



# EPA Report to Congress and ENERGY STAR Datacenter Initiatives

CRITICAL FACILITIES ROUND TABLE

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# Presentation Agenda

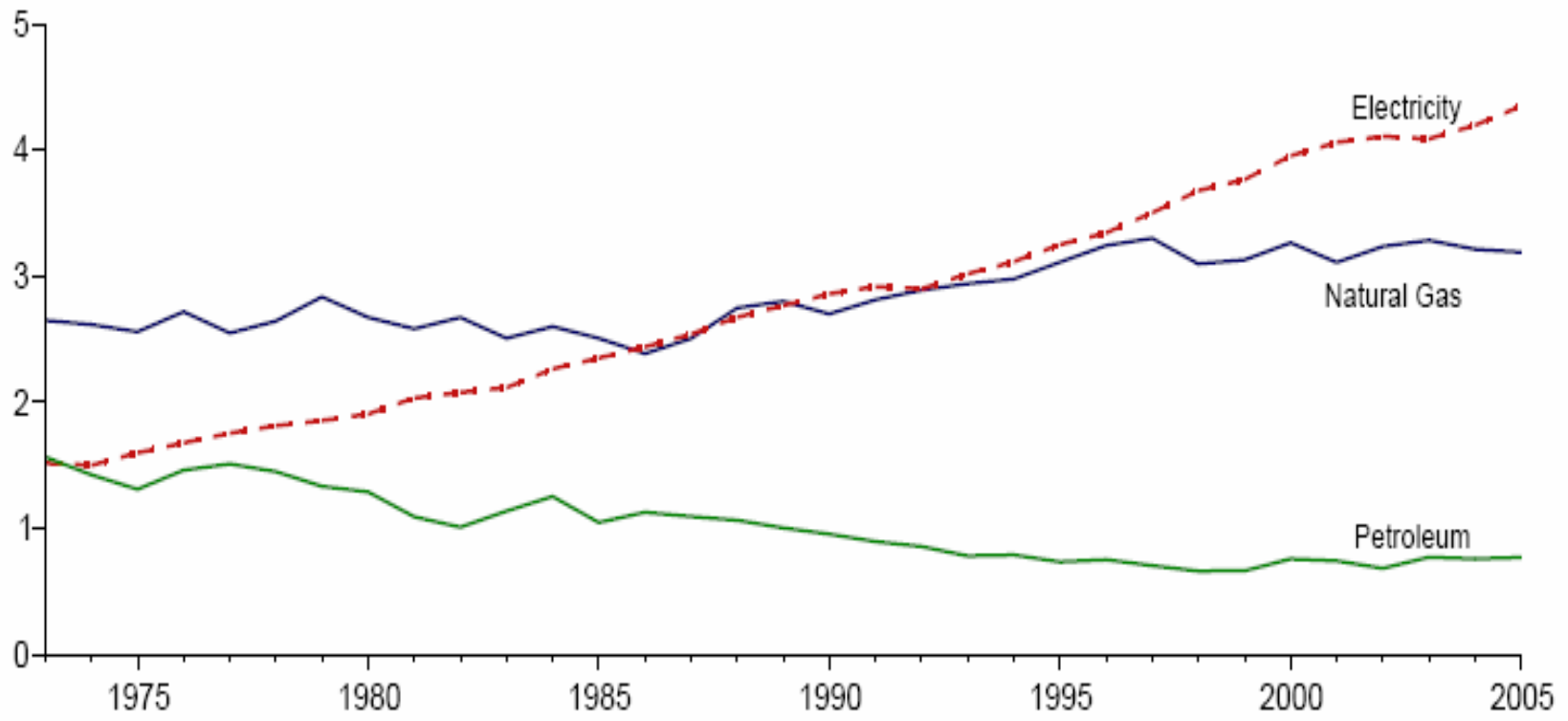


- The Big Energy Picture
- Where do Datacenters Fit In
- Government Role in this Sector
- EPA Report to Congress: Findings and Recommendations
- Other EPA ENERGY STAR Initiatives
- Q&A

