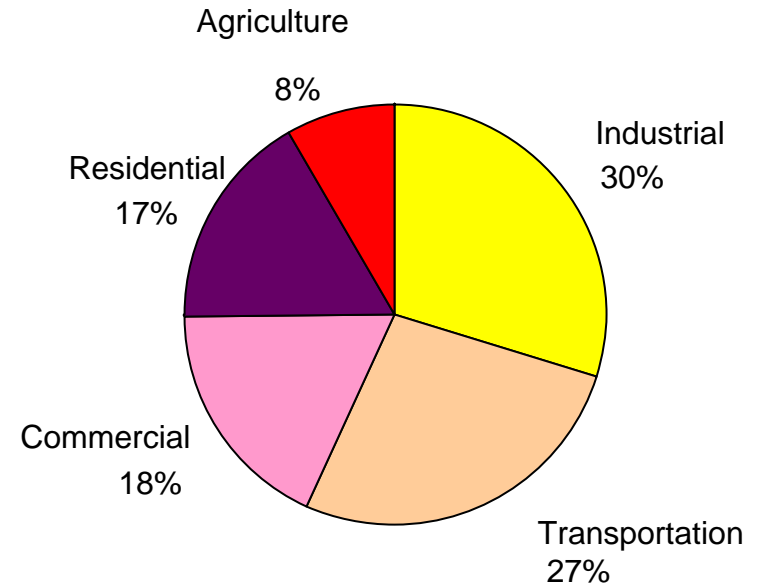
Electricity Generation Contributes to Emissions of Greenhouse Gases



U.S. Greenhouse Gas Emissions by Sector
(2002 Total = 6,888 MMTCO₂E)



U.S. Greenhouse Gas Emissions by Sector with Electricity-Related Emissions Distributed
(2002 Total = 6,888 MMTCO₂E)



What is Energy Star?



- Partnership
- Financial Value
- Environmental Results
- Trusted Source of Information

- Homes
- Products
- Commercial Buildings

What is Energy Star?



- 2006 Results
 - \$14 billion in savings
 - 37 million metric tons CE
 - emissions of 25 million cars
 - 5% of total electricity demand

Product Specification Development



- Guiding Principles
 - Several industry stakeholder meetings
 - Cost-effective efficiency
 - Performance maintained or enhanced
 - Significant energy savings potential
 - Efficiency is achievable with several technology options
 - Product differentiation and testing are feasible
 - Labeling can be effective in the marketplace

Developing Minimum Performance Requirements



- Specification levels typically represent top 25% of models available in marketplace
- Also take into consideration:
 - Diversity of manufacturers/brands represented
 - Emerging energy saving designs/technologies
 - Utility, state, and federal government initiatives
- Use industry accepted test procedures to evaluate product performance, when available

