# Energy Efficiency Workshop
# Kansas Corporation Commission

January 27, 2006

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# The Regulatory Assistance Project

RAP is a non-profit organization, formed in 1992, that provides workshops and education assistance to state government officials on electric utility regulation. RAP is funded by the Energy Foundation and the US DOE.

Richard Sedano was commissioner of the Vermont Department of Public Service, 1991-2001, member of the Secretary of Energy's Task Force on Reliability, 1998-99.

Rick Weston was an economist and hearing examiner with the Vermont Public Service Board, 1989-99 and was staff chair to the NARUC Committee on Energy Resources and the Environment

# Iowa Utilities Board (IUB)

- Gordon Dunn has been a staff member at the IUB since 1985, serving as team leader for energy efficiency rulemakings, plan reviews and cost recovery proceedings.
- Energy efficiency by Iowa investor-owned utilities has evolved over 20+ years. IOUs are implementing their third round of plans and achieving very good results.

# Today's Workshop Program

- Why Energy Efficiency
- How to Implement Energy Efficiency and Associated Policy Issues
- Paying for Energy Efficiency and Compensating the Utilities
- Open Discussion

# I. Why Energy Efficiency

- Cost-effective compared with other resources
- It can offset the consequences of growth
- Inherent barriers exist for electric and gas consumers to do efficiency on their own
- The utility system is a good delivery mechanism
- Commission clarity and leadership are important
- It can be an economic development tool

# Cost of Energy Efficiency

- Mature energy efficiency programs are being delivered at a cost to consumers of 3 cents per kWh
- Supply sources (plus transmission, losses, etc.) generally cost more
  - Issue to flag for later: capital investments get paid for over time – roughly 15-20% of capital cost is the rate effect
- Risks of cost increases from fossil fuel-driven supply, especially in wholesale market structure

# Energy Efficiency Program Spending and Savings

- For highest spending states:
  - Spending ranges beyond 3% of utility revenues
  - Savings are approaching 1% of sales and 1% of peak

# Connection to Codes and Standards

- If standard practice for energy consumption is more efficient, consumer funded energy efficiency programs can focus on more valuable objectives.
  - This is the way building energy codes and appliance and equipment efficiency standards work with consumer funded energy efficiency programs

# Growth in Electric Use and Demand has Risks

- More power generation (cost control, siting)
- More exposure to fuel price increases
- More exposure to fuel price and availability volatility
- More exposure to energy security concerns
- More transmission
- More air emissions (caps) and water use

# Barriers to Energy Efficiency

- Information and Knowledge
  - Customers, stores, contractors, suppliers, etc.
- Time to make different decisions
- Upfront cash
- Long run cash, Financing
- Split Responsibility (the renter's dilemma)

# Use of Incentives

- Manage incentives carefully
- For generally available programs, link amount to desired effect, expect to ramp down incentive as higher standard becomes ordinary

# Delivering Energy Efficiency through Utility Rates

- Consumers pay because there are system benefits to all from energy efficiency
- Utilities or other administrator delivers
- Network of contractors to the program
- Supply chain of services and products (trade allies)
- Leadership reinforces success
- Regulators oversee progress and direction

# Leadership and Clarity

- Leadership is very important with energy efficiency
  - It is a departure from traditional strategies to meet energy needs, and some experts and highly experienced professionals are skeptical of EE value
  - It relies on investments in assets not owned or controlled by the utilities
  - To overcome "legacy friction" and apply current imperatives and lessons of success from other states, clear, unambiguous leadership is valuable

**Important choice: make new system that takes time to grow and apply lessons, or fast implementation that makes mistakes?**

# Ancillary Benefits of Energy Efficiency

- Economic Development
  - State can use availability of EE as a quality enhancement in dealing with businesses
- Environment
  - The cleanest kWh is the one not used
- Quality
  - Efficient products and processes also tend to be of higher quality and better engineering

# IUB – 2004 DSM Results - IOUs

- Cumulative effects of 14 years of DSM
- 1,400 GWh – about 3.5% of MWh sold
- 970 peak MW – about 12% of peak MW
- 6,000,000 MCF – about 2.5% of total "throughput" or 4% of retail sales
- B/C ratios about 2.0 and NEW net benefits about $100 million per year, 1999-2004

# II. Implementing Energy Efficiency Programs

- Budgets, cost-effectiveness analyses, and resource potential studies
- Scope of programs, equity, and low-income issues
- Administration
- Regulatory oversight (program budgets, M&V, annual reports, public involvement)
- Customer focus and marketing
- Integration into utility resource planning and investment

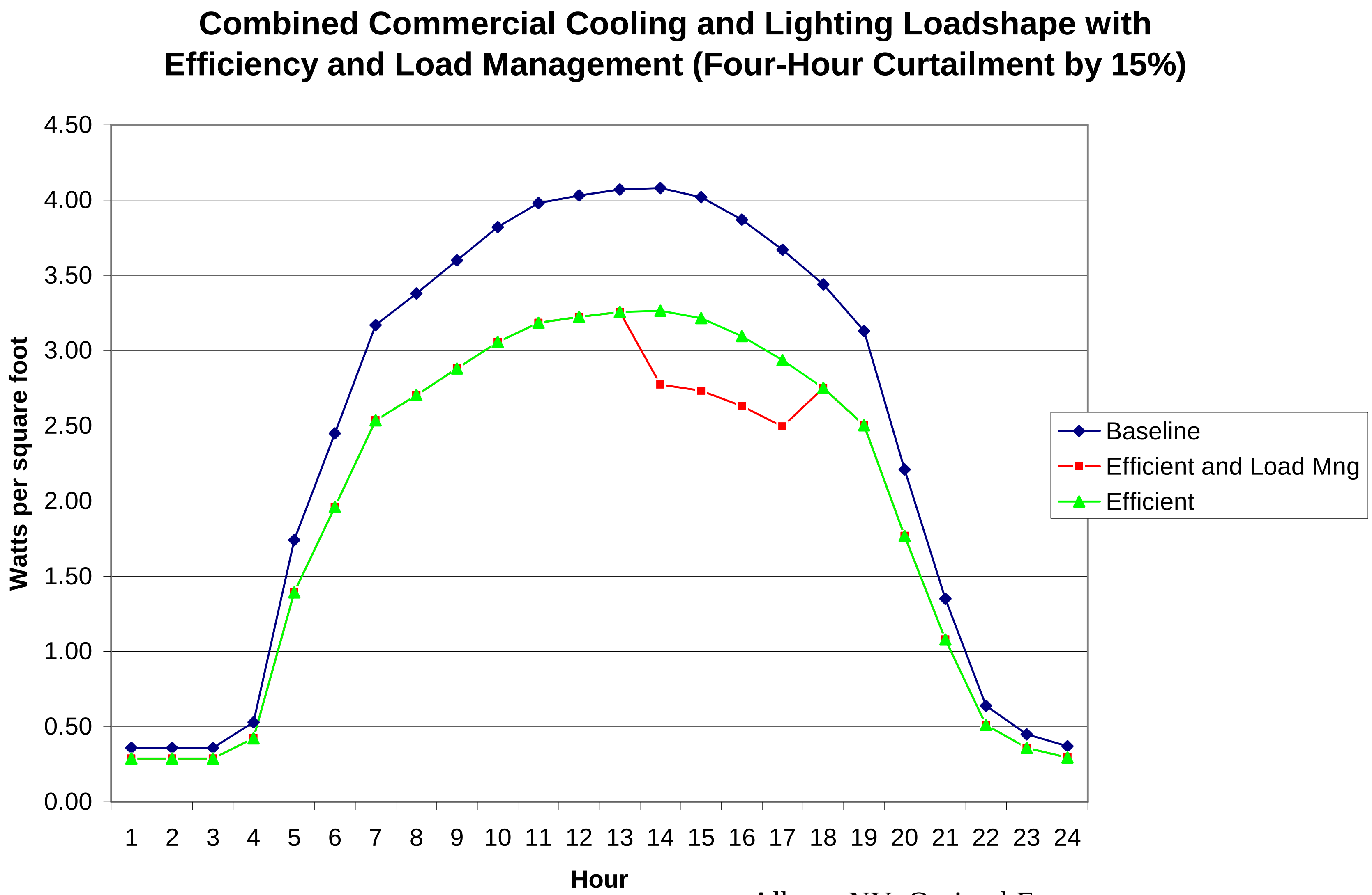
# Cost Effectiveness Tests

- Ratepayer Test (RIM)
- Utility Test
- Total Resource Test
    - Societal Test

- Some jurisdictions use several for different purposes, others focus on just one

# Some Elements of Cost-Effectiveness

- Life-cycle – requires assessment of average measure life
- Free riders – minimize, can't eliminate, appropriate discount
- Persistence – characterize by program for evaluation
- Capacity value




Albany NY, Optimal Energy

# Cost-Effectiveness Tests

- Choice communicates priorities of the state
  - RIM Test is concerned for the individual, but ignores the system benefits of efficiency
  - Total Resource Test considers the system benefits, but ignores external benefits
  - Societal Test considers everything
- Using TRC or societal test could produce cost-effective programs equivalent to more than 5% of total utility revenues. Regulator gets to decide what consumers and the state economy can afford, and what cost-effective programs to sacrifice, and to recognize the capital consequences.

# Some Observations on the RIM Test

- The RIM test is not used to evaluate supply-side investments
  - The TRC (or societal) test is used, implicitly or explicitly, for all other utility investments
  - Only short-term load management activities satisfy RIM
- Use of RIM assumes that price alone is sufficient to inform consumers about efficient choices
  - Ignores well-documented and significant barriers to adoption of energy efficiency
  - It also assumes that the price *ex ante* is more efficient than the price *ex post*
- Use of RIM assumes that greatest economic efficiency is served by no change in price
  - Economic efficiency is maximized when total cost to serve a given level of demand is minimized
  - Under conditions of natural monopoly, significant barriers to efficient investment, and substantial unpriced external costs, minimizing price does not equate to minimizing total cost.

# IUB Benefit/Cost Analysis

- Use all perspectives, but Societal is defining test for programs and plans
- Discount rate tied to U.S. Treasury bonds
- “Adders” to avoided cost for externalities
- Free riders vs. “free drivers” is a wash
- Low-income exempt from B/C by statute

# Program Screening

- Generally reduces to a spreadsheet
- Most states have an overall target benefit/cost ration for overall programs
  - Allows very beneficial programs to create “room” for socially important but economically borderline programs to be included