# Commercial Sector Energy Consumption (quadrillion Btu)



By Major Sources, 1973-2005



Source: February 2007 Monthly Energy Review, EIA

# The Energy Straitjacket



- Deliverability limitations in all markets for all fuels
- Oil market restrained by refining capacity
- Coal market restrained by rail & mining capacity
- Electricity constrained by available fuel and transmission
  - high demand taxes grid infrastructure
- Renewables limited by equipment manufacturing
- Fuel switching limited by tight markets

# Climate Concerns Gaining Momentum



ABOUT THE EVENT CLIMATE CRISIS TOOLS WHO

LATEST NEWS: MORE THAN 10 MILLION WATCH L

## THE EVENT 7.7.07

Live Earth will use the global reach of music to engage people on a mass scale to combat our climate crisis.

NEW YORK  
LONDON  
JOHANNESBURG  
RIO DE JANEIRO  
SHANGHAI  
TOKYO  
SYDNEY  
HAMBURG

## ABOUT THE EVENT



### LIVE EARTH

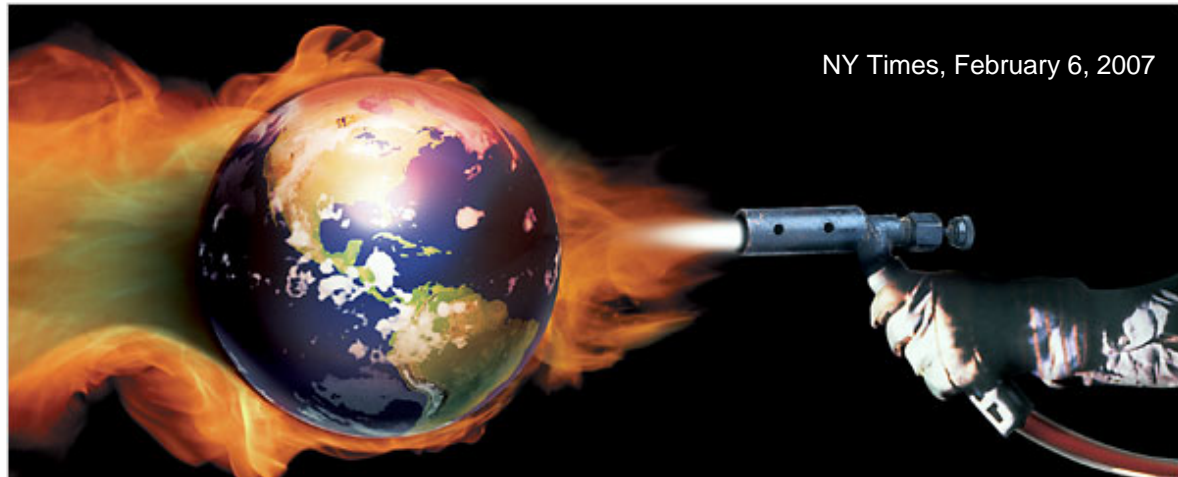
climate crisis.

Live Earth will reach this worldwide audience through an unprecedented global media architecture covering all media platforms - TV, radio, Internet and wireless channels.

Live Earth marks the beginning of a multi-year campaign led by the Alliance for Climate Protection.

Live Earth is a 24-hour, 7-continent concert series taking place on 7/7/07 that will bring together more than 100 music artists and 2 billion people to trigger a global movement to solve the climate crisis.

## On the Climate Change Beat, Doubt Gives Way to Certainty



NY Times, February 6, 2007

## Scientists: Humans 'very likely' cause global warming

POSTED: 6:46 a.m. EDT, April 29, 2007

### STORY HIGHLIGHTS

- Scientists release a 21-page report strongly linking humans to climate change.
- Report scientist: Evidence of warming on the planet is unequivocal.
- Scientists predict global temperature increases of 3.2-7.1 degrees F.
- Sea levels could rise between 7 and 23 inches by the end of the century.