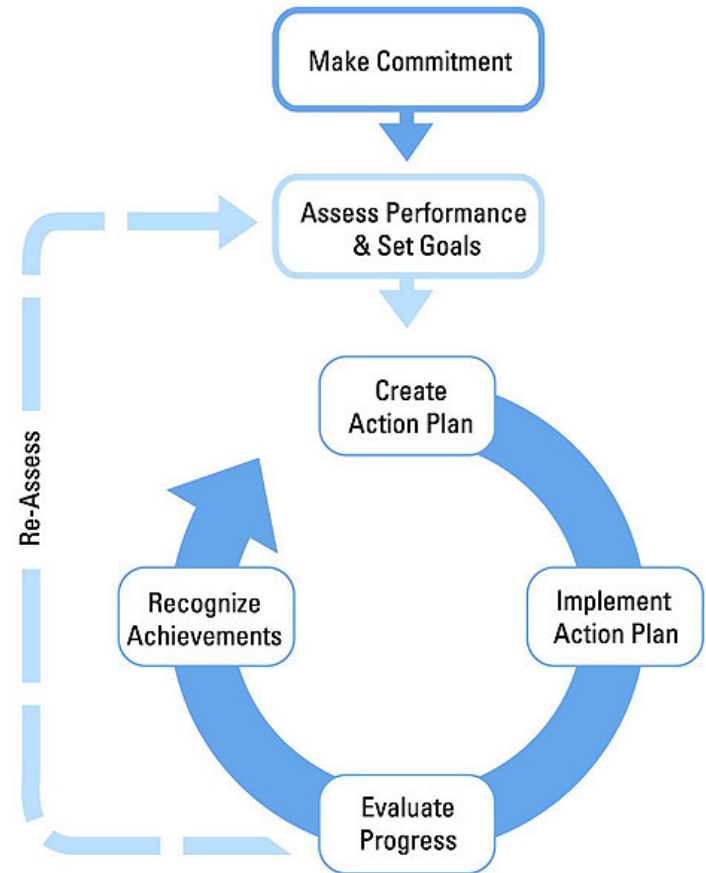
Stakeholder Involvement



- Important component of development process
- EPA strives to be transparent and inclusive
 - Several industry stakeholder meetings
 - Stakeholder comment period for each Draft version
 - Comments posted to ENERGY STAR Web site
 - Use manufacturer-supplied data, where available
- Coordination with international stakeholders to encourage global harmonization
 - i.e., EU and China, especially for servers

Strategic Approach to Energy Management in Buildings

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



Assessing Energy Performance



Do you know how your buildings perform?

- A standardized, comparable metric of whole building energy *performance* did not exist in the past
- EPA introduced the *Energy Performance Rating System* to meet this need

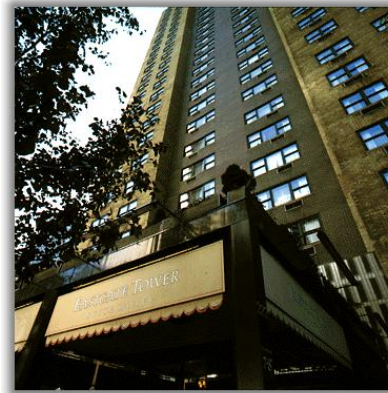
National Energy Performance Rating System



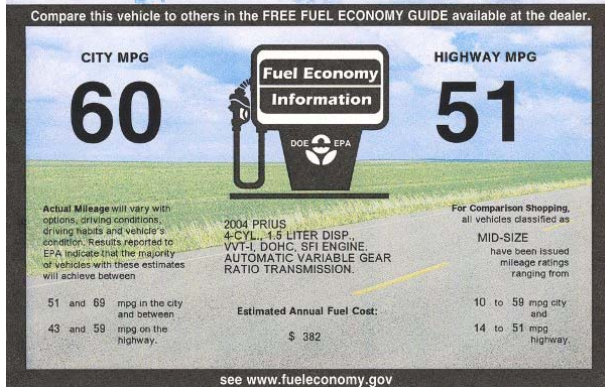
Is 10 MPG high or low for this automobile?



Is 90 kBtu/SF/YR high or low for this hotel?



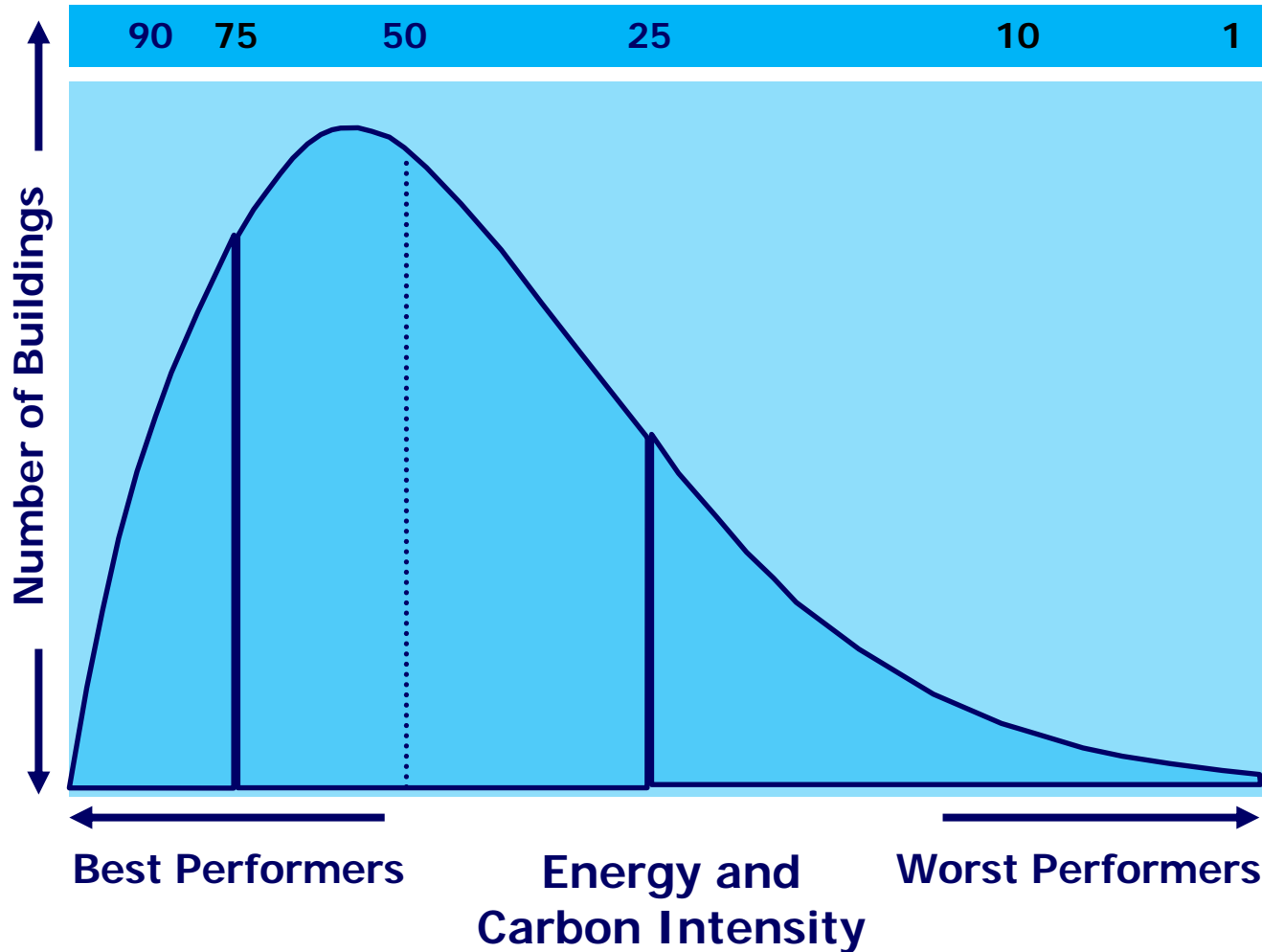
Fuel Efficiency (MPG)



