

Regulatory Barriers to Energy Efficiency

Eliminating Disincentives,
Creating the Right Incentives

Minnesota PUC

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Cheryl Harrington

Jim Lazar



The Regulatory Assistance Project

*50 State Street, Suite 3
Montpelier, Vermont USA 05602
Tel: 802.223.8199
Fax: 802.223.8172*

*177 Water St.
Gardiner, Maine USA 04345
Tel: 207.582.1135
Fax: 207.582.1176*

Website:

<http://www.raponline.org>



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, US DOE and US EPA.
- 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.



Who We Are

- **Cheryl Harrington** is an attorney and cofounder of RAP. She was Commissioner of the Maine Public Utility Commission 1982-1991, Vice Chair of NARUC's Energy Conservation Committee. She has taught utility resource planning in just about every state except Nebraska.
- **Jim Lazar** is a regulatory economist based in Olympia, Washington consulting in electric and natural gas utility ratemaking and resource planning since 1982. His clients have included municipal and cooperative electric utilities, natural gas utilities, regulatory commissions, state consumer advocates, and public interest organizations in the United States, Canada, Ireland, New Zealand, and Australia.



Lost Profits Problems

- Consider whether regulation may unintentionally cause utilities to limit their demand side (baseload energy efficiency) and distributed resources and, if so, what regulatory fixes are available.





Regulatory Barriers

- Regulatory practice does not really support EE investment.
- Unless it is modified, utilities will carefully contain their EE investments.
- It usually takes broad stakeholder consensus to modify current regulatory practice.



The Effect of Energy Efficiency on Utility Profits

- With a fully-reconciled fuel clause, every lost sale means lost profits.
- Even without a fully-reconciled fuel clause, if retail rates are above short-run market prices, every lost sale means lost profits.
- The numbers can be very large – a 1% reduction in sales can mean a 5% reduction in profits.



Cost-Effectiveness of Efficiency is Not the Issue

- EE has the same energy and capacity values as generation facilities, transmission lines and distribution facilities.
- EE is considerably cheaper than most supply-side alternatives, lowering total revenue requirements.
- Furnace replacement and stopping building leaks especially important for gas customers right now.



Influencing Behavior: How Do Utilities Make \$?

- Under traditional rate-of-return (ROR) regulation:
 - ❖ $\text{Price} = \text{Revenue Requirement} / \text{Sales}$
- But:
 - ❖ **Actual** Revenues = Price * Quantity
- 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



Lowered Sales Reduces Revenues and Profits

- Vertically integrated utility with \$284M 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 \$3.5M
- EE equal to 5% of sales will cut profits by 23%
 - ❖ The effect is even worse for distribution-only utility: a reduction in sales of 5% lowers profits by 57%




Assumptions for A Sample Utility

| Assumptions | | | | | | | |
|--------------------------|---------------|-----------|-----------|--------------|------------------|---------------------|--|
| Operating Expenses | \$160,000,000 | | | | | | |
| Rate Base | \$200,000,000 | | | | | | |
| Tax Rate | 35.00% | | | | | | |
| Cost of Capital | % of Total | Cost Rate | Wtd. Cost | | Dollar Cost Amt. | | |
| | | | Pre-tax | After-Tax | Pre-Tax | After-Tax | |
| Debt | 55.00% | 8.00% | 4.40% | 2.86% | \$8,800,000 | \$5,720,000 | |
| Equity | <u>45.00%</u> | 11.00% | 4.95% | <u>7.62%</u> | \$9,900,000 | \$15,230,769 | |
| Total | 100.00% | | | 10.48% | | | |
| Revenue Requirement | | | | | | | |
| Operating Expenses | \$160,000,000 | | | | | | |
| Debt | \$5,720,000 | | | | | | |
| Equity | \$15,230,769 | | | | | | |
| Total | \$180,950,769 | | | | | | |
| Allowed Return on Equity | \$9,900,000 | | | | | | |

Manager A: Purple Results

Manager B: Green Results

Which Manager Gets Promoted?



