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A Decision-Making Framework for Assessing New Rate Mechanisms: The Case of US Gas Distributors

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ABSTRACT

To make an assessment of ratemaking proposals, this article proposes that regulators should consider applying a logical decision-making process, such as multi-criteria decision analysis (MCDA), that selects or modifies those rate mechanisms that come closest to achieving the public interest, as defined by regulators. MCDA seems like an fitting tool to improve regulatory decisions by making more explicit the relationship between different rate mechanisms and the public interest. This article provides a simplified version of MCDA to demonstrate how regulators can apply this tool to evaluate new rate mechanisms in terms of the public interest. As far as the author knows, the MCDA methodology applied to utility ratemaking has not appeared in the literature. While regulators may not want to or lack the resources to execute all the steps presented in this article, MCDA can provide direction to regulators in evaluating different rate mechanisms and ultimately reaching decisions that are more rational and aligned with the public interest. After all, evaluating rate mechanisms is one of the major functions of utility regulators. Doing it wrongly can have a consequential effect on society's welfare.

KEYWORDS

Multi-criteria decision analysis; traditional ratemaking; new rate mechanisms; public interest; alternative decision strategies

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1. Introduction

The utility ratemaking process is complex and interactive, involving groups with diverse goals, interests and agenda. It also entails addressing several objectives, each of which has a distinct effect on the public interest. After all, a rate mechanism like a surcharge on utility bills is desirable only if they are compatible with the objectives set out by regulators, assuming they satisfy public policy, and statutory and other legal requirements.

This article defines rate mechanisms as the regulatory-approved instrument through which a utility recovers its costs from customers. They include rate structure, which determines how a utility recovers the costs allocated to specific customer classes in the different components of a tariff (e.g., fixed charge, volumetric charge). Rate mechanisms also determine the level of rates, their criteria (e.g., reflect only prudent costs) and the timing of new rates (e.g., before the next general rate case).

The focus of this article is on nontraditional rate mechanisms (hereafter referred to as "new rate mechanisms") proposed by US natural gas utilities (or distributors) since the beginning of this century before their state public utility commissions (PUCs). "New" connotes rate mechanisms that depart from traditional regulatory practices of energy utilities recovering their costs only after a rate case, with limited exceptions, and movements away from a rate structure where utilities recover a substantial portion of their fixed costs in the volumetric charge.[1] PUCs as well as regulators throughout the world are grappling with whether to replace traditional rate mechanisms for energy utilities that in the past have served the public interest well but are now under scrutiny (Zaki and Hamdy, 2022; Gunatilake et al., 2008; and Reber et al., 2018).

Although this article highlights US natural gas utilities as a case study, the analytical framework and other discussion presented in it are applicable to other utility industries across the different countries. As in the US, regulators in other countries face escalating pressure to address social problems, like climate change and utility-service affordability, that historically fall outside their purview. Technological and economic changes, as well as new public policies are also affecting the utility industries.[2] All of these changes are calling into question the efficacy of prevailing rate mechanisms to promote the public interest (Kind, 2013; and Costello, 2014). For example, regulatory objectives have become more expansive and conflicting: Should service affordability come at the expense of setting efficient rates? How much should rates increase to accommodate clean-energy objectives?

New developments have complicated the decisions that utility regulators have to make; and may demand new rate mechanisms to adequately address the continuing dynamic changes in the utility industries so as to advance the public interest. Specifically, new economic, political and technological developments question the value of existing rate mechanisms to serve the public interest. The increasing emphasis on utilities promoting energy efficiency and mitigating climate change, for example, may be incompatible with a rate mechanism that encourages utilities to sell more of their electricity or natural gas (Costello and Jones, 1995; and McDermott, 2012). These developments affect all utility sectors across different countries.

As argued in this article, a logical approach to ratemaking should result in more transparent, effective and consistent regulatory decisions. It can help to elevate the scientific aspect of ratemaking by combining objective and subjective information, as well as unavoidable judgment, more formally. The public interest stands to benefit from this approach that stands to enhance the rationality of regulatory decisions.

In reviewing different rate mechanisms, regulators should have access to unbiased information for helping them better understand and evaluate the consequences of a decision. To assess different rate mechanisms,

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1 Most both electric and gas utilities recover most of their fixed costs in the volumetric charge (Burger et al., 2019). Setting volumetric rates greater than short-run marginal cost creates, among other things, what economists call a deadweight loss by impeding welfare-enhancing electricity or natural gas consumption. For other problems with so-called volumetric rates, see Schittekatte et al., 2023; and Costello and Hemphill, 2022.

2 International organizations like the World Bank have recognized the challenges faced by public utilities in a dynamic world. See https://openknowledge.worldbank.org/handle/10986/35076?show=full.

regulators should follow three steps. First, regulators need to define the public interest. The public interest is a nebulous term devoid of any definite metric. Generically, it refers to the "common well-being" or "general welfare." It is central to policy debates, politics, democracy, and the purpose of government itself.[3] One idea is for regulators to identify the multiple objectives that coincide with the public interest, assigning weights to those objectives and resolving the trade-offs among them. Of course, trade-offs must recognize the prevailing statutory, constitutional and other checks.[4] This means that any rate mechanism must satisfy thresholds for "core" objectives (e.g., fairness, revenue sufficiency) identified by regulators. In the US, utility rates cannot be confiscatory and unduly discriminatory.

Second, regulators should understand how each rate mechanism advances or impedes the multiple objectives that comprise the public interest. Trade-offs are inevitable, making the regulator's job more difficult for evaluating different rate mechanisms. There is no one rate mechanism that dominates in advancing all regulatory objectives.

Third, regulators can benefit from applying a logical, transparent decision-making method, such as multi-criteria decision analysis (MCDA), that selects or modifies rate mechanisms that come closest to achieving the public interest, as defined by a regulator. It allows a regulator to assess rate options systematically, based on both unbiased and subjective information. Under this approach, prior to a utility proposal, a regulator would have enunciated its ratemaking principles and objectives in a public venue.

This article provides a simplified version of MCDA to demonstrate how regulators can apply this tool to evaluate new rate mechanisms in terms of the public interest. As far as the author knows, the MCDA methodology applied to utility ratemaking has not appeared in the literature.