Energy Efficiency Rating (1 – 100)

STATEMENT OF ENERGY PERFORMANCE				Date: 08/20/2004	
Sample Facility				Sample Facility	
Building: 10000				Address: 10000	
For 12 Month Period Ending: 12/31/03				City: 10000	
Energy Star Score: 90				State: 10000	
Facility Name	10000	Energy Star Score	90	Number of Floors	10
Facility Type	Office	Energy Star Score	90	Number of Units	10
Facility Size (SF)	100,000	Energy Star Score	90	Number of Units	10
Facility Address	10000	Energy Star Score	90	Number of Units	10
Facility City	10000	Energy Star Score	90	Number of Units	10
Facility State	10000	Energy Star Score	90	Number of Units	10
Facility ZIP	10000	Energy Star Score	90	Number of Units	10
Facility Year Built	10000	Energy Star Score	90	Number of Units	10
Facility Year Renovated	10000	Energy Star Score	90	Number of Units	10
Facility Year Occupied	10000	Energy Star Score	90	Number of Units	10
Facility Year Inspected	10000	Energy Star Score	90	Number of Units	10
Facility Year Certified	10000	Energy Star Score	90	Number of Units	10
Facility Year Recertified	10000	Energy Star Score	90	Number of Units	10
Facility Year Recertified	10000	Energy Star Score	90	Number of Units	10

National Energy Performance Rating System



ENERGY STAR
Performance
Rating

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Public Law 109-341: EPA Study



- Purpose: assess energy impacts on and from datacenters, identify energy efficiency opportunities, and recommend strategies to drive the market for efficiency
- Chapters/Topics:
 - Trends in growth and energy use of servers and data centers
 - Potential energy and cost savings due to improved energy efficiency
 - Electric utility impacts from server and data center energy efficiency
 - Potential impacts of energy efficiency on performance, reliability
 - Role of fuel cells and distributed generation in data centers
 - Barriers to implementation of energy efficiency
 - Recommendations for incentives and voluntary activities

Study Goals and Expectations



- Inform Congress & other policy makers of important market trends, forecasts and opportunities
 - Understand the impact energy consumption is having on datacenters and its implications for national energy consumption
- Identify and recommend potential short and long term efficiency opportunities and match them with the right policies
- Identify areas for additional strategic research outside the scope of the report
- Stress voluntary initiatives not regulatory standards

EPA Study Timeline



- **February 15:** EPA hosted workshop to discuss approach and generate ideas and leads
 - Discussion summaries available on Web site
- **April:** EPA to post Draft study for 2-week comment period
- **May 18:** EPA to share overview of study findings at Datacenter Dynamics conference in Washington
 - EPA may also host a Web conference in May to present final approach and recommendations
- **June:** Final study due to Congress in June
 - EPA will share with stakeholders key conclusions of that final report