| % Change in Sales | Revenue Change | | Impact on Earnings | | |
|-------------------|----------------|--------------|--------------------|----------------|---------------|
| | Pre-tax | After-tax | Net Earnings | % Change | Actual ROE |
| 5.00% | \$9,047,538 | \$5,880,900 | \$15,780,900 | 59.40% | 17.53% |
| 4.00% | \$7,238,031 | \$4,704,720 | \$14,604,720 | 47.52% | 16.23% |
| 3.00% | \$5,428,523 | \$3,528,540 | \$13,428,540 | 35.64% | 14.92% |
| 2.00% | \$3,619,015 | \$2,352,360 | \$12,252,360 | 23.76% | 13.61% |
| 1.00% | \$1,809,508 | \$1,176,180 | \$11,076,180 | 11.88% | 12.31% |
| 0.00% | \$0 | \$0 | \$9,900,000 | 0.00% | 11.00% |
| -1.00% | -\$1,809,508 | -\$1,176,180 | \$8,723,820 | -11.88% | 9.69% |
| -2.00% | -\$3,619,015 | -\$2,352,360 | \$7,547,640 | -23.76% | 8.39% |
| -3.00% | -\$5,428,523 | -\$3,528,540 | \$6,371,460 | -35.64% | 7.08% |
| -4.00% | -\$7,238,031 | -\$4,704,720 | \$5,195,280 | -47.52% | 5.77% |
| -5.00% | -\$9,047,538 | -\$5,880,900 | \$4,019,100 | -59.40% | 4.47% |



Alternatives to Addressing Utility Profit Loss

- Lost Margin Recovery Mechanisms
- Rate of Return Incentives
- Fixed / Variable Rate Design
- Real-Time Pricing
- Moving Efficiency Outside the Utility
- Revenue Adjustment Mechanism
(Decoupling)



Lost Margin Recovery Mechanisms

- Does not remove sales incentive.
- Best financial outcome is when EE fails early.
- Measurement intense – lots of room for squabbles.
- Does not address rate design issues



Fixed / Variable Rate Design

- \$30/month + variable energy cost
- Eliminates sales incentive
- Weakens consumer incentives for self-initiated efficiency.
- May attract uneconomic load – space heating and water heating.
- Without TOU prices, invites surging growth in on-peak loads like air-conditioning.



Rate of Return Incentives

- Washington (1980 – 1990): 2% bonus for return on equity for efficiency investment.
- Encouraged maximum spending on measures with minimum savings.
- Did not reduce sales incentive.
- Utility invested heavily in heat pump retrofits in mobile home parks – to prevent migration to natural gas.



Real-Time Pricing

- Often advocated by market theorists.
- Consumers do not like the volatility or, may not pay attention to price signals.
- Uneconomic metering for small consumers.
- Only addresses generation component of pricing – distribution capacity costs can be significant at the margin.



Moving Efficiency Outside the Utility

- Efficiency Vermont, Energy Trust of Oregon (org)
- Efficiency Maine (gov)
- Utility collects and remits revenue
- Efficiency company has no exposure to lost utility margins.
- Willingness of utilities to cooperate requires legislation.
- May not optimize geographic focus of investment without utility involvement.



Decoupling: How it Works

- Instead of rewarding the utility for increased sales, create a system that holds the company harmless (i.e., no effect on profits) for reductions in sales due to efficiency
- 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



Revenue Normalization Mechanisms (Decoupling)

- Establish an approved revenue requirement, and adjust rates as needed over time to sustain it.
- Breaks the sales incentive.
- Reduces volatility of utility earnings
- Allows management to focus on reducing costs – which will benefit consumers after next general rate proceeding.



Decoupling Examples

- CA - All gas & electric IOUs
 - ❖ <http://www.sdge.com/tm2/pdf/EPBR.pdf>
- MD, OR – Washington Gas, Baltimore Gas (MDPSC, Calvin Timmerman), Northwest Natural (ORPUC, Lisa Schwartz)
- NC- Piedmont Gas
- NJ - gas filings pending for NJ Natural Gas (NJBPU, Mike Winka)
- OH - gas filings pending for Vectren (Ohio Consumers' Counsel, Janine Migden-Ostrander)
- WA – gas filings pending for PSE and Cascade



HOW TO...