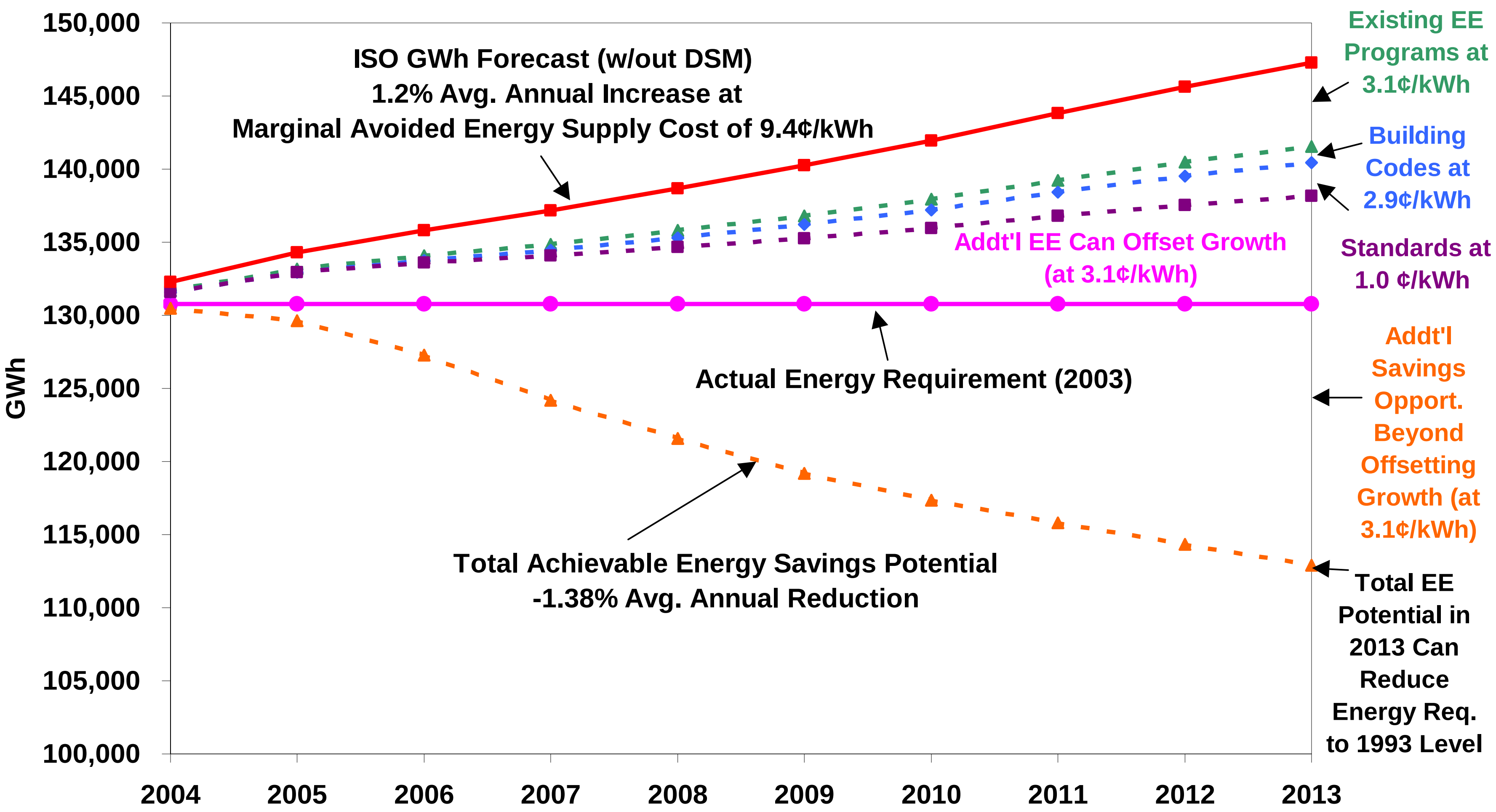
# Resource Potential Studies

- Assesses market potential for energy efficiency efforts
  - Valuable for strategic planning
  - Particularly useful if market is segregated to assess growth areas that might eventually require wires upgrades
  - Generally show potential far in excess of current program scope
  - Cost that many states find worth the investment

# IUB - Assessment of Potential

- IOUs were original proponents – provided spreadsheet “end-use forecasts” and potential in plans for 1991 and 1995.
- IUB adopted AP in 1997 to help set goals for IOU plans.
- New (2002) plans use “black box” models and restricted “market potential,” but actual program results can exceed potential.

# Existing and New EE Strategies Can Offset ISO Forecasted Energy Requirements (GWH) and Beyond

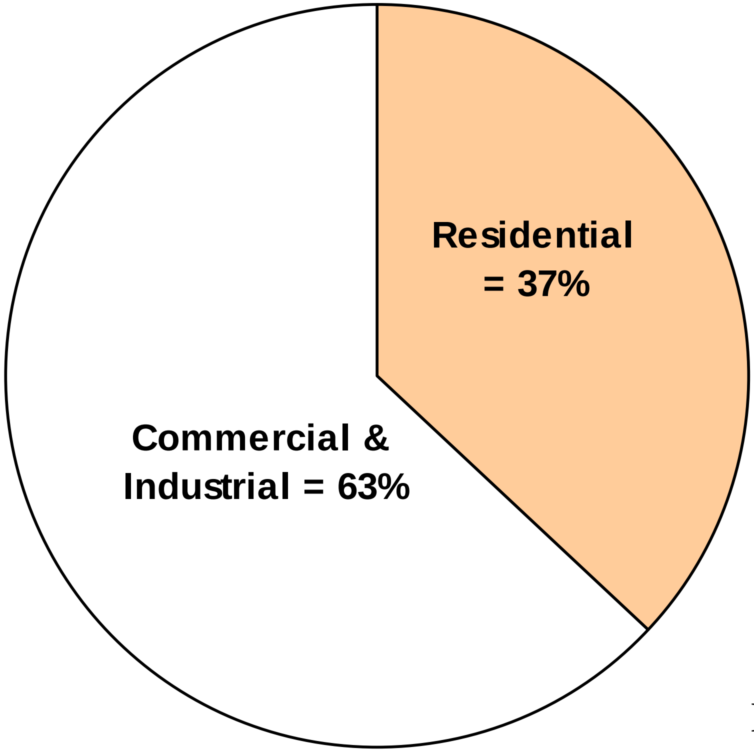



New England EE potential www.neep.org

# What are the Major "Reservoirs" of Achievable EE Potential in 2013?
# #1: By Sector

**Residential Savings = 12,745 GWH**

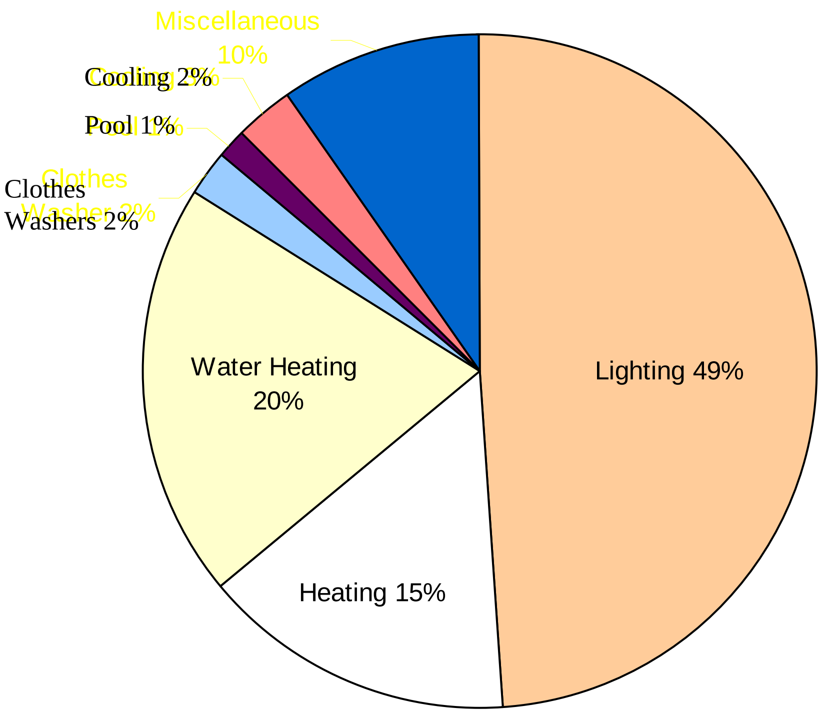
**C&I Savings = 21,630 GWH**



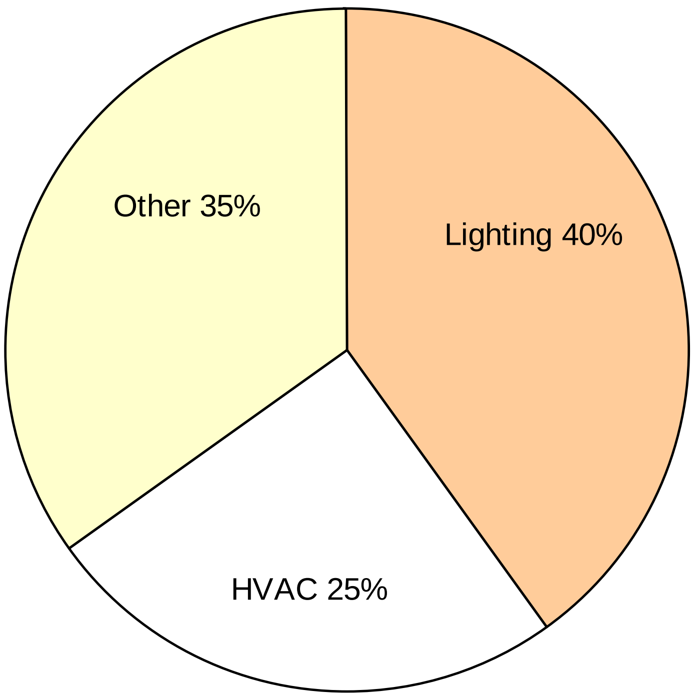

NEEP assessment of New England, 2004

# What are the Major "Reservoirs" of Achievable EE Potential in 2013?
# #2: By End Use

## Residential Savings




## C&I Savings




NEEP assessment of New England, 2004

# Ways to Measure Potential

- Technical Potential: complete penetration of all measures deemed technically feasible
- Economic Potential: technical potential constrained by cost-effectiveness compared with supply
- Maximum Technically Achievable: Technical potential overtime with most aggressive programs
- Maximum Economically Achievable: Economic potential over time with most aggressive programs
- Budget Constrained: savings with specific funding

# Some Energy Efficiency Potential Studies

| State | Type of Potential | Year | Estimated Consumption Savings as % of Sales | | Est. Summer Peak Demand Savings as % of total capacity | Years to Achieve Savings Potential |
|---|---|---|---|---|---|---|
| | | | Residential | Total | | |
| Connecticut | *Technical<br>*Max. Technically Achievable<br>*Max. Economically Achievable | 2003 | 21<br>17<br>13 | 24<br>17<br>13 | 24<br>13 | 10 |
| Massachusetts | Max. Economically Achievable | 2001 | 25 | | | 5 |
| New York | *Technical<br>*Economic | 2002 | 37<br>26 | 37<br>30 | | 10 |
| Vermont | Max. Technically Achievable | 2002 | 30 | 31 | 37 | 10 |

# Energy Efficiency Budgets

- What is your point of view?
  - What can we afford?
  - What is cost-effective?
  - Do we set a firm figure and stick with it?
  - Do we allow increases above the firm figure for particular purposes
- At the beginning, plan for a transition

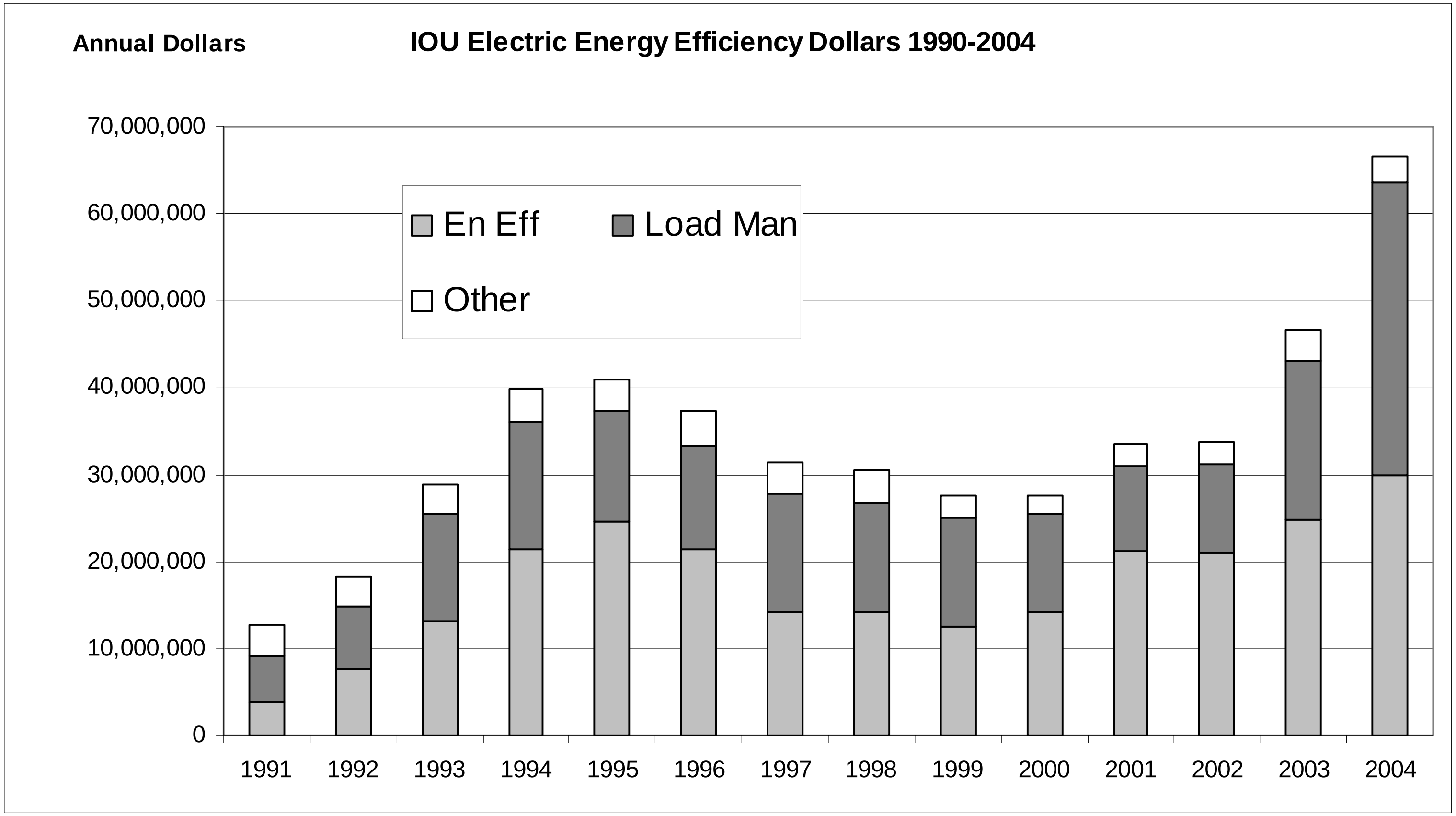
# Approaches to Setting DSM Spending Levels

- Cost-Effective DSM Potential Estimates
- Percentages of Utility Revenues
- Mills/kWh of Utility Electric Sales
- Levels Set Through Resource Planning Process
- Expenditures Set Through the Restructuring Process (N/A in Kansas)
- Tied to Projected Load Growth
- Case-by-Case Approach

# IUB – Energy Efficiency Budgets

- Budgets initially set at percentages of revenue: 2% electric, 1.5% natural gas.
- Changed to energy and capacity goals.
- Cost recovery – contested until 1997.
- Costs plus return and rewards until 1997.
- Now, costs are expensed via concurrent recovery. No returns, no rewards, no lost revenues, decoupling being discussed.

# Iowa IOU DSM Spending



# A few budget details

- Equity by customer class and region is a good long term strategy
- Pay attention but don't worry too much about Administration and General
  - Important factor is outcomes
  - Accounting methods from state to state are different, so comparing A&G is confounding
- Low unit costs come from maximizing savings per customer contact (lesson learned!)
  - Treat whole buildings, avoid piecemeal delivery

# Program Scope

- 1. Lost Opportunity Programs
  - Address decision-makers at the time they make purchase decisions concerning energy
    - New construction
    - Point of purchase
    - Trade ally training (the WalMart story)
- 2. Low income Programs
  - Essential, lower benefit/cost threshold

# Program Scope

- 3. Retrofit Programs
  - Costly
    - Appliance bounty programs good for quick hits
  - Reservoir of cost-effective savings is huge due to lower quality of pre-1970s buildings
- 4. Emerging Markets and Technologies
  - Devoting a slice of budget to trying new stuff can be risky, but can also bring a reputation of high expectation and quality

# Program Scope

- 5. Market Transformation
  - Investment in changing the way people make energy decisions (information, training)
  - There is some market transformation in every energy efficiency program
  - Some program “designs” can have little or no ability to measure savings
  - Requires regulators to take long view and accept slightly higher cost of efficiency per kWh

# IUB – Special Programs

- All except trees are specified in statute
- Low-Income
- Research and Development (Iowa Energy Center and Center for Global and Regional Environmental Research)
- Street lighting
- Trees

# Low income programs

- Sometimes called “hard to reach customers”
- Programs qualify with lower benefit/cost ratios
- Financing, to the extent that the cash flow requirement from the customer is reasonable
  - Split savings, positive cash flow outcome
- Integrate with Weatherization
  - Pay weatherization out of program $$ to deliver
- Building Energy Codes and Home Energy Ratings

# Resources for Multi-Family, Split Incentive Solutions

- From Portland OR: a community program http://www.sustainableportland.org/energy_menu_Mul.html
- From California utilities (rebates) http://www.sce.com/RebatesandSavings/Residential/Multi-FamilyEfficiency/ http://www.pge.com/res/rebates/lighting/multi_family_properties/
- From Wisconsin: a program description http://www.mncee.org/workplan.pdf
- From New York: a suite of programs (note sub-metering) http://www.getenergysmart.org/BuildingOwners/default.asp

# Another Program Feature

- Opt out – Some states allow qualifying customers (large manufacturers) to avoid some or all of the cost of energy efficiency
  - Qualifying means aggressive self-directed efficiency efforts
  - Some payment is justified for system benefits

# Customer Focus of Energy Efficiency

- Consumers want service, not programs
  - Avoid “silo effect” when managing programs
- Education and Market Transformation
  - Integrate with programs as much as possible
- Bang for the buck
  - Point of decision/purchase
  - “train the trainer” (contractors, vendors, retail)

# Administration of Energy Efficiency

- Utility – builds on customer relationship, opportunity to integrate into other resources
- State – addresses throughput conflict
- Third Party – keep government in its “overseer role, can add competitive element

- All can work well or fail, and the choice is a preference on what works best, or political

# Role of Regulator Overseeing Energy Efficiency Programs

- EE budget is the consumer's money
- Evaluation, Measurement and Verification are vital parts of the EE effort
  - Some states require EM&V independence from the administrator
  - Rough cost: 5% of total, could be more at the beginning, for smaller programs, or in years with a greater EM&V effort
  - Good models in US to draw from

# IUB – Review of Results

- Up to 1997, contested proceedings for review and approval of cost recovery
- Post 1997, “prudence reviews” as needed
- IUB has disallowed costs, for imprudent performance. Dollar amount was small but sent a strong signal, and utilities responded with new efforts.

# Integration of EE into Resource Planning and Investment

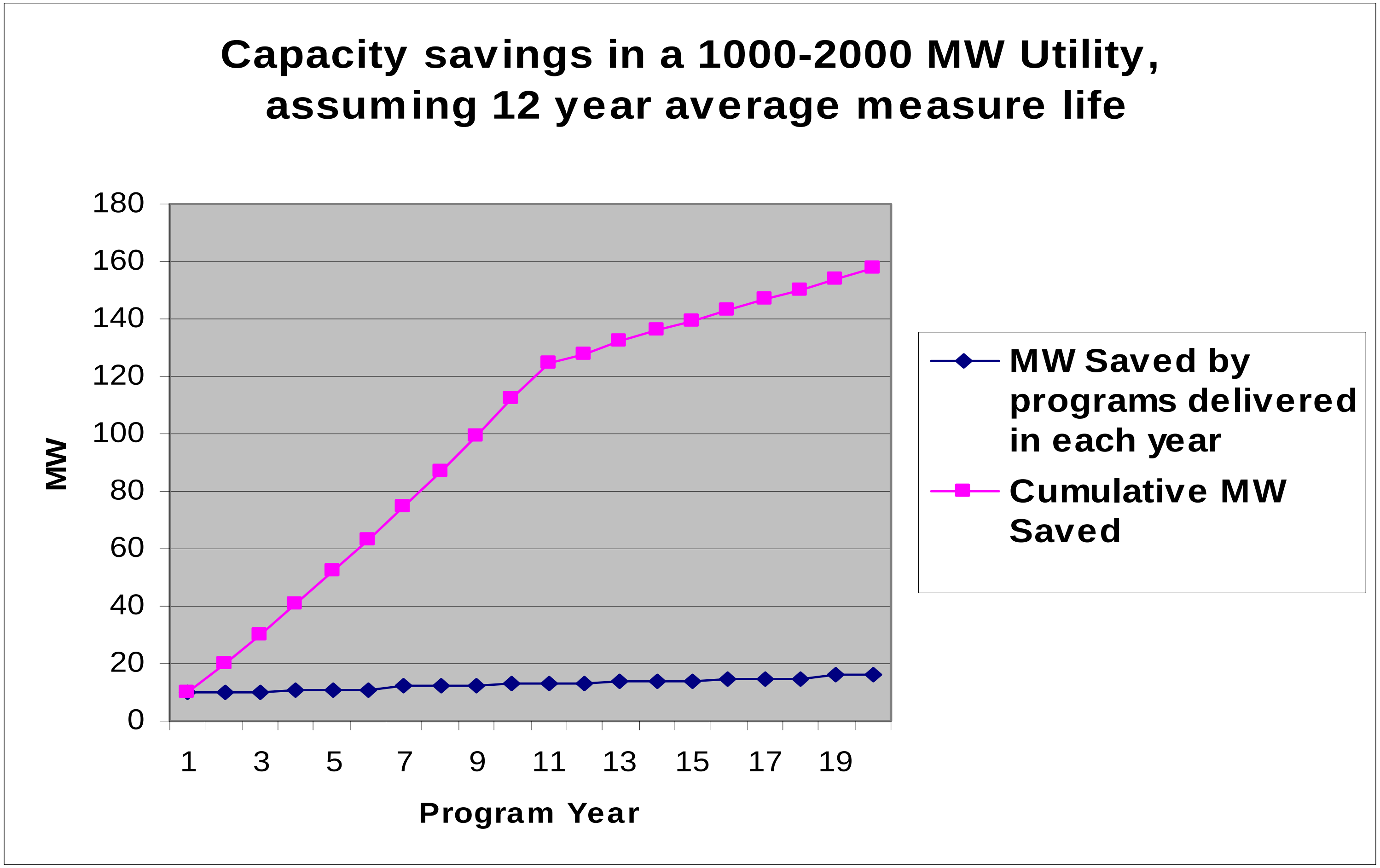
- Is EE an afterthought?
  - Are utility generation expansion plans created with a static load forecast?
  - Are transmission expansion plans created with a static load forecast?
  - Is energy efficiency deployed with any consideration of avoiding generation or wires?

# Integration of EE into Resource Planning and Investment

- Energy efficiency can be the least cost alternative for meeting consumer electricity needs if planners ask the right questions
  - How much energy efficiency (reduced load growth) would alleviate the need for this new transmission line?
  - How much energy efficiency would it take to achieve sustained zero load growth?

# "Is Energy Efficiency 'Real'?"

- Utilities, especially system operators, ask a good question
  - They want to know that when the system needs the promised effects of energy efficiency that EE will deliver, and they start out skeptics
  - EM&V is key (when are "deemed savings" OK?)
  - Some programs are more "hard wired" than others
  - All programs deliver some resource benefit
  - Better question: "How to get an accurate measure of system benefit from energy efficiency?




Showing accumulated capacity saving. Assumption: Start out at 10 MW saved each year, increasing to 16 MW each year

# Performance Goals for Energy Efficiency Program

- Many Examples
- Some come from Performance Measures
  - Amount of saved kWh, penetration of certain appliances, number of buildings
- Some are Policy or Resource Driven
  - Savings equal to x% of sales or peak demand

# III. Paying for Energy Efficiency, Compensating the Utility

- Cost Recovery
- The Throughput Incentive and Solutions
- Incentives
- Time Sensitive Rates
- New ideas

# Funding Energy Efficiency

- Efficiency is a resource, like any other resource necessary to the least-cost provision of service
- How much EE should be purchased?
  - Ideal: all societally cost-effective measures
    - Legal requirement in some states: e.g., CA, VT
  - Practical: Budgets constrained by a variety of considerations

# EE Cost Recovery

- Utility EE costs should be treated as any other prudent cost of service item:
  - Rate based: Amortized over a specified period (life of measure or less); unamortized portion earns a return
    - Logic: Reduces initial rate impacts and links cost recovery to the useful life of the investment, similar to supply-side investments
    - Many states took this approach: e.g., CA, WI, NY, VT
  - Expensed: Current year cost recovery; no return on investment but also no risk of stranded regulatory asset
    - With a fuel-adjustment clause and annual adjustments to base rates, net lost revenue impacts are minimized
    - E.g., New England Electric System/National Grid

# Realizing Good Outcomes: Follow the Money

# Influencing Behavior: How Do Utilities Make $?

- Under traditional rate-of-return (ROR) regulation:
  - P = RR/sales
- But:
  - **Actual** Revenues = P * Q
    - Where: Q = actual sales
- And, therefore:
  - Profit = **Actual** Revenues – **Actual** Costs
- The utility makes money by:
  - Reducing costs and
  - Increasing sales

# Traditional Regulation: The Throughput Problem

- Traditional ROR regulation sets *prices*, not *revenues*
  - The revenue requirement is simply an estimate of the total cost to provide service
- Without adjustment, consumption-based rates ($/kWh and $/kW) link profits to sales
  - The more kilowatt-hours a utility sells, the more money it makes
  - This is because, in most hours, the price of electricity is greater than the cost to produce it
    - *Utility makes money even when the additional usage is wasteful, and loses it even when the reduced sales are efficient*
- The profit incentive to increase sales is extremely powerful

# Efficiency Reduces Revenues and Profits

- Vertically integrated utility with $284 mn ratebase
- ROE at 11%—$15.6 million
- Power costs $.04/kwh, retail rates average $.08; Sales at 1.776 TWh
  - At the margin, each saved kWh cuts $.04 from profits
  - If sales drop 5%: profits drop  $3.5 mn
- DR equal to 5% of sales will cut profits by 23%
  - The effect is even worse for the wires-only business: a reduction in sales of 5% lowers profits by 57%

# Two Solutions

- Adjustments for net lost revenues under traditional ROR ratemaking
  - Compensates utility for contribution to fixed costs that is lost as a consequence of successful energy efficiency
- Decoupling
  - Ratemaking is reformed to break the link between sales and profits entirely

# Net Lost Revenue Recovery

- For every kWh saved through EE, the utility avoids a marginal cost but also loses a contribution to fixed costs
  - Recovery of that contribution can be assured through either
    - The use of a projected test year, adjusted for expected EE savings, or
    - An *ex post* calculation:
      - Net lost revenues = (P – MC) * kWh saved

# Net Lost Revenue Recovery

- In the 80s and 90s, some form of net lost revenue recovery was implemented by almost all the states that were engaged in IRP and DSM
- Most recognized, however, that, though it muted some of the disincentive to EE, it did nothing to eliminate the powerful incentive to increase sales

# PBR and Decoupling

- PBR: It refers to any variation on traditional regulation that aims to encourage, by the application of specific rewards and penalties, identified outcomes and behavior
  - Used extensively in telecom regulation
- New twist for gas and electric PBR: “Decoupling”
  - Breaking the link between profits and sales
  - Today, PBR = decoupling

# Aims of PBR

- Improved economic efficiency for the utility and customers
  - Stronger incentives for cost containment
    - Any utility cost savings, whether the result of improved efficiency by the utility or the customer, go directly to the company's bottom line, i.e., profits
  - Improved incentives for
    - Innovation
    - Market flexibility
    - Sharing of benefits

# Decoupling: How it Works

- Instead of rewarding them for sales, we create a system that holds the company harmless (i.e., no effect on profits) for reductions in sales due to efficiency
- The PBR replaces traditional ratemaking with a formula that determines how *revenues* will change over time
- The company, knowing what revenue levels to expect, is then free to take whatever actions it wants (within other legal and accounting constraints) to improve its profitability

# One Approach to Decoupling: Per-Customer Revenue Cap

- The PBR should align utility incentives with the primary factors that drive its costs
- A truth that traditional regulation ignores:
  - ***In the short run, electric utility costs vary more closely with changes in numbers of customers than they do with changes in electricity sales***
- A per-customer revenue cap tells the company how much money it will be allowed to keep, on average, for every customer it serves
  - This gives the company a very strong incentive to make sure its customers are efficient, that is, that they impose as few costs upon it as possible: the fewer the costs, the greater the share of revenue that can go to its bottom line

# Per-Customer Revenue Cap Formula

- Revenue-per-customer (RPC) PBR
  - $RR_t$/number of $customers_t$ = revenue per customer (RPC)
- The RPC can be adjusted by inflation (*I*), productivity (X), and exogenous factors (Z) to allow for multi-year plan
  - Revenues in the first year ($RR_t$) are calculated in the traditional manner: a revenue requirements analysis
- $RPC_{(t+1)} = [RPC_t * (1 + I_t - X_t)] \pm Z_t$
- Allowed revenues in year t + 1
  - $RR(_{t+1}) = RPC_{(t+1)}$ * number of $customers_{(t+1)}$

- ***Important: This is not how rates should be designed, but only how revenues should be determined***

# What About the Long Term?

- Costs may vary with numbers of customers in the short run (several years), but in the long run costs are driven by demand for electricity
- Thus, the prices that consumers pay must be designed to reflect the causes of costs in the long run
  - Therefore, consumption-based prices
- Each customers does not pay the RPC
  - The RPC is merely a tool for calculating how much money the company is entitled to each year.

# Pricing Under An RPC PBR

- Prices are still set in the usual way
  - Consumption-based unit prices: per kWh, per kW
  - Retains customer incentives for efficiency
  - Prices are adjusted annually (up or down) to reflect:
    - Changes in the allowed RPC and
    - Over- or under-collections from the previous year
  - Challenge: designing the RPC formula to minimize the effects (on both consumers and the utility) of annual changes in the RPC
    - One approach: Structure the PBR to roughly track the revenue growth that would have otherwise occurred under traditional regulation
      - This can be done by adjusting either the inflation or productivity factor, or applying a coefficient (either greater than or less than 1.0) or other adjustment to the overall formula
      - This balances consumer and utility concerns, and it still assures that the longer-term productivity gains will inure to consumers (when the PBR comes up for renewal)

# Improvements to Decoupling

- Several gas utilities have adopted revenue caps
- Mid-Atlantic Distributed Resources Initiative forum is improving on decoupling for electric, building in protections and ease of administration
- See www.energetics.com/madri

# Performance Incentives

- Decoupling and, to a lesser extent, net lost revenue recovery remove the profit disincentive to EE investment
- To encourage superior performance, some states offered utilities financial incentives
- Penalties for non-performance?

# Performance Incentives: For Both ROR and PBR

- Shared savings
  - Return to utility of some fraction (say, 10-20%) of the savings (avoided costs) from the EE
    - Goes directly to utility's bottom line
  - Collars and deadbands
- Performance targets
  - Specified rewards (e.g., % of EE budget) for achieving a mix of targets
    - Energy savings, capacity reductions, customer installations, reductions in program administration costs, etc.
- ROE adder
  - A premium on the ROE applied to unamortized portion of EE costs included in ratebase

# 1989 NARUC Resolution

- "Reform regulation so that successful implementation of a utility's least-cost plan is its most profitable course of action"

# Dynamic Rates

- Beyond the scope of this day
- Important complement to energy efficiency
- Opportunity for consumers to self-regulate their usage
  - Design is important to anticipate “losers” and maximize system benefit
  - Baby steps and long term vision needed
  - See http://www.energetics.com/madri/ for Advanced Metering Toolbox

# Other Strategies

- Energy efficiency performance (or portfolio) standard
  - Target savings as % of sales or % of growth
  - Verified credits can be traded among utilities
    - EM&V more rigorous to support trading system
  - KCC would not worry about budgets as long as performance is assured
- A commitment to zero or negative sales growth
  - Mid West Natural Gas Initiative: -1% per year

# Resources

- Energy Efficiency Tool Box http://www.raponline.org/Pubs/General/EfficiencyPolicyToolkit106.pdf
- www.Neep.org
- www.aceee.org
- http://www.mwnaturalgas.org/
- Forthcoming paper with Summit Blue for CAMPUT

# Thanks for your attention

- rapsedano@aol.com, rapweston@aol.com
- http://www.raponline.org
- RAP Mission: ***RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.***