RAP | Energy solutions for a changing world

Why Should Utility Customers Support Energy Efficiency Investments in Rates?

A Briefing for the New Mexico PRC

Presented by Richard Sedano

September 15, 2011

The Regulatory Assistance Project

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Introducing RAP and Rich

- RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP Principals all have extensive utility regulatory experience.
  - Richard Sedano directs RAP's US Program. He was commissioner of the Vermont Department of Public Service from 1991-2001 and is an engineer.

Today's Briefing

- How States Supervise Energy Efficiency
  - Implementing Energy Efficiency Programs and Associated Policy Issues
- New Mexico Efficient Use of Energy Act
- Avoid jargon, or explain it clearly

Briefing Objectives

- Framework to assess energy efficiency policy
- Assess the value of investing in energy efficiency through utility rates
- Discuss and become familiar with typical commission practices addressing energy efficiency
- Flag matters that are controversial
- Position commission to make decisions and provide clarity for stakeholders

Energy Efficiency: one of a group of customer resources

- A principal investment tactic to manage the power system of the future
- Customers are resources for:
  - Year round load reductions with energy efficiency
  - Opportunistic load reductions with demand response for emergencies and price reduction
  - Customer Generation offsetting grid supply and losses, perhaps adding on-site reliability

Electricity and Natural Gas

- Analogous points regarding energy efficiency apply to electricity and natural gas
  - Details are distinct and important in implementation

Energy Efficiency in New Mexico

Why?

- Costs less than alternatives
- Less risky than alternatives
- Market failures
- The Law
- Consumers Like It
- Builds businesses
- Coherent Government

Why Not?

- Rates may go up
- Can be done badly
- Hard to oversee
- Market interference
- Energy growth signals economic growth

Energy Efficiency in New Mexico

Why?

- **Costs less** than alternatives

Why Not?

Energy Resources: Costs trending up
on top of deferred maintenance

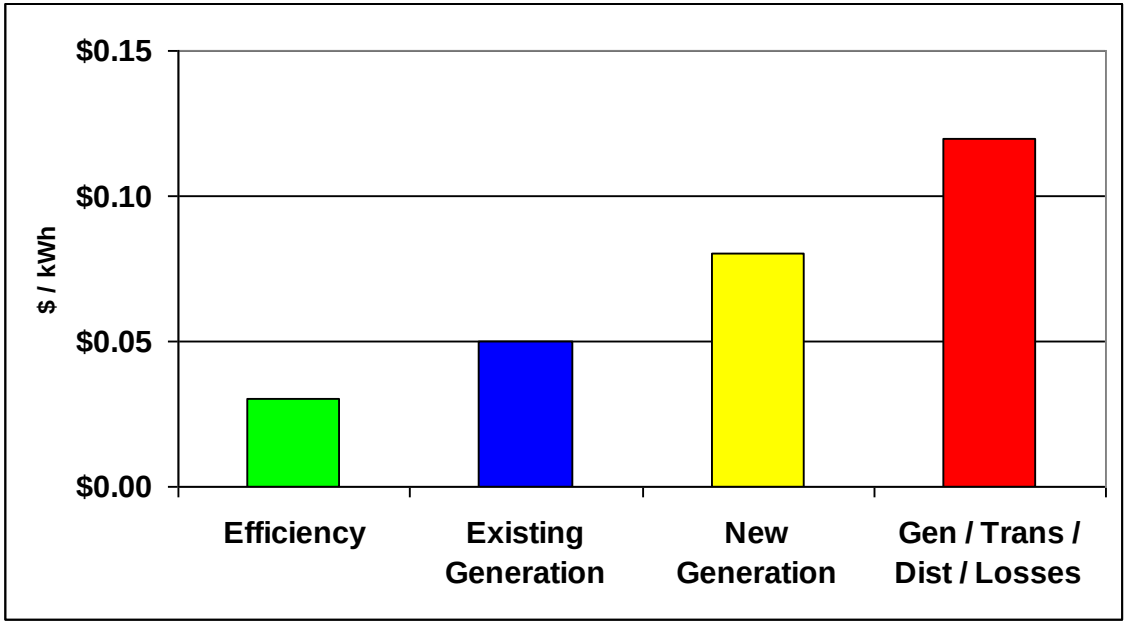
- Combustion sources
  - with new pollution controls
- Nuclear already too expensive for market
- Fuel Commodity prices risk going higher
  - A dash to gas would propel prices
- Renewable costs trending down, but larger scale integration brings new system costs

There is already "upward rate pressure" throughout the US

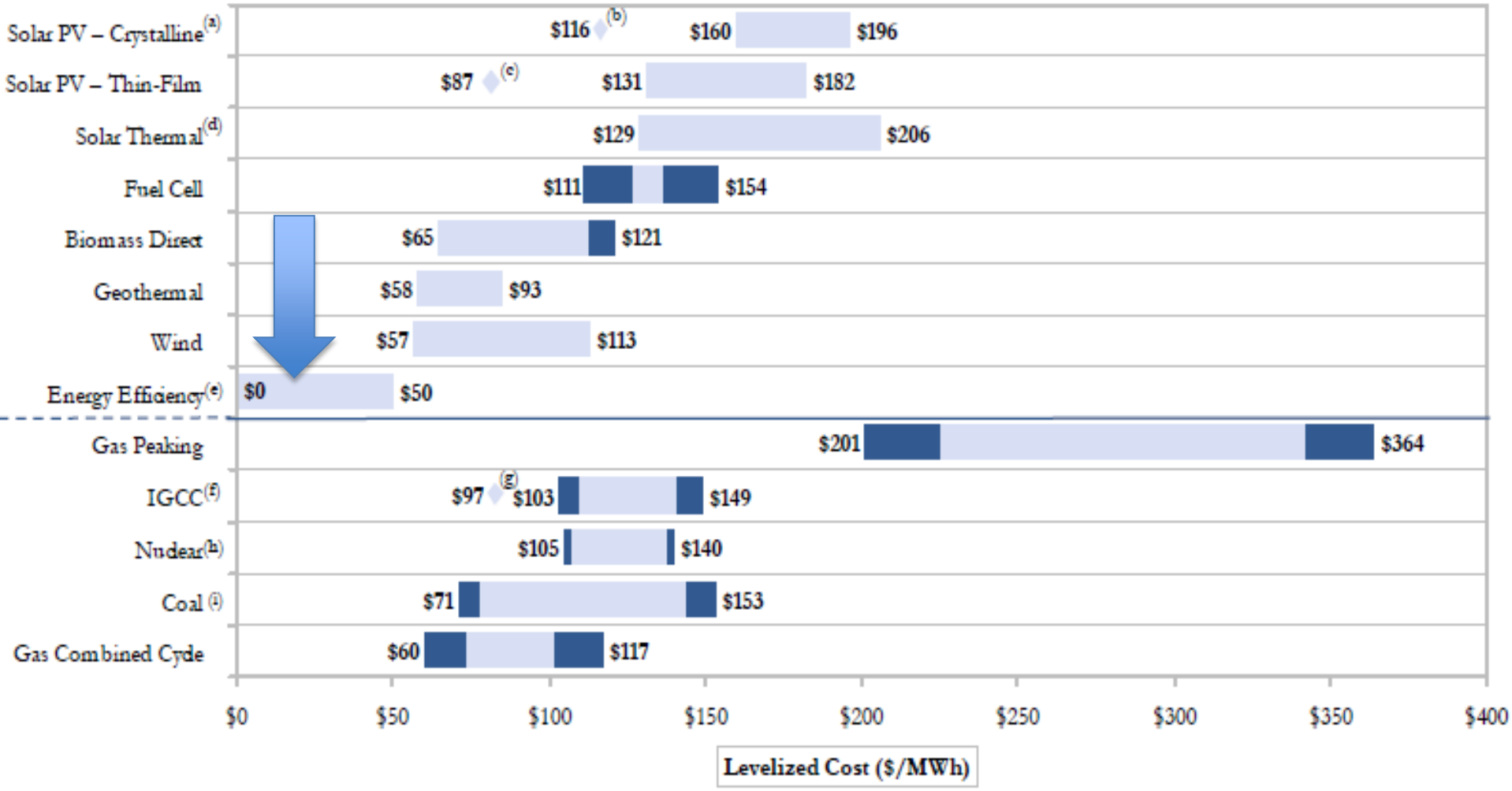
- Marginal costs > Average Cost
  - (the cost to make and to sell the next kWh is greater than the cost customers see to make the energy they use now)
- Energy Efficiency can diminish upward rate pressure over time
  - Upward rate pressure associated with growth and capital replacement
  - EE can reduce the growth induced pressure

Cost of Energy Efficiency

- Mature energy efficiency programs are being delivered at a cost to consumers of **3 ¢** per kWh



More detail about energy efficiency in comparison with **new** supply

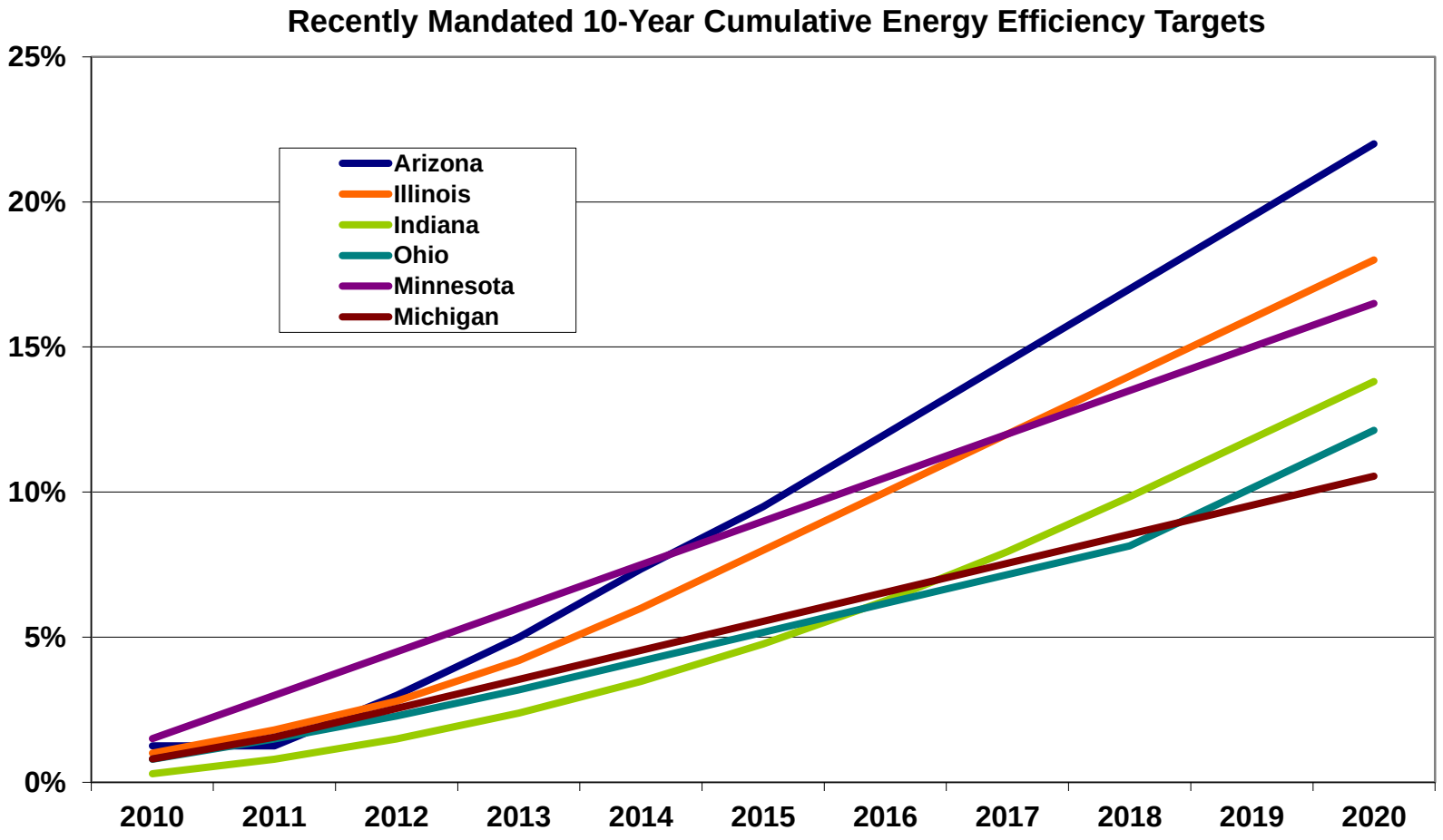


Source: Lazard. (February 2009). *Levelized Cost of Energy Analysis- Version 3.0*. http://blog.cleanenergy.org/files/2009/04/lazard2009_levelizedcostofenergy.pdf

Energy Efficiency Program Spending and Savings

- For highest spending states (electric):
  - Spending ranges beyond **4%** of utility revenues
  - Savings are approaching **2% of sales and 2% of peak**
- Realistic to consider **offsetting** or **exceeding load growth** with energy efficiency alone
  - or in combination with customer-sited generation and demand response

Savings Trajectories for Several States



Cumulative Savings Are Substantial

- Energy Efficiency can avoid significant, more expensive investments
  - If there is a **sustained commitment** to it over time
  - Energy Efficiency is not a quick fix

How do we measure value for energy efficiency programs?

- Benefit/Cost tests are common in all states with energy efficiency programs
- There is a range of standard B/C tests
  - Each asks the question from a point of view

PCT
- Participants (marketing programs and services)

UCT
- Utility (total system costs, EE as a resource)

RIM
- Non-participants (what will rates do?)

TRC
- General Economy (quantified effects)

SCT
- General Economy (quant + unquantified factors)

Defining Cost Tests: 5 points of view

Cost Test	Acronym	Key Question Answered	Summary Approach
Participant Cost Test	PCT	**Will the participants benefit over the measure life?**	**Comparison of costs and benefits of the customer installing the measure**
Utility/Program Administrator Cost Test	UCT/PAC	**Will utility bills increase?**	**Comparison of program administrator costs to supply side resource costs**
Ratepayer Impact Measure	RIM	**Will utility rates increase?**	**Comparison of administrator costs and utility bill reductions to supply side resource costs**
Total Resource Cost	TRC	**Will the total costs of energy in the utility service territory decrease?**	**Comparison of program administrator and customer costs to utility resource savings**
Societal Cost Test	SCT	**Is the utility, state, or nation better off as a whole?**	**Comparison of society's costs of energy efficiency to resource savings and non-cash costs and benefits**

- Test most broadly used in US (and specified in the New Mexico rules): **Total Resource Cost Test** (TRC)

Table 4-1. Universe of Energy and Capacity Benefits for Electricity and Natural Gas

Electricity Energy Efficiency	
Energy Savings	**Capacity Savings**
Market purchases or fuel and operation and maintenance costs	Capacity purchases or generator construction
System losses	System losses (peak load)
Ancillary services related to energy	Transmission facilities
Energy market price reductions	Distribution facilities
Co-benefits in water, natural gas, fuel oil, etc.	Ancillary services related to capacity
Air emissions	Capacity market price reductions
Hedging costs	Land use
Natural Gas Energy Efficiency	
Energy Savings	**Capacity Savings**
Market purchases at city gate	Extraction facilities
Losses	Pipelines
Air emissions	Cold weather action/pressurization activities
Market price reductions	Storage facilities
Co-benefits in water, natural gas, fuel oil, etc.	LNG terminals
Hedging costs	

Cost-effectiveness Framework

Testing whether an alternative plan is lower cost is the basic building block of CE analysis

Step 1 Evaluate the costs of EE program

Step 2 Evaluate the change in costs of your preferred supply plan ("avoided costs")

- These are the 'benefits' of implementing your program

Step 3 Compute the difference (or ratio)

More formally, net present value difference of benefits and costs…

Net Benefits (difference)	Net Benefits$_a$ (dollars)	= NPV $\sum$ benefits$_a$ (dollars) -NPV $\sum$ costs $_a$ (dollars)
Benefit-Cost Ratio	Benefit-Cost Ratio$_a$	$= \frac{\text{NPV} \sum \text{benefits}_a \text{ (dollars)}}{\text{NPV} \sum \text{costs}_a \text{ (dollars)}}$

Summary of Costs and Benefits

- High level summary of costs and benefits included in each cost test
- Each state adjusts these definitions depending on circumstances
- Details can significantly affect the type of energy efficiency implemented

Component	PCT	UCT	RIM	TRC	SCT
Energy and capacity related avoided costs.	-	Benefit	Benefit	Benefit	Benefit
Additional resource savings	-	-	-	Benefit	Benefit
Non-monetized benefits	-	-	-		Benefit
Incremental equipment and install costs	Cost	-	-	Cost	Cost
Program overhead costs	-	Cost	Cost	Cost	Cost
Incentive payments	Benefit	Cost	Cost	-	-
Bill Savings	Benefit		Cost	-	-

Table 3-9. Total Resource Cost Test for SCE Residential Energy Efficiency Program

TRC Calculations		
	Benefits	**Costs**
Program overhead		$ 3,494,619
Program incentives		
Measure costs (net)		$ 41,102,993
Energy savings (net)	$ 187,904,906	
Bill savings		
Monetized emissions (net)	(included in energy savings above)	
Non-energy benefits		
Total	**$ 187,904,906**	**$ 44,597,612**
Net benefit	**$143,307,294**	
Benefit-cost ratio	**4.21**	

Table 6-4. Benefits and Costs Included in the Total Resource Cost Test

Benefits and Costs from the Perspective of All Utility Customers (Participants and Non-Participants) in the Utility Service Territory	
Benefits	**Costs**
▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution ▪ Additional resource savings (e.g., gas and water if utility is electric) ▪ Monetized environmental and non-energy benefits (see Section 4.9) ▪ Applicable tax credits (see text)	▪ Program overhead costs ▪ Program installation costs ▪ Incremental measure costs (whether paid by the customer or the utility)

Source: Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.

The TRC shows the net benefits of the energy efficiency program as a whole. It can be used to evaluate energy efficiency alongside other regional resources and communicate with other planning agencies and constituencies.

Applying the Tests

- A **screen**: program "passes" if B/C exceeds a threshold value (1? 2?) for a specific test
  - Budget limits may force portfolio choices among programs that pass
- A **guide**: program passes if regulator judges it passes after considering all B/C test results
  - and comparing with other programs if $ limited
- Either way, regulator decides what "passes"

Timing of Energy Efficiency Costs and Benefits

- Costs happen now
- Benefits accrue over time
- **Embracing energy efficiency means embracing a long view**
  - Consistent with other significant utility investments
- Most states expense costs, leading to immediate rate effects

Discount Rate: Valuing savings over time depends on perspective

Table 4-3. The Use of Discount Rates in Cost-Effectiveness Tests

Tests and Perspective	Discount Rate Used	Illustrative Value	Present Value of $1 a Year for 20 Years*	Today's Value of the $1 Received in Year 20
PCT	Participant's discount rate	10%	$8.51	$0.15
RIM	Utility WACC	8.5%	$9.46	$0.20
PACT	Utility WACC	8.5%	$9.46	$0.20
TRC	Utility WACC	8.5%	$9.46	$0.20
SCT	Social discount rate	5%	$12.46	$0.38

Source: Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.

* This value is the same as not having to purchase $1 of electricity per year for 20 years.

Energy Efficiency in Utility Resource Plans

- All supply-side and demand-side options
- Evaluated on a comparable basis
  - EE reduces fuel price, market price and environmental risks
  - EE can delay costly, riskier power plant and other investments
- EE potential study done periodically
- **Least cost action plan** includes all EE that is part of the best cost/risk portfolio

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**
  - Can energy efficiency (reduced load growth) alleviate the apparent need for this new transmission line?
  - Can energy efficiency achieve sustained zero load growth?

IRP or a Resource Standard?

- If legislature decides, that's that
- If it is up to the commission, think…
  - Top down or bottom up?
  - How much rigor (work) goes into EE plan?
  - How aggressive?
- Arkansas and Arizona choose a standard
  - Arizona is aggressive
- Missouri chooses IRP

Energy Efficiency in New Mexico

Why?

- Costs less than alternatives
- **Less risky than alternatives**

Why Not?

Large Asset Plans are Hard to Manage

- Financial markets are tougher now than in prior build periods

Growth in Electric Use and Demand has Risks

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

Balancing Consumer and Utility Risk

- Regulator in the middle
- Many states and utilities actively avoiding large asset investments now
  - Especially with energy efficiency most cost-effective and available
    - **Reliable**
    - **Targetable**
    - **Modular**
    - **Manageable**

"Is Energy Efficiency 'Real'?" Experience says "Yes!"

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

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- **Rates may go up**

Energy Efficiency is an investment that is expensed

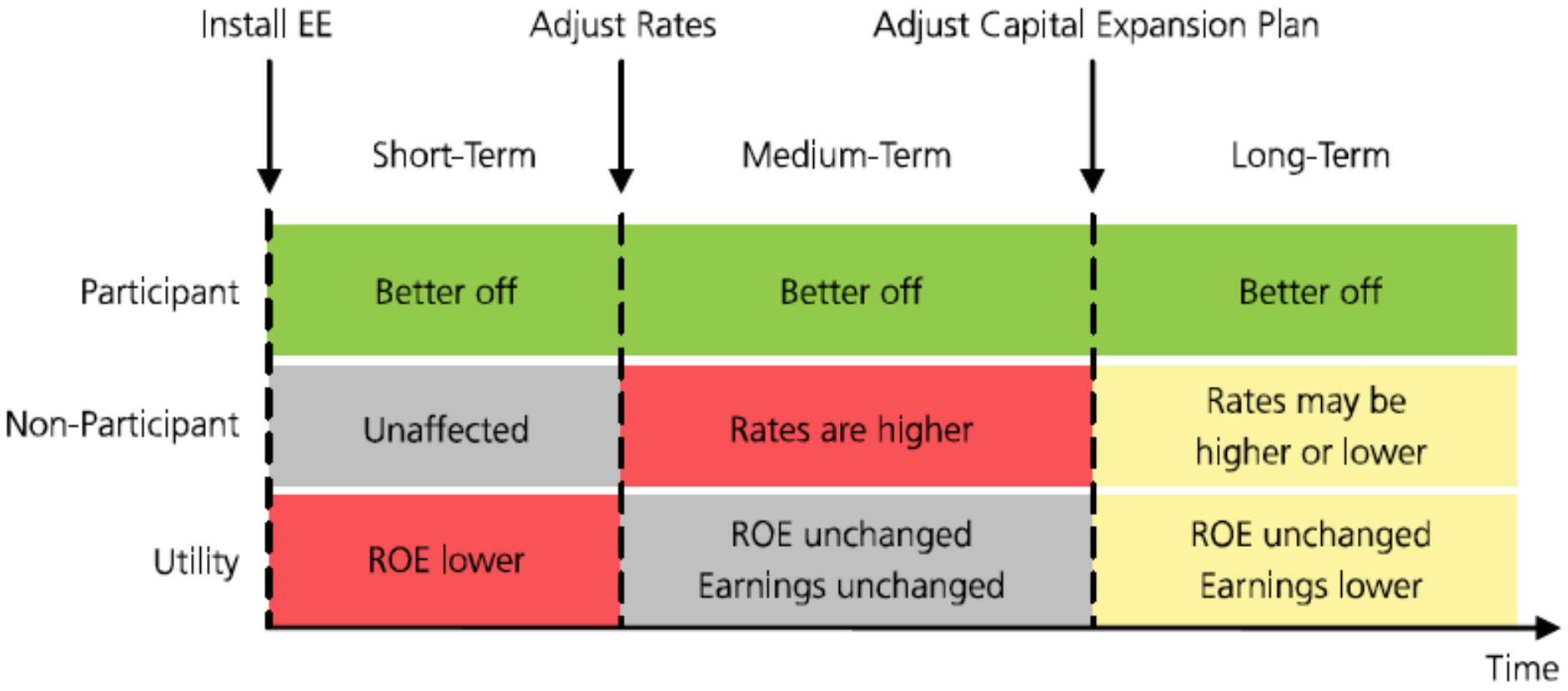
- Energy Efficiency is a cost and adds to rates
  - Average across the US is less than 1%
  - States spending the most add over 4%
- Investments accumulate and avoids generation, transmission, distribution cost
- By definition of the Benefit-Cost Tests, total costs to consumers over time go down with an EE portfolio that passes

Participants - Non-Participants

- Participants clearly benefit from energy efficiency programs
  - What about non-participants?
- Non-participants benefit from the system benefits derived from these investments
  - As they benefit from investments in system reliability upgrades remote from their service
  - System benefit (EE) = Avoided costs

	Costs	Benefits
Participants	Pay for programs in rates Pay to participate in programs	Get system benefits from program savings Gets personal benefits from participation
Non-participants	Pay for programs in rates	Get system benefits from program savings

I think those concerned about this trade-off for non-participants are really concerned that the system benefits do not exist or are unreliable or are over-stated.
For me, there is ample evidence that system benefits calculations are accurate. This concern motivates regulators and system planners on EM&V.


Install EE
Adjust Rates
Adjust Capital Expansion Plan
Short-Term
Medium-Term
Long-Term
Participant
Non-Participant
Utility
Better off
Better off
Better off
Unaffected
Rates are higher
Rates may be higher or lower
ROE lower
ROE unchanged
Earnings unchanged
ROE unchanged
Earnings lower
Time

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Some Energy Efficiency Happens Naturally

- Many products are more efficient now, so when we replace them, efficiency happens
  - Refrigerators, pumps, motors, HVAC, lights
- Some customers see the potential to benefit, know what to do about it and they invest
  - But many do not…

Why Programs Make a Difference in Helping Customer to say "Yes"

- Decision-makers (people like us) do not always act in our own best interest
- There are clear reasons
- If we acted like perfect market actors, programs would not be needed because
  - We know all we need to know
  - All product and service choices are available
  - Financing easily available for good projects

Without Programs, Markets Fail, Efficiency Investments that Benefit All Are Lost

- Why?
  - Lack of awareness
  - Lack of knowledge about how to be informed
  - Lack of knowledge about how to act
  - Lack of time to find out, easier to just replace in kind
  - Lack of available products and services
  - Lack of control of, motivation for the decision
    - Agency problem, or split incentive problem
  - Money
    - Lack of it forever (low income)
    - Lack of it right now (financing)
    - Competing uses (as with industrial capital budgets)

Timing for Energy Efficiency Investments

- Make the most of an opportunity
  - Or lose the opportunity
  - Build a new building
  - Replace failed equipment
- Replace functioning device to save money
  - Retrofit or "replace before burnout"
    - Weatherize an existing building

It's OK that markets fail sometimes

- They fail because we humans have
  - Imperfect information and accountability
  - Limited time
  - Limited money
- Most instances, that's just too bad
- In utilities, markets for energy efficiency failing means we all pay too much for avoidable resources – a "commons" issue
  - So we invest to fix (transform) the market

Programs are Business Plans that Address Market Barriers to Energy Efficiency

- Programs include strategies that identify the market failures standing in the way of decision-maker, and lay out the information, services and incentives necessary to achieve a percentage of decision-makers saying "yes"
  - And ways to measure effectiveness and when a program needs to change or to end

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New Mexico Efficient Use of Energy Act, PRC Rule Are Clear about Directing Energy Efficiency Investment

- Act is as unambiguous about directing energy efficiency as there is in US
  - Many "shalls"
- Clear appreciation of value for clear direction and adjustments in regulation to reflect the new utility mission to sell less
  - Balance of direction and latitude to utilities with good reporting requirements

Key Words and Phrases from the Act (with some synthesis by me)

- All cost-effective
- Essential affordable, reliable
- Under-utilized
- Re: utilities: Incentives, disincentives, profit, cost recovery flexibility
- A goal and targets
- Collaboration
- Competitive services
- Self-direct for industrial
- Non-energy benefits appear in policy, TRC
- EM&V independence
- Integrated resource plan
- Economically disadvantaged and Wx
- Customer communication
- Demand response distinct
- (adapt for) munis, coops
- Third party authorized

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Energy Efficiency isn't easy

- Intervening in markets is done all the time, sometimes to good effect, sometimes not
  - Regulators intervene in markets for public interest
- Energy efficiency is voluntary to customers
  - Does any other utility activity get as personal with so many customers?
  - How to get customers to say "yes"
- **Energy efficiency is not a traditional utility activity**
  - Not always a good fit with management and staff

Regulators have tried to adjust regulation to adapt to energy efficiency

- Solutions to address incentives to sell more and to resist selling less (the "throughput incentive")
- Performance incentives
- Cost recovery riders
- Collaboratives
- Energy efficiency resource standards
- Penalties
- Non-utility administration
- Other mechanisms

Throughput Incentive: A Disincentive for Efficiency

- A fact of the math of traditional regulation
- Rate case establishes revenue requirement
  - Rate is a calculation at the end
- Rates include a contribution to fixed cost
- Selling less than expected means utility comes up short on revenues to cover costs already approved in a rate case
  - Selling more creates free cash flow

Chronic Issues with Throughput Incentive

- Is it a good idea for utilities to be motivated to sell more?
  - With capital and commodity risks and environmental issues looming
- Should utilities be more focused financially on what customers value?
  - Reliability
  - Service

Throughput incentive for those preferring numbers

The Rate Case	Made-up-Co
Expenses	$100,000,000
Sales (MWh)	**1,000,000,000**
Rate Base	$100,000,000
Allowed ROE	10.00%
Allowed Return	$10,000,000
Taxes (35%)	$5,384,615
Return + Taxes	$15,384,615
Revenue Req.	$115,384,615
Rate per MWh	$0.115