(CNN) -- Global warming is here and humans are "very likely" to be the cause, a new report from an international group of scientists meeting in Paris, France, a

## Climate change fight 'can't wait'

The world cannot afford to wait before tackling climate change, the UK prime minister has warned.

A report by economist Sir Nicholas Stern suggests that global warming could shrink the global economy by 20%.



BBC News, October 31, 2006

CNN, April 29, 2007

# What's the Risk to Business?



- Energy Supply/Security & Climate Change Risk
  - **Physical risk** to property from extreme weather
  - **Financial risk** to the health and competitiveness of firms
  - **Reputational risk** due to poor public and investor community perception
- There is a growing demand for energy management strategies designed to mitigate risks while seeking a competitive advantage

# Where do Data Centers Fit In?



- Data centers are energy intensive facilities
  - Server racks now designed to carry 25 kW load
  - Typical facility ~ 1MW, but can be > 20 MW
    - *Information factories*
  - Nationally **1.5% of US Electricity consumption** in 2006
    - Could double in next 5 years
- Critical national and global infrastructure
  - Few technology barriers to increased efficiency
  - Good candidates for efficiency investments by utilities to reduce peak loads

# EPA Becomes Involved



- January 2006 server and datacenter conference brought together key stakeholders and generated intense media interest (\$100,000 in earned media coverage)
  - Conference action item: find way to measure server energy efficiency performance
- Since then EPA has been working with industry to identify opportunities to reduce energy used by this sector
- Many organizations and IT leaders looking to reduce climate footprint – industry has made strides and is eager to work with EPA



# Energy Issues Abound



- Over the next five years, power failures and limits on power availability will **halt data center operations at more than 90% of all companies**  
(AFCOM *Data Center Institute's Five Bold Predictions, 2006*)
- By 2008, **50% of current data centers will have insufficient power and cooling capacity** to meet the demands of high-density equipment  
(Gartner press release, 2006)
- Survey of 100 data center operators: 40% reported running out of space, power, cooling capacity **without sufficient notice**  
(Aperture Research Institute)

# Rising Cost of Ownership



- From 2000 – 2006, computing performance increased 25x but energy efficiency only 8x
  - Amount of power consumed per \$1,000 of server spending has increased 4x
- Cost of electricity and supporting infrastructure now surpasses capital cost of IT equipment
- Creating perverse incentives --- IT and facilities costs separate

# IT Industry Taking Action



**Join us in slowing global warming - one energy-efficient computer at a time.**

Believe it or not, the average desktop PC wastes nearly delivered to it. Half! This wasted electricity unnecessary the cost of powering a computer, and it also increases t greenhouse gases.

Improving the energy efficiency of computers is a cost-effective y to reduce electricity consumption and the emission of greenhouse gases that contribute to climate change.

- Home
- Individuals
- Businesses
- Pledge Your Support
- About the program
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[www.climatesaverscomputing.org](http://www.climatesaverscomputing.org)



the green grid™

[www.thegreengrid.com](http://www.thegreengrid.com)



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Minneapolis-Phoenix-Atlanta Server Colocation & Hosted Solutions

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## IBM Plans \$86M Big Green Data Center

IBM (NYSE: IBM) has announced plans for an \$86 million data center expansion that will add 80,000 square feet of technical space to its Boulder, Colo. facility. IBM will use the space to build a "green data center" featuring IBM's latest energy-efficient technology. The project is supported by a \$480

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## HP plans data center consolidation

By Candace Lombardi

Staff Writer, CNET News.com

# What's the Government's Role?



- EPA & DOE can be catalyst
  - Stimulate competition on energy efficiency
  - Foster discussions between key stakeholders
  - Provide key recommendations (EPA Report to Congress)
  - Developing standardized test procedures and metrics to measure energy consumption (e.g., ENERGY STAR)
- Take the lead on best practices and metering federal datacenters
- Promote initiatives globally (Canada, EU, UK, China, India)

