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RESEARCH INSTITUTE

## Energy Efficiency: How Much Can We Count On?

**Ellen Petrill**  
Director, Public/Private Partnerships  
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**ASERTTI Winter Meeting**  
February 2, 2009

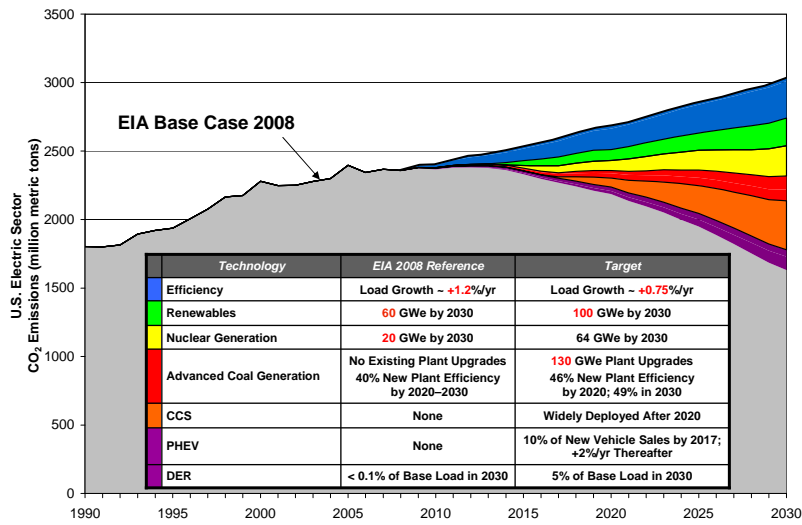
## The Electric Power Research Institute

RD&D consortium for the electricity industry founded in 1973

- Independent, unbiased, tax-exempt collaborative research organization
- \$335+ million funding in 2008
- Major offices in Palo Alto, CA; Charlotte, NC and Knoxville, TN
- 460 participants in over 40 countries



## EPRI PRISM – An Aggressive Technology Strategy Can Reduce Electricity CO<sub>2</sub>

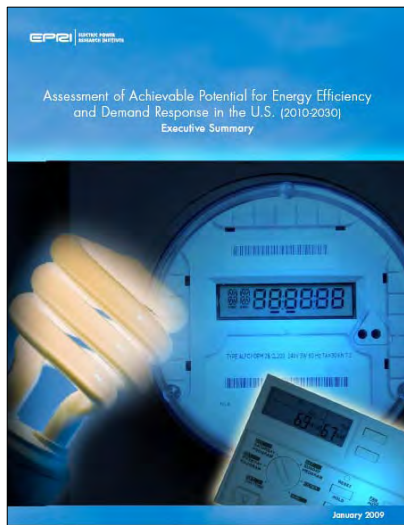


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## Energy Efficiency Potential Study



Available at  
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## Energy Efficiency Study

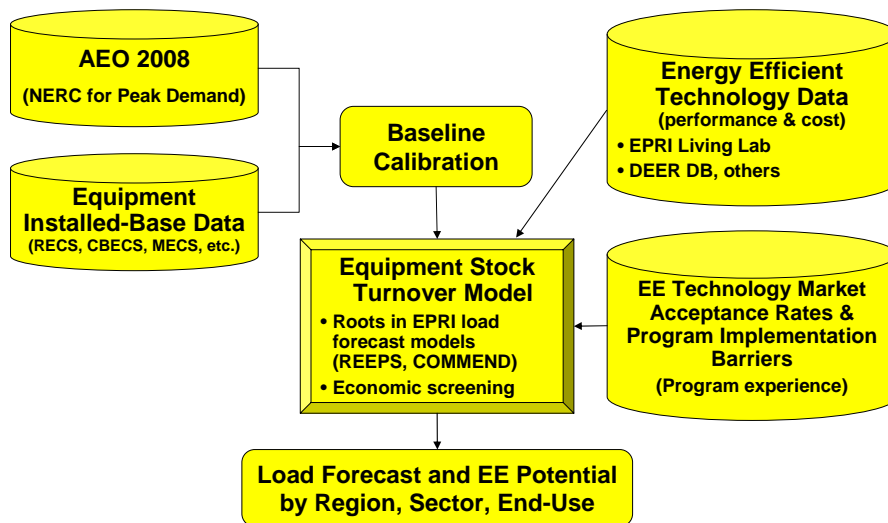
### Potential U.S. Energy Efficiency Savings – Now to 2030

