

Workshop on Demand Side Management IEA DSM Programme

USA Activities on DSM (Demand Response & Energy Efficiency)

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Main Point of this Presentation

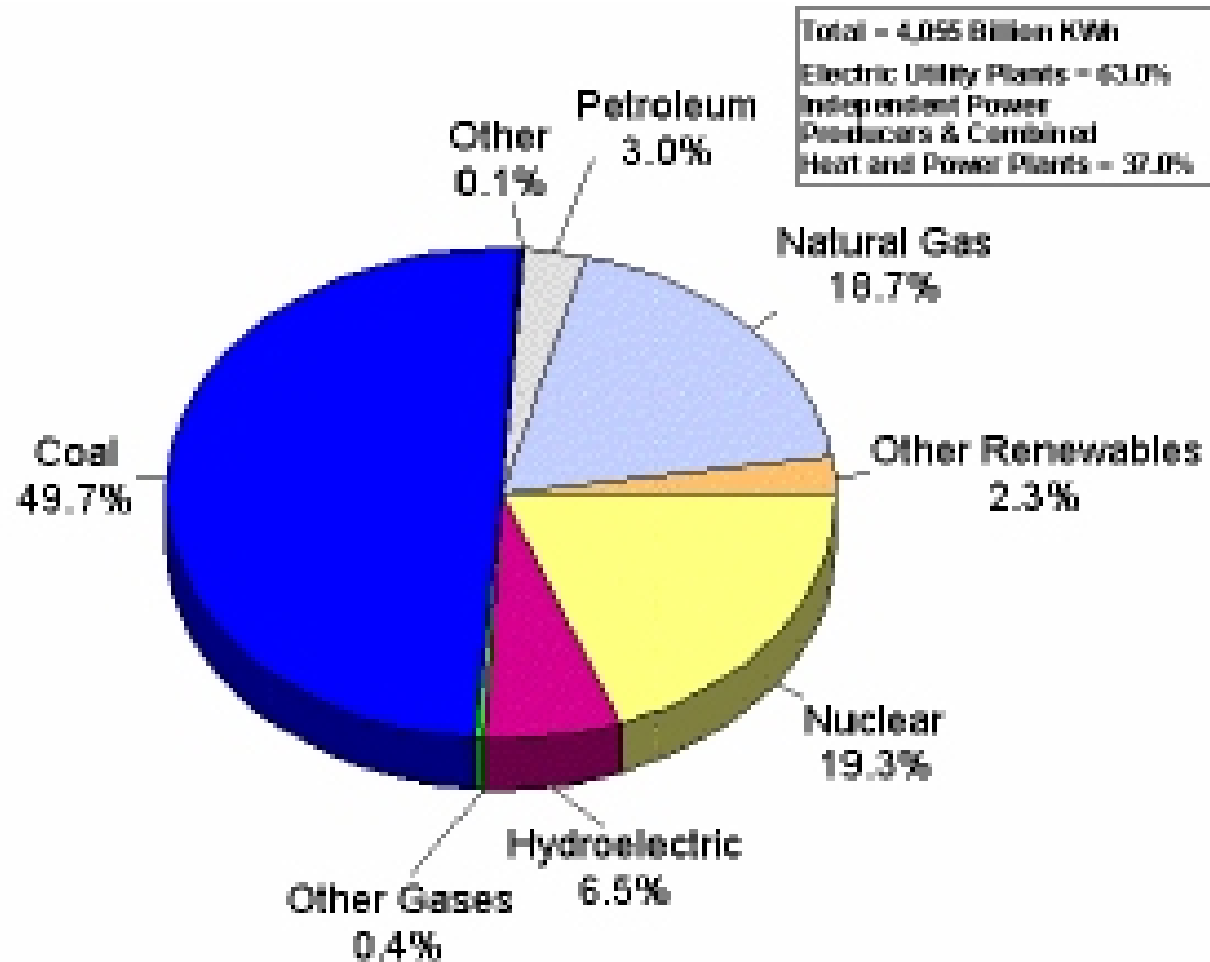
- Main Point: Strong, renewed recent interest in demand response and energy efficiency after a decade of reduced interest in many parts of U.S.
- Note: “DSM” term in U.S. is no longer used
- Instead, “DSM” in U.S. refers to either “demand response” or “energy efficiency as delivered by electric utilities”



DESCRIPTION OF U.S. ELECTRICITY SYSTEM



Electric Power Generation by Fuel Type (2005)



Source: Energy Information Administration, Form EIA-906, "Power Plant Report"



U.S. Electric Industry – 3,200 utilities plus others

Investor-Owned Utilities -- 232

- Account for a majority of net generation (52%), transmission (80%), and distribution (50%)

Publicly-Owned Utilities and Cooperatives -- 2,900

- Account for 15% of net generation, 12% of transmission, and nearly 50% of the nation's electric distribution lines

Independent Power Producers -- 2,800

- Account for 26% of net generation

Federal Government

- Owns 9 power agencies (including 4 Power Marketing Administrations and TVA) with 7% of net generation and 8% of transmission

Electric Power Marketers -- 128

- Account for 2.5% of sales to consumers; 67.8% of sales for resale

Sources: [1] EIA, Electric Power Annual 2001, March 2003 (p.2)

[2] EIA, Annual Energy Review 2001, November 2002, Chapter 8 (Electricity)



Status of Wholesale Regional Power Markets

- **California's high-profile 2000-2001 market meltdown helped overshadow other, more successful, market restructurings elsewhere that saved customers billions of dollars while enhancing power-grid reliability. But still problems with centralized mkts.**
- **Centralized power markets with independent power grid operators are in California, Texas, New York, MidAtlantic, Northeast and Midwest, serving areas representing two-thirds of U.S. \$10 trillion economy.**
 - **New England (ISO-NE), New York, (NYISO), Mid-Atlantic (NYISO and PJM), Midwest (MISO), California (CAISO), and Southwest (SPP)**
- **No regional markets: Northwest, West (outside of California), and Southeast.**



U.S. Electricity Regulation Summary

- Secretary of Energy is part of the President's Cabinet and reports to him
- DOE does not regulate electricity (except transmission lines/exports with Canada & Mexico)
- Federal Energy Regulatory Commission (FERC) regulates all wholesale transactions and transmission.
 - regulates transmission and wholesale electricity sales in U.S. for "jurisdictional entities" (excludes state, federal, municipal, and most rural electric cooperative wholesale sales)
 - Independent of the President, but he appoints all five commissioners



U.S. Electricity Regulation Summary (continued)

- States regulate retail electricity sales for investor-owned
- Local governments regulate sales of municipal and publicly-owned utilities
- Sales by rural cooperatives regulated by member boards
- U.S. Congress enacts laws affecting reliability, wholesale sales, fuel diversity, and environmental impact of electricity



State of the U.S. Electric Industry

- **Continued regulatory uncertainty: structure (who will own what?); reliability; environmental**
- **Regional transmission operators & wholesale markets in some regions; Other regions resist. Wholesale markets are not working right yet – not enough new transmission being built.**
- **A lot of congestion on transmission system; few new built**
- **Generation: concern on rapid growth in natural gas use. Climate policy uncertainty.**
- **Demand side not sufficiently engaged – needed for markets to work well and be a “fifth fuel”**
- **Uncertainty: causes lack of investment**
- **New Energy Policy Act of 2005: will it reduce uncertainty?**



DESCRIPTION OF NATIONAL POLICY



Grid Modernization – A National Priority

“... We have modern interstate grids for our phone lines and our highways. It's time for America to build a modern electricity grid.”

President George W. Bush

April 27, 2005

.... And now also a priority of Congress due to the Energy Policy Act of 2005



Energy Efficiency – U.S. Federal Government Perspective

Federal government wants to see **more energy efficiency in electric and gas markets.....BUT**

While there are federal **efficiency standards on various consumer products...THERE ARE**

No federal efficiency mandates on electric and gas utilities -- up to states and the boards of non-state regulated utilities to decide

Both the Administration and Congress leave it to **States (and the boards of non-state regulated utilities) to chose** how much energy efficiency is appropriate

....While there are no federal demand response standards on consumer products, everything else on this slide is same for demand response



U.S. Congress Demand Response Policy Statement

Federal Encouragement of Demand Response

“It is the policy of the United States that time-based pricing and other forms of demand response....shall be encouraged, the deployment of such technology and devices....shall be facilitated, and unnecessary barriers to demand response participation in energy, capacity and ancillary service markets shall be eliminated.”

– Energy Policy Act of 2005, Sec. 1252(f)

- *But EPA Act only requires States to consider requiring demand response.*



DEMAND RESPONSE STATUS



A Definition of Demand Response

“Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.”

- *Benefits of Demand Response in Electricity Markets Report to Congress, U.S. Department of Energy*
- *Demand Response and Advanced Metering Report to Congress, Federal Energy Regulatory Commission*



DOE's and FERC's Demand Response Resources Classification

▪ **Incentive-based Programs**

- Direct Load Control (DLC)
- Interruptible/curtailable rated (I/C)
- Demand bidding/Buy-back programs (DB)
- Emergency Demand Response Programs (EDRP)
- Capacity Programs (CAP)
- Ancillary Services markets program (A/S)

▪ **Time-based rates**

- Time-of-use (TOU)
- Critical peak pricing (CPP)
- Real-time pricing (RTP)

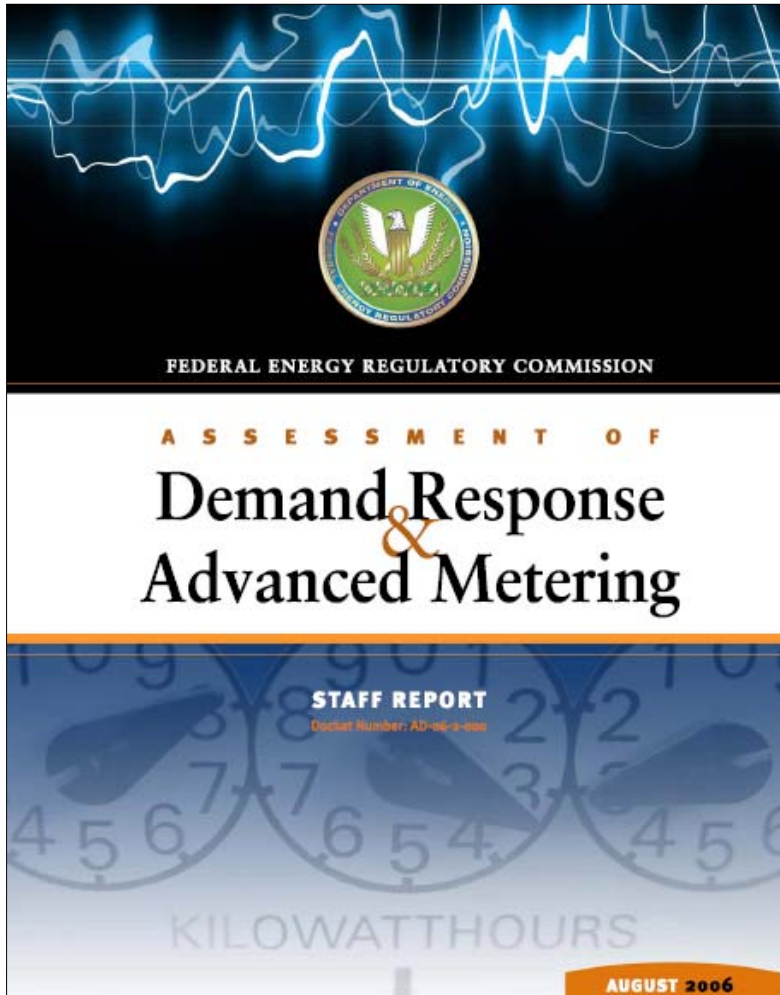


DOE Feb 2006 Report to Congress on Nat'l Benefits of Demand Response

- Identified DR Benefits:
 - Participant financial benefits, market-wide benefits, reliability and market performance benefits
 - DOE reviewed 10 recent studies and concluded:
 - Lack of standardized and accepted analytic methods
 - Preferable to quantify DR benefits at state/regional level (rather than nat'l) because tied directly to local system conditions and market structure
- Made Policy Recommendations in Six Areas:
 - Fostering Price-based Demand Response
 - Improving Incentive-based DR Programs
 - Strengthening DR Analysis and Valuation
 - Integrating DR into Resource Planning
 - Increased Adoption of Enabling Technologies
 - Enhancing Federal Demand Response Actions



Federal Energy Regulatory Commission Staff Report on Demand Response and Advanced Metering



