

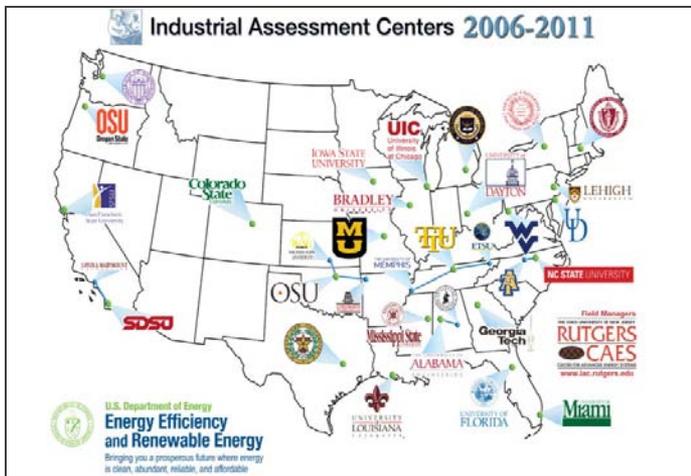
# Energy Efficiency – the Big Picture

## A Presentation to the IAC Forum

February 4, 2010

Brian Castelli

Executive Vice President



ALLIANCE TO  
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*Creating an Energy-Efficient World*

# What is the Alliance to Save Energy?



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- ***The Alliance to Save Energy promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment and greater energy security.***
  - Non-profit organization headquartered in U.S.; operations world-wide
  - Led by **Senator Mark Pryor (D-Ark.)** and **Peter Darbee, President and CEO of Pacific Gas and Electric**
  - Includes 10 Members of Congress – Bi-Cameral; Bi-Partisan
  - Also includes environmental, consumer, and trade associations heads, state and local policy makers, corporate executives



# Forging Partnerships: Business, Govt. & Public Interests



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- Alliance enjoys sponsorship by more than 170 businesses and organizations across a broad spectrum of economic sectors
- Unique structure with expertise in research, policy advocacy, education, technology deployment, and communications