# Public Law 109-431: EPA Report



- **Purpose:** assess energy impacts on and from datacenters, identify energy efficiency opportunities, and recommend strategies to drive the market for efficiency
- **Goals:**
  - Inform Congress & other policy makers of important market trends, forecasts, opportunities
  - 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

# Industry Involvement



- Early discussions with key stakeholders to shape the scope of the report
- Public workshop February 16, 2007
  - 130+ attendees participated in discussions
  - Opportunity to provide input and feedback about EPA's approach
- Draft report shared for review and comment
  - More than 50 sets of comments received from a wide range of stakeholders

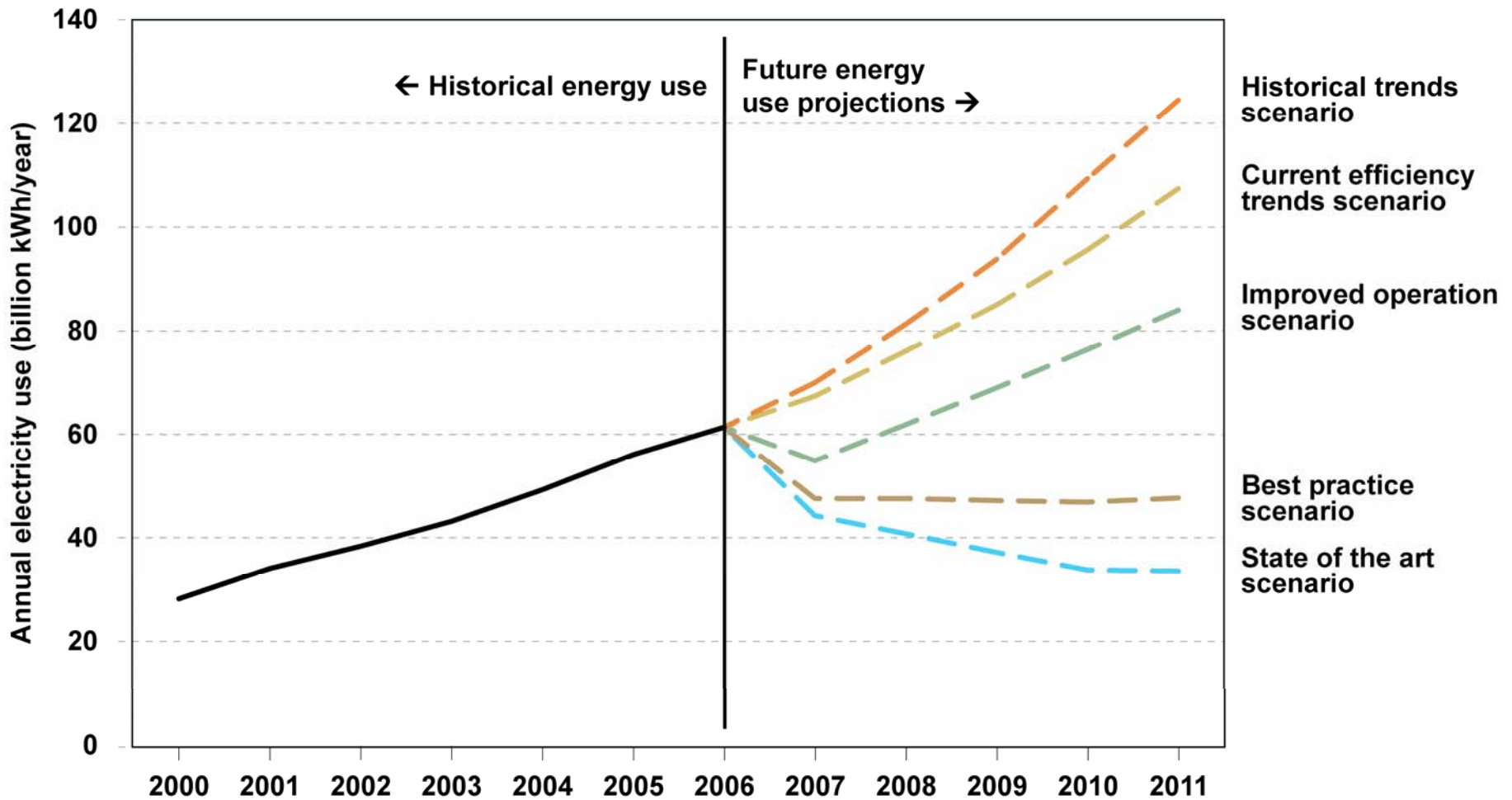
# Results of EPA Report



## Data Center Energy Use Trends

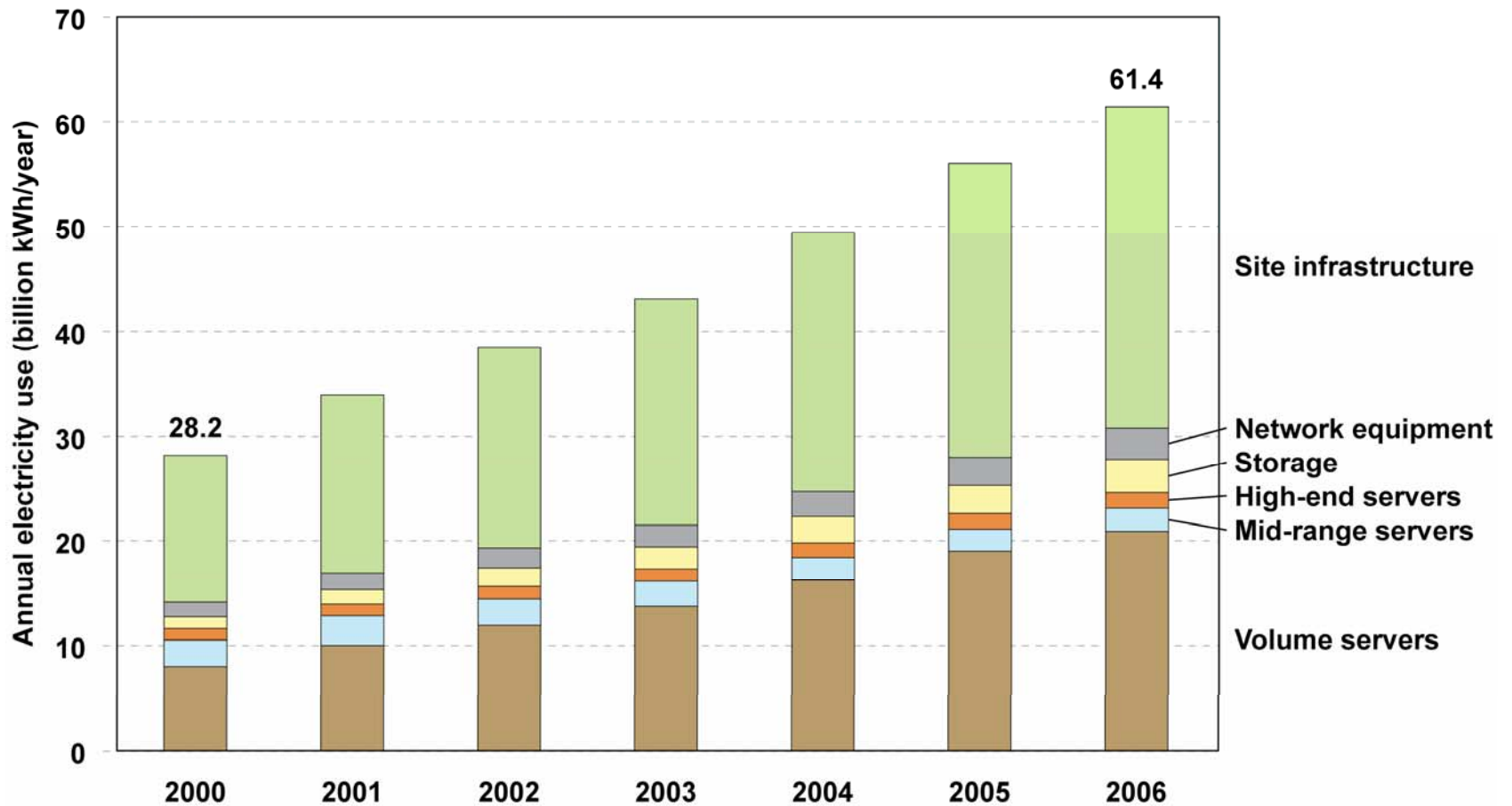
- Sector consumed about **61 billion kWh** in 2006
  - Equates to **~1.5%** total U.S. electricity consumption and **~\$4.5 billion**
  - Federal sector: ~6 billion kWh and ~\$450 million
- Projected to increase to **100 billion kWh** in 2011
  - Equates to **~2.5%** of total U.S. electricity consumption and **~\$7.4 billion**

# Comparison of Projected Electricity Use, All Scenarios, 2007 to 2011





# Electricity Use by End-Use Component, 2000 to 2006



# Report Results, *cont.*



## Identified Key Barriers to Energy Efficiency

- Lack of efficiency definitions for equipment and data centers
  - Service output difficult to measure, varies among applications
  - Need for metrics and more data: *How do we account for computing performance?*
- Split incentives
  - Disconnect between IT and facilities managers
- Risk aversion
  - Fear of change and potential downtime – energy efficiency perceived as a change with uncertain value and risk

# Report Results, *cont.*



## Recommendations

- Standardized performance measurements for data centers and IT equipment
  - Development of benchmark/metric for data centers
  - ENERGY STAR label for servers
- Leadership by federal government
  - Publicly report energy performance of datacenters
  - Conduct energy efficiency assessments, all datacenters in 2-3 years
  - Architect of the Capital, implement server-related recommendations in Greening of the Capital report

# Report Results, *cont.*



## Recommendations, *cont.*

- Private Sector Challenge
  - CEOs conduct **DOE Save Energy Now** energy efficiency assessments, implement measures, and report performance
- Information on Best Practices
  - Raise awareness and reduce perceived risk of energy efficiency improvements in datacenter
  - Government partner with private industry: case studies, best practices
- Research and Development
  - Develop technologies and practices for datacenter energy efficiency (e.g., hardware, software, power conversion)

# Benchmark for Datacenters



- **Core recommendation** of the EPA report
- Benchmark provides opportunity to compare and measure impacts of changes made to facility
  - Users can measure total facility energy consumption over time by adding submeters to monitor specific loads within the datacenter
  - Building owners and operators can track datacenter energy use alongside their other facilities

## Role of the government

- Forge consensus on industry accepted benchmark
- DOE Save Energy Now Program, metering datacenters
- EPA considering an ENERGY STAR benchmarking tool

# ENERGY STAR for Servers



- Server energy demand drives DC power & cooling needs
- Goal: Create protocol to measure server energy efficiency to allow fair competition
- Technical specification would have several key elements:
  - Definitions of product types eligible for ENERGY STAR
  - Test procedure for energy efficiency & computing performance
  - Proposed levels to set the bar: near term (i.e. Tier 1) may include power supply efficiency; longer term (i.e. Tier 2, replacing Tier 1) would be a more holistic metric (system efficiency)
- Draft framework discussion document available for stakeholder review -- EPA seeking comments by **August 31**

# Takeaways



- Rising energy supply / security & climate change concerns
  - Emergence of green economy but standard metrics & energy transparency needed
- Financial and reputational risk associated with doing nothing
  - Boardrooms, investors, and customers taking notice
  - Energy efficiency should be a first resource in an action plan
- Data centers a key economic and CO2 reduction opportunity
- *Stay tuned for EPA & DOE plan to implement recommendations*
- Track progress at [www.energystar.gov/datacenters](http://www.energystar.gov/datacenters) and <http://hightech.lbl.gov/datacenters.html>

# Q&A