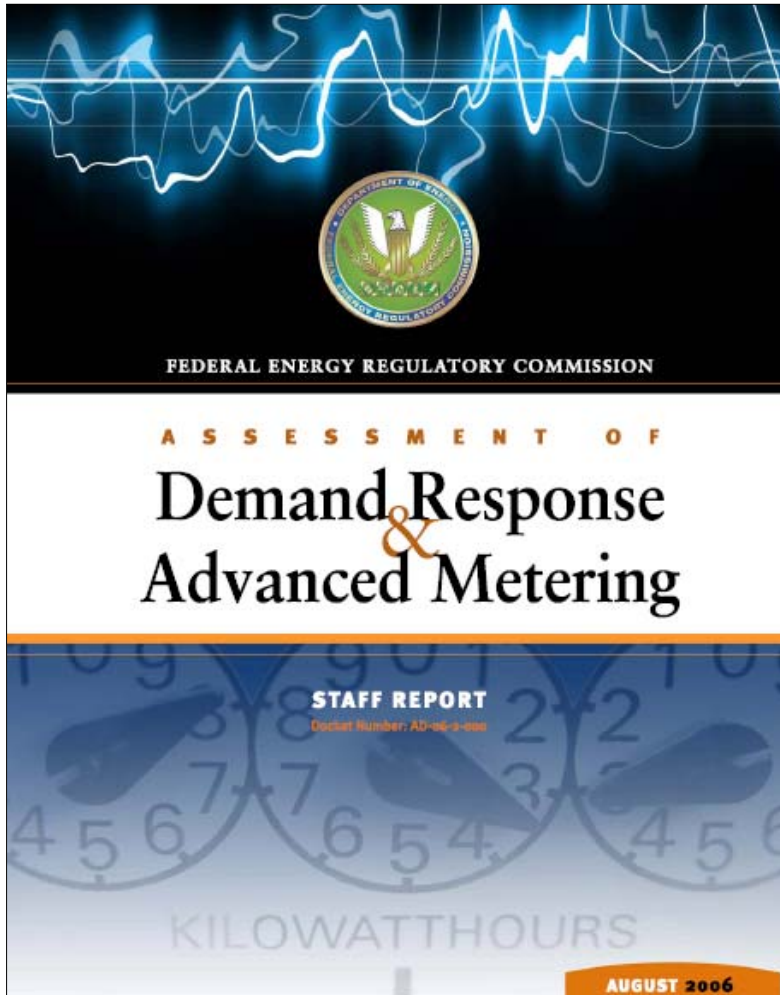
**Energy Policy Act of 2005
(Section 1252e) requires
FERC to identify and
review:**

- Advanced metering penetration
- *Demand response programs and resource contribution*
- Role of DR in regional and transmission planning
- Regulatory barriers

<http://www.ferc.gov/legal/staff-reports/demand-response.pdf>



Federal Energy Regulatory Commission Staff Report on Demand Response and Advanced Metering



Main Conclusions:

- Demand response is important for both wholesale and retail markets
- Current DR capability represents
 - between 3% to 7% of peak demand in most regions
- Low penetration of enabling technologies

<http://www.ferc.gov/legal/staff-reports/demand-response.pdf>



FERC Demand Response Report Gives Status

- 37,500 MW of demand response potential available in the U.S.
 - ~5% of summer 2006 peak demand
- ~9,000 MW available from wholesale programs operated primarily by “Independent System Operators” (ISOs)
- Major portion is contributed by incentive-based programs



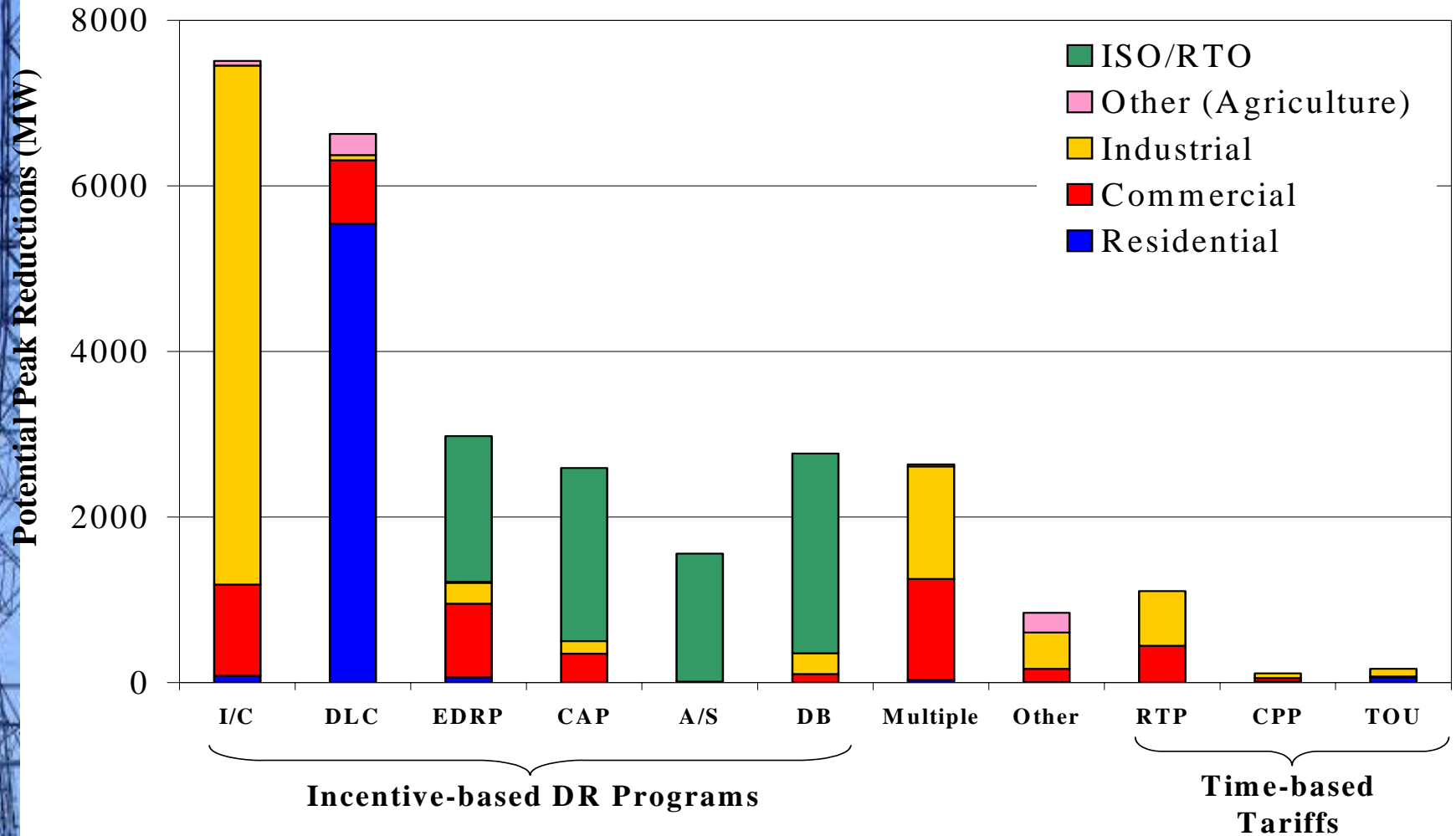
FERC Demand Response Report

Types of DR Programs Offered in U.S.: 2005

Type of DR Program	Number of Entities (1,063 entities responded to the survey)
Time-varying tariffs	
Time-of-use Pricing	187
Real-time Pricing	47
Critical Peak Pricing	25
Incentive-based DR programs	
Direct Load Control	234
Interruptible/Curtailable	218
Emergency Demand Response Program	27
Capacity Market Program	16
Demand Bidding	18
Ancillary Services	1