There is also very little in the economics literature on utility ratemaking that delves into the regulatory decision process; most studies involve examining the consequences, such as the economic efficiency and distributional effects, of different rate mechanisms – not why regulators choose some over others. One exception is Joskow (1974), who discusses how the combination of inflation, oil price shocks, technological changes and stricter environmental standards caused steep increases in US electricity generating costs in the late 1960s and early 1970s. Utilities could not incorporate these cost increases (to a large extent beyond the control of utilities) into rates fast enough to keep profits from falling. Eventually regulators allowed fuel adjustment clauses (and, to a lesser extent, future test years) to reduce regulatory lag and avert more serious financial difficulties. Regulators also revisited existing rate structures (e.g., declining block rates) to evaluate whether they satisfied new objectives (e.g., energy efficiency and environmental) and were still in the public interest. In general, Joskow discussed how the changed political, technological and economic background pressured regulators to adapt their rate mechanisms to this new environment. But even Joskow analysis did not scrutinize the decision-making process that utility regulators apply in selecting rate mechanisms.

2. Traditional ratemaking in the US

Traditional ratemaking, sometimes called rate-of-return regulation, refers to the application of cost-of-service principles as the primary criterion for setting rates. Features include: (1) new rates remains fixed until the regulator

[3] One definition of "the public interest" is the composite indicator of the public well-being that combines the individual effects of an action on stakeholders and other societal interests. Another definition relates the public interest to the stakeholders' collective acceptance of a regulatory action. While nearly everyone would agree that advancing the common good or general welfare is an admirable goal, there is little consensus on what exactly constitutes the public interest.

[4] Legally, utility regulators in the US must set reasonable rates that allow a prudent utility to operate successfully, maintain its financial integrity, attract capital, and compensate its investors in line with actual risks. [The U.S. Supreme Court outlined these conditions in its order for *FPC v. Hope Natural Gas Co., 320 U.S. 591, 605 (1944)*]. The emphasis is then on the results reached rather than the methods used or means of getting to those results. Another constraint is regulators setting rates based on cost of service, which is the second side to "just and reasonable rates"; regulators also face constrains from legislatures in setting rates; for example, in some states regulators must set rates that don't conflict with utility incentives to promote energy efficiency and clean energy.

approves new rates after a comprehensive rate case; (2) the utility has a reasonable opportunity (but no guarantee) to earn its authorized rate of return; (3) the balancing of utility customer and shareholder interests is an overriding goal; (4) the selected test year matches revenues with costs over the first year of new rates; (5) the utility's actual rate of return between rate cases deviates from the authorized return when actual sales and costs differ from their test-year levels; and (f) regulatory lag can either benefit or harm utilities, depending on whether average cost is decreasing or increasing (Kahn, 1971).

Traditional ratemaking is the default method that PUCs and regulators in other jurisdictions have relied on over decades for setting utility rates (Philips, 1988). Even though some countries implement price caps and other rate-setting methods, they typically rely on cost-of-service studies as a benchmark starting point for determining rates.[5]

Even though some industry observers have written off traditional ratemaking as an anachronism, it still retains the status of the core ratemaking paradigm in US utility regulation, notwithstanding the onslaught of alternative rate mechanisms proposed by diverse interest groups over the past few decades (Borenstein and Bushnell, 2015; and Kind, 2013). Typically, the onus is on utilities and other interest groups to demonstrate the superiority of an alternate approach (e.g., price caps) over traditional ratemaking. A proactive regulator would initiate, or at least consider, alternative rate mechanisms on its own when conditions change to cast doubt on the efficacy of existing ratemaking mechanisms.[6]

Four factors explain the popularity of traditional ratemaking in the US over time: (1) its perceived fairness to all parties under most market and business conditions; (2) its ease of understanding; (3) the public's general acceptance of average-cost pricing that relates prices to costs, even if not the correct costs from an economic-efficiency perspective; and (4) its attempt to achieve a balanced outcome that avoids, in most circumstances, extreme discontent by individual stakeholders. PUCs balance the rights of utilities and their customers by considering three major factors: (1) *legal controls* – for example, utilities have the constitutional right to be given a reasonable opportunity to be financially viable, and customers have a right to just and reasonable prices; (2) *the regulator's perception of fairness*; and (3) *compatibility with a broader interest.* Regulators attempt to balance the interests of the different stakeholders with the ultimate objective of promoting the general good; at least, that is the premise behind the public-interest theory of regulation (Bonbright et al., 1988).

Traditional ratemaking has several features, some of which have faced severe criticism, triggering the support for alternative rate mechanisms. The first feature is the objective of allowing utilities the opportunity to earn a reasonable return on prudent costs. As a general practice, regulators set rates so that utilities have the opportunity to recover prudently incurred costs plus a reasonable (or "fair") return on equity. At the conclusion of a rate case, the regulator considers the utility's new rates to be "just and reasonable" on a forward-going basis. The regulator determines the new rates to be sufficient for allowing a utility to attract capital necessary so that it can finance its operations to provide the services consumers demand, while at the same time charging consumers a fair price for the services purchased.

A second feature of traditional ratemaking is that utility rates remain constant between rate cases, except for riders and trackers, surcharges, and indexing. The trend in recent years is to allow more rate changes between rate

[5] One view is that price caps and other forms of multi-year rate plans are more of an adaptation to cost-of-service ratemaking than a radically different ratemaking paradigm. (Multi-year rate plans are a comprehensive regulatory-pricing mechanism that allows base rates to change outside of a general rate case. Some MRPs specify allowable revenue changes, which has a different effect on utility behavior than specifying allowable rate changes. The former specification would give utilities less disincentive to promote demand management and conservation, which has become a major objective for many utility regulators.) See Joskow and Schmalensee, 1986.

[6] One regulatory expert argues that utility regulators should initiate proposals for changing regulatory practices when theydeem prevailing practices are antithetical to the public interest. One of his arguments is that the information regulators receive from stakeholders is biased by advocating private interests rather than the public interest. In other words, regulators need information directed at identifying decisions that would coincide with the public interest (Hempling, 2013).

cases to account for unexpected costs or revenue changes that are difficult to predict in a general rate case or that fall outside the test period (Costello, 2009). Cost recovery for new capital projects outside of a general rate case is an example of this trend.