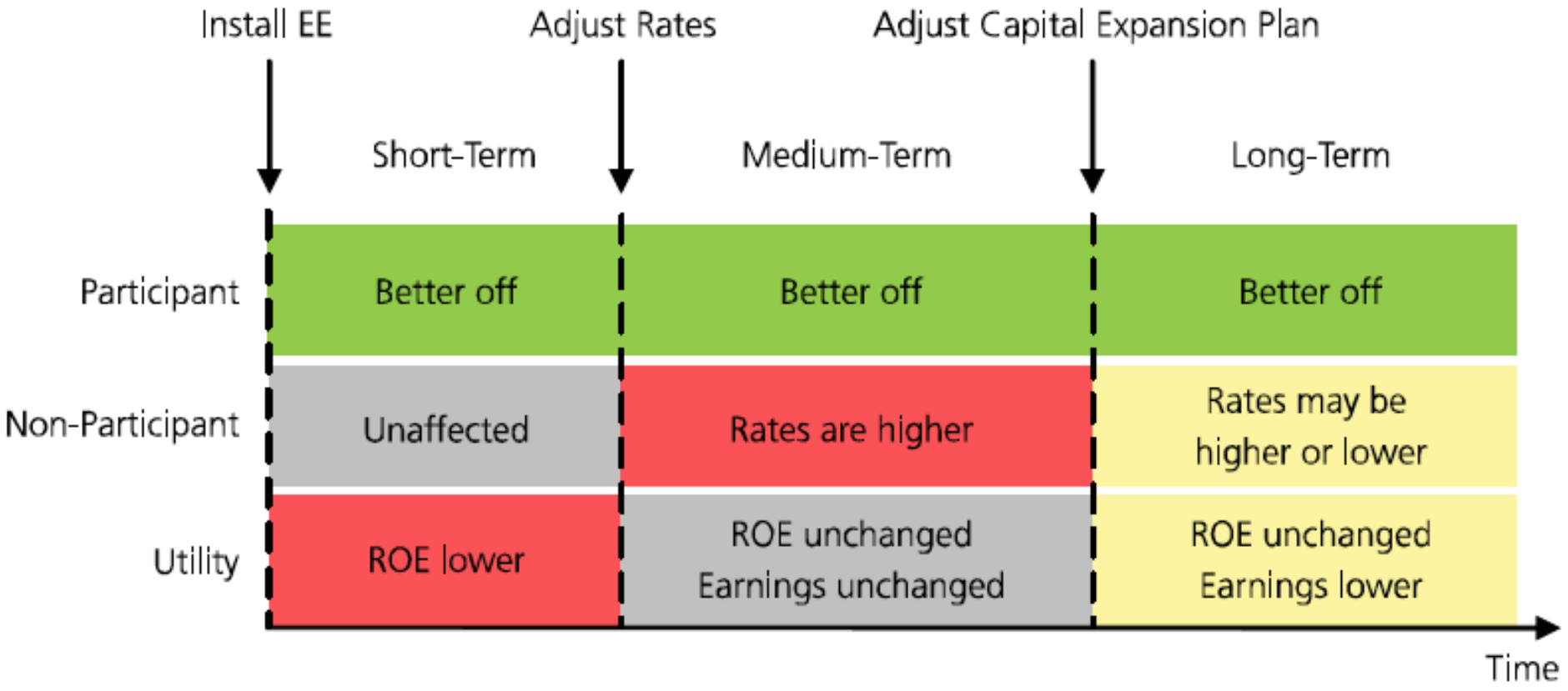
What actually happens	
Revenue Req.	$115,384,615
Sales **(-1%)**	**990,000,000**
Actual Revenue	$114,230,769
Shortfall	$1,153,846
Shortfall % ret	**-11.54%**

Energy efficiency hits utility returns hard

Or this could happen	
Revenue Req.	$115,384,615
Sales **(+1%)**	**1,010,000,000**
Actual Revenue	$116,538,461
Excess	$1,153,846
Excess% of ret.	**11.54%**

Throughput Incentive Corrections

- **Frequent rate cases** will reset rates to cover fixed costs
- **Future Test Year** forecasts EE effects
- **Lost contributions to fixed costs** can be added back to revenue requirement
- Rates can be reconciled periodically to align with prior revenue requirement - **Decoupling**
- **Customer charge** can be increased
- **Regulation disciplines** utility, no correction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Work for Regulators: Leadership

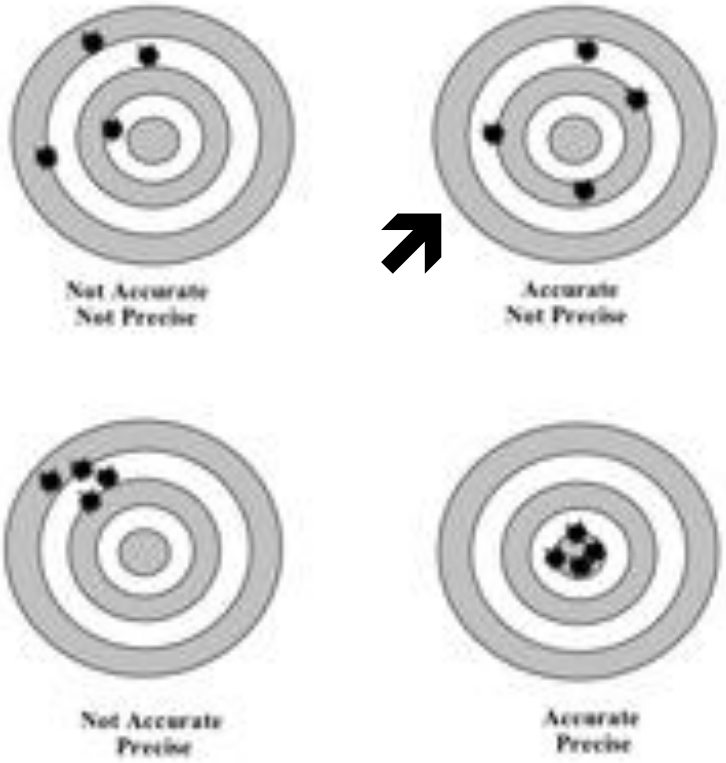
- Enforcing a **stable** environment for utilities and private businesses
  - Manage expectations, maintain consistency
  - Approving programs
  - Adjusting programs
  - Evaluation, measurement and verification
  - Flak from those not convinced about value
- More attention to energy efficiency than many other facets of utility regulation

Cost Control and Energy Efficiency

- Regulators are always concerned about utility costs
  - Energy efficiency costs are no exception
- A distinction: if more cost-effective investments are available, spending more money pays dividends.
- **Measure outputs**: i.e. savings per $ spent
  - Focus on admin costs can be misplaced

Right-sizing Good Impact Evaluation

- Accuracy vs. Precision
- Bias
- Go for cost-effective and useful **balance**



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Consumers Like Energy Efficiency

- More and better products in the store
  - High, not perfect correlation to quality
- Better services
  - Contractors, suppliers specifying best “stuff”
- Lower Bills
- J.D. Power ratings seem to improve
  - Service not just for big customers

Not just because of a giveaway

- In the early years of energy efficiency, participating consumers see there own benefits
- With cumulative energy efficiency and reports in the press, consumers can see that costly investments are avoided by the efficiency by themselves and their neighbors and local businesses

Local businesses get and stay modern

- Energy efficiency is a labor intensive activity
  - Person to person contacts
  - Services in buildings
  - Methods and products are up to date
    - Better buildings and industrial processes
  - Demand grows into more jobs
    - Input – Output models (used for state revenue forecasts) measure economic effects of EE

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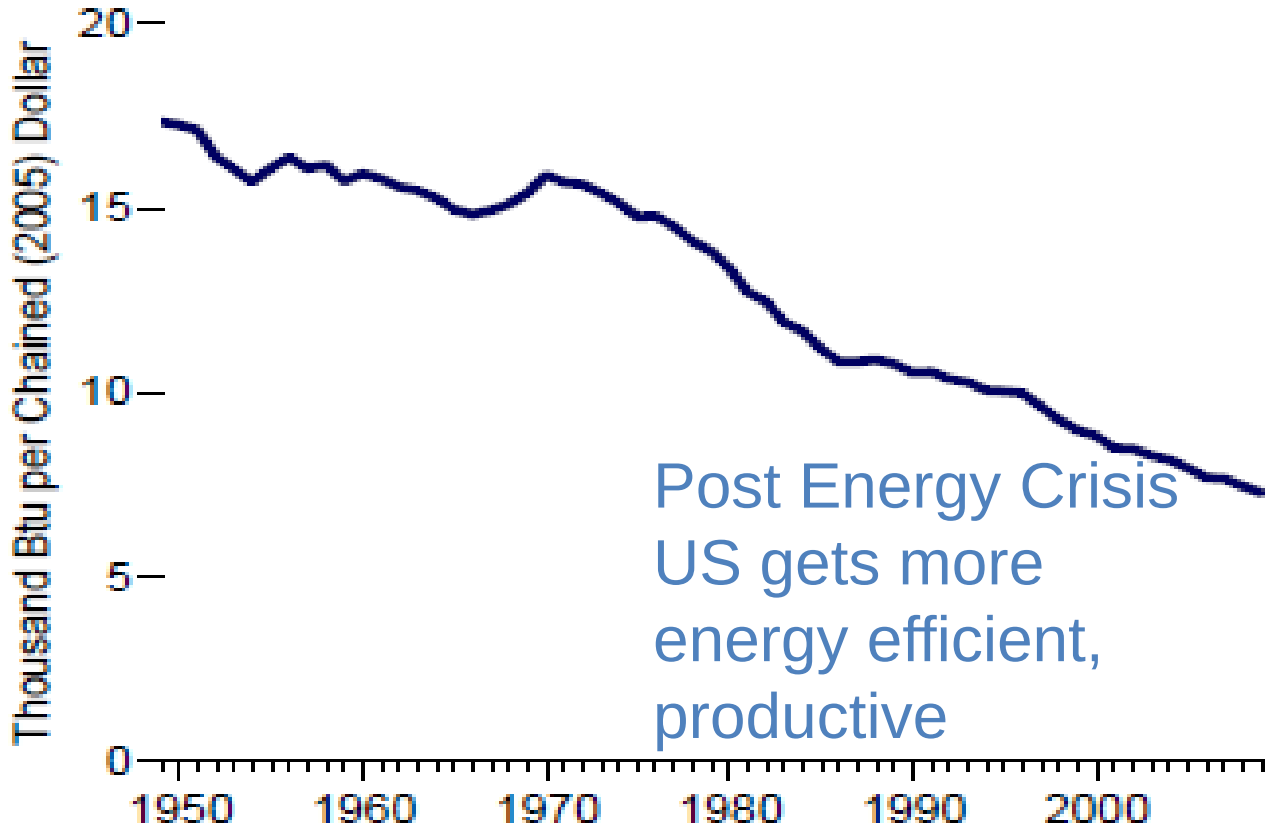
Does the utility energy efficiency activity stifle competition?

- It can, but it does not have to
- Energy Service Companies do cover some of the market
  - Institutional and Government customers tolerate long paybacks, shared savings deals
  - Larger customers making the size of the deal worth while
- Programs can provide standard offers for these customer groups to aid ESCOs

Most Energy Efficiency Opportunities Have No One Competing

- Evidence: it is not happening now
  - All recent potential studies how unmet potential for cost-effective energy efficiency
- So for most situations, energy efficiency is a monopoly activity, like distribution
- Utilities can use competitive bidding to acquire services from the market

Energy Consumption per Real Dollar[2] of Gross Domestic Product, 1949-2009



Source: US Energy Information Administration, Annual Energy Review 2009; GDP in chained (2005) dollars;

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Energy Efficiency Makes Government Look Good

- Investing in end uses with 2x benefit-cost ratios looks like a good investment to citizens
  - Seems like a win-win
  - Publicity can point to avoiding risky investments and other system benefits while benefiting state interests
  - Commission uses discretion to find the sweet spot on rates and program budget addressing concerns of price sensitive customers

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Resources

- National Action Plan for Energy Efficiency
- State Energy Efficiency Action Network
- RAP state energy efficiency database
  - And other RAP resources
- American Council for an Energy Efficient Economy (ACEEE), especially juried papers
- Lawrence Berkeley National Lab

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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Appendix
B/C tests

Table 2-3. Summary of Cost-effectiveness Test Results for Four Energy Efficiency Programs

Test	Southern California Edison Residential Energy Efficiency Incentive Program	Avista Regular Income Portfolio	Puget Sound Energy Commercial/ Industrial Retrofit Program	National Grid MassSAVE Residential
	Benefit-Cost Ratio			
PCT	7.14	3.47	1.72	8.81
PACT	9.91	4.18	4.19	2.64
RIM	0.63	0.85	1.15	0.54
TRC	4.21	2.26	1.90	1.73
SCT	4.21	2.26	1.90	1.75

Source: E3 analysis; see Appendix C.

Note: The calculation of each cost-effectiveness test varies slightly by jurisdiction. See Appendix C for more details.

Table 3-3. SCE Residential Energy Efficiency Incentive Program Benefits

Net Benefit Inputs			
Resource savings	**Units**		**$**
Energy (MWh)	2,795,290	$	187,904,906
Peak demand (kW)	55,067		—
Total resource savings		**$**	**187,904,906**
Participant bill savings		**$**	**278,187,587**
Emission savings	**Tons**		
NO_x	421,633		
PM_{10}	203,065		
CO_2	1,576,374		

Source: E3 analysis; see Appendix C.

Table 3-4. SCE Residential Energy Efficiency Incentive Program Costs

Cost Inputs		
Program overhead		
Program administration	$	898,548
Marketing and outreach	$	559,503
Rebate processing	$	1,044,539
Other	$	992,029
Total program administration	**$**	**3,494,619**
Program incentives		
Rebates and incentives	$	1,269,393
Direct installation costs	$	564,027
Upstream payments	$	13,624,460
Total incentives	**$**	**15,457,880**
Total program costs	**$**	**18,952,499**
Net measure equipment and installation	**$**	**41,102,993**

Source: E3 analysis; see Appendix C.

Table 3-5. Summary of Cost-Effectiveness Test Results ($Million)

Test	Cost	Benefits	Ratio	Result
PCT	$41	$294	7.14	Bill savings are more than seven times greater than customer costs.
PACT	$19	$188	9.91	The value of saved energy is nearly 10 times greater than the program cost.
RIM	$297	$188	0.63	The reduced revenue and program cost is greater than utility savings.
TRC	$45	$188	4.21	Overall benefits are four times greater than the total costs.
SCT	$45	$188	4.21	Same as the TRC, as no additional benefits are currently included in the SCT in California.

Source: E3 analysis; see Appendix C.

Table 3-6. Participant Cost Test for SCE Residential Energy Efficiency Program

PCT Calculations		
	Benefits	**Costs**
Program overhead		
Program incentives	$ 15,457,880	
Measure costs		$ 41,102,993
Energy savings		
Bill savings	$ 278,187,587	
Monetized emissions		
Non-energy benefits		
Total	**$ 293,645,466**	**$ 41,102,993**
Net benefit	**$252,542,473**	
Benefit-cost ratio	**7.1**	

Source: E3 analysis; see Appendix C.

Table 3-7. Program Administrator Cost Test for SCE Residential Efficiency Program

PACT Calculations		
	Benefits	Costs
Program overhead		$ 3,494,619
Program incentives		$ 15,457,880
Measure costs		
Energy savings (net)	$ 187,904,906	
Bill savings		
Monetized emissions (net)	$ 0	
Non-energy benefits		
Total	**$ 187,904,906**	**$ 18,952,499**
Net benefit	**$168,952,407**	
Benefit-cost ratio	**9.91**	

Source: E3 analysis; see Appendix C.

Table 3-8. Ratepayer Impact Measure for SCE Residential Energy Efficiency Program

RIM Calculations		
	Benefits	**Costs**
Program overhead		$ 3,494,619
Program incentives		$ 15,457,880
Measure costs		
Energy savings (net)	$ 187,904,906	
Bill savings (net)		$ 278,187,587
Monetized emissions (net)	$ 0	
Non-energy benefits		
Total	**$ 187,904,906**	**$ 297,140,085**
Net benefit	**($109,235,180)**	
Benefit-cost ratio	**0.63**	

Source: E3 analysis; see Appendix C.