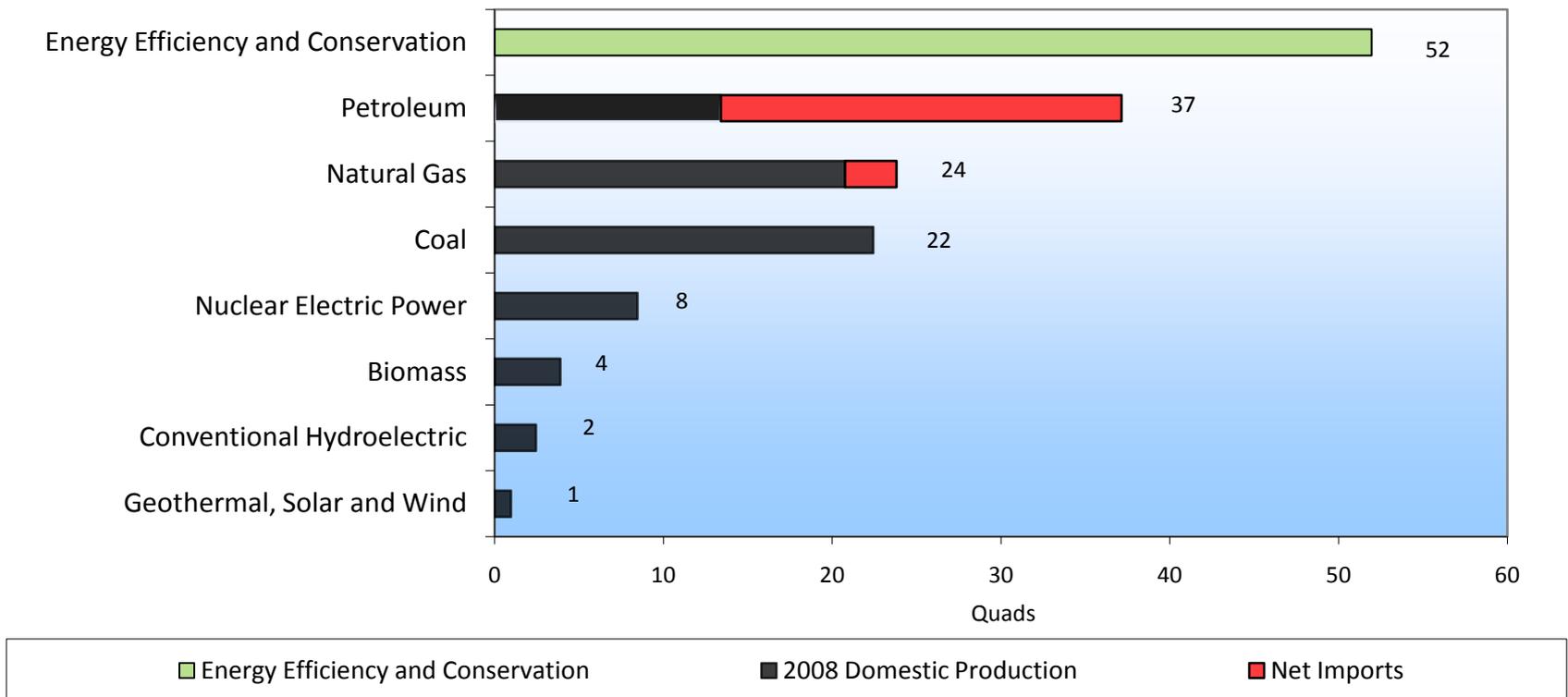


# Energy Efficiency – the Greatest Energy Resource



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## America's Greatest Energy Resource Energy Efficiency and Conservation Improvements Since 1973 Have Reduced Annual Energy Consumption by 52 Quads in 2008



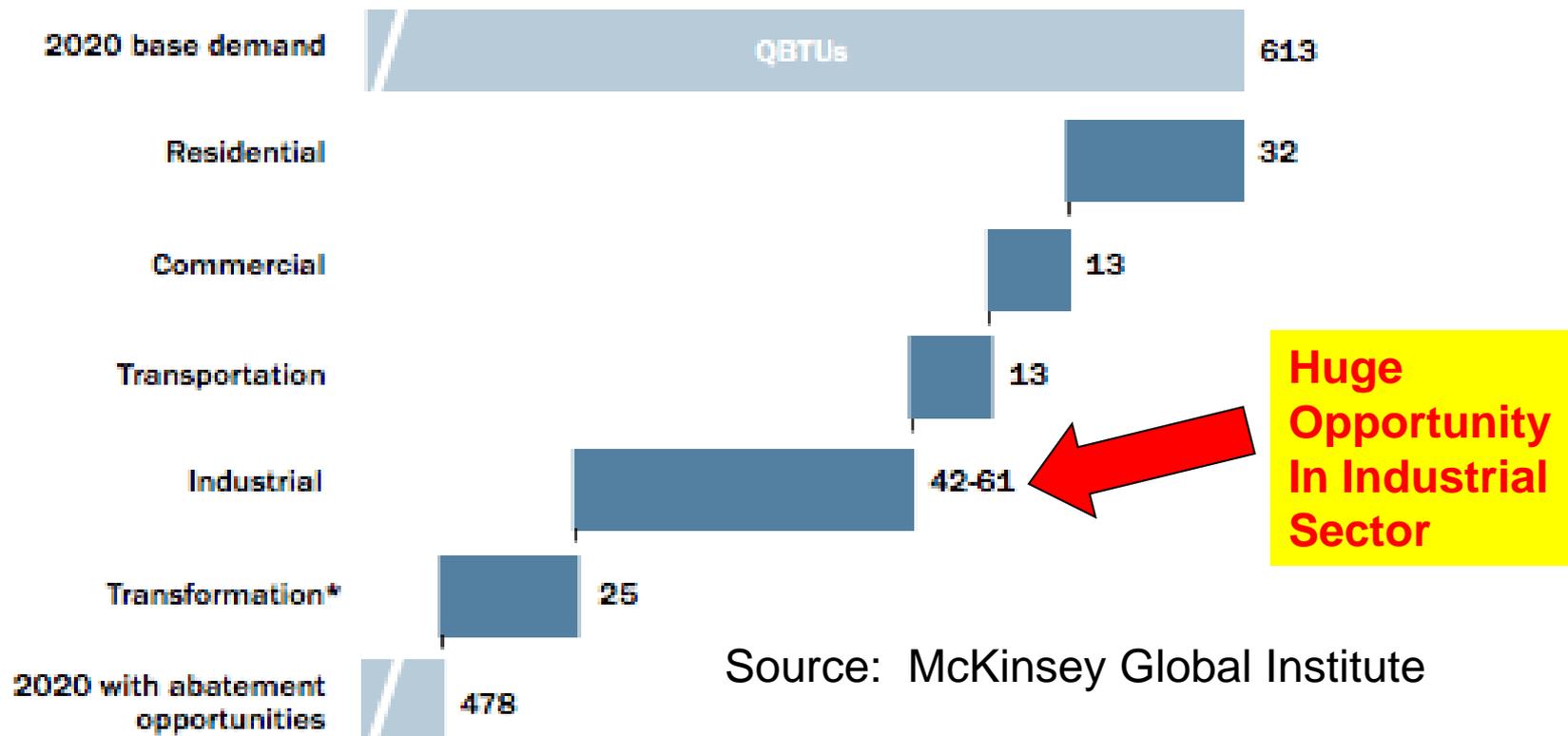
# Why Energy Efficiency? It's the Gift That Keeps on Giving