A third feature is that regulators do not guarantee that utilities will earn their authorized rate of return. Almost always, a utility will not earn exactly its authorized rate of return. It can expect actual sales and costs to deviate from test-year levels. The gap depends on the accuracy of test-year parameters in representing sales and costs over the period of new rates.[7] The regulatory obligation is only to provide the utility with a reasonable opportunity to earn the authorized level.

A fourth feature is that a utility has a strong incentive to control costs between rate cases. This motivation derives from the mechanics of traditional ratemaking in setting the price, not the actual earnings of a utility.[8] To the extent that the utility is better able to hold down costs, its earnings and rate of return increase (Pint, 1992).[9] If a utility, for example, enjoyed an unexpected growth in productivity resulting in lower costs between rate cases, it benefits for a time.[10] In this instance, regulatory lag works in favor of the utility – a utility's rates remain constant while its actual average cost falls below the test-year estimate. Customers do not enjoy the benefits of lower utility costs until regulators reflect them in new rates. This outcome is known in regulatory circles as the "ratchet effect," which says, in effect, that utilities eventually would have to turn over any past cost savings to customers.[11] Analysts sometimes refer to this turnover, especially when rate cases occur frequently (i.e., with a shortened regulatory lag), as the antecedent of the cost-plus nature of traditional ratemaking.

As a fifth feature, traditional ratemaking attempts to balance the interests of different stakeholders. Regulators face the challenge of translating individual groups' interests into a broader public or general interest. Utility regulation exhibits a "balancing act" approach. To wit, by statute, PUCs have a legal obligation to take a broad societal perspective, whether for ratemaking, planning, or other matters, in decision making. Regulators should, therefore, look at the totality or aggregative effects rather than just the outcome on the utility's financial condition, consumer short-term economic welfare, energy efficiency, social goals, or fairness to one party. In their duties, PUCs must acknowledge the interests of individual groups by avoiding actions that would have a devastating effect on any one group. Since PUCs assign objectives to ratemaking, logically they should evaluate rate mechanisms on how they advance certain objectives while not seriously encumbering others that are at the core of good ratemaking.

3. Case study: new rate mechanisms for US natural gas distributors

A revisiting of the merits of existing rate mechanisms and their underlying premises has occurred periodically throughout the 100-plus years of public utility regulation in the US. One lesson learned over this time is that regulators should consider the merits of alternative rate mechanisms when market, economic, operating, technological, and other conditions change (Joskow, 1974; McDermott, 2012; and Costello and Jones, 1995). If in

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[7] Assume that a utility's actual costs are 3 percent below test-year costs and that its profits or margins are 20 percent of costs. The utility's margins or ROR would increase by 15 percent. If the authorized ROR on equity is 10 percent, the actual ROR would then increase to 11.5 percent.

[8] As economist and regulator Alfred Kahn once remarked:
"Freezing rates for the period of the lag imposes penalties for inefficiency, excessive conservatism, and wrong guesses, and offers rewards for their opposites; companies can for a time keep the higher profits they reap from a superior performance and have to suffer the losses from a poor one." (Kahn, 1971, 48)

[9] Because utilities initiate rate cases under traditional ratemaking, they can file for new rates, for example, when their costs rise because of lax management. This ability to control the timing of rate cases would somewhat weaken utilities' incentive to control costs.

[10] It is assumed that expected growth in productivity is built into existing rates (which are based on a utility's average cost). Expressed mathematically, *Average Cost (AC)* = the price of inputs/total factor productivity. Thus, % ΔAC = % Δ price of inputs minus % Δ total factor productivity, or % Δ price of inputs plus % Δ inputs minus % Δ output.

[11] The "ratchet effect" may derive from the PUC's adjustment of future forecasts based on past forecasting errors. The PUC observes the utility's past actual costs to reset a future price. The "ratchet effect" reflects dynamic strategic behavior that could motivate a utility to intentionally inflate its costs so as to increase the price that a PUC will allow in a future rate case (Costello, 2013).

fact the underlying assumptions of traditional ratemaking no longer hold, it becomes less likely that regulation will serve the public interest. One outcome might be the utility failing to recover its prudent costs. Another outcome might be the utility earning excessive profits and customers paying for imprudent costs. Regulators should then consider ratemaking alternatives to the status quo by either (1) revamping traditional ratemaking or (2) supplementing it with alternative rate mechanisms, to maintain the implicit "regulatory bargain." [12] Other countries can learn from this experience in the US as their utility sectors undergo transformation from a dynamic political, economic and technological environment.

Going back over 20 years, US gas distributors (or utilities) have proposed rate mechanisms that break from convention.[13] These utility proposals encompass both the cost recovery and rate-structure aspects of ratemaking. Many of these proposals involve rate mechanisms reflecting changes in market conditions for natural gas as well as in regulatory and energy policies.[14]

Support for new rate mechanisms reflects the view of some gas utilities and other stakeholders that the world has changed, and existing mechanisms no longer serve the public interest; at least that is their assertion.[15] The US natural gas industry has undergone a roller-coaster ride since the beginning of the century. Wholesale gas prices have become more volatile and difficult to predict and, beginning in the first decade of this century, reached much higher levels than 1990s prices.[16] After peaking in 2008, wholesale gas prices exhibited a sharp downward trend until 2021.[17] Over the entire period, however, wholesale prices, have been volatile on a year-to-year basis.

A key issue in US gas rate cases since the beginning of this century is whether the continuation of traditional ratemaking practices will allow a utility a reasonable opportunity to earn its authorized rate of return considering the changes in the market environment and public policy (e.g., mandates for utilities to promote energy efficiency and replace their old distribution pipes). With many gas utilities arguing that traditional practices will not, they have proposed new cost and revenue riders in addition to new rate structures (Feingold, 2016).

The most prominent new rate mechanisms[18] are:

- Rider for revenue deviations from some baseline level;[19] hereafter, this article refers to this mechanism as a revenue decoupling (RD) rider[20];

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[12] This bargain is two-sided: (a) prudent utilities have a reasonable opportunity to recover operations and capital costs and (b) utility customers pay no more than required to recover those costs. The traditional regulatory bargain in the US equates "just and reasonable" rates with cost-based rates.