ENERGY STAR IT Equipment Specifications: Servers



- Initial focus will be on **servers** but EPA also interested in storage and other IT equipment longer term
- Goal is to release a strawman document at end of June for stakeholder review that shares overall approach and includes:
 - Basic requirements of all ENERGY STAR partners/products
 - Well defined product definitions and applicable categories
 - Potential testing, performance, and reporting requirements
- EPA is currently considering power supply efficiency and energy efficiency performance benchmarking
 - Need support from industry stakeholders to help shape this first framework document

Timeline: Next 6 Months*



- **June:** Specification framework document is released for review and comment
- **July:** Stakeholder meeting to discuss framework document
 - First official Draft document released following meeting
- **October:** Potential second stakeholder meeting to discuss Draft specification

* Dates are tentative and will depend on available data and level of industry feedback.

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Whole Building Approach & Implications



- EPA whole building ratings
 - Objective
 - Statistical Foundation
- Benchmarking Data Centers
- Challenges and Opportunities in Data Centers
- Potential Metric
- Next Steps

EPA Rating – Objectives



- Monitor actual as-billed energy data
- Create a whole building indicator
 - Capture the interactions among building systems not individual equipment efficiency
 - Track energy use accounting for weather and operational changes over time
- Give a peer group comparison
 - Compare a building's energy performance to its national peer group
 - Track how changes at a building level alter the building's standing relative to its peer group

EPA Rating – Statistical Foundation



- Analyze national survey data
 - Energy Information Administration’s Commercial Building Energy Consumption Survey (CBECS)
- Develop regression models to predict energy use for specific building types based on operations
- Create scoring lookup table
 - Ratings are based on the distribution of energy use for a given building type
 - Ratings are expressed on a 1-to-100 scale such that one point represents one percentile of buildings
- Buildings that earn a 75 or higher can earn the ENERGY STAR label
- Based on analysis only available for certain building types:
 - Office, School, Hotel, Supermarket, Hospital, Medical Office, Warehouse, Dormitory

EPA Rating – Statistical Foundation



- The rating **does**
 - Evaluate as billed energy use relative to building operations
 - Normalize for operational characteristics
 - Number of employees and computers, operating hours, climate
 - Depend on a statistically representative sample of the US commercial building population
- The rating **does not**
 - Attempt to sum the energy use of each piece of equipment
 - Normalize for technology choices or market conditions
 - Specific technology, energy price
 - Explain how or why a building operates as it does

Benchmarking Data Centers



- Data centers are critical for the ENERGY STAR Commercial Buildings program
- Important for existing commercial partners including
 - Financial service sector
 - Retail sector
 - IT sector
- EPA initiating a working group to develop an appropriate metric for data centers
 - Agree on an appropriate metric and terminology
 - Identify data needs and data collection method to establish a benchmark using that metric

Challenges and Opportunities in Data Centers



- No standard measure of operation (i.e. processing, memory, etc)
 - ENERGY STAR Products team is working to standardize these metrics
 - In the absence of a measure of operation, ENERGY STAR Buildings team can work to benchmark based on supporting systems (i.e. HVAC, power supply)
- No national representative data source for analysis
 - CBECS does not include a sample of Data Centers
 - Given widespread interest, EPA will lead a working group in this area
 - With data collection, EPA hopes to provide benchmark capability and guidance in Portfolio Manager
 - Without national, statistically representative sample cannot award ENERGY STAR Label

Potential Metric



- Ratio: *Total Facility Power / IT Equipment Power*
 - Based on Uptime Analysis
 - Ranges from 1.6 (ideal) to 3+
 - 2.4 = Average
 - Termed “Power Usage Efficiency” (PUE) by Malone/Belady
- Reciprocal (efficiency)
 - Ranges from 30-60%
 - Potentially easy to communicate, but will never be higher than approximately 60%

Next Steps for Benchmarking



- Add IT Power as an input in Portfolio Manager
 - Would allow anyone to see their ratio
(total facility power/IT equipment power)
 - Building owners and operators could track data center energy use alongside their other facilities (i.e. offices)
 - Owners and operators can take advantage of all Portfolio Manager tools and ENERGY STAR strategies
- EPA to convene Data Center Working Group

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Working Group



- Feedback from industry stakeholders
 - Agree on appropriate metric and terminology
 - Identify data needs and data collection method to establish benchmark
- Contact us:
benchmark-datacenters@energystar.gov