- Detailed micro-economic model
- Database of energy efficiency technologies
- Calibrated with input from 50+ industry experts



Latest research results from EPRI's Living Laboratory

## Project Methodology



# EPRI's Living Laboratory



Evaluate and test energy efficient technologies

# Energy Efficiency Featured in TIME

**Wasting Our Watts**  
 We don't need new drilling or new power plants. We need to get efficient

BY MICHAEL BROWNWALD



Photographs for TIME by JEFF FORTSON—Bridges

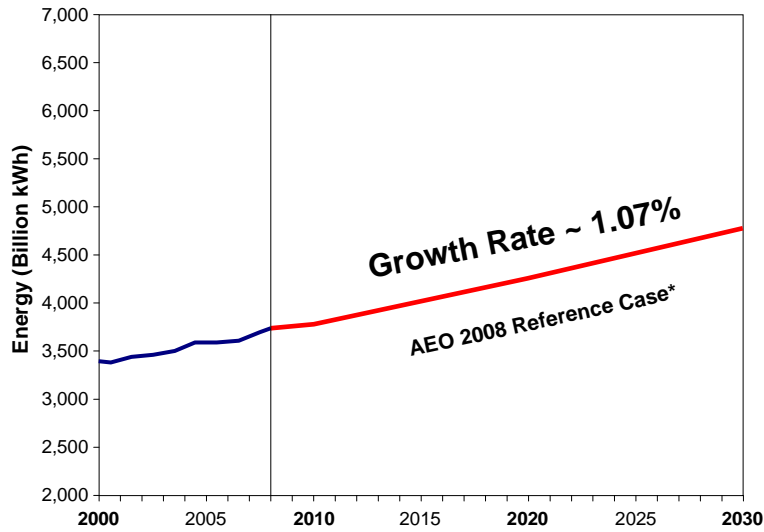


**Why We Need To See The Light About Energy Efficiency**

The greenest economy. Clearly, it needs an upgrade. But it's a simple enough way to save energy: Change incandescent bulbs for compact fluorescent bulbs (CFLs) and you'll save 75 percent on electricity bills. And it's a simple enough way to reduce demand: Turn off lights and unplug electronics when you're not using them. It's a simple enough way to save money: Turn off lights and unplug electronics when you're not using them. It's a simple enough way to save energy: Turn off lights and unplug electronics when you're not using them.

**'A lot of simple answers are just sitting around waiting for us to execute.'**  
 —TOM REDDOCH, ELECTRIC POWER RESEARCH INSTITUTE

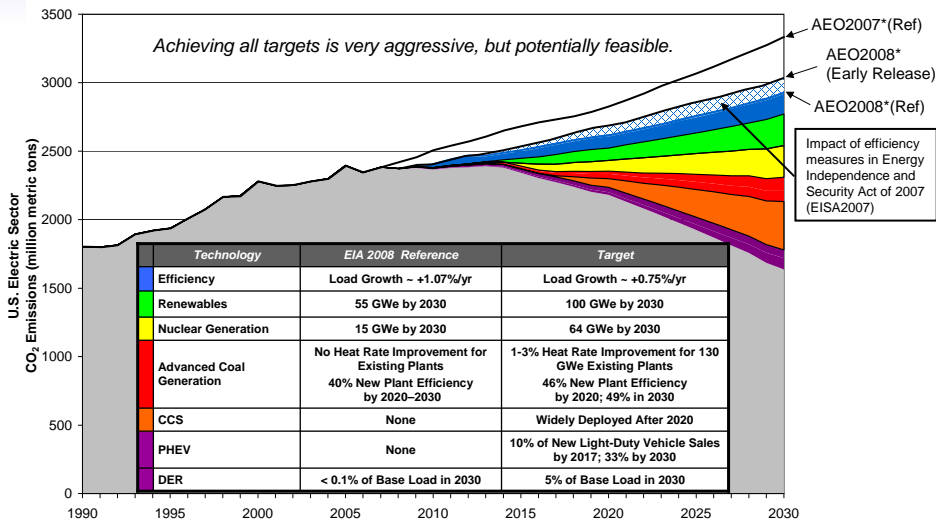
# Electricity Consumption



\* EIA Annual Energy Outlook 2008, Final Edition (Residential, Commercial, and Industrial sectors)

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# EPRI 2008 PRISM Had Built-In Reductions

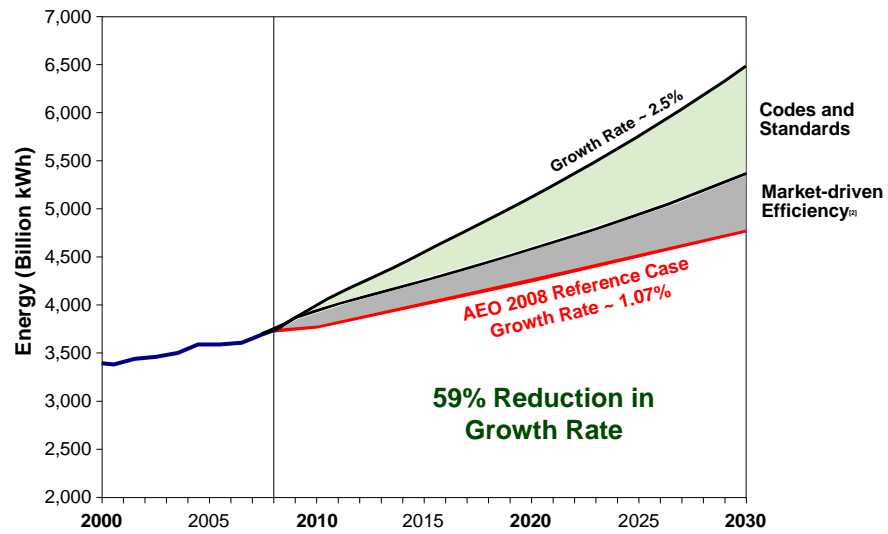


\*Energy Information Administration (EIA) Annual Energy Outlook (AEO)

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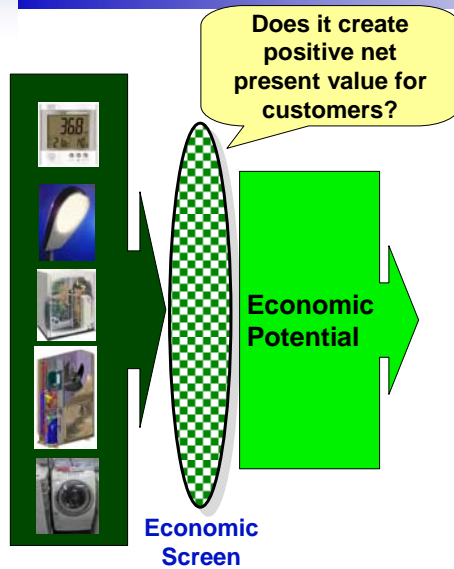
# Electricity Consumption

## Impact of Codes & Standards and Market-Driven Efficiency



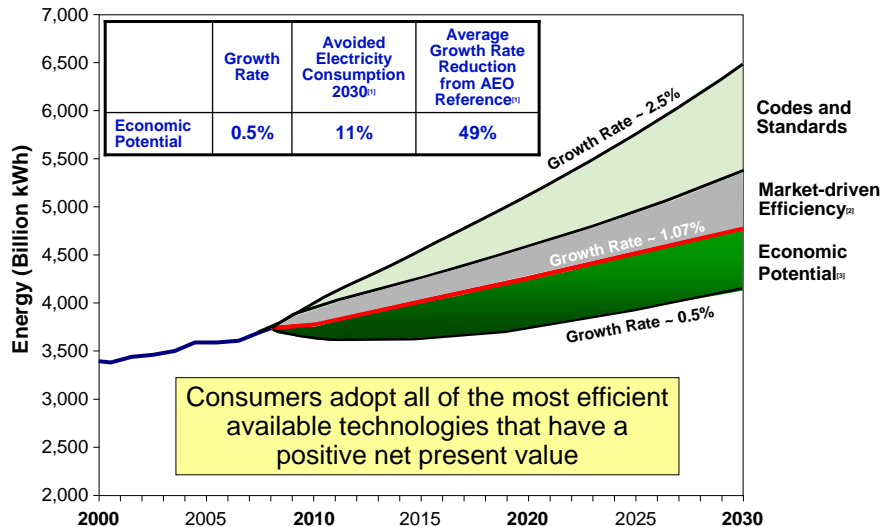
[1] Includes embedded impact of EE programs implicit in AEO 2008  
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# Energy Efficiency Potential Analysis



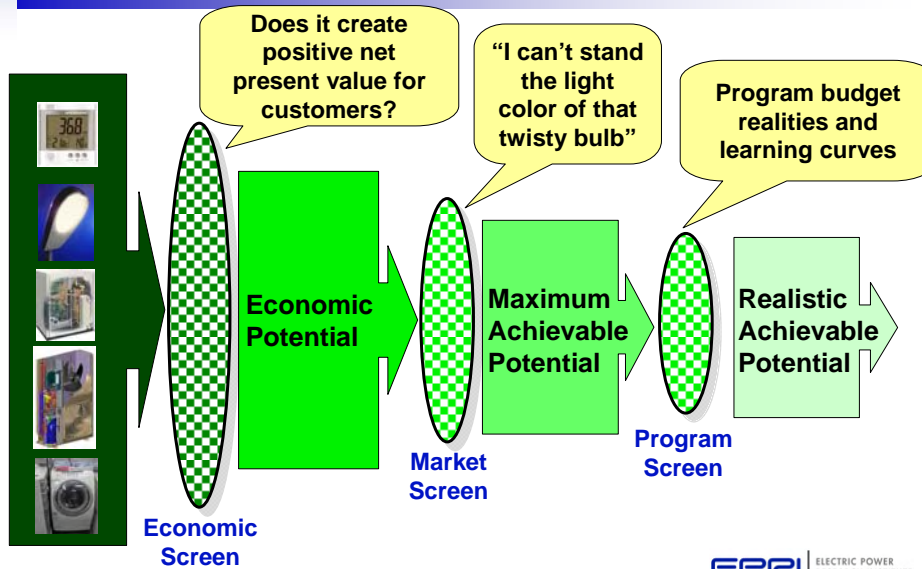
# Electricity Consumption

## Impact of Achieving Economic Potential



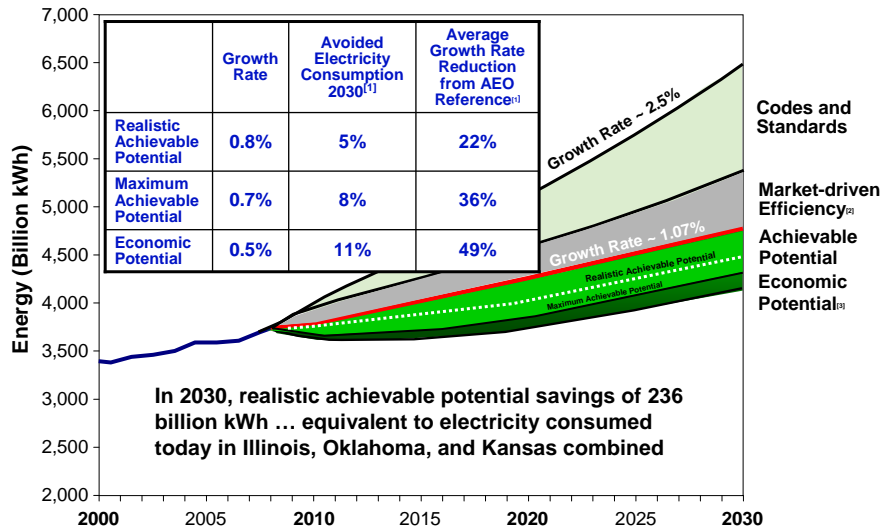
[1] Relative to AEO 2008 Reference Case  
 [2] Includes embedded impact of EE programs implicit in AEO 2008 [3] Consumers adopt all available technologies with positive net present value  
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# Energy Efficiency Potential Analysis



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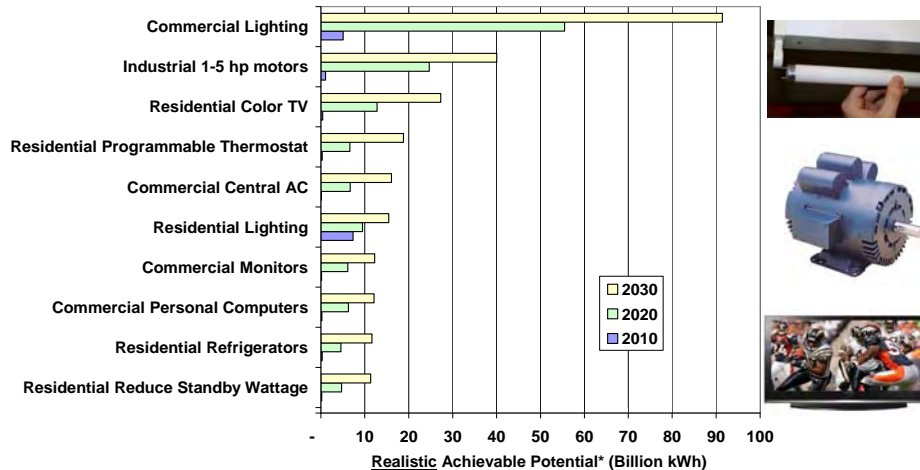
# Electricity Consumption Impact of Utility Programs



[1] Relative to AEO 2008 Reference Case  
 [2] Includes embedded impact of EE programs implicit in AEO 2008 [3] Consumers adopt all available technologies with positive net present value  
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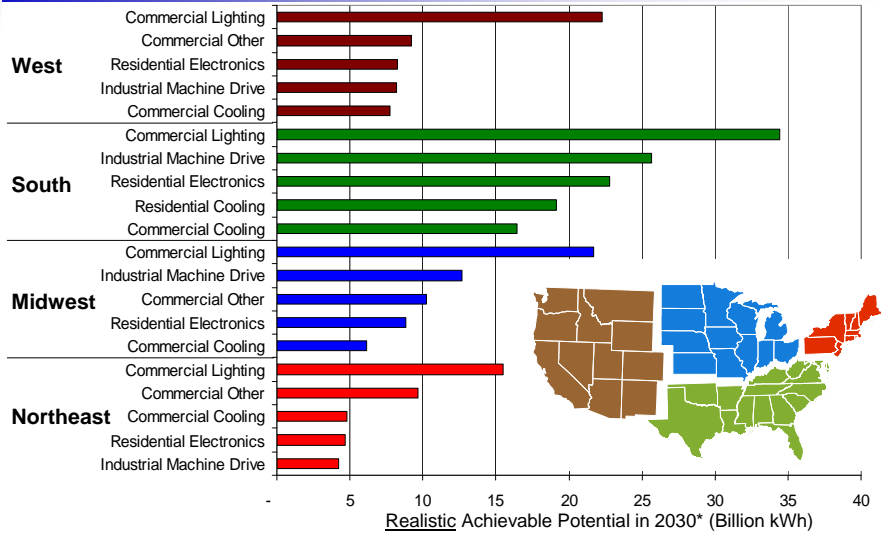
# Opportunities for Energy Efficiency Savings

Top 10 Energy Efficiency Achievable Potentials Includes . . .