Construct a Revenue Adjustment
(Decoupling) Mechanism



Decoupling Basics

- Traditional regulation
- Step 1, revenue requirements.
 - ❖ Focus is on investment, expenses, return
 - ❖ Result is an accurate snapshot of revenue needs
- Step 2 , prices or revenue requirements / sales
 - ❖ Some parties focus on efficiency, some fairness, some revenue volatility, some revenue growth
- Step 3, prices are set and steps 1 and 2 are forgotten history



Decoupling Basics

- Traditional regulation and its theory embraced decoupling
- Price equaled cost so, increased sales resulted in increased revenue, increase expense and increased rate base.
- If all moved in lockstep:
 - ❖ No change in rate of profit
 - ❖ New plant paid for itself
 - ❖ No need for a rate adjustment



Decoupling Options

- There are many options
- Allow revenue growth to track cost changes
 - ❖ Example: Set forecasted base revenue on revenue requirement forecasts
- Allow revenue growth to be based on customer growth
 - ❖ Examples Revenue/customer model used in many states
- I'll focus on RPC method



RPC Steps

- Decoupling requires adding 2 steps
- Step 1, no change
- Step 2, no change
- Step 3, using data from 1 and 2 set RPC.
RPC used to determine allowed revenue
- Step 4, periodically compare allowed revenue to actual revenue and true-up



Design Criteria

➤ Must do

- ❖ Get the structure right to produce the right incentives
- ❖ Get the numbers right to be fair to utility and consumers

➤ Other considerations

- ❖ Weather risk
- ❖ Economic risk
- ❖ Trends in usage and revenue unrelated to weather or conservation.



Getting the Numbers Right

- Design decoupling formula to approximate revenue growth (and perhaps pattern) under traditional regulation
- Why?
 - ❖ To avoid windfall gains and losses
 - ❖ To minimize annual rate changes
- If risks shift consider effect on cost of capital



Existing System

- ***Rev = Price * Sales*** general formula for existing regulation.
- More precisely, the formula is ***Rev = K*(Price * Sales)***
- ***K*** is
 - ❖ The factor that reconciles required revenue growth to growth in the utility billing determinants (customers, kilowatts, kilowatt-hours).
 - ❖ Close to 1, could be higher or lower.
 - ❖ Different for each customer class
 - ❖ Changes with different rate designs
 - ❖ Different rate designs can dramatically affect revenue growth, revenue volatility, and weather related risk



Decoupling Formula

- Basic formula for RPC approach
 - ❖ Allowed rev = allowed revenue/customer * # of cust
 - ❖ More specifically, Allowed rev = K * allowed revenue/customer * # of cust
- K is designed to allow revenue growth to approximate revenue growth w/o decoupling



Mechanism Varies Depending on Type of Utility and Adjustment Mechanisms

- Gas Utility with PGA
 - ❖ Margin / Customer
- Electric Utility With Power Cost Adjustment
 - ❖ Non-Power Cost / Customer
- Electric Utility Without PCA
 - ❖ Total Revenue / Customer (and K factor is fairly critical)



Decoupling: Electric Utility With Power Cost Mechanism

- Basic principle: Average revenue minus average variable cost included in PCA
- Example:
 - ❖ \$.08/kWh rates
 - ❖ \$.04/kWh in PCA
 - ❖ \$.06/kWh incremental cost of power (flows through PCA)
 - ❖ 1,000 kWh/ customer/month
 - ❖ 100,000 customers
 - ❖ 2,000 new customers per year using 1,000 kWh

- Revenue =
 - ❖ $100,000 \times 1,000 \times 12 \times \0.08
 - = \$96 million / year
 - \$48 million in PCA
 - \$48 million to decouple
 - $RPC = \$48,000,000 / 100,000$
 - = \$480/year/customer + PCA

 - Add 2,000 customers
 - New revenue requirement = $\$48,000,000 + 2,000 \times \480
 - = \$48,960,000 + PCA Costs
 - = \$480 / customer + PCA costs

 - If sales < 1,000 kWh/customer a true up surcharge of \$.04 x reduced kWh flows into subsequent rates.
 - If sales > 1,000 kWh/customer, a true up refund of \$.04 x increased kWh flows into subsequent rates.



Without Decoupling: Electric Utility Without PCA

➤ Basic principle: Average revenue minus marginal variable cost

➤ Example:

- ❖ \$.08/kWh rates
- ❖ \$.04/kWh in average power costs
- ❖ \$.04/kWh in delivery costs
- ❖ \$.06/kWh is marginal market price for power
- ❖ 1,000 kWh/ customer/month
- ❖ 100,000 customers
- ❖ 2,000 new customers per year using 1000 kWh.

➤ Revenue =

$$\begin{aligned} & \text{❖ } 100,000 \times 1,000 \times 12 \times \$.08 \\ & = \$96 \text{ million / year} = \$960 / \text{customer} \end{aligned}$$

New customers require \$.04/kWh x 1,000 kWh delivery costs + \$.06/kWh for marginal power supply costs.

New revenue requirement =

$$\begin{aligned} & \$96 \text{ million} + 2,000 \times 1,000 \times 12 \times \$.04 + \\ & \quad 2,000 \times 1,000 \times 12 \times \$.06 \end{aligned}$$

$$= \$98,400,000$$

$$= \$964.70/\text{customer}$$

➤ General Rate Case Allows an increase of \$479,400.



With Decoupling: Electric Utility Without PCA

- Basic principle: Average revenue minus marginal variable cost
- Example:
 - ❖ \$.08/kWh rates
 - ❖ \$.04/kWh in average power costs
 - ❖ \$.04/kWh in delivery costs
 - ❖ **\$.06/kWh is marginal market price for power**
 - ❖ 1,000 kWh/ customer/month
 - ❖ 100,000 customers
 - ❖ 2,000 new customers per year using 1000 kWh.
- Revenue =
 - ❖ $100,000 \times 1,000 \times 12 \times \0.08
 - = \$96 million / year = \$960 / customer

New customers require \$.04/kWh x 1,000 kWh delivery costs + \$.06/kWh for marginal power supply costs.

New revenue requirement =
 $\$96 \text{ million} + 2,000 \times 1,000 \times 12 \times \$0.04 + 2,000 \times 1,000 \times 12 \times \0.06
 = \$98,400,000
 = **\$964.70/customer**

Utility is allowed \$960; in their interest to reduce consumption to previous kWh total.

If they succeed, they are allowed to recover DSM costs plus RPC of \$960 per customer.

If they do NOT succeed, they absorb excess costs above \$960.

OR: Commission sets “K” factor to reflect higher cost per customer over time. Allows **\$965/customer**.

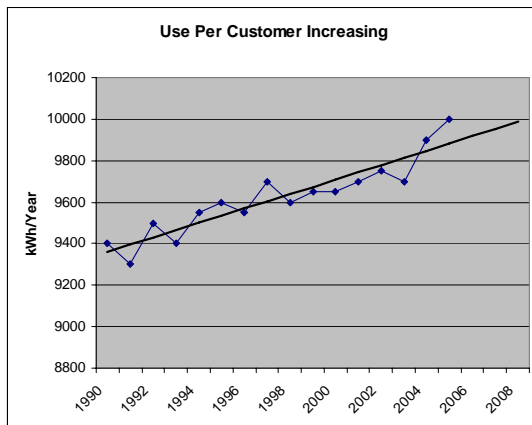
If usage exceeds 1,000 kWh, a refund is due to consumers based on $(\$0.08 - \$0.06) \times \text{kWh}$ (the gained margin).

If utility succeeds in keeping usage of customers below 1,000 kWh, a surcharge is allowed based on $(\$0.08 - \$0.06) \times \text{kWh}$ saved (the lost margin).