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## LARGE OPPORTUNITIES FOR IMPROVING ENERGY PRODUCTIVITY ARE AVAILABLE

Potential demand reduction in 2020 through enhanced energy productivity









# EE potential is uncertain

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## ■ Depends

- *Discount rates*
- *Economic growth*
- *Energy prices*
- *Capital turnover*
- *Technology development*
- *Market barriers*
- *Policy to overcome market barriers*

Note:

Supply potential is  
uncertain too

# The 'New Green Economy' and Green Jobs

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- The creation of so-called 'green jobs' has been touted as a major selling point for energy efficiency programs.
  - Investing \$1 million in energy efficiency generates 19 to 25 jobs
    - Efficiency more labor-intensive than energy production - \$1 million in energy production creates only 5 to 10 jobs
    - (MRG Associates 2004)

# Green jobs and EE: Top of the President's Agenda



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the WHITE HOUSE PRESIDENT BARACK OBAMA

the BRIEFING ROOM the AGENDA the ADMINISTRATION ABOUT the WHITE HOUSE our GOVERNMENT CONTACT us

THE AGENDA • ENERGY & ENVIRONMENT

### ENERGY AND THE ENVIRONMENT

The energy challenges our country faces are severe and have gone unaddressed for far too long. Our addiction to foreign oil doesn't just undermine our national security and wreak havoc on our environment -- it cripples our economy and strains the budgets of working families all across America. President Obama and Vice President Biden have a comprehensive plan to invest in alternative and renewable energy, end our addiction to foreign oil, address the global climate crisis and create millions of new jobs.

The Obama-Biden comprehensive New Energy for America plan will:

- Help create five million new jobs by strategically investing \$150 billion over the next ten years to catalyze private efforts to build a clean energy future.
- Within 10 years save more oil than we currently import from the Middle East and Venezuela combined.
- Put 1 million Plug-In Hybrid cars -- cars that can get up to 150 miles per gallon -- on the road by 2015, cars that we will work to make sure are built here in America.
- Ensure 10 percent of our electricity comes from renewable sources by 2012, and 25 percent by 2025.
- Implement an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80 percent by 2050.

#### Create Millions of New Green Jobs

- Ensure 10 percent of Our Electricity Comes from Renewable Sources by 2012, and 25 percent by 2025.
- Deploy the Cheapest, Cleanest, Fastest Energy Source - Energy Efficiency.
- Weatherize One Million Homes Annually.
- Develop and Deploy Clean Coal Technology.
- Prioritize the Construction of the Alaska Natural Gas Pipeline.

#### Reduce our Greenhouse Gas Emissions 80 Percent by 2050

- Implement an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80 percent by 2050.
- Make the U.S. a Leader on Climate Change.

### THE AGENDA

- Civil Rights
- Defense
- Disabilities
- Economy
- Education
- Energy & Environment
- Ethics
- Family
- Fiscal
- Foreign Policy
- Health Care
- Homeland Security
- Immigration
- Iraq
- Poverty
- Rural
- Seniors & Social Security

### LATEST NEWS and UPDATES

READ THE BLOG

### THE AMERICAN PRESIDENTS

1. PARTICIPATE

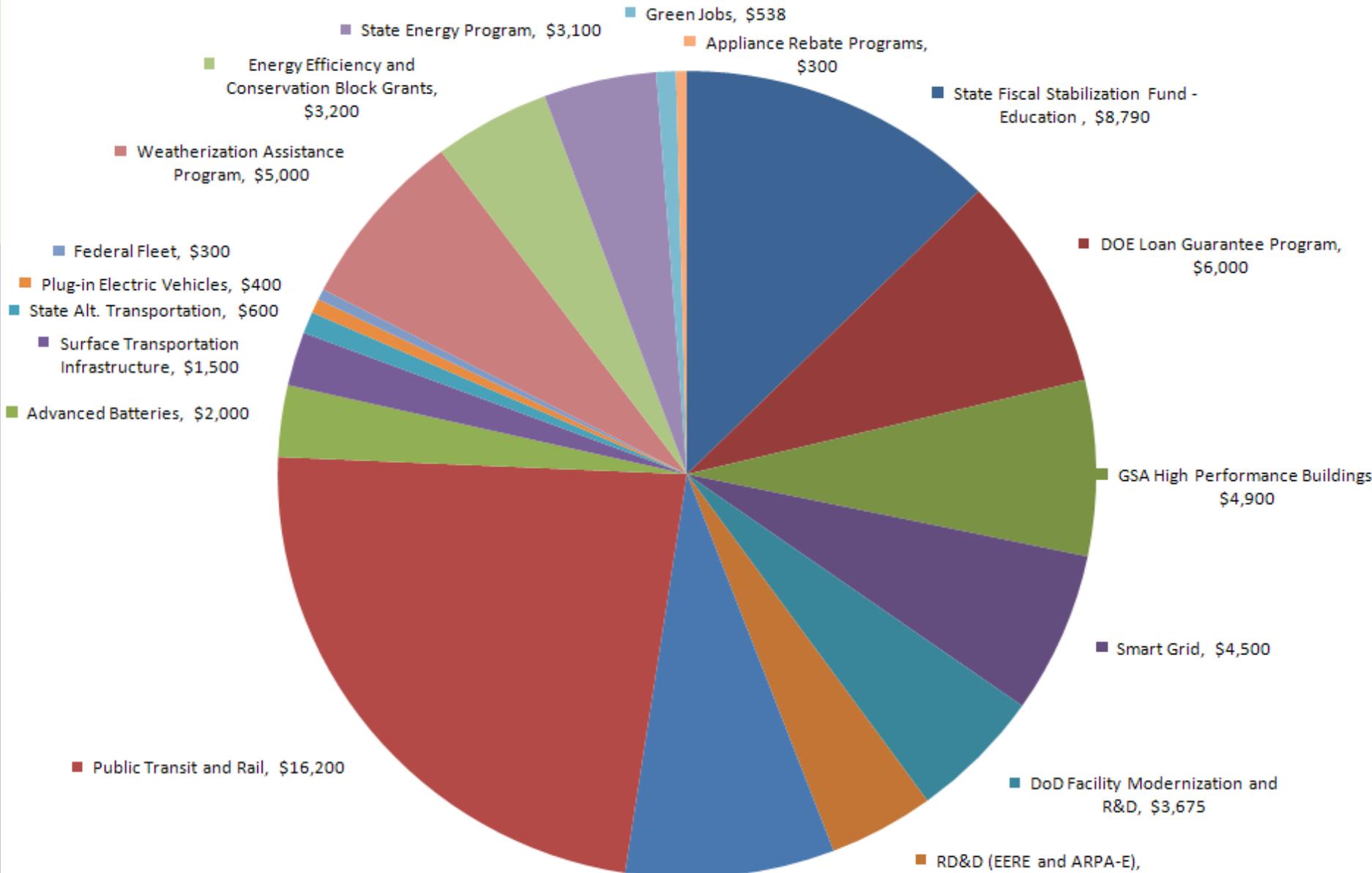
OFFICE of PUBLIC LIAISON  
CHANGING the WAY AMERICANS ENGAGE WITH THEIR GOVERNMENT

MORE INFORMATION

“Help create 5 million new jobs...by investing \$150 million in clean energy future”

“Deploy the cheapest, cleanest, fastest energy source: energy efficiency”

# Stimulus: Potentially \$65 Billion related to energy efficiency



**Funding in Millions of US Dollars**

Assisted Housing, \$5,750



# Energy Efficiency in Practice

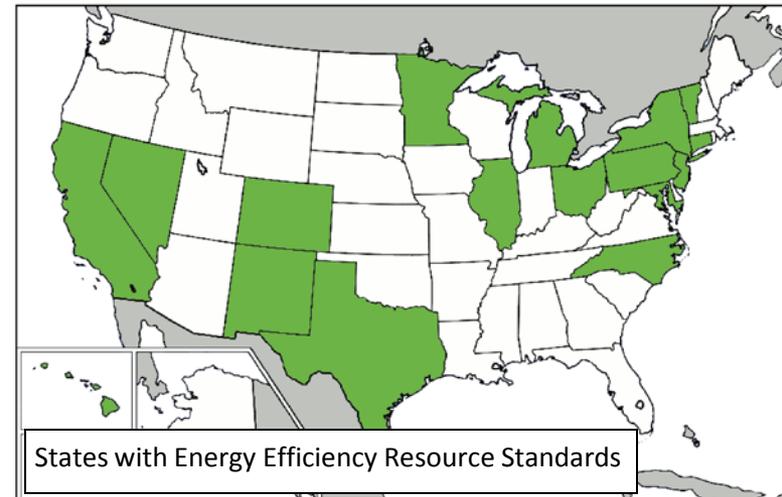
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- Energy efficiency as a resource
  - Energy Efficiency Resource Standards
  - 'White tags'
  - Carbon market offsets
  - Efficiency projects substituting for generation in electricity forward capacity markets



# Energy Efficiency in Practice

- Energy Efficiency Resource Standards (EERS)
  - Efficiency counterpart to renewable portfolio standards
  - Require a certain percentage of a utility's load to be met with efficiency measures
  - Implemented by several US states. Federal program has been proposed alongside renewable standards.





# Energy Efficiency in Practice

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- Energy Efficiency Resource Standards (EERS)
  - In some EERS programs, efficiency credits are tradable, making efficiency itself a tradable commodity



# Energy Efficiency in Practice

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- Efficiency in forward capacity markets
  - When electricity distribution networks hold auctions for generators to bid for contracts, some distribution networks now allow entities to propose efficiency programs to meet projected load
  - The Federal Energy Regulatory Commission recently required that the PJM interconnection (serving much of the mid-Atlantic coast region and some of the mid-west region) allow providers of efficiency programs to bid in their forward capacity market

# How do we know we achieved Energy Efficiency?

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- Evaluation, Measurement, & Verification
  - ‘EM&V’ – how to measure the additionality of efficiency programs?
  - With programs promising or claiming quantifiable energy savings, we must develop metrics to measure success
- EM&V challenge is how to estimate energy not consumed that would have been otherwise—the counterfactual.

# How do we know we achieved Energy Efficiency?



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- Evaluation, Measurement, & Verification
  - Several US states have developed their own protocols, but they vary
  - For instance, the “simple” lightbulb swap
    - The same CFL bulb gets credited with different savings depending on what state it’s in, based on different states’ assumptions
    - Similar issue across EU



# Huge differences in the simplest assumptions for the simplest EE measure



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15W CFL installed in a living room, with a rated lifetime of 10,000 hours

|  | CT                | PA                                      | VT           | CA                 | Energy Star     | CO   | WI (ACES Deemed Savings Review, June 2008) | MA (draft as of 10/09) |
|--|-------------------|---|--------------|--------------------|-----------------|--|--|------------------------|
| <b>How equivalent incandescent wattage is calculated</b> | 3.4 x CFL wattage | Measured                                | CFL W + 48.7 | 3.53 x CFL wattage | 4 x CFL wattage | Assumption that 13-16W CFLs replace 60W incandescent | CFL W + 51.9                               | 3.4 x CFL wattage      |
| <b>Change in Wattage</b>                                 | 36                | varies depending on individual measures | 48.7         | 37.95              | 45              | 45   | 51.9                                       | 36                     |
| <b>Hours/day</b>   | 2.96              | 3                                       | 3.4          | 2.18               | 3               | 2.37   | 2.3  | 2.96                   |
| <b>Life in years</b>                                     | 5.25              | 6.4                                     | 6.4          | 6.6                | 9.13            | 7  | Not given                                  | 6                      |
| <b>Life in Hours</b>                                     | 5672.1            | 7008                                    | 7942.4       | 5251.62            | 9997.35         | 6048   | Not given                                  | 6482.4                 |

# EM&V – Where is it Going?



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- Part of a trend toward regional and national protocols and standards
  - Growing scope of EERS and EE in RES.
  - Potential trading of ESCs directly or as components of RES or as carbon credits and offsets.
  - Northeast Energy Efficiency Partnership (NEEP)—investigating regional protocol development.
  - North American Energy Standards Board (NAESB)—tech standards
  - National Action Plan for Energy Efficiency (NAPEE)—evaluating if it has a role in protocol development

# End-Use Technology Example



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## Smart Grid - Potential Benefits

- Enhance customer service
- Improve operational efficiency
- Enhanced DR and load control
- Customer behavior
- Support new utility business models
- Integrate intermittent RE and PHEVs



"The Green Grid; Energy Savings and Carbon Emissions Reductions

Enabled by a Smart Grid." Report, No. 1016905



# End-Use Technology Example

- Smart grid and consumer data display systems
  - Allow real-time or near-real-time knowledge of energy usage.
  - Pilot program energy use reductions highly variable: 1%-27% (Darby, 2006)
  - Design of human interface (*viz.* data display) very important, also real-time pricing





# End-Use Technology Example

- Smart grid and consumer data display systems
  - Could facilitate demand response
    - Not necessarily reducing total energy peak shaving tends to just move demand to other times of day, though it could reduce transmission line loss



# Supply-Side Technology

## Example

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- Combined Heat and Power
  - Greater fuel use efficiency through the capture of waste heat in electricity generation, or generation of electricity while producing heat
  - Can be used in any thermal generation system
  - Popular in Scandinavia
  - Increasingly available in smaller-scale units

# Alliance Consumer Campaigns with Diverse Partners



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**The Power is In Your Hands**  
Industry, DOE, EPA, Alliance  
All Media Outlets, Web &  
Collateral



## *Super Powers*

EPA, NYSERDA, Alliance  
Nationwide TV & Radio (ABC,  
CNN, USA)  
Website



## *Powerful Savings*

DOE & Alliance Partnership  
All Media Outlets; Reached  
Millions



A Partnership of the U. S. Department of Energy  
and the Alliance to Save Energy

**Promoting 100<sup>th</sup> Anniversary of  
Programmable Thermostat  
SMTs, earned media**

**Honeywell**

## **Energy Hog**

DOE, Ad Council, Alliance, States  
All Media Outlets  
Web, Collateral Materials



[www.energyhog.org](http://www.energyhog.org)

## **P&G Coldwater Campaign**

P&G, Alliance  
All Media Outlets & Web  
Reached Millions



## *Drive Smarter Challenge*

Wal-Mart Foundation, Alliance & 1 / partners,  
Reaching Millions, Web, Collateral, PSAs,  
Billboards



**Eureka \$mart House  
Energy Efficiency Challenge**



11 Partners, Website Contest, Home Makeover



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<http://www.youtube.com/watch?v=2Gwl8nuVrKY>

# Alliance's Green Schools Program



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## ■ Program Goals:

- **Educate students** about energy and the link between energy and the environment
- **Save Energy** at school
- Affect residential energy use by sending information home with students
- Train the next generation of energy professionals



# Commercial Buildings Initiative Overview



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- EISA-07 authorizing language
- **Goal:** *Transform US commercial buildings to net-zero energy use & carbon by ~2030*
- Public-Private consortium: R&D through market transformation
- DOE seed funding:
  - 2 planning workshops: ~200 participants
  - Sectoral analysis
  - CBI Action Plan
- Appropriations added to FY09 bill (\$20 million)
- Website [www.zeroenergyCBI.org](http://www.zeroenergyCBI.org)



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U.S. Department of Energy  
Energy Efficiency  
and Renewable Energy



World Business Council for  
Sustainable Development



# ASE's Industrial Activities

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## ■ Past

- Support EERE Steam Challenge/BestPractices
  - Training development & delivery; newsletter; Steering Committee
- Developing technical resources
- Industrial Partnerships

## ■ Present

- Outreach & Analysis for Save Energy Now LEADER and ALLY initiatives
- Analyses of industrial energy efficiency best practices and emerging technologies
- Support for Superior Energy Performance & ISO 500001

# ASE's Industrial Activities – 2010 & Beyond

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- Expanded outreach and analysis for ITP
- Additional analyses and support of ISO 50001
- Explore international industrial EE partnership
- Analysis of federal collaboration for small/medium enterprises
- Develop an **Industrial Energy Efficiency Coalition (CEEM)**
- **Our Growth = increased staffing needs**
  - IAC students welcomed!!
  - Contact Bruce Lung at [rlung@ase.org](mailto:rlung@ase.org)

# The American Political Perspective

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- Energy efficiency is becoming increasingly visible in national policy-making
  - Energy Policy Act of 2005 (EPAct '05)
  - Energy Independence and Security Act of 2007 (EISA)
  - Stimulus (February 2009)
  - Energy & Climate bill now in Congress
    - American Clean Energy and Security Act (House of Representatives) and American Clean Energy Leadership Act (Senate)



# 2005 Federal Energy Legislation

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- Energy Policy Act of 2005 will by 2020:
  - Reduce U.S. energy use by 2%
  - Reduce electricity demand by 4%
  - **Reduce oil use by 0%**
- Energy savings from
  - Appliance standards
  - Tax incentives – lots of incentives for buildings
  - Federal energy management
  - New programs authorized (but not funded – some have since been funded in the stimulus bill)



# 2007 Federal Energy Legislation

- Energy Independence and Security Act of 2007 will by 2020 (2030):
  - Reduce U.S. energy use by 4% (7%)
  - Reduce electricity demand by 4% (5%)
  - Reduce oil use by 5% (10%)
  - Reduce CO<sub>2</sub> emissions by 5% (9%)
- Energy Savings from:
  - Vehicle CAFE standards
  - Appliance standards
  - Federal energy management
  - Certain building standards
  - R&D program authorizations



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# Core Energy Efficiency Funding

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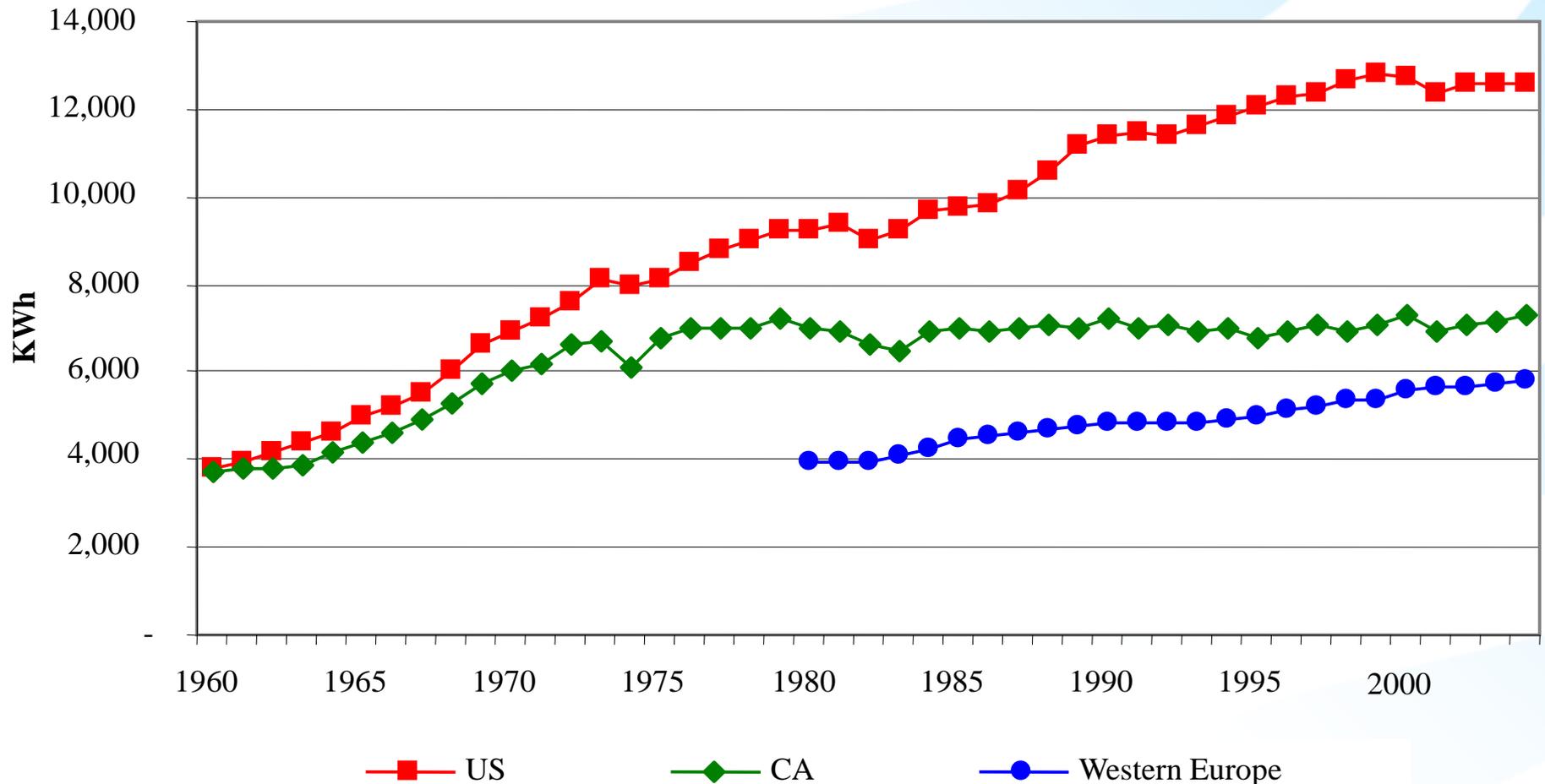
- SEP
  - Appropriated: \$3.1 billion
- EECBG
  - Appropriated: \$3.2 billion
- WAP
  - Appropriated: \$5 billion
- Green Jobs
  - Appropriated: \$500 million
- Smart Grid Investment Grant Program
  - Appropriated: \$4.5 billion
- Smart Grid Demonstration Projects
  - Appropriated: \$615 million
- HUD's EE Public Housing Capital Funds
  - Appropriated: \$4 billion
- HUD's Green Retrofit Program
  - Appropriated: \$250 million

# Policies and Investment Make a Difference!



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# On the Horizon...

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... More Energy  
Efficiency?





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# Miracles Wanted

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- American Physical Society list (Sept. 2008)
  - energy storage
  - thermoelectric devices
  - advanced windows
  - ultrathin insulators
  - behavioural research
  - solid-state lighting
  - lightweight materials
  - advanced ventilation
  - thermodynamic cycles
- Others
  - High temperature superconductivity
  - Clean energy resources



# EE Highlights in ACES

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- Cap on carbon: 83% reduction in covered emissions by 2050 (85% of emissions are covered)
- Building codes, building labels, appliance standards and labels
- Renewable electricity standard of 20% by 2020 – a quarter may be met through EE, or 40% if governor requests
- Vehicle emissions standards
- Land use planning to reduce VMT



# EE Highlights in ACELA

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- Renewable electricity standard of 15% by 2021
  - 4% may come from efficiency if governor petitions
- Improvements in model building energy codes
  - 30% by 2010
  - 50% by 2016
- Energy Efficiency in Manufacturing
  - Funding for research and implementation of EE technologies, expansion of IACs
- Clean energy investment fund
  - Loans, loan guarantees, etc., for commercialization of clean energy technologies



# EE Highlights in ACELA

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- New energy efficiency standards
  - for portable lighting fixtures, commercial furnaces and reflector lamps; new appliance test procedures
- State building retrofit grant program
  - Grants for retrofits of residential and commercial buildings
- Voluntary building energy performance information program
  - To display relative energy performance; raise public awareness
- Residential High-Performance Zero-Net-Energy Buildings Initiative
  - Goal to enable residential buildings without net emissions to be cost-effective by 2020



# The Future is Ours to Invent!

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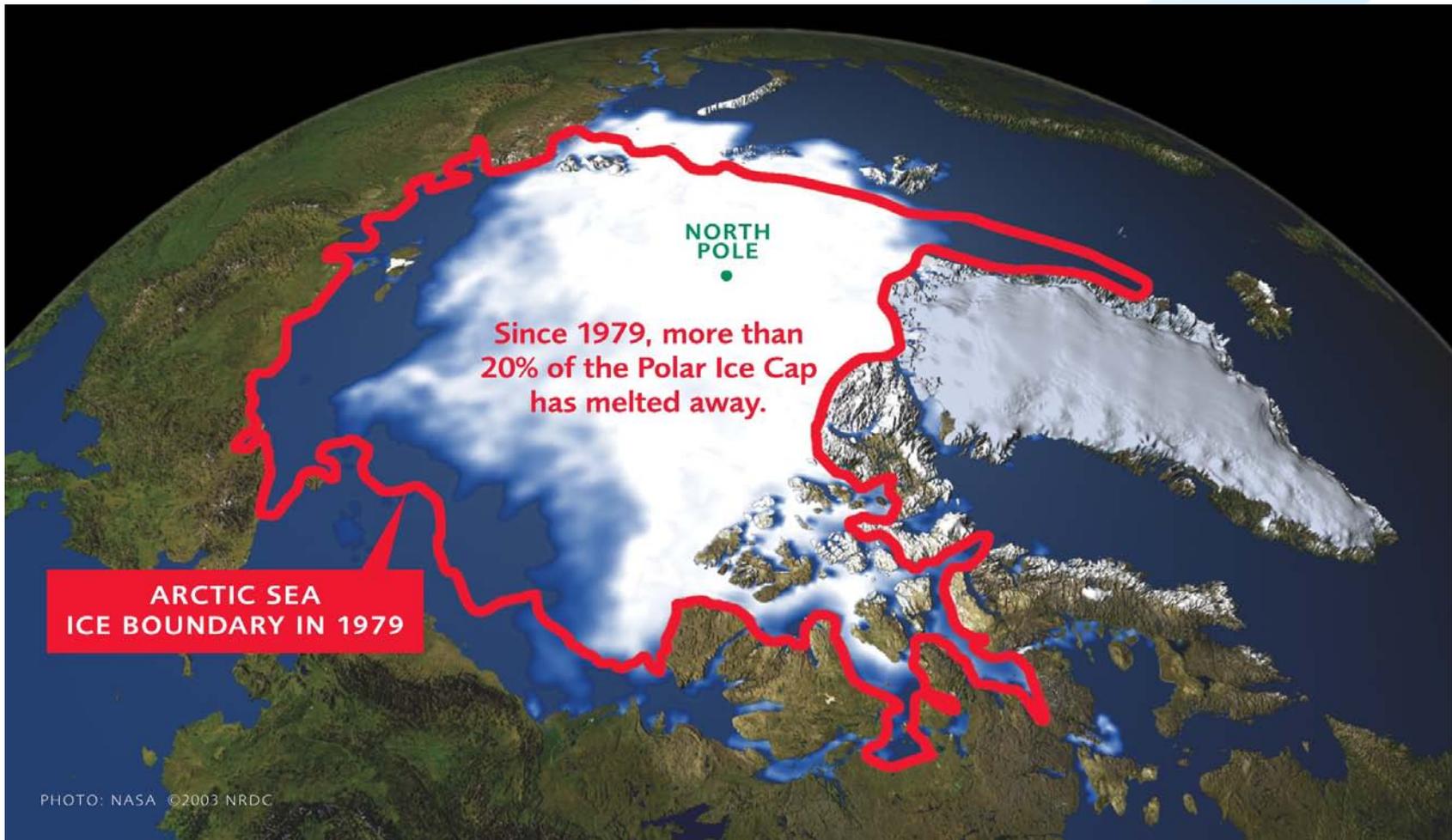
- A Future of Promise:
  - U.S. Becomes the Most Energy Efficient Economy in the World
  - The U.S. Economy is Re-built on Development and Deployment of Clean Energy and Technologies
  - Energy Efficiency is the “First Tool” in the Arsenal for Fighting Climate Change

# Why is all this important? We only have one World...



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# Thank you!

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**For More Information....**

**[www.ase.org](http://www.ase.org)**

**202.857.0666**