\* Savings reflect total EE program savings potential, inclusive of savings implicit in AEO 2008  
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# Opportunities for Energy Efficiency Savings

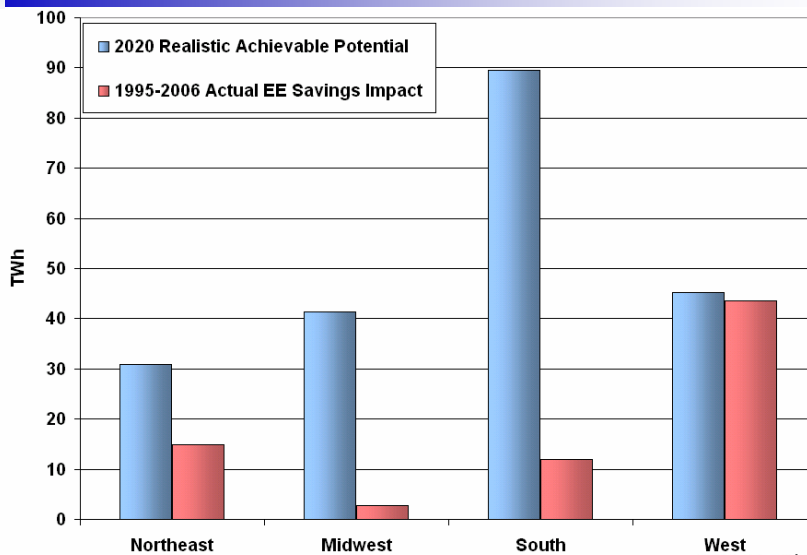


\* Savings reflect total EE program savings potential, inclusive of savings implicit in AEO 2008  
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# Energy Efficiency Potential in Historical Context

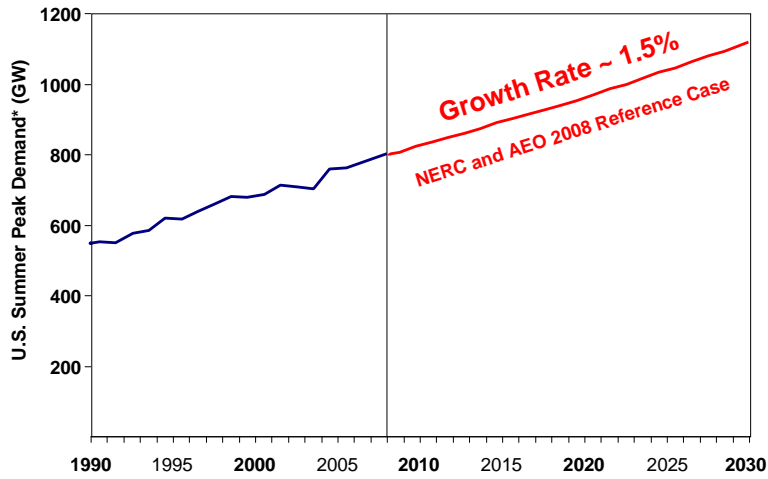


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# U.S. Peak Demand



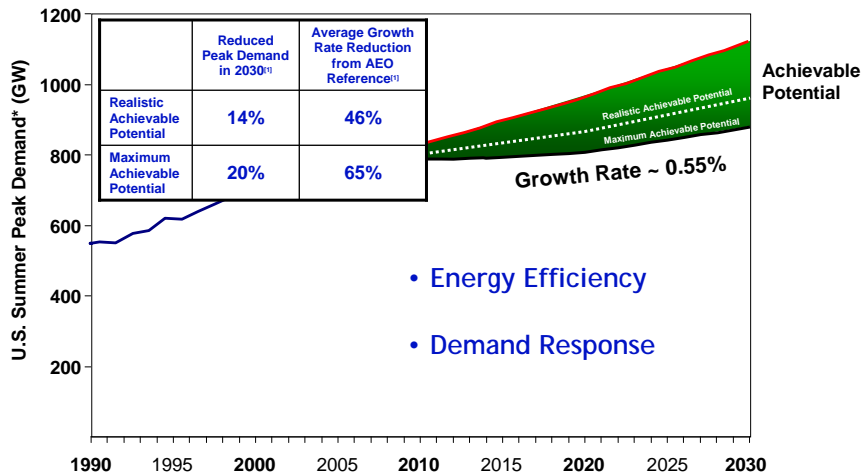
\* Aggregation of regional summer peak demands; non-coincident