Table 3-9. Total Resource Cost Test for SCE Residential Energy Efficiency Program

TRC Calculations		
	Benefits	**Costs**
Program overhead		$ 3,494,619
Program incentives		
Measure costs (net)		$ 41,102,993
Energy savings (net)	$ 187,904,906	
Bill savings		
Monetized emissions (net)	(included in energy savings above)	
Non-energy benefits		
Total	**$ 187,904,906**	**$ 44,597,612**
Net benefit	**$143,307,294**	
Benefit-cost ratio	**4.21**	

Table 3-10. Societal Cost Test for SCE Residential Energy Efficiency Program

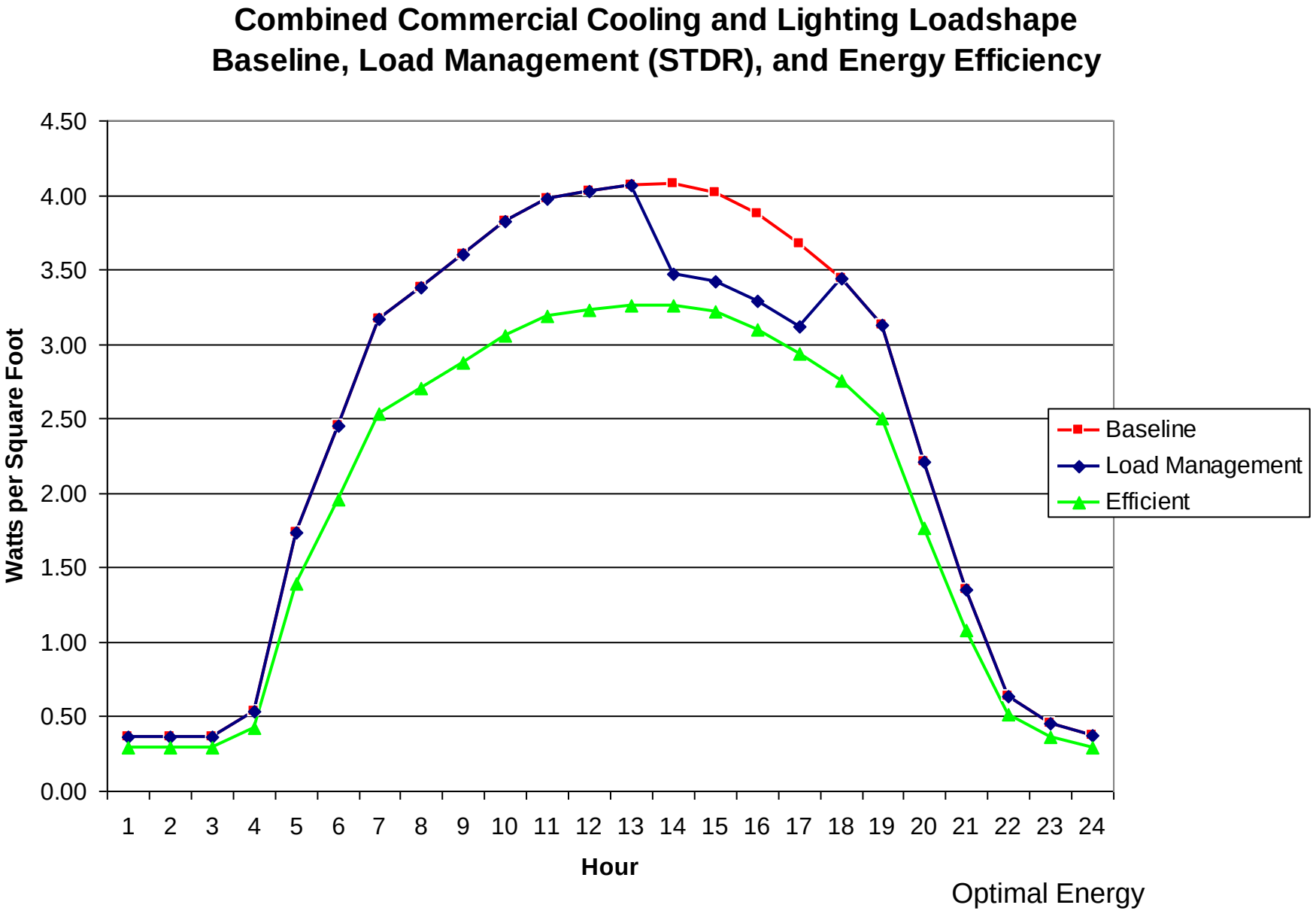
SCT Calculations		
	Benefits	**Costs**
Program overhead		$ 3,494,619
Program incentives		
Measure costs (net)		$ 41,102,993
Energy savings (net)	$ 187,904,906	
Bill savings		
Monetized emissions (net)	(included in energy savings above)	
Non-energy benefits (net)	$ 0	
Total	**$ 187,904,906**	**$ 44,597,612**
Net benefit	**$143,307,294**	
Benefit-cost ratio	**4.21**	

Lost Contribution to Fixed Costs

- Calculating the lost contribution
  - Energy efficiency quantity
  - Value of savings
- Booking and Deferring
  - How long is amortization period?
  - Return of or return on? At what rate?
- Experience in 90s indicates big fights accompany this device

Decoupling vs. Lost Contribution

- Each makes utility indifferent to lost sales and associated lost contribution to fixed costs (neither motivates)
- Choice should promote energy efficiency
- Decoupling a more comprehensive solution to utility motivation to sell more
  - Utility motivation could better be about what customers care about (i.e service, reliability)



Optimal Energy

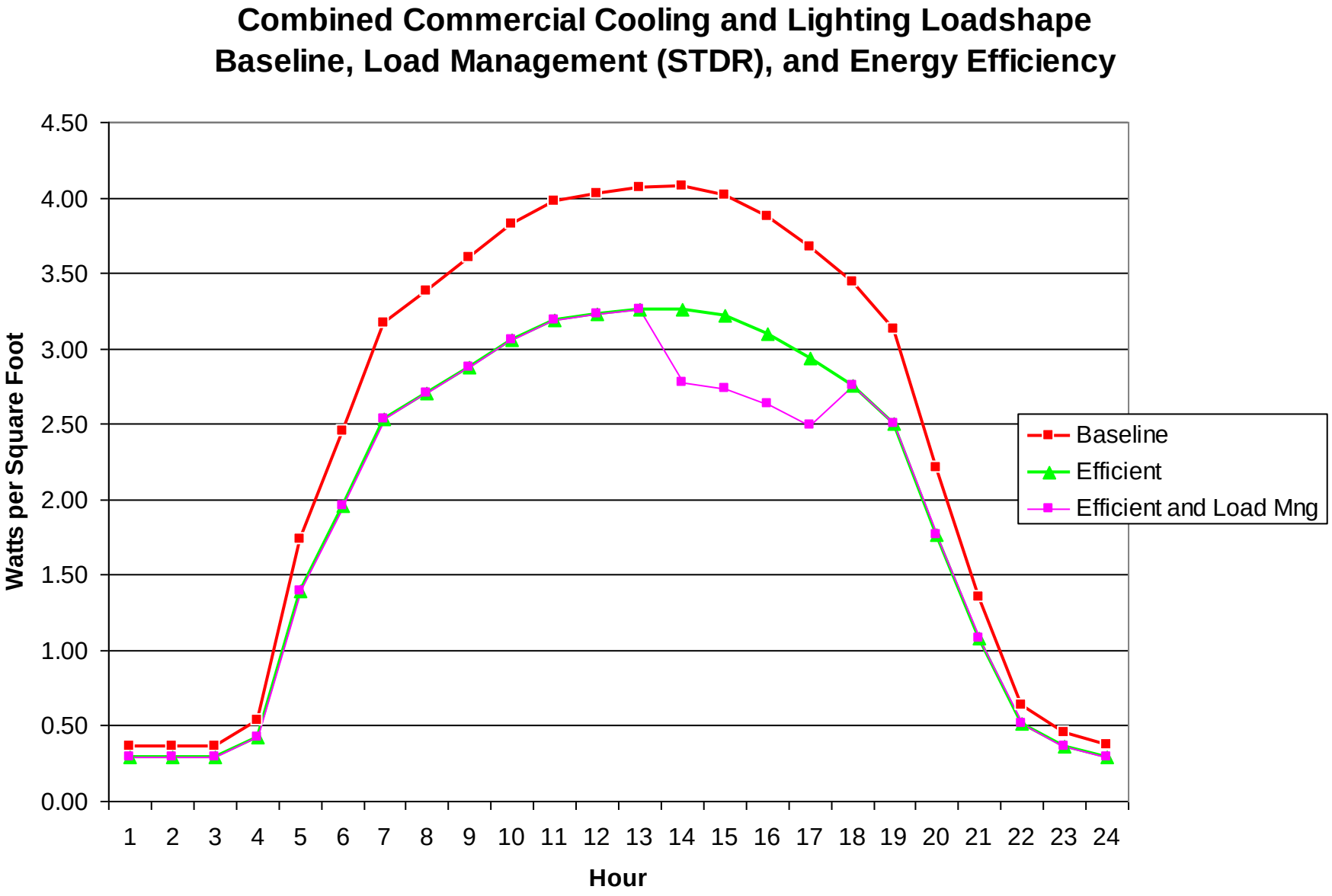
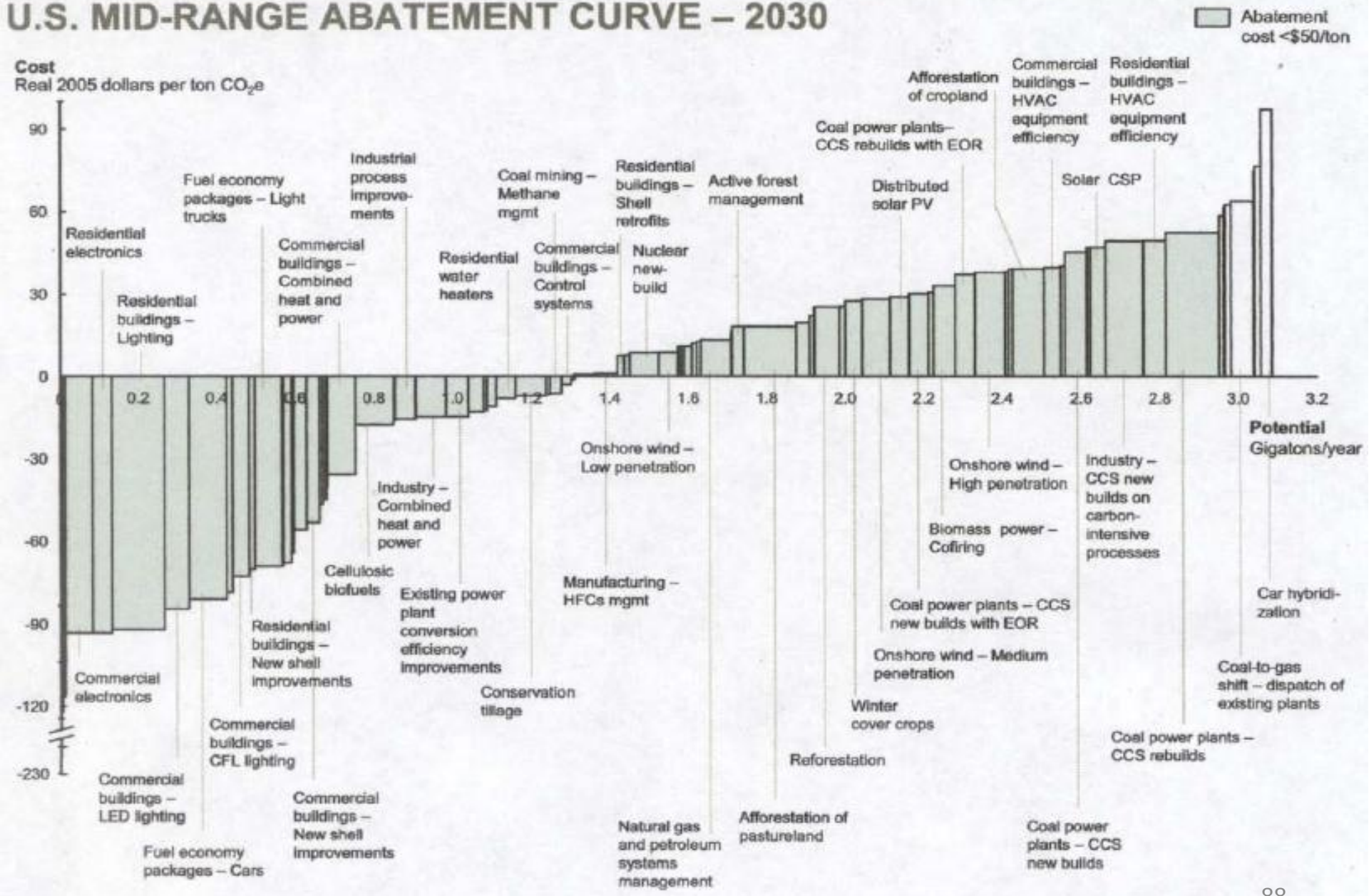

Combined Commercial Cooling and Lighting Loadshape
Baseline, Load Management (STDR), and Energy Efficiency
Watts per Square Foot
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Baseline
Efficient
Efficient and Load Mng

Exhibit B

U.S. MID-RANGE ABATEMENT CURVE – 2030



Source: McKinsey analysis

Why Is Financing Not Used as Often as You Might Expect?

- Needs
  - Source of capital
    - Utility reluctant, ill-suited
  - Ways to reduce risk
    - Dealing with loss risk via a reserve
  - Use the utility bill? Property tax bill?
  - Aggregation of loan "commodity"
  - Understanding distinct markets

Financing a Tool, not THE ANSWER

- Finance what?
  - Need good programs to steer decision-makers to good investments
  - Some don't need financing
  - Some don't want financing
- Financing can be an expensive way to motivate customer to action

More Profound Economic Concern: Energy Use = Prosperity?

- The economy grew in step with energy use when energy was a declining cost industry
  - Changed in Energy Crisis in 1970s
  - Energy no longer "unlimited" or "without effects to the rest of the economy or environment"

Productivity + Efficiency = Prosperity

- Results: spontaneous efficiency by consumers and other engines of productivity enable growth without more energy consumption

Notes to Lazard slide

Note: Darkened areas in horizontal bars represent low end and high end levelized cost of energy corresponding with ±25% fuel price fluctuations.

(a) Low end represents single-axis tracking crystalline. High end represents fixed installation.

(b) Represents estimated implied levelized cost of energy in 2012, assuming a total system cost of $3.50 per watt for single-axis tracking crystalline.

(c) Represents a leading thin-film company's targeted implied levelized cost of energy in 2012, assuming a total system cost of $2.00 per watt.

(d) Low end represents solar tower. High end represents solar trough.

(e) Estimates per National Action Plan for Energy Efficiency; actual cost for various initiatives varies widely.

(f) High end incorporates 90% carbon capture and compression.

(g) Represents estimated implied levelized cost of energy for Southern Company's proposed IGCC facility in Mississippi that is expected to be in service in 2013, assuming a total system cost of $3.00 per watt and 50% carbon capture, per Southern Company public comments.

(h) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.

(i) Based on advanced supercritical pulverized coal. High end incorporates 90% carbon capture and compression.