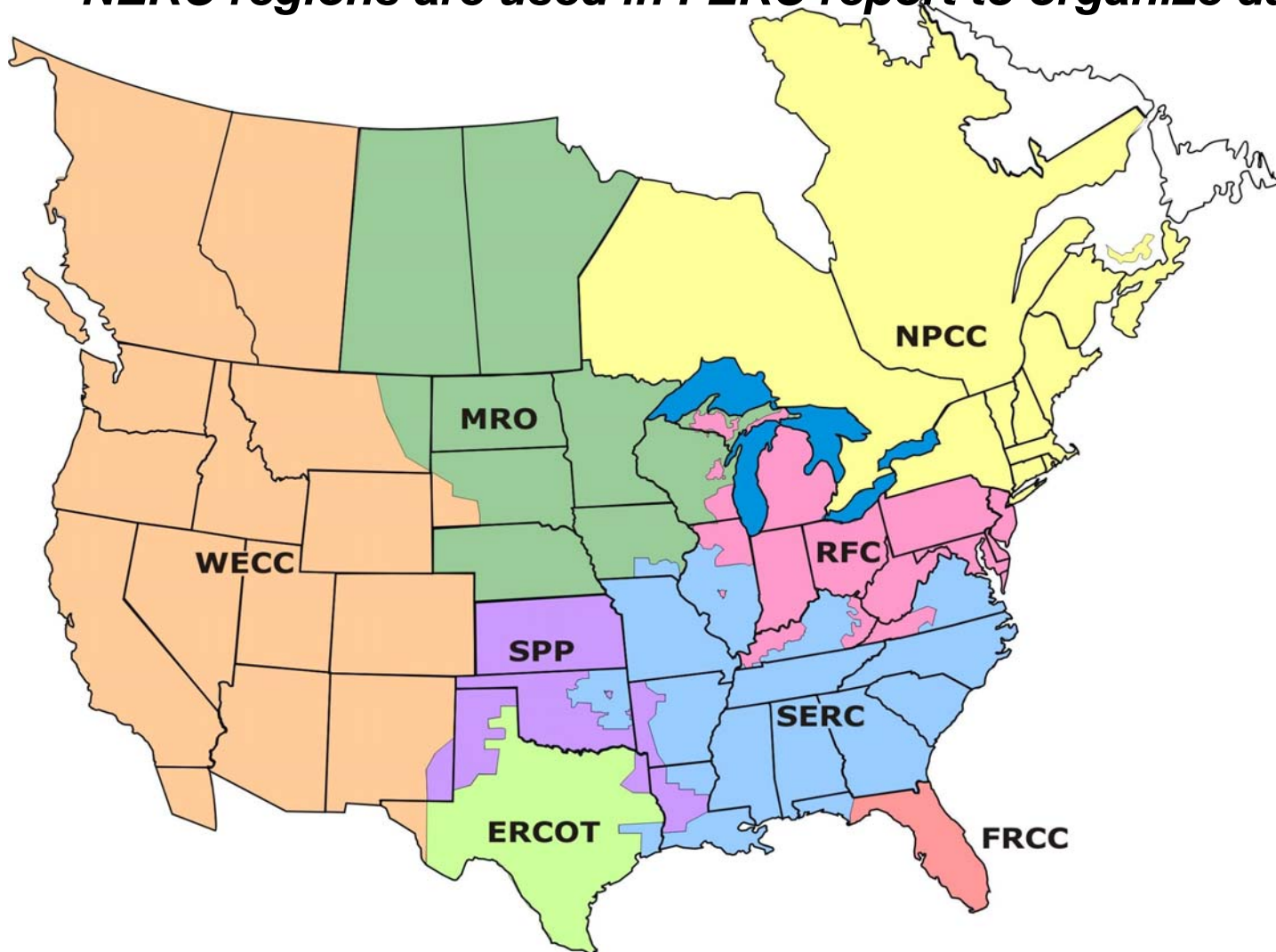
FERC Demand Response Report Existing DR Resource Potential by Type of Program





North American Electric Reliability Council (NERC) Regions

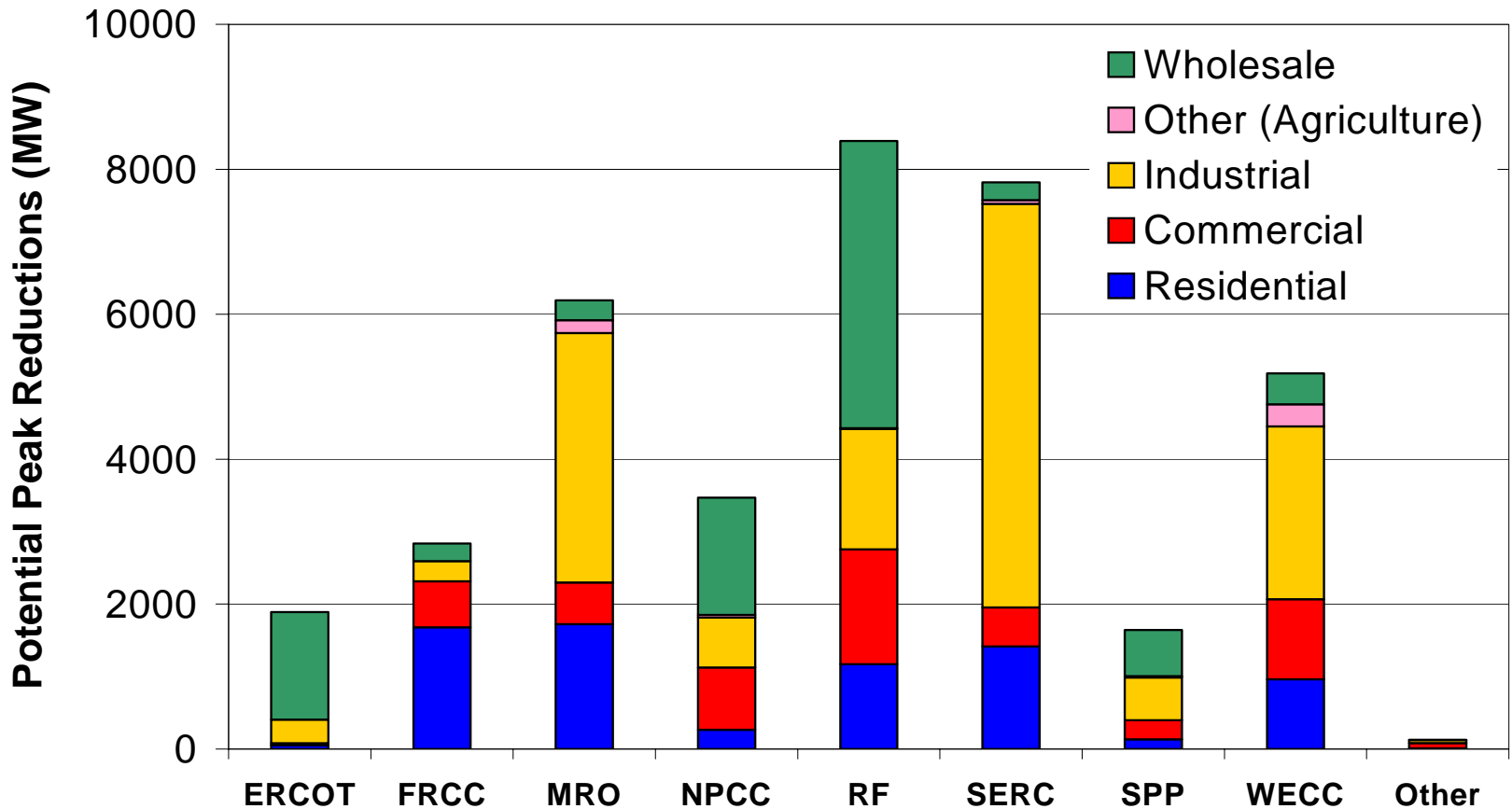
NERC regions are used in FERC report to organize data





FERC Demand Response Report

Existing Demand Response Resource Potential - by NERC Region



As Percent of Summer 2006 Demand	ERCOT	FRCC	MRO	NPCC	RF	SERC	SPP	WECC	Other
	3%	7%	20%	6%	4%	5%	4%	4%	N/A

FERC Demand Response Report Direct Load Control (DLC) Programs

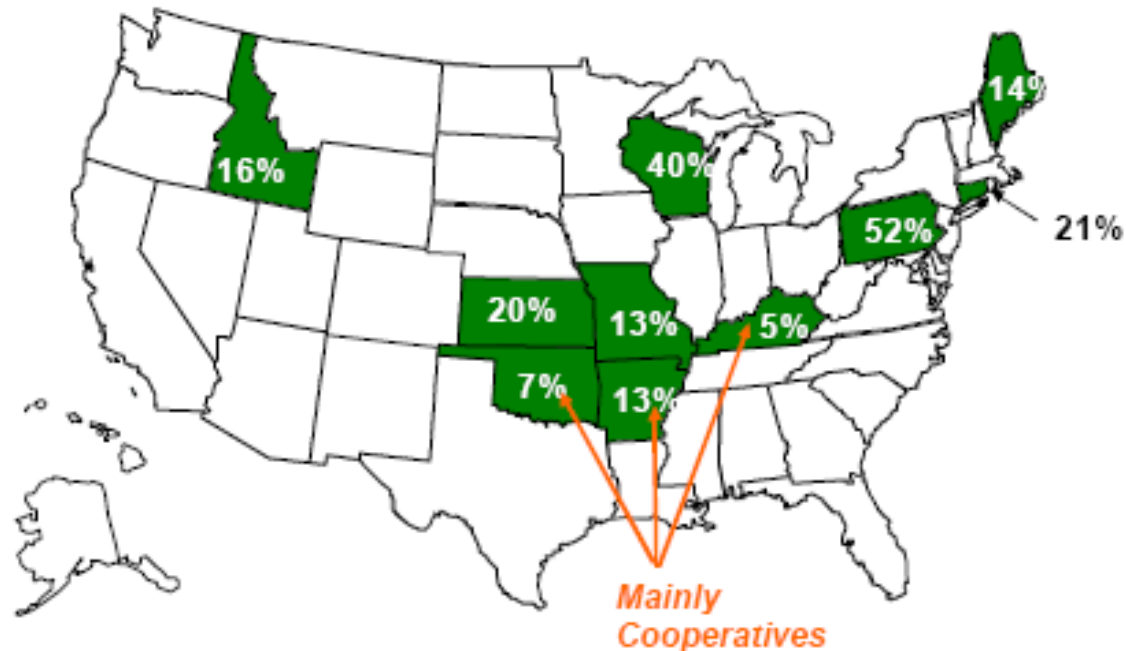


- 234 entities offer 565 DLC programs
 - Residential: 211 entities offer 348 programs
 - Commercial: 78 entities offer 123 programs
- 6,627 MW of DR resource
 - 84% residential, 12% commercial
- 4.8 million customers enrolled (not all active)
 - 98% residential, 2% commercial
- Actual peak reduction reported in 2005: 826 MW
 - 88% residential, 8% commercial
 - ~13% of potential peak reduction of these customers' loads



FERC Demand Response Report Advanced Metering Penetration

Advanced Metering Penetration Top Ten States



Source: FERC Report to Congress, www.ferc.gov, under Energy Policy Act



FERC Demand Response Report Use of Advanced Metering

- **Penetration of advanced metering lower than expected (~ 6%)**
 - Other estimates had been closer to 10%
 - Some utilities with fixed network automated meter reading did not report their meters as “advanced meters”
- **High penetration exists in both rural and more urbanized states**
- **Rural electric cooperatives have the highest penetration**
 - Likely driven by meter reading savings
- **Except for a few states, penetration in Northeastern U.S. is less than the national average**

--- **Source: 2006 FERC Report to Congress**



Renewed DR Interest: Creation of a U.S. Demand Response Coordinating Committee (DRCC)

- Ameren
- American Electric Power
- Demand Response Research Center
- ISO-New England
- MidAmerican Energy
- MidWest ISO
- National Grid
- NYSERDA
- PJM Interconnection
- Pacific Gas & Electric
- Salt River Project
- San Diego Gas & Electric
- Southern California Edison
- Southern Company
- Tennessee Valley Authority

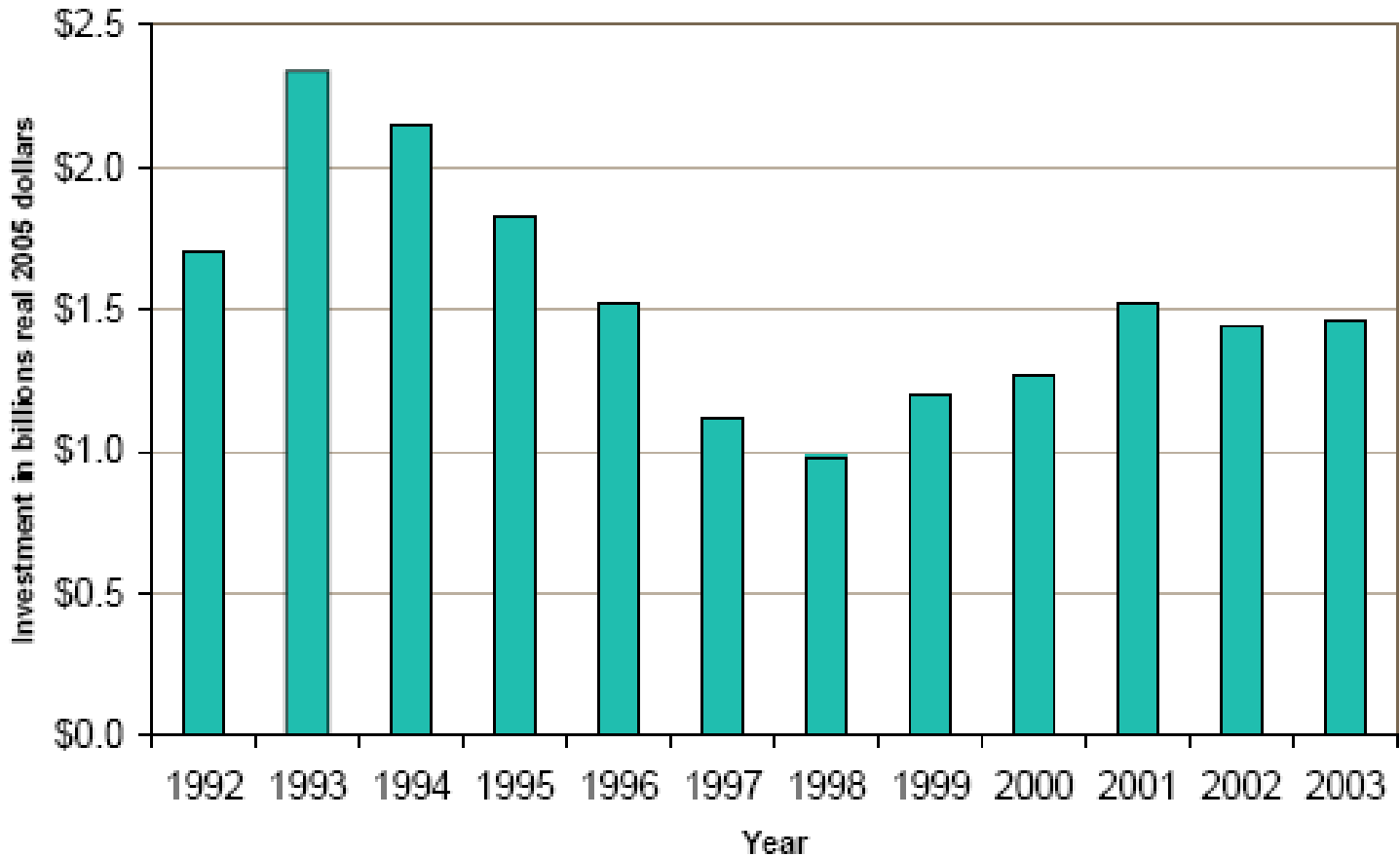
DRCC created as part of IEA DSM Programme Task XIII



ENERGY EFFICIENCY STATUS

EE Funding Has Declined over Last Decade

Energy Efficiency Spending from Charges Included in Customer Rates



Source: Data from ACEEE 2005 Scorecard adjusted for inflation using U.S. Department of Labor Bureau of Labor Statistics Inflation Calculator



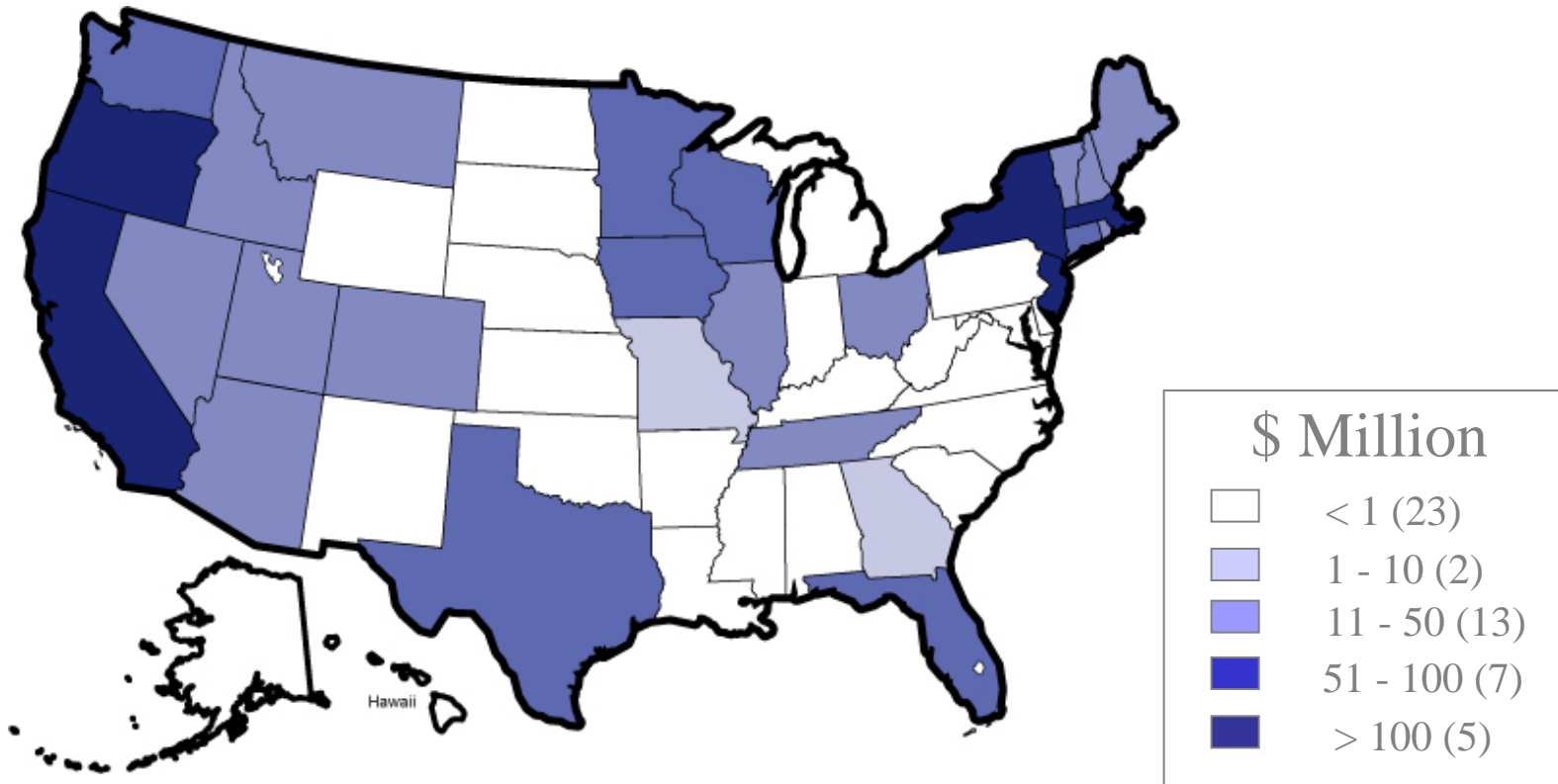


But Utility-Delivered Energy Efficiency Has More Than a Decade of Experience

- **Established energy efficiency as reliable, low-cost resource in parts of country**
 - Real programs with real results
 - Delivering efficiency typically at \$0.02 to \$0.03 per lifetime kWh saved and \$1.30 to \$2.00 per lifetime MMBtu saved
- **Established large potential to meet new demand, address growth**
 - Regionally, nationally
 - Can help control load growth by 50% or more if desired
- **Established various measurement and verification procedures**
 - Savings are real, persistent if programs designed and implemented well
 - Can be integrated into resource planning
- **Established model energy efficiency delivery programs for key customer classes**
 - Residential -- commercial – industrial
 - Low income
 - Gas / electric
 - New / mature portfolios
- **Energy efficiency programs can help customers**
 - Make sound energy use decisions
 - Increase control over their energy bills
 - Save 10, 20 and 30 percent on energy bills



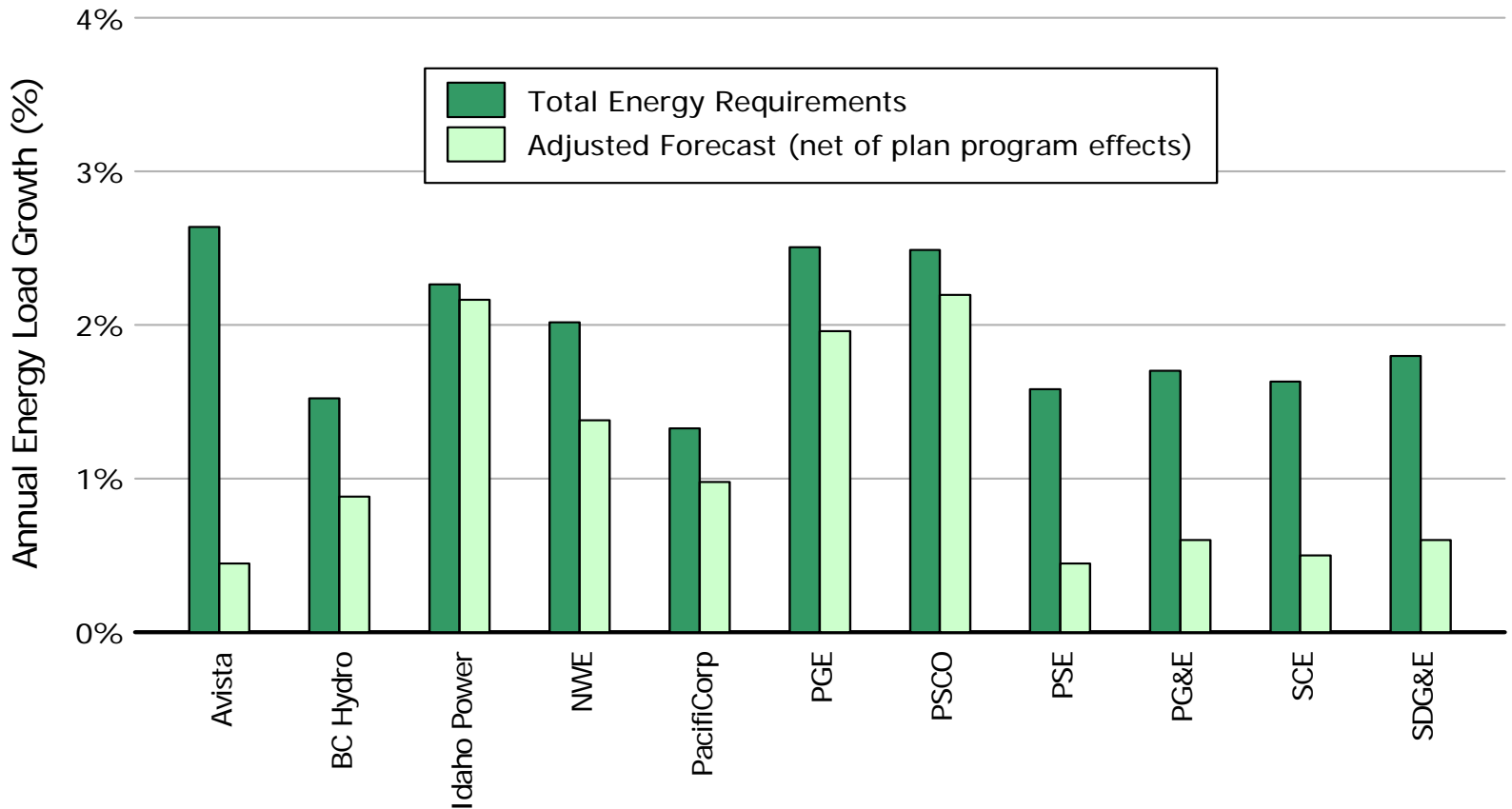
Energy Efficiency Spending: Utility Sector



- **30 state public utility commissions have directed utilities and/or public benefit administrators to invest in energy efficiency**
- **U.S. electric and gas utility spending on energy efficiency was ~\$2.2B in 2006 (*growing level?*)**



Impact of Energy Efficiency programs in reducing utility load growth in the West (2004-2013)



- Five utilities (Avista, PSE, PG&E, SCE and SDG&E) proposed EE programs that reduce forecasted load growth by 50-75% (1.6–2.6% per year to under ~0.5%)



"National Action Plan for Energy Efficiency" Captures New Interest

- Released on July 31, 2006 at the National Association of Regulatory Utility Commissioners meeting
- Goal: To create a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations
- Over 50 member **public-private Leadership Group** developed five recommendations and commits to take action
- DOE and EPA only facilitate!!!
- Additional commitments to energy efficiency – exceeds 90 organizations

www.epa.gov/eeactionplan

National Action Plan for Energy Efficiency Recommendations

1. Recognize energy efficiency as a high-priority energy resource.
2. Make a strong, long-term commitment to implement cost-effective energy efficiency as a resource.
3. Broadly communicate the benefits of and opportunities for energy efficiency.
4. Provide sufficient, timely and stable program funding to deliver energy efficiency where cost-effective.
5. Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.



National Action Plan for Energy Efficiency Leadership Group

- **Sets tone and overall direction of the Action Plan**
- **Released Action Plan Report and Recommendations (July 06)**
- **Co-Chaired by:**
 - **Commissioner Marsha Smith, National Association of Regulatory Utility Commissioners First Vice President & Member of Idaho Public Utility Commission**
 - **Jim Rogers, Chairman of Edison Electric Institute & President and CEO of Duke Energy**
- **Includes 50 leading electric and gas utilities, state utility commissioners, state air and energy agencies, energy services providers, energy consumers, and energy efficiency and consumer advocates ---US DOE and US EPA facilitated & did not determine recommendations!**





The Leadership Group

The Leadership Group includes 28 electric and gas utilities, 18 state agencies, and 12 other organizations:

- Alliance to Save Energy
- American Council for an Energy-Efficient Economy
- Ameren
- American Electric Power
- Arkansas Public Service Commission
- Austin Energy
- Baltimore Gas and Electric
- Bonneville Power Administration
- California Energy Commission
- California Public Utilities Commission
- Servidyne Systems
- Connecticut Consumer Counsel
- Connecticut Department of Environmental Protection
- Connecticut Department of Public Utility Control
- District of Columbia Public Service Commission
- Duke Energy
- Entergy Corporation
- Environmental Defense
- Exelon
- Food Lion
- Great River Energy
- Idaho Public Utilities Commission
- ISO New England Inc.
- Johnson Controls
- MidAmerican Energy Company
- Minnesota Public Utilities Commission
- National Grid
- Natural Resources Defense Council
- New Jersey Board of Public Utilities
- New Jersey Natural Gas
- New York Power Authority
- New York State Public Service Commission
- North Carolina Air Office
- North Carolina Energy Office
- Ohio Consumers' Counsel
- Pacific Gas and Electric
- Pepco Holdings, Inc.
- PJM Interconnection
- PNM Resources
- Public Advocate State of Maine
- Puget Sound
- Sacramento Municipal Utility District
- Santee Cooper
- Seattle City Light
- Servidyne Systems
- Southern California Edison
- Southern Company
- Tennessee Valley Authority
- Texas State Energy Conservation Office
- The Dow Chemical Company
- Tristate Generation and Transmission Association, Inc.
- USAA Realty Company
- Vectren Corporation
- Vermont Energy Investment Corporation
- Wal-Mart Stores, Inc.
- Washington Utilities and Transportation Commission
- Waverly Light and Power
- Xcel Energy



Pending Work Products National Action Plan for Energy Efficiency

- Guide on Potential Studies
- Guide on Evaluation, Measurement & Verification Procedures
- Guide on Integrating Efficiency into Resource Planning and Procurement
- Regional Implementation Meetings
- Communication Kit
- Building codes fact sheet
- Paper on Mechanisms for Aligning Utility Incentives



BARRIERS TO MORE EFFICIENCY AND DEMAND RESPONSE

LOOKING AHEAD



Customer Market Barriers to Energy Efficiency and Demand Response

	Energy Efficiency	Demand Response
Lack of a price signal (e.g. averaged rates)		X
Metering/Communication system upgrade costs		X
Lack of awareness/information	X	X
Lack of product availability	X	
Split incentives/responsibility	X	O
Access to capital/financing or high investment hurdle rates	X	O
Organizational practices	X	X

X is most important, x medium important, o less important



Institutional/Structural Barriers

	Energy Efficiency	Demand Response
Environmental costs not fully internalized in prices	X	O
Rate designs promote throughput	X	
Reliability market rules exclude/limit demand-side resources		X
Utility financial incentives and ratemaking practices discourage demand-side investments	X	O

x is most important, X medium important, o less important

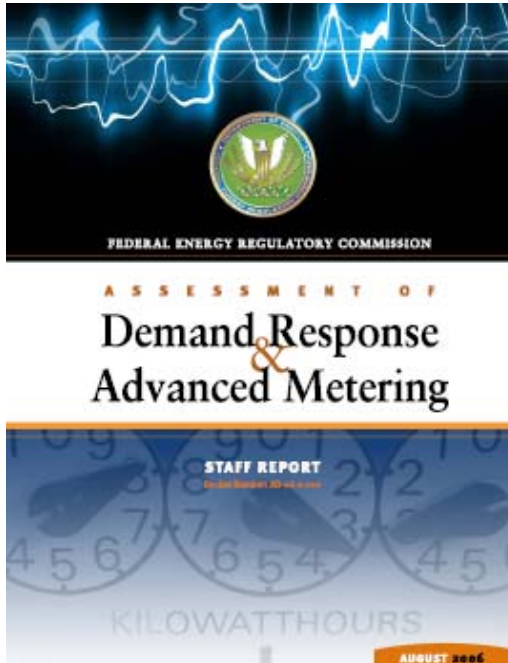


Looking Ahead: Future of Energy Efficiency and Demand Response

- **Jim Rogers, Edison Electric Institute current chair and CEO of Duke Energy: “Energy Efficiency should be considered a fuel choice – the fifth fuel”**
- **National Action Plan for Energy Efficiency catches renewed interest**
 - **Public commitments by ~90 organizations to advance EE activities**
- **Policies to promote Energy Efficiency in Utility Sector**
 - **Public Benefit surcharges (16 states) or ratepayer-funding (with EE treated as resource; 14 states)**
 - **Electric Efficiency Resource Standards (TX, NV, HA, CT) or Goals (CA, RI, VT)**
 - **Including EE as part of Default Service for residential & small commercial customers (ME)**
 - **Included as resource option in Forward Capacity Market (ISO-NE)**
- **Integration of Energy Efficiency and Demand Response beginning**
- ***Returned and stronger interest in energy efficiency and demand response***



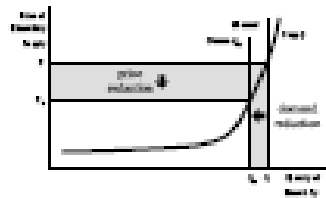
For More Information Three Reports to Congress



go to Energy Policy Act, electricity tab, of www.ferc.gov

BENEFITS OF DEMAND RESPONSE IN ELECTRICITY MARKETS AND RECOMMENDATIONS FOR ACHIEVING THEM

A REPORT TO THE UNITED STATES CONGRESS
PURSUANT TO SECTION 1252
OF THE ENERGY POLICY ACT OF 2005



February 2006



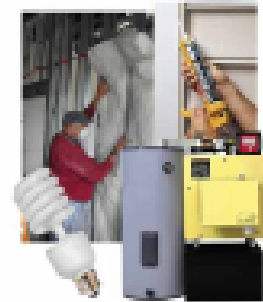
U.S. Department of Energy



go to Energy Policy Act part of www.oe.energy.gov

STATE AND REGIONAL POLICIES THAT PROMOTE ENERGY EFFICIENCY PROGRAMS CARRIED OUT BY ELECTRIC AND GAS UTILITIES

A REPORT TO THE UNITED STATES CONGRESS
PURSUANT TO SECTION 139
OF THE ENERGY POLICY ACT OF 2005



March 2007



U.S. Department of Energy





For More Information

- National Action Plan for Energy Efficiency - www.epa.gov/eeactionplan
- Demand Response Coordinating Committee - www.demandresponseinfo.org
- American Council for and Energy Efficient Economy – www.aceee.org
- DOE funded work:
 - Regulatory Assistance Project – www.raonline.org
 - Lawrence Berkeley National Laboratory – <http://eetd.lbl.gov/ea/EMS/emp.html>