[13] Russell A. Feingold, "Regulatory and Ratemaking Responses to a Changing Gas Utility Industry," at https://www.senate.mo.gov/18web/wp-content/uploads/2016/08/Mo.-Senate-Committee-Meeting-Presentation-Feingold-Final.pdf; American Gas Association, "Alternative Ratemaking," at https://www.aga.org/research/fact-sheets/fact-sheets/; and EUCI, "Natural Gas Cost of Service and Rate Design," Agenda for online course, June 29-30, 2022, at https://www.euci.com/event_post/0622-natural-gas-rate-design/.

[14] Over the past decade, electric and water utilities have also filed new rate designs and cost-recovery mechanisms, partially because of rising prices and an increased emphasis on reducing electricity and water usage (Pacific Economics Group Research, 2013; and The Brattle Group, 2013).

[15] Over the past 20 years or so, both regulated and unregulated industries have undergone radical shifts in pricing practices. Internet service and telecommunications service are prime examples of this phenomenon. Numerous other examples exist for a wide range of industries where changes in market dynamics have led to new pricing practices.

[16] See https://www.eia.gov/dnav/ng/hist/rngwhhda.htm. The most referred-to wholesale natural gas price is the Henry Hub spot price. Henry Hub is a pipeline interchange located in Louisiana that serves as the delivery point of natural gas futures contracts. It is the most active gas hub in North America, with access to major onshore and offshore gas producers.

[17] The Henry Hub price rose over 91 percent in 2021 and over 65 percent in 2022. See *ibid*.

[18] *Supra* note 13.

[19] The generic term "revenue decoupling" refers to the separation of a utility's earnings from actual sales. Under this definition, revenue decoupling includes riders and a SFV rate design where the utility recovers all of its fixed costs in a non-usage charge.

[20] Under RD riders, actual revenues correspond to the utility's revenue requirement, as determined in the last rate case, with rate adjustments made between rate cases as sales volumes deviate from the predetermined baseline level (e.g., weather-normalized usage per customer). With revenues more stable under a RD rider, the utility's actual earnings would deviate less from the level established during the last rate case. Overall, a RD rider, would increase the likelihood of a utility earning its authorized rate of return.

- Straight fixed-variable (SFV) rate structure, where the utility shifts all the fixed costs, both customer and demand related, out of the volumetric charge to a fixed charge such as the customer charge or demand charge; [21]
- Earnings sharing mechanism (or sometimes referred to as a return stabilization mechanism) where periodic adjustments, usually annually, occur when the utility's actual rate of return on equity falls outside some pre-determined band[22];
- Cost rider for bad debt, pipeline integrity management, pipeline replacement costs, [23] pension costs, energy efficiency or demand-side management costs, and so forth.

The new rate-mechanism proposals (sometimes referred to by gas utilities as "innovative rates") largely attempt to stabilize utility revenues and to allow recovery of certain costs outside a general rate case. They reflect the view, largely advanced by utilities, that the longstanding use of a test year (i.e., a twelve-month period chosen to calculate the required revenue to recover a utility's distribution non-gas costs) to measure certain costs and gas sales for the rate-effective period is no longer appropriate. The basic argument made by proponents of new rate mechanisms is that events in the natural gas sector have made costs and sales difficult to predict and unstable. Even with modification to historical costs and sales for "known and measurable" changes, according to this argument, a gas utility would still face high risk, reducing its chances to earn its authorized rate of return.[24]

Most of the new ratemaking proposals by gas utilities involve the use of trackers or riders to allow the utility to adjust its rates outside of a rate case. For the past thirty years, PUCs have allowed utilities to recover changes in their purchased gas costs through a rider-type mechanism, commonly called a PGA mechanism (Costello, 2009). Some PUCs have also permitted gas utilities to recover other costs, for example those related to energy efficiency activities and capital expenditures, outside of a rate case.

Throughout most of its history, PUCs have frown upon pass-through of costs outside of a general rate case (even when subject to a prudence review) unless extraordinary circumstances exist.[25] PUC decisions have focused on whether to pass through costs, and make rate adjustments for unexpected changes in sales, outside of rate case review in light of the possible downside consequences.[26] One such consequence is allowing the utility to increase

[21] In other words, the utility recovers all of its fixed costs through a fixed monthly charge that is independent of customer usage. It recovers all its variable costs (i.e., costs that vary with the quantity of service) through a volumetric charge. Similar to a RD rider, this rate design separates a utility's earnings from its actual sales. This rate structure provides customers with price signals conducive to efficient gas consumption. It also removes any utility disincentive to promote energy efficiency, since any revenue declines would equal avoided costs. On the downsides, compared to the prevailing two-parttariff, this rate structure would increase the gas bills of low usage customers and reduce the benefits to consumers from using less gas.

[22] Gas utilities have argued that earnings sharing would extend the time between general rates cases, better link rates to more current information on costs and sales and keep the PUC current on the financial condition of a utility.
Earnings sharing allows a utility to adjust its rates periodically (e.g., annually) when its actual return on equity falls outside some specified band. If the band encompasses a 10-14 percent rate of return on equity, when the actual return is 9 percent, the utility could adjust its rates upward to increase its return to 10 percent. This mechanism helps to stabilize autility's rate of return without a formal rate case review. Compared to traditional ratemaking, because of the diminution of regulatory lag this mechanism may reduce the incentive of a utility to control its costs between rate cases (Joskow and Schmalensee, 1986).

[23] A 2013 National Association of Regulatory Utility Commissioners (NARUC) resolution bolstered the actions of PUCs to allow recovery of pipeline replacement costs outside a general rate case via cost riders or surcharges. See https://pubs.naruc.org/pub.cfm?id=53A08441-2354-D714-5173-84C451721EC4.

[24] This rationale has also been put forward by the US electric industry (Costello, 2013).

[25] Under a rider, a utility adjusts its rates to collect certain costs from its customers without a formal, comprehensive, and detailed rate review of revenues and expenses like that of a base distribution rate case. (A formal rate review – which is a highly transparent event before the general public – has been the dominant regulatory procedure for setting utility rates.) These costs associated with a rider or tracker typically include those that deviate from the test-year level – for example, bad-debt costs that exceed the level implicit in base rates determined by a PUC in the last rate case.

[26] Prior to the recent interest in revenue decoupling, rate adjustments for sales focused mostly on weather normalization adjustments (WNAs). The mechanism adjusts customers' monthly gas bills, usually during the winter heating season, to reflect weather patterns commensurate with "normal weather." The rationale for WNAs centers on the effect of the traditional ratemaking practice to cause earnings to fluctuate based on actual sales and the fact that winter temperatures have become more volatile and risen over time above previously historically levels. Twenty-three PUCs allow at least one gas utility to use a WNA mechanism. (See

rates to cover increased costs associated with one cost category, while failing to look at the utility's overall costs and financial situation – for example, to determine whether other costs have decreased or revenues have increased. After all, as the argument goes, the dominant rationale for riders is that they prevent utilities from earning a rate of return far below what the regulator authorized in the last general rate case.

PUCs generally applied a three-part test in judging the merits of a rider or tracker. The three-part requirement for PUC approval of riders and trackers typically include: (1) the cost or sales activity must lie outside the control of the utility, (2) variations in outcomes can have a material effect on utility earnings, and (3) the activity is difficult to predict. But in recent years, PUCs have relaxed some of these conditions in approving riders and trackers (Costello, 2009).[27]

The reluctance of PUCs, historically, to approve riders and trackers mainly lied with their effect on shifting risk to utility customers and on diminishing regulatory lag (Larkin & Associates, PLLC, 2012). Regulatory lag refers to the time gap between when a utility undergoes a change in cost or sales levels, and when the utility can reflect these changes in new rates. As mentioned earlier, PUCs rely on regulatory lag as an important stimulant in motivating utilities to act efficiently. Regulatory lag is a less than ideal method, however, for rewarding an efficient, and penalizing an inefficient, utility (Posner, 1961). Some of the additional costs may fall outside the control of a utility (e.g., increase in the price of materials), and any cost declines may not relate to a more efficient utility (e.g., deflationary conditions in the general economy).

4. Strategies for assessing rate options

Ratemaking demands consideration of governmental statutes, regulatory rules, economic principles, fairness, precedent, and trade-offs among different regulatory objectives or criteria.[28] When regulators approve or reject certain rate mechanisms, they implicitly (if not explicitly) apply their judgment on (1) what objectives ratemaking should achieve (Hanser, 2012), (2) the relative significance of each objective, and (3) the willingness to impede certain objectives to advance others; for example, the loss of economic efficiency from rates deemed fairer.

Before applying this judgment, regulator should begin by reviewing unbiased information and analyzing how each ratemaking option advances some objectives while hindering others.[29] Overall, good ratemaking requires judgment, and disinterested analysis and information to make decisions that best serve the public interest. Judgment reflects the regulator's preference for the different objectives underlying ratemaking and the strategy it applies based on the available, though often incomplete, information. This section of the article will discuss different strategies available to regulators for organizing and interpreting the information presented to them.

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https://www.senate.mo.gov/18web/wp-content/uploads/2016/08/Mo.-Senate-Committee-Meeting-Presentation-Feingold-Final.pdf).

[27] Although utilities tend to be the ones initiating riders, other stakeholders have supported riders when they advance their interests. There is what I call an Iron Triangle – Wall Street, utilities and some "agenda" advocates – favoring riders, with utility consumers on the other side as skeptics, either questioning or opposing them. Riders have also become popular with legislators and PUCs. Some have speculated that PUCs fear criticism for being anti-safety, anti-environment, anti-jobs, and anti-investment. Given the strong support for riders from diverse groups, one can surmise that utility consumers are paying for politically popular capital expenditures, which some customer advocates have questioned as being excessive and failing a cost-benefit test. See AARP, AARP Policy Book 2021-2022 at https://policybook.aarp.org/policy-book/utilities/energy/utility-rates.

[28] Statutes in different countries generally are fairly vague (although to varying degrees), specifying, for example, that rates should be just, reasonable and nondiscriminatory. This may require that rates reflect only "prudently incurred" costs and costs of facilities that are "used and useful." Regulators therefore have much discretion in determining specific rate mechanisms in satisfying statutory mandates.

[29] This information could come from PUC staff testimony and other advisory documents that staff can draft for commissioners. The regulator's judgment could derive from her impression or intuition about a specific rate mechanism (e.g., "I think all rate mechanisms that discourage energy efficiency are bad, irrespective of their other effects."). Alternatively, judgment could stem from the regulator's reasoning applying available information and a logical construct such as MCDA (to be discussed later). For these generic differences on the sources for judgment, see Kahneman (2003).

4.1. Problems with the prevailing decision-making process

An optimal process for decision-making by regulators, whether for the US natural gas sector or other utility sectors across countries, involves ordering and interpreting the information presented to them in a way that best advances the public interest. This approach requires that regulators: (1) define the public interest in terms of the objectives they assign to ratemaking (Hanser, 2012), (2) comprehend the effect of each rate mechanism on advancing and impeding the different objectives, and (3) apply a logical decision-making strategy to select or reject a rate mechanism.

Based in part on my US and international experience, the prevailing process applied by most utility regulators for assessing rate mechanisms in all the utility industries tends to encompass several suboptimal features in common. First, regulators often do not explicitly consider and define the criteria for assessing ratemaking options. Although regulators consider different objectives for ratemaking, they often do not explicitly state what those objectives are, how to measure and *balance* them, and what effect they have on the public interest.[30]

For example, the balancing test is a process by which the regulator weighs, implicitly if not explicitly, the positive and negative aspects of rate mechanisms in a systematic way to arrive at a decision that best advances the public interest. When one views regulators' decisions on topics relating to ratemaking, one common feature is a checklist of the pros and cons of each alternative, after which the decision would enunciate its acceptance of one alternative. The "missing link" is the transparent reasoning for the regulator's rejection of all the alternatives but one, even though each alternative has positive and negative features. This process comes across as an arbitrary and subjective decision that is susceptible to appeal by a contesting party. It lacks a balancing test that, for example, considers the benefits and costs of each alternative in arriving at a "score" for each one and ranking them in terms of their effect on the public interest. Some alternatives may be outright rejected when they fail to satisfy public policy, core ratemaking tenets, precedent, statutory or constitutional requirements. A prime example is a rate structure that encourages the consumption of natural gas but clashes with a state energy policy that calls for the electrification of water and space heating to reduce reliance on fossil fuels by a certain year. Another rate mechanism may encourage utilities to construct large capital projects but does so by passing through all the risks of cost overruns and unexpected market developments to their customers (Larkin & Associates, PLLC, 2012).

Regulators frequently acknowledge the need for "just and reasonable" rates, but they typically do not enunciate what criteria – for example, the acceptable degree of price discrimination, the proper allocation of business risk between shareholders and consumers – would support such rates. "Just and reasonable" thus becomes a mantra, or a post-hoc justification, rather than the outcome of a decision criterion whose effect on a decision is traceable.[31]

Second, regulators often choose ratemaking options based on implicit weights for individual objectives, without identifying those weights in their written opinions or final orders.[32] These opinions oftentimes fail to articulate that they favor one rate mechanism over another because certain objectives are more central than others

[30] As stated by one regulatory expert,
"Traditionally, regulators used a few criteria like cost and need. However, the number and diversity of criteria have grownto include some…that are indefinite and subjective. Some legislatures authorize dozens of criteria (e.g., impact on the environment, impact on educational facilities, economic development, etc.). Evolving criteria tend to be general or indefinite, orif not, they are specific and numerous, but lacking a balancing test to resolve subjectivity or conflicts." (Filipink, 2009, 5)

[31] One interpretation of "traceable" is the regulator moving from the listing of the pros and cons of different ratemaking options to a finding that one option, while having drawbacks, is on net preferable to the other options in advancing the public interest. The regulator cannot avoid making a subjective judgment, if for no other reason that a benefit-cost evaluation requires qualitative information; for example, how much would revenue decoupling induce more utility energy-efficiency programs, how much less incentive would a utility have if it can more easily pass through more of management mistakes to customers?

[32] A problem is that a stakeholder may litigate a regulator's decision because it gave too little consideration to a specific criteria, for example affordable utility service or neutrality between different technologies. A regulator's decision may provide a certain technology with a subsidy that places its competitors at an unfair disadvantage.

in serving the public interest.[33] The public and stakeholders thus remains uninformed about the actual reasons for the decision.

Third, ratemaking decisions often forego comprehensive “grounds up” analysis in favor of focusing on the marginal gains over the status quo. Regulators typically make ratemaking decisions by reacting to the positions of stakeholders, who present conflicting information, in the absence of pre-existing regulatory statements enunciating ratemaking principles and weights assigned to different objectives. Taking a reactive stance makes regulators vulnerable to the political influence of individual special interests, like utilities, environmentalists and consumer advocates.[34]

Fourth, regulators often make trade-offs among different objectives on an ad hoc basis. They do not explicitly analyze, for example, the trade-off between allowing a utility to recover certain costs through a rider and the incentive of the utility to control those costs. Another example is the trade-off between avoiding a dramatic change in rate structure and the consequences of continuing with economically inefficient rates.

Overall, the ratemaking process in different countries frequently lacks transparent regulatory guiding principles, priorities or guidelines, creating a moving target for regulators, utilities and other stakeholders. Consequently, the regulatory process is less efficient and more resource-draining than it could otherwise be. These deficiencies in the ratemaking process tend to increase the chances of suboptimal decision-making or failing to maximize the public interest.

The culprits include inadequate availability of objective information, the intent by regulators to serve their own interests or special interests, and the lack of a rational analytical framework from which regulators process the information presented to them. For example, what psychologists call “confirmation bias” can cause regulators applying heuristics (e.g., simple rules-of-thumb) to act poorly by failing to pursue objective facts and having an aberrant view of the world (Thaler, 2015).

An example of confirmation bias is the regulator having a preconceived strong aversion toward a new rate design even though the evidence strongly shows that the rate design is superior to the existing one. Notwithstanding this, the regulator rejects the new rate design. Another example is a regulator believing, on the ground of fairness, that all customers should face the same rate, irrespective of the cost to serve them. The analytical framework presented next in this article attempts to addresses what I label in this section as the “Prevailing Decision-Making Process Problem” and is applicable to all the industries under the purview of utility regulation.

4.2. The seven steps of MCDA

MCDA is a tool well suited for ranking and comparing different ratemaking options based on evaluation criteria.35 It has been used for decades in several fields, including the energy sector. MCDA has helped to align unbiased and analytical information with the decision-maker’s judgment in a logical manner, with the effect of

[33] As one author (Filipink, 2009) noted, “In the absence of legislative guidance, regulators can simply recite competing goals and decide…” Such a decision process, of course, avoids the need to explain why, for example, the decision advances the public interest better than another possible decision.
To wit, regulators often make trade-offs among different objectives in an unsystematic way. They do not explicitly analyze, for example, the trade-off between allowing a utility to recover certain costs through a rider and the incentive of the utility to control those costs. Another example is the trade-off between avoiding a radical change in rate structure and the consequences of continuing with economically inefficient rates.

[34] By reacting to stakeholders arguing in their best interests, the regulator loses sight of being an agent for the public good. The regulator should initially set guidelines and principles that it believes align with the public interest. The stakeholders will then have to form their narrative around the public interest, rather than their respective self-interests. See Filipink, 2009; and Hempling, 2013.

[35] Keeney and Raiffa (1976) were pioneers in extending decision analysis to address problems that involve multiple objectives – thus, the genesis of MCDA.

enhancing rational, transparent and efficient decision-making. 36 As far as the author knows, MCDA has never been applied to utility ratemaking.

MCDA is especially applicable to problems of a multi-objective nature, where decision-makers have to make trade-offs among multiple objectives.[37] MCDA can assist regulators in making these trade-offs by offering them an orderly framework to assess the implications of different value judgments for decisions.[38] By varying the weights or significance attached to utility-initiated energy efficiency activities, for example, a regulator can determine any change in the ranking of a revenue-decoupling rider relative to other ratemaking options. Another example is where MCDA can assist in determining if an increased emphasis on price-induced energy efficiency causes declining-block rates to fall below some threshold level for acceptance.

The application of MCDA to ratemaking requires seven steps:

Frame the decision problem: Two key questions confront regulators: (a) Do the traditional rate mechanisms deny a gas utility the reasonable opportunity to earn its authorized rate of return? and (b) Do the traditional rate mechanisms provide a gas utility with a weak incentive or disincentive to support energy efficiency?[39] A related question is how a regulator can promote the twin objectives of revenue sufficiency[40] and energy efficiency with minimal negative effects on other objectives (e.g., the "fair" allocation of business risk, public acceptability).

Define the objectives and the set of evaluation criteria: MCDA uses criteria to operationalize the objectives for comparing and evaluating potential options. An objective indicates a movement toward improved outcomes; for example, a stronger incentive for a utility to promote energy efficiency, or a better chance for a utility to earn its authorized rate of return. A criterion or attribute measures an objective pertinent to analysis; the expected number of customer complaints, for example, can indicate public acceptability, and the relationship of price to marginal cost can help to gauge the presence of efficient consumption.[41]

Specify the options: What rate mechanisms should regulators review, for example, in addressing the problem of weak utility incentives for cost control and innovation, as well as other problems warranting further consideration? Should regulators rely exclusively on rate mechanisms proposed by stakeholders, or should they offer their own? For other problems, regulators can redress by choosing one of a number of rate mechanisms.

Develop a performance matrix: Each row in the matrix describes an option and each column measures the performance of the option against each objective or criteria (the column entries represent, for example, how well each option promotes the objective of economic efficiency). The next subsection illustrates a performance matrix.

Identify the preferences of decision makers: This step comprises the normative aspect of MCDA, where regulators designate preferences for the different objectives or criteria.[42] The identification and measurement of

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36 As one analyst has stated, MCDA can "provide help and guidance to the decision-maker in discovering his or her most desired solution to the problem (in the sense of that course of action which best achieves the decision-maker's long-term goals." (Stewart, 1992).

37 Analysts have applied MCDA to address complex decision-making problems that involve multiple criteria and stakeholders, including energy planning, business management and health care. See Loken, 2007; Wang et al., 2009; and Sahaduddin and Khan, 2021, for a small sample of studies that involve the energy sector. MCDA has been particularly useful in evaluating renewable energy, whose value to society extends beyond economics to include environmental and social benefits.

38 See https://en.wikipedia.org/wiki/Multiple-criteria_decision_analysis.

39 This is a major reason for why regulators have approved revenue decoupling mechanisms for electric and gas utilities around the country. See Costello (2014); and Morgan (2013).

40 PUCs are under legal constraints to set rates that allow utilities a reasonable opportunity to achieve sufficient revenuesto cover their expenses and cost of capital. But their decisions over time have shown that the likelihood of them doing so varies across PUCs and time periods, depending on such factors as the test year (e.g., historical or future), rate design and the parameters (e.g., sales and costs projections) approved by PUCs in determining new rates.

41 From my experience working with state utility commissions for close to thirty years, regulators are more willing to support a new rate design when the public accepts it and no one group of customers is severely harmed. This acceptabilitystandard requires that both utilities and regulators educate the general public. Regulators like to avoid negative public reaction to their decisions, as this places them in an unfavorable light and more likely would trigger legislative meddling. Three signs of public acceptability are minimal customer complaints, little legislative intervention and rare negative media publicity.

42 MCDA studies typically measures the preferences (or weights) for the different objectives based on a survey of stakeholders,

preferences allows regulators to assign weights. Regulators can express their preferences by ranking the criteria, by assigning numerical weights, by identifying criteria as "must haves" (or primary) and others as "desirable but optional," (or secondary) or by verbal evaluations. Weights are location, situation and regulator specific. They can also change over time. For example, if regulators have a heightened interest to mitigate climate change, they may place a higher weight on a rate mechanism that encourages energy efficiency, relative to other objectives.[43]

Select a method for aggregating the information presented to decision-makers for ranking and comparing the different rate mechanisms: This step allows for the comparison of two or more rate mechanisms with varying performance over the range of objectives or criteria. The method constitutes a decision rule or strategy for sorting and evaluating the information available to regulators. A common approach is a simple additive weighted calculation of the overall performance for each option.

Interpret the results and apply sensitivity or robustness analysis: Regulators should not solely rely on MCDA to reach decisions; this tool, however, should assist in providing support for any selected decision. The robustness of a decision also depends on whether the selected option continues to rank the highest, for example, as regulators assign a set of different weights for the objectives or criteria, or for the performance scores for each option.

4.3. A simplified MCDA illustration for ratemaking

Assume that a hypothetical regulator has four ratemaking objectives:[44] (1) revenue sufficiency,[45] (2) promotion of utility-initiated energy efficiency measures (e.g., rebate programs, free energy audits) that reduce gas consumption, (3) economic efficiency and (4) fairness (or equity). The criteria or metrics used to measure these four objectives include the likelihood that a utility would earn its authorized rate of return,[46] the effect of energy-efficiency activities on a utility's earnings, the relationship of price to marginal cost, and the perception of fairness by utility customers and shareholders.

Concerning the first objective, revenue sufficiency requires that any rate mechanism examined with MCDA must expect the utility to have a reasonable opportunity to recover its costs, including an adequate rate of return. Another objective, fairness, is a nebulous and controversial term, dependent upon the eye of the beholder. The term "fairness" and its derivative, "fair," appear commonly in the regulatory arena. We often hear of a "fair rate of return," "fair and reasonable rates," "fair value," and a "fair process." Because fairness is elusive and enters the domain of philosophy, it becomes difficult to know what is fair and to assert that one policy is fairer than another is. Because stakeholders' perceptions of fairness differ, regulators face the difficult task of balancing them to decide what is in the public interest.[47] In the end, it is regulators that define fairness. Instead of evaluating actions and policies based

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management or experts (Loken, 2007; Wang et al., 2009; and Sahaduddin and Khan, 2021). For evaluating rate mechanisms, it would be the regulators themselves who would set the weights; that is, the weights represent the relative importance that individual regulators place on the different ratemaking objectives. Additionally, the individual regulators wouldimplicitly reveal the weights they applied when deciding on a proposed rate mechanism. The weights essentially represent the ordinal preferences that individual regulators place on the different ratemaking objectives.

[43] This is exactly what is happening in both the US electric and natural gas industries (Trabish, 2022).

[44] A regulator might have other objectives (e.g., public acceptability, rate stability), but for our illustration it regards the four specified ones as the critical ones for decision-making.

[45] While US utilities have a legal right to generate enough revenues to cover its cost, regulators cannot guarantee it. Regulators have discretion to make decisions in rate case that affect the likelihood that a utility will achieve "revenue sufficiency."

[46] This assumes that the authorized rate of return is an unbiased estimate of a utility's cost of capital. If the authorized rate of return is below the utility's cost of capital, then revenue insufficiency could occur because of both the authorized rate of return is set too low and the chance of a utility to achieve its authorized rate of return even when set correctly is low (Kihm, Beecher and Lehr, 2017).

[47] In balancing the rights of consumers and utilities, state utility regulators consider (among others) the following three factors: (1) legal constraints—for example, utilities have a right to be given a reasonable opportunity to be financially viable, and consumers have a right to just and reasonable prices; (2) the regulator's perception of fairness; and (3) compatibility with the public interest. Regulators attempt to balance the interests of different stakeholders with the overall objective of promoting the general good; at least, that is the premise behind the public-interest theory of regulation. Terms like "fairness" and "just and reasonable prices" have subjective connotations that challenge regulators to balance the dual objectives of fairness and cost-effectiveness. Because of legal and other restrictions facing regulators, MCDA reduces to solving a constrained, multi-objective optimization problem.

on fairness, regulators might find it easier to eliminate those policies that are clearly unfair before determining whether a particular policy passes a "fairness" test. Regulators may then say, "I can detect unfairness when I see it," rather than to say, "I know when something is fair." The latter usually requires determining that an outcome is fair even though it negatively impacts some people while benefiting others, relative to an alternate outcome. Regulators would then have to make a subjective judgment that a particular redistribution of economic well-being passes some "fairness" threshold.

Assume next for simplicity that the three rate mechanisms under consideration include the existing mechanism (i.e., the standard two-part tariff where the volumetric charge includes most of a utility's fixed costs[48]), a RD rider and a SFV rate structure. Although other rate mechanisms might address the alleged problems of revenue insufficiency and utility disincentives for energy efficiency – a declining block rate structure and earnings sharing mechanism, for example – the assumption is that the PUC, for whatever reason, would not seriously consider them.[49]

The next step in the MCDA process would require the PUC staff or some other objective party[50] to assess the performance of the candidate rate mechanisms according to each criterion. This part of MCDA demands objective analysis and information compiled by PUC staff. Judgment is necessary, but it is objective judgment that becomes transparent. This aspect of the ratemaking process is more scientific in nature, as predicting the outcomes for the different rate mechanisms relies on both economic theory and empirical evidence (e.g., the experiences of the options in real-world applications).[51] Assume that the analyst gives scores (from a scale of 1-5, with a higher score indicating better performance[52]) to each option for each criterion, as shown in Table 1.

Table 1. Scores for Different Rate Mechanism/Criterion Combinations.

Rate Mechanism	Revenue sufficiency	Incentives for utility-initiated energy efficiency	Economic efficiency	Fairness
Standard tariff	2	1	3	5
RD rider	5	3	3	3
SFV	5	3	5	1

For each criterion, the performance scores require at the minimum how each option compares with the others. We know that the utility is less likely under both the RD rider and SFV, for example, to experience a revenue shortfall than under the standard two-part tariff [53] For some readers, to say that each of these methods should receive a

48 See Costello (2006) and Feingold (2016).

49 The regulator might eliminate outright these other rate mechanisms because they impede critical regulatory objectives previously enunciated by the regulator. They also may conflict with state statutes. It could also be that stakeholders have petitioned just the RD rider and the SFV options, with the regulator not considering other options. This is a position thatHempling (2013) refers to as a passive regulator who believes that its job is merely "to call balls and strikes."

50 An objective party would advocate the public interest rather than special interests.

51 For example, would a RD rider induce utilities to invest more in energy efficiency programs? Would a SFV rate increase the gas bills of low-income households?

52 The decision-maker can choose a range of performance scores; for example, a range of 1-25 or 1-100. One interpretation of the 1-5 range illustrated here is as follows: 1 (poor/subpar), 2 (mediocre), 3 (average), 4 (above average), 5 (excellent). One can compare this scoring to a school letter grading system: A, B, C, D, F. In effect, the performance scores are normalized so that the worst performer for a particular objective receives a score of one and the highest performance receives a score of five. Alternatively, the decision-maker may want to give "pluses and minuses" to the scores. For example,instead of the whole numbers (1-5), she may want to give 1.5, 2.5, 3.5, 4.5, 5.5 scores; a 3.5 score would indicate that she believes that the performance of a particular rate mechanism is higher than average but below above average.

53 The reason is that under both rate mechanisms actual sales would have no or a lesser effect on a utility's rate of return than under the standard two-part tariff. In fact, regulators have rationalized their approval of RD riders for gas utilities in part because of the declining use of natural gas per customer and the push for utility-financed energy efficiency programs. Under such conditions, regulators feared that utilities would likely fall short of achieving their authorized rate of return. See Costello (2006) and Morgan (2013).

score of five while the standard method receives a score of two would seem hard to fathom. Yet, these scores could come from objective information and analysis. The PUC staff, for example, could compute the average deviation of actual earnings from allowed earnings over the past several years, assuming each rate mechanism was in place. Assigning scores to each option requires a combination of judgment by the analyst and available objective information.

Next, the PUC's commissioners collectively (i.e., the ultimate decision-maker) must express their relative preference for each criterion by assigning relative weights to them. This requires balancing various elements of the public interest. Assume that a PUC assigns the following weights (which add up to 100 percent):

- Revenue sufficiency: 30%[54]
- Incentives for utility-initiated energy efficiency: 20%
- Economic efficiency: 10%
- Fairness: 40%

The weