Performance-Based Ratemaking

Multiyear Rate Plans and Performance-Based Incentives

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COSR Under Stress

Utility regulation is in the shop for a tune-up in many states today. Underlying causes include…

- Load growth slowed by demand-side management (DSM) and distributed generation (DG)
- Cost growth accelerated by need for grid modernization and cleaner energy (and now inflation)

Under traditional cost of service ratemaking (COSR), chronically unfavorable business conditions like these lead to frequent rate cases that:

- Raise cost of regulation
- Weaken cost containment incentives

Utilities also have weak incentives to protect the environment.

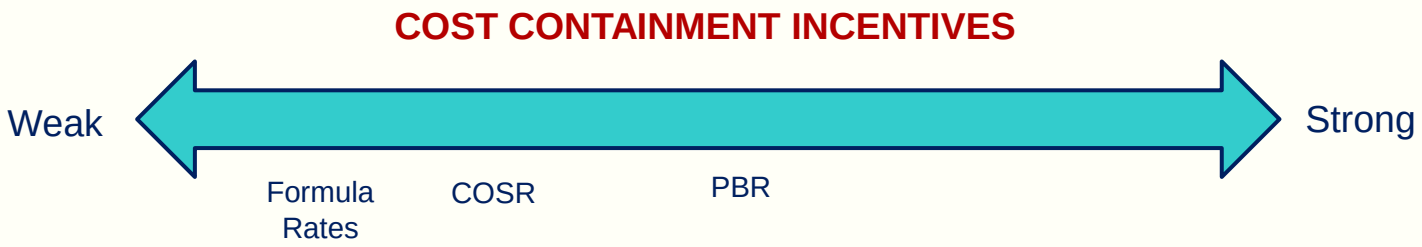
>>> Legislated clean energy mandates
>>> Green interests are major players in regulatory arena

New Regulatory Frameworks

Problems with COSR have spurred development of alternative ratemaking options.

- New trackers and riders to recover rapidly-rising costs
- Formula rates[1] (essentially, comprehensive cost trackers)
- Various kinds of performance-based ratemaking (PBR)

These approaches have varied incentive properties.



[1]The term formula rate is short for a cost of service formula that causes a utility's revenue to closely track its own cost of service.

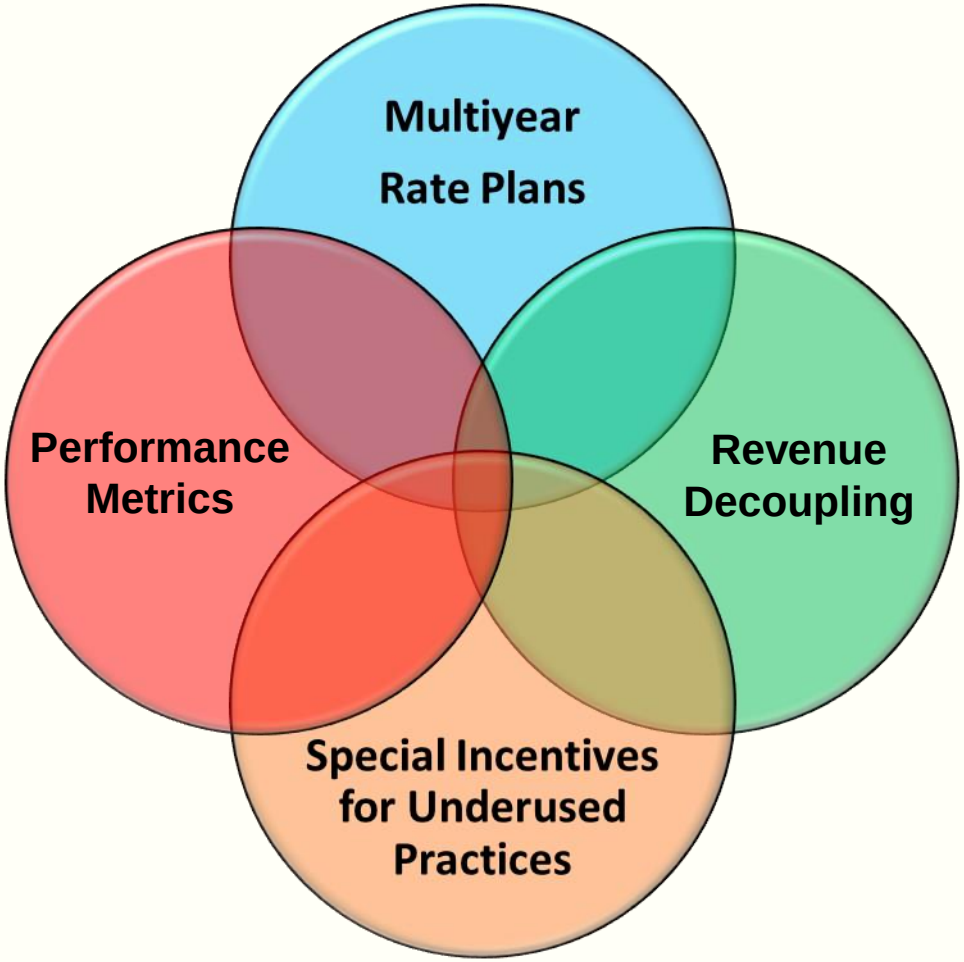
Performance-Based Ratemaking

PBR: Alternative forms of regulation intended to encourage better utility performance through stronger incentives

4 well-established approaches:

- Revenue Decoupling
- Performance Metrics
- Special Incentives for Underused Practices
- Multiyear Rate Plans (MRPs)

Basic PBR Approaches Often Combined



Performance Metrics

Performance metrics quantify utility activities in key areas.

Several uses in regulation

- **Metrics Only**
- **Metrics with Target**
- **Performance Incentive Mechanisms (PIMs)**

PIMs strengthen utility incentives in targeted areas by linking revenue to performance as measured using metrics.

Publicly-available scorecards[1] use multiple metrics to summarize utility performance.

[1] See Ontario example in Appendix.

What Do Metrics and PIMs Target?

PIMs most commonly target:

- Reliability and customer service quality
- Energy efficiency

New performance metrics (sometimes called "policy" metrics) and PIMs address emerging issues and challenges.

Policy PIMs

- Peak load management
- Beneficial electrification (electric vehicles and space heating)
- Automatic metering infrastructure (AMI) use and functionality
- Quality of service to DG customers

Other Policy Metrics

- Greenhouse gas emissions
- Equity issues

Metric and PIM Advantages

Target "holes" in regulatory system incentives

Alert utility to key concerns

- Areas of poor performance
- Emerging performance issues — such as system resilience and AMI

>>> Metrics and PIMs are "utility infielders" of PBR

Metric and PIM Challenges

Lots of design work for "smallish" net benefits

Focus is frequently not on vital consumer concerns

>>> Few policy PIMs have as yet been approved

But worthy area for new initiatives

Special Incentives for Underused Practices

The Basic Idea

Utilities reluctant to fully embrace some practices, like those that:

- are innovative but risky
- limit utility investment opportunities (e.g., DSM)

Special incentives can "nudge" utilities in right direction.

Tools

- Trackers for costs of underused practices (e.g., DSM)
- Return on equity premium for capitalized costs of these practices
- Management fee
- Pilot programs and innovation funds ("Regulatory Sandbox")

Multiyear Rate Plans

Key Components

- Reduced rate case frequency (e.g., 3-5 year general rate case cycle)
- Attrition relief mechanism provides automatic relief for cost pressures but *isn't linked* (*like a tracker*) *to utility's contemporaneous cost growth*

>>> Stronger cost containment incentives, streamlined regulation

- Trackers for some costs (e.g., energy and DSM)

Optional Components

- PIMs (e.g., for service quality and energy efficiency)
- Revenue decoupling
- Special incentives for underused practices (e.g., pilot programs)
- Earnings sharing mechanism automatically shares surplus earnings

MRP Case Study: Xcel Energy - Minnesota

Plan term 4 years

Base Revenue Escalation	2016	2017	2018	2019
	2.47%	1.97%	0.0%	1.65%

Capital cost savings refunded

Revenue Decoupling

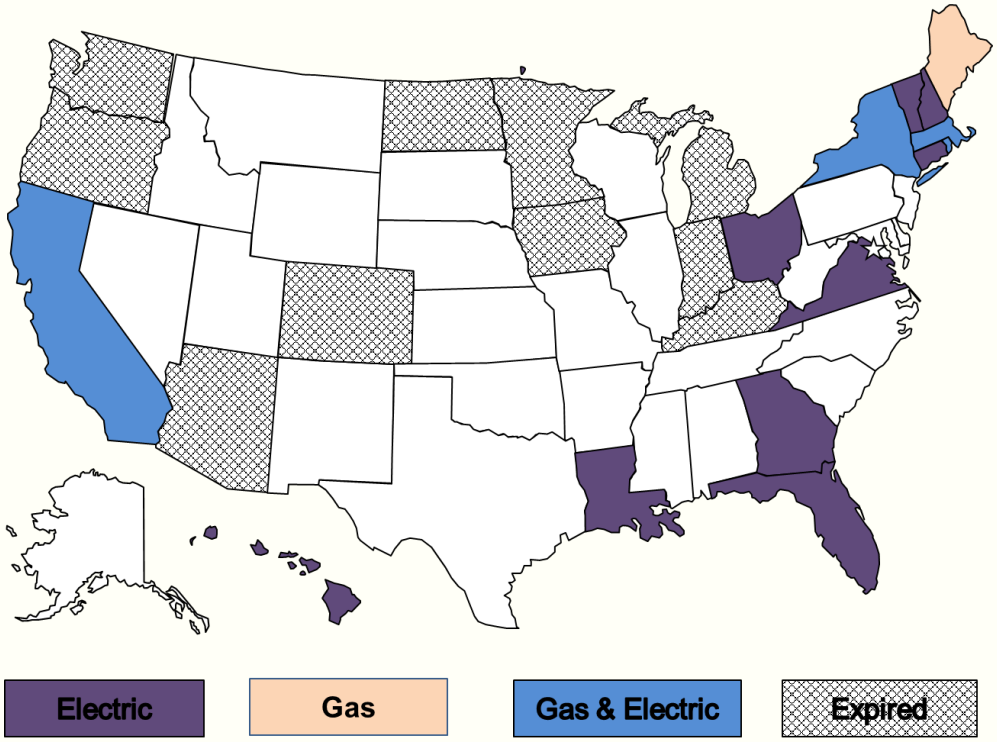
Cost Trackers

- Fuel & purchased power
- Transmission cost
- DSM expenses
- Renewable generation costs
- Environmental compliance cost

PIMs for DSM, reliability, and customer service quality

Reference: Minnesota Public Utilities Commission Docket No. E-002/GR-15-826

MRPs in the US

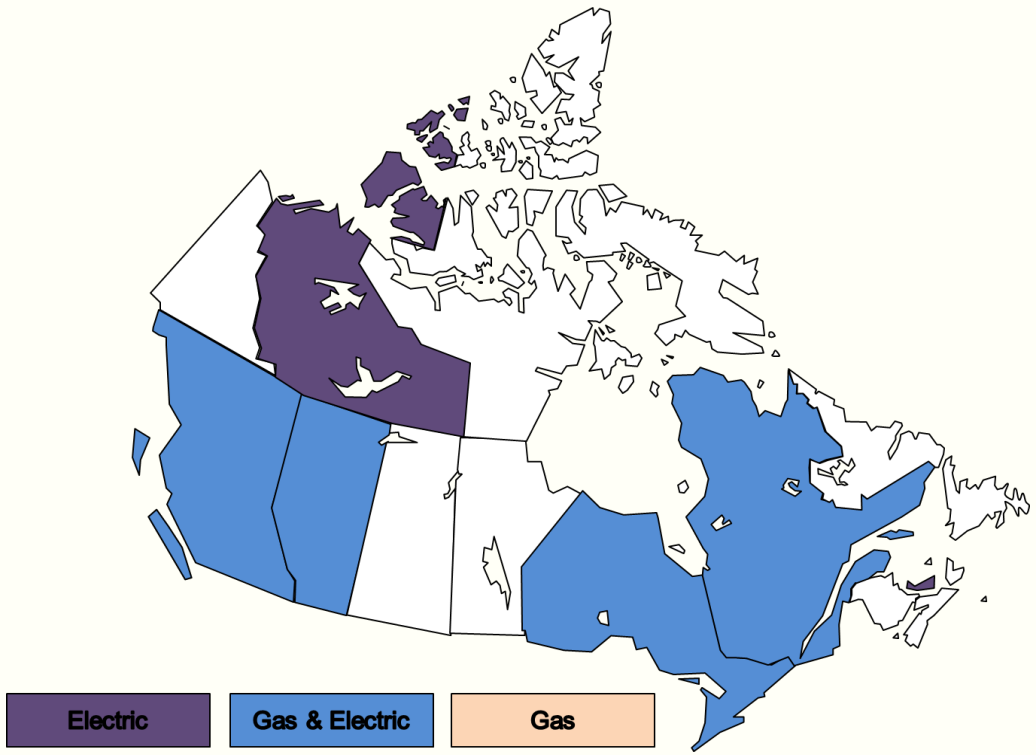


MRPs are popular in U.S., especially for electric utilities.

Recent legislation encourages MRPs in North Carolina and Washington.

Regulatory systems in some states are *called* MRPs but act more like formula rates due to fine-print "reconciliation mechanisms" (e.g., IL, MD, DC).

MRPs Abroad



MRPs are also popular in Canada, Britain, Australia, Latin America, and Europe. Impetus abroad often comes from policymakers and/or regulators.

Attrition Relief Mechanism Design Options

ARM design biggest issue in most MRP filings

Capex and opex requirements during plan are key issues

ARMs may cap growth in rates or allowed revenue

Several well-established approaches to ARM design

- Indexing
- Forecasting
- Hybrid

"Forecasted" (aka Stairstep) ARMs

Allowed revenue based entirely on cost "forecast" (or proposal)

This produces predetermined "stairstep" revenue trajectory

e.g., *3% growth in 2022, 2.5% in 2023, etc.*

Utilities may exaggerate cost forecasts

Several methods have been used for capex budgets

- Multi-year proposal/forecast
- Average of recent historical values
- Test year capex (repeated)

Capex underspends may be refunded to customers

Current Precedents: CA, FL, NY

Indexed ARMs

Rates or allowed revenue indexed to inflation and other cost drivers

Standard revenue cap index formula for energy distributor:

$$growth\ Revenue = Inflation - (X + Stretch) + growth\ Customers + Z$$

X = X-factor (aka "productivity offset") commonly based on industry productivity trend studies — these can be controversial

Stretch = Stretch factor (aka "consumer dividend")

Z = Z-factor adjusts revenue for earnings impact of miscellaneous, hard-to-foresee external events (e.g., severe storms, tax rates)

Current Precedents: MA, HI, Alberta, Ontario, Quèbec

Hybrid ARMs

Hybrid approaches combine elements of indexing & stairsteps

Different ARM designs for different revenue components

Operation and Maintenance	Indexing
Capital	Stair steps

Precedents: "Old School" California approach
Southern California Edison (current)

MRP Case Study: Massachusetts Electric

Plan term: 5 years

Indexed ARM

$$Base\ Revenue_{Class,t} = Base\ Revenue_{Class,t-1} * (1 + Inflation - X - Consumer\ Dividend +/- Z)$$

where… Inflation: growth Gross Domestic Product Price Index
X = -1.72%
Consumer Dividend: 0 – 0.55% based on inflation and performance in annual cost benchmarking

Revenue Decoupling

Management Fee for long-term renewable contracts

Trackers for various costs including DSM, smart grid, electric vehicle pilot, and enhanced vegetation management

PIMs for DSM, reliability, and customer service quality

Reference: Massachusetts Department of Public Utilities 18-150

MRP Pros and Cons

Advantages

- Stronger cost containment incentives
- Fewer, less overlapping rate cases free regulatory resources for other uses
- Benefits can be shared with customers

Disadvantages

- Consumer groups wary of automatic rate increases
- ARM design methods can be complex and controversial
- Performance incentives weakened by earnings sharing
- Utilities may strategically defer some costs to customers' detriment
- Utilities have "captured" MRP design process in some jurisdictions

PBR Challenges for Consumer Advocates

New area: Advocates must retool and "go out the learning curve"

Limited funding for advocates and regulators

- Utilities have large funding advantage in US
- Regulators sometimes side reflexively with utilities (e.g., MA)
- But consumer advocates have won notable victories (e.g., HI, Canada)

Role of green interests

- Environmental groups often play large role in PBR proceedings and negotiations
- Environmental groups often better funded than consumer groups

Effective Consumer Strategies

Revenue Decoupling Reduced ROE to reflect reduced risk

PIMs Advocate PIMs in areas that matter to all customers

- Service quality
- AMI use and functionality
- Cost and reliability benchmarking

Reasonable targets

Penalties as well as rewards

MRPs Indexed and hybrid ARMs

No "reconciliation provisions"

Preferable to formula rates

>>> Consumer-friendly PBR can be a condition for the approval of expedited revenue growth

Effective Consumer Strategies (*cont'd*)

Miscellaneous

Pool funding to develop rate case resources

Federal government funding

Higher budgets for multiyear rate plans

Commission should pay for key tasks
(e.g., productivity and benchmarking)

Conclusions

Environmental concerns and unfavorable business conditions have in recent years spurred use of diverse “Altreg” options in US ratemaking.

Multiyear rate plans, PIMs, and other PBR approaches are increasingly popular forms of Altreg which have more upside than other approaches.

While promising, PBR is a work in progress with many bugs to work out.

US consumer advocates can become effective PBR operatives.

They can oppose PBR more effectively or make it more customer-friendly.

A good understanding of PBR fosters better strategies and outcomes.

Appendix

Resources

Jim Lazar, Frederick Weston, and Wayne Shirley (2011), *Revenue Regulation and Decoupling: A Guide to Theory and Application.* http://www.raponline.org/document/download/id/902

Mark Newton Lowry and Matthew Makos (2021), "Revenue Decoupling at 40," *Public Utilities Fortnightly*, April. https://www.fortnightly.com/fortnightly/2021/04/revenue-decoupling-40

Mark Newton Lowry (2021), "Four Common Myths About Performance-based Regulation," *Utility Dive*, April 27. https://www.utilitydive.com/news/4-common-myths-about-performance-based-regulation/598007/

Mark Newton Lowry and Tim Woolf (Lisa Schwartz, technical editor) (2016), *Performance-Based Regulation in a High Distributed Energy Resources Future,* prepared for Lawrence Berkeley National Laboratory. https://emp.lbl.gov/sites/all/files/lbnl-1004130_0.pdf

Mark Newton Lowry, Matthew Makos and Jeff Deason (Lisa Schwartz, technical editor) (2017), *State Performance-Based Regulation Using Multiyear Rate Plans for U.S. Electric Utilities,* prepared for Lawrence Berkeley National Laboratory. https://emp.lbl.gov/publications/state-performance-based-regulation

Melissa Whited, Tim Woolf, and Alice Napoleon (2015), *Utility Performance Incentive Mechanisms, A Handbook for Regulators*, prepared for Western Interstate Energy Board. https://www.synapse-energy.com/about-us/blog/synapse-handbook-provides-guidance-designing-implementing-utility-performance

Acronyms

AMI	Advanced metering infrastructure
COSR	Cost of service regulation
DERs	Distributed energy resources (e.g., demand-side management and distributed generation, storage, and microgrids)
DG	Distributed generation
DSM	Demand-side management
MFP	Multifactor Productivity
MRP	Multiyear rate plans
O&M	Operation and maintenance
PBR	Performance-based ratemaking
PIM	Targeted performance incentive mechanism

Glossary of Terms

Alternative Regulation (Altreg): Alternatives to traditional cost of service ratemaking. The include formula rates, forward test years, and various kinds of PBR

Attrition Relief Mechanism (ARM): A common component of multiyear rate plans that automatically adjusts rates or revenues to address utility cost pressures without closely tracking the utility's own cost. Methods used to design ARMs include forecasts and indexation to quantifiable business conditions such as inflation and customer growth.

Cost of Service Ratemaking (COSR): The traditional North American approach to utility regulation that resets base rates in occasional rate cases to reflect the costs of service that regulators deem prudent.

Earnings Sharing Mechanism (ESM): Automatically shares surplus or deficit earnings (or both) between utilities and customers which result when the rate of return on equity deviates materially from its commission-approved target. ESMs often have dead bands in which earnings variances are not shared.

Formula rates: Short for cost of service formula rate, this is a method of setting a utility's rates which ensures that its revenue closely tracks its cost of service. This is often undertaken by an earnings true-up mechanism that adjusts rates so that earnings variances are reduced or eliminated. Formula rates are used by the FERC and some state commissions.

Multi-Year Rate Plan (MRP): A common approach to PBR that typically features a multiyear rate case moratorium, an ARM, special incentives for underused practices, and several PIMs.

Glossary of Terms (*cont'd*)

Performance-Based Ratemaking (PBR): An approach to rate regulation designed to strengthen utility performance incentives. Common approaches include revenue decoupling, performance metricsm special incentives for underused practices, and multiyear rate plans.

Performance Incentive Mechanism (PIM): A mechanism consisting of one or more metrics, targets, and financial incentives (rewards and/or penalties) which is designed to strengthen performance incentives in targeted areas such as service quality.

Performance Metric: A specific measure intended to shed light on a utility's performance. Some examples of performance metrics include cost per customer, the system average interruption duration index, and annual energy efficiency savings.

Pilot Program: An experimental initiative undertaken by a utility in an attempt to increase its efficiency or provide additional and/or improved services to customers. Pilot programs may include tests of new technologies or revised processes.

Productivity: The ratio of outputs to inputs is a rough measure of operating efficiency that controls for impact of input prices and operating scale on cost. Productivity may be measured for all inputs or just for O&M or capital inputs.

Revenue Adjustment Mechanism (RAM): A mechanism for escalating allowed revenue automatically between rate cases which is commonly used in conjunction with revenue decoupling.

Glossary of Terms (*cont'd*)

Revenue Cap Index: An index linked to inflation and other external cost drivers which escalates allowed revenue automatically between rate cases.

Scorecard: A summary of a utility's performance on various metrics in a performance metric system. This summary is often reported on a publicly available website.

Stretch Factor (aka Consumer Dividend): A term in an index-based ARM or RAM formula that reflects the customer's share of the expected benefit of increased cost containment incentives from an approved MRP.

X-Factor (aka Productivity Factor): A term in an index-based ARM or RAM formula that reflects the typical impact of productivity growth on utility cost growth. It may also incorporate an adjustment for the inaccuracy of the inflation measure.

Z-factor: A term in an index-based ARM formula that adjusts rates or revenues for the earnings impact of miscellaneous, hard-to-foresee external events (e.g., severe storms, tax rates).

About Dr. Lowry

President, Pacific Economics Group Research LLC

- PBR practitioner since 1989
- Specialties: multi-year rate plans, PIMs, revenue decoupling, productivity and statistical benchmarking studies
- Recent clients: Alberta and British Columbia consumer groups, British Columbia Utilities Commission, Duke Energy, Hawaiian Electric, Berkeley Lab, Ontario Energy Board, Puget Sound Energy, Quebec industrial intervenors, Xcel Energy
- Former Penn State University energy economics professor
- PhD Applied Economics, University of Wisconsin

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Additional Materials

X Factors

X factors in North American MRPs are commonly based on productivity research [e.g., industry multifactor factor productivity (MFP) trend]

growth Productivity = growth Scale – growth Inputs

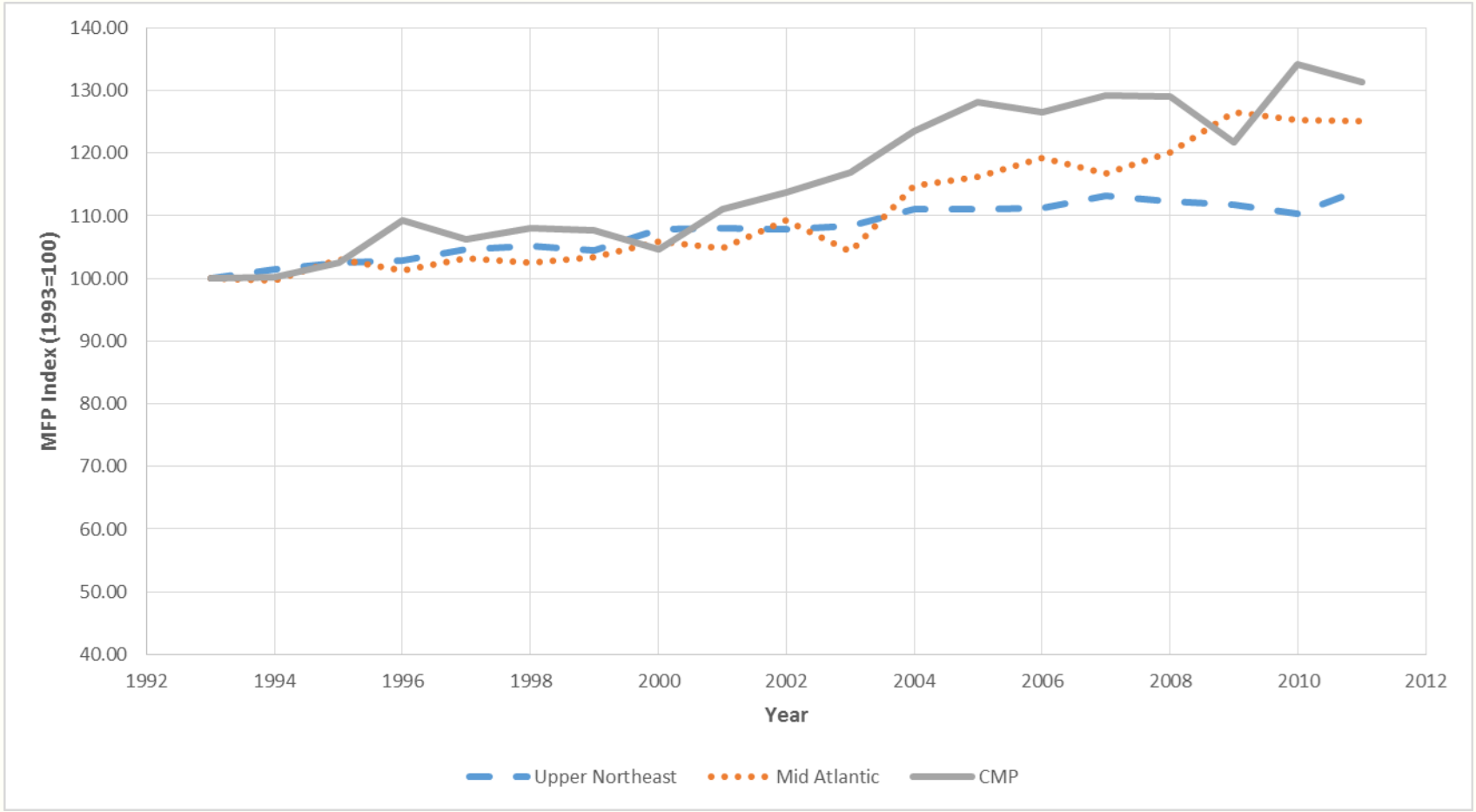
Productivity growth has diverse drivers that include changes in

- Technology
- "X-inefficiency"
- Scale economies
- Miscellaneous other business conditions (e.g., undergrounding, reliability standards, system age)

Some business conditions can drive productivity growth *negative*

Controversies have arisen over X factor research methods in several recent proceedings (e.g., ALTA, ON, Québec, MA, HI)

Productivity Growth of Central Maine Power Accelerated under MRPs



Revenue Decoupling

Decoupling Basics

- Tracker and rider cause *actual* revenue to track *allowed* revenue closely.
- Thus, revenue (and earnings) are "decoupled" from changes in system use.
- Revenue adjustment mechanism provides some relief for cost pressures (e.g., for customer growth).

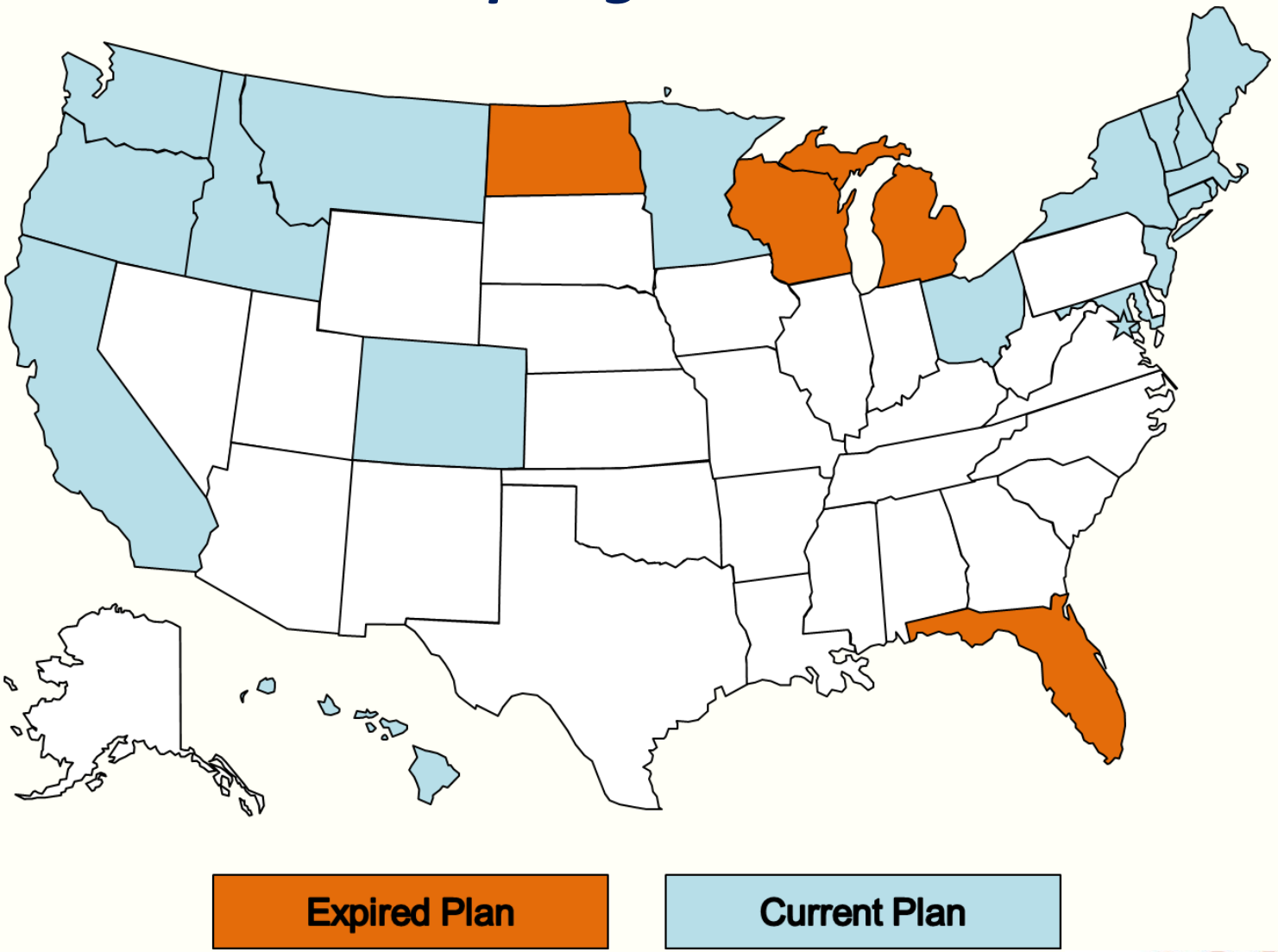
Pro

- Eliminates "lost margin" disincentive for utility to embrace DSM and DG.
- No need for high fixed charges that harm small-volume customers.
- New rate designs that encourage efficient DSM and DG are less risky.
- Stabilizes and accelerates revenue growth, leading to fewer rate cases.

Con

- By denying utilities the margin from electrification of transportation and space heating, it weakens utility incentive to promote them.

Revenue Decoupling Precedents: Electric



COSR Under Stress (*cont'd*)

Canadian regulators have acknowledged inherent COSR problems.

> This initiative proceeds from the assumption that **rate-base rate of return regulation offers few incentives to improve efficiency**, and produces incentives for regulated companies to maximize costs and inefficiently allocate resources…. **Regulators … must critically analyze in detail management judgments and decisions that, in competitive markets and under other forms of regulation, are made in response to market signals and economic incentives. The role of the regulator in this environment is limited to second guessing**…. The Commission is seeking a better way to carry out its mandate so that the legitimate expectations of the regulated utilities and of customers are respected.

Alberta Utilities Commission, "AUC letter of February 26, 2010," pages 1-2, Exhibit 1.01 in Proceeding 566.

MRP Case Study: Ontario

Ontario Energy Board (OEB) requires MRPs for all utilities

Rate (or revenue) cap index has X factor based on:

- industry productivity trend
- utility cost benchmarking

Utilities must benchmark forward test year cost proposals using OEB model

Utilities can request supplemental capex funding

Utilities must file distribution system plans

Numerous performance metrics but typically no PIMs

5-year terms, staggered rate cases

Reference: Ontario Energy Board (2012), "Report of the Board Renewed Regulatory Framework for Electricity Distributors: A Performance-Based Approach."

Ontario Scorecard Metrics

Performance Outcomes	Performance Categories	Measures	
Customer Focus Services are provided in a manner that responds to identified customer preferences.	Service Quality	New Residential/Small Business Services Connected on Time	
		Scheduled Appointments Met On Time	
		Telephone Calls Answered On Time	
	Customer Satisfaction	First Contact Resolution	
		Billing Accuracy	
		Customer Satisfaction Survey Results	
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved; and distributors deliver on system reliability and quality objectives.	Safety	Level of Public awareness [measure to be determined]	
		Level of Compliance with Ontario Regulation 22/04	
		Serious Electrical Incident Index	Number of General Public Incidents
			Rate per 10, 100, 1000 km of line
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted	
		Average Number of Times that Power to a Customer is Interrupted	
	Asset Management	Distribution System Plan Implementation Progress	
	Cost Control	Efficiency Assessment	
		Total Cost per Customer [1]	
		Total Cost per Km of Line [1]	

Notes:
1. These figures were generated by the Board based on the total cost benchmarking analysis conducted by Pacific Economics Group Research, LLC and based on the distributor's annual reported information.
2. The Conservation & Demand Management net annual peak demand savings include any persisting peak demand savings from the previous years.

Ontario Scorecard Metrics (*cont'd*)

Performance Outcomes	Performance Categories	Measures	
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Board).	Conservation & Demand Management	Net Annual Peak Demand Savings (Percent of target achieved) [2]	
		Net Cumulative Energy Savings (Percent of target achieved)	
	Connection of Renewable Generation	Renewable Generation Connection Impact Assessments Completed On Time	
		New Micro-embedded Generation Facilities Connected On Time	
Financial Performance Financial viability is maintained; and savings from operational effectiveness are sustainable.	Financial Ratios	Liquidity: Current Ratio (Current Assets/Current Liabilities)	
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio	
		Profitability: Regulatory Return on Equity	Deemed (included in rates)
			Achieved

Notes:
1. These figures were generated by the Board based on the total cost benchmarking analysis conducted by Pacific Economics Group Research, LLC and based on the distributor's annual reported information.
2. The Conservation & Demand Management net annual peak demand savings include any persisting peak demand savings from the previous years.

Cost Benchmarking

Utility cost depends on external business conditions (aka cost "drivers") as well as management effort and acumen

Cost benchmarks should reflect these drivers

Most Important

Operating scale (e.g., number of customers served, area served, and maximum peak demand)

Input prices

Also Significant

Urban density challenges

Forestation

System age

Econometric Benchmarking

Basic steps…

Develop mathematical model of relationship between performance metric (e.g., cost) & external business condition variables (e.g., cost "drivers")

Estimate model parameters using historical data

Fit model with parameter estimates (a_0 , a_{02}, …) & utility values for business condition variables — for example:

$$Cost_{Benchmark} = a_0 + a_1 \, x \, Customers^{Hydro\ One} + a_2 \, x \, Line\ Miles^{Hydro\ One} + \ldots$$

Compare company's historical or forecasted value to benchmark

$$Performance^{Hydro\ One} = Cost_{Actual}{}^{Hydro\ One} / Cost_{Benchmark}{}^{Hydro\ One}$$

Illustrative Econometric Benchmarking Model of Total Distributor Cost

VARIABLE KEY

YL =	Area in Square Kilometers
N =	Number of Customers
D =	Ratcheted Max Distribution Peak
PELEC =	Percent Electric Customers
OHFOR =	Percent Overhead Distribution Plant times Forestation of Service Territory
AMI =	Percent AMI
PTCU =	Percent Service Territory Congested Urban
ELEV =	Std Deviation of Elevation of Service Territory
Trend =	Time trend

EXPLANATORY VARIABLE	PARAMETER ESTIMATE	T-STATISTIC	P-VALUE
YL	0.060	6.150	0.000
N	0.698	35.240	0.000
D	0.266	14.630	0.000
YL*YL	0.049	6.490	0.000
N*N	0.725	42.950	0.000
D*D	0.860	39.780	0.000
Y*N	0.048	10.540	0.000
YL*D	-0.059	-17.300	0.000
N*D	-0.771	-37.540	0.000
PELEC	0.203	11.930	0.000
OHFOR	0.047	16.460	0.000
AMI	0.015	9.110	0.000
PTCU	0.010	11.990	0.000
ELEV	0.022	9.580	0.000
Trend	-0.003	-3.200	0.005
Constant	13.118	1334.300	0.000

Adjusted R^2	0.970
Sample Period	2002-2019
Number of Observations	1,383

Model developed by PEG Research LLC