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# U.S. Peak Demand Reduction



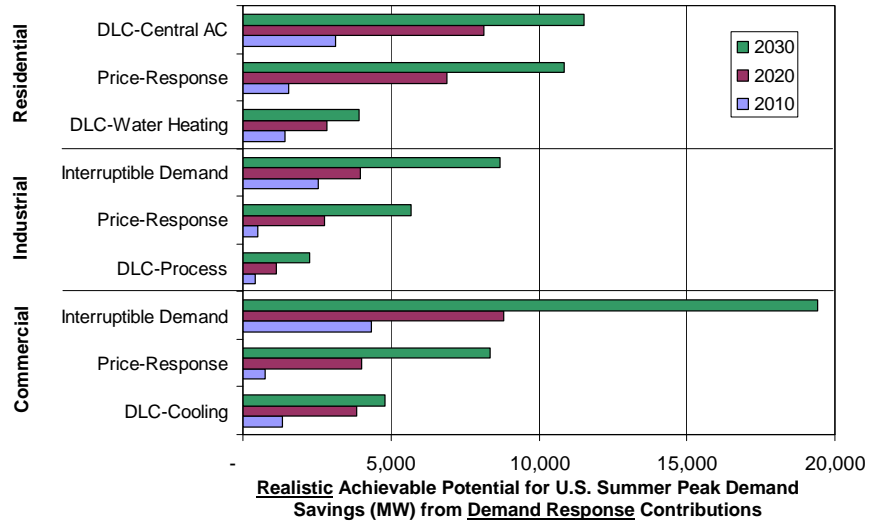
\* Aggregation of regional summer peak demands; non-coincident

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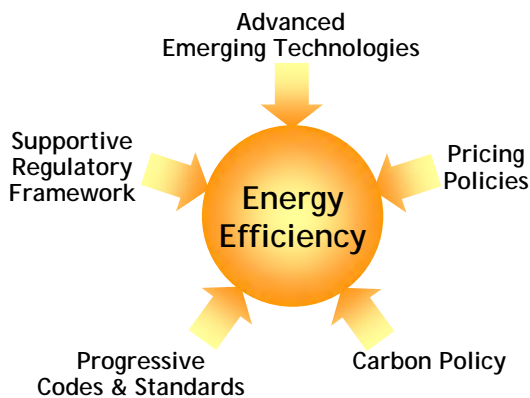
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# U.S. Peak Demand Reduction



DLC = Direct Load Control  
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# Impact of Key Drivers on Energy Efficiency Potential



The New Administration



## Conclusions

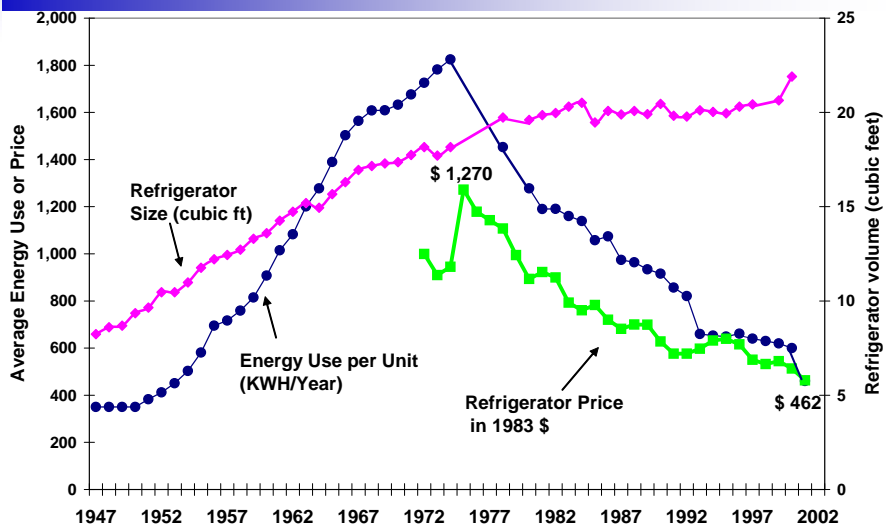
- Energy efficiency programs can *realistically*:
  - Reduce growth in electricity consumption by 22%
  - Reduce growth of peak demand by 46%
- Estimated cost
  - \$1-2 B in 2010
  - \$8-20 B in 2020
  - \$19 – 46 B in 2030

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## US Refrigerators Improved in Every Way



Source: David Goldstein/Art Rosenfeld

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## Next Generation Appliances: Standards Needed!

- Increase in electricity use of 46” plasma and set-top box:  
**~ 860 kWh/yr/household or 2.7% of US electricity consumption**



Plasma TV (~250W),  
Set-top Box (~30W)

- Increase in electricity use by adding one digital photo frame per household:  
**~ Five 250-MW power plants**



Digital photo frame  
(6W-15W)

**By 2030 almost 30% of residential load will be “plug connected”**  
(DOE/EIA Annual Energy Outlook 2007)

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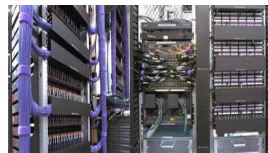
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## EPRI to Demonstrate Hyper-Efficient Technologies



Variable Refrigerant Flow  
Air Conditioning



Efficient Data Centers



LED Street and  
Area Lighting



Heat Pump Water Heaters



Ductless Residential Heat  
Pumps and Air Conditioners



Hyper-Efficient  
Residential Appliances

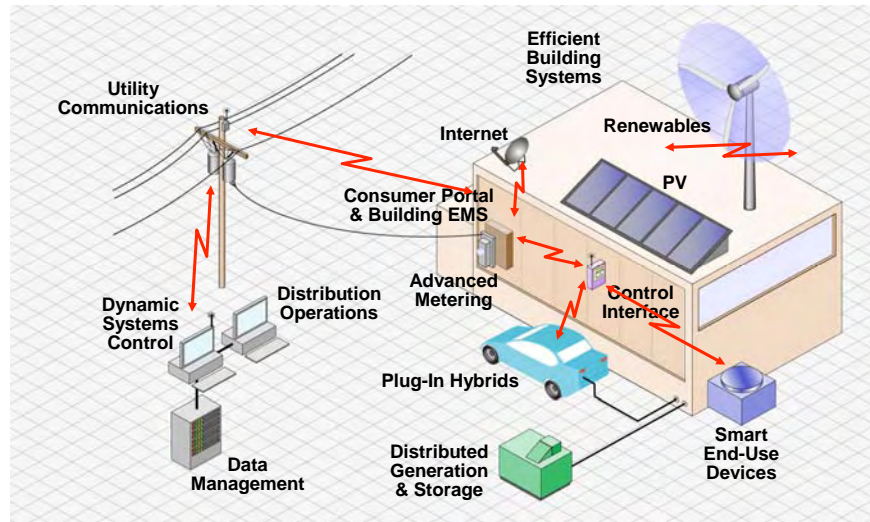
**This technology 6-pack can fundamentally change how energy is used in U.S. buildings**

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## The Smart Grid: Enables Dynamic Energy Management: Prices to Devices



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## Smart Grid = Green Grid

Enables energy savings mechanisms:

- Continuous commissioning of buildings
- Reduced T&D line losses
- Direct feedback for customers
- More effective, reliable demand response
- Enhanced measurement and verification capabilities

**EPRI analysis shows potential reduction of 1.2 – 4.3% of retails electricity sales in 2030.**

**Green Grid report on [www.epri.com](http://www.epri.com)**

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## Energy Efficiency: ~~End Use~~ → End-to-End

Generation



~5%

Transmission



~3%

Distribution



~5%

Residence/  
Buildings



~62%

Industries



~25%

**Significant opportunity to improve efficiency at every stage**

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## What's Next

- We need to take all opportunities to use electricity more efficiently . . .
  - Aggressive codes and standards
  - Hyper-efficient end-use technologies
  - Smart grid technologies
  - End-to-end efficiency solutions

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Together...Shaping the Future of Electricity



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Image from NASA Visible Earth