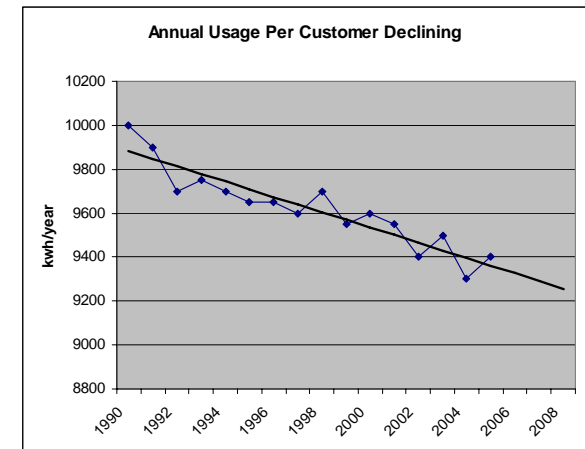
Incentive is to avoid those expensive marginal kilowatt-hours

Why Does the K Factor Vary from 1.00?

- Causes of Rising Revenue Per Customer (unrelated to utility marketing programs)
 - ❖ Inflation outstripping productivity
 - ❖ Bigger houses
 - ❖ More appliances
 - ❖ Growing A/C Penetration
 - ❖ Larger average size of new businesses
- K-factor > 1.00



- Causes of Declining Revenue Per Customer (unrelated to utility DSM programs)
 - ❖ Productivity outstripping inflation
 - ❖ Building Codes
 - ❖ Appliance Efficiency Standards
 - ❖ Higher % of multifamily housing
- K-factor < 1.00





The “K” Factor: Decoupling Is NOT An Attrition Adjustment

- If use per customer is rising, independent of utility DSM efforts, the utility should be “made whole” for the revenue that would be expected.
- If use per customer is declining, independent of utility DSM efforts, the utility should not get a windfall attrition adjustment.
- If average use is changing due to new customers using more or less than existing customers, a different RPC can be applied to customer growth.
- The line extension policy may need revision to ensure that new customers are contributing as much to revenue as to cost.



Dealing with Growth Trends: Xcel Energy Growth Rates

- Xcel historical growth, 1998-2004 - Residential
 - ❖ Cust growth 1.3%
 - ❖ Sales growth 2.3%
 - ❖ RPC growth ~ 1%
- 2004-2006 per rate case filing
 - ❖ Cust growth 1.4%
 - ❖ Sales growth 2.6%
 - ❖ RPC growth ~ 1.2%
- Allowed RPC increased each year.



Revenue Growth

- NSP existing revenue growth is about 2.8% per year. Customer growth about 1% per year.
- Use/customer is growing
- Setting revenue growth at customer growth would
 - ❖ Give NSP less \$
 - ❖ Lead to annual reconciliations giving money back to consumers
 - ❖ May or may not be reasonable on a cost basis
- Unless productivity is offsetting factor, K-factor is > 1.0



Weather Risk

- Typical decoupling plans shift weather risk to customers
- Not unique to decoupling plans, rate design changes can have similar results
- When deciding risk allocation consider who can best bear risk, the cost implications of changing risk, the added administration of weather normalizing
- Rating agencies recognize weather risk reduction as a significant change, allowing a lower equity capitalization ratio and therefore lower cost of capital (and lower revenue requirement).



Elements for Fair and Effective Decoupling

- Significant commitment to energy efficiency investment.
- Progressive rate design that keeps fixed rate elements low (or zero.)
- A “collar” on rates – no more than X% change in a year. Additional amounts deferred
- Scheduled periodic rate cases: 3-5 years
- Capital Structure Adjustment if weather risk is shifted to consumers.



Resource Needs

- Commission attention needed
- At the time of rate cases
 - ❖ Getting the formula numbers right takes care but the data needs are already part of typical rate cases
 - ❖ Define key terms: how customers are counted
- Monthly or annual reconciliation
 - ❖ Much more routine than FAC – nothing to audit.



Five Point Plan for Achieving Consensus on Decoupling

- Significant Energy Efficiency Investment Commitment
- Good Rate Design
- Capital Structure Adjustment
- A Collar on Maximum Possible Adjustment
- Periodic Rate Cases



A Word About 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 positive financial incentives



Performance Incentives: For Both ROR and RPC

- Shared savings
 - ❖ Return to utility of some fraction (say, 10-20%) of the savings (avoided costs) from distributed resource deployment
 - ◆ Goes directly to utility's bottom line
 - ❖ Collars and dead bands
- Performance targets
 - ❖ Specified rewards (e.g., % of program 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



Your Turn...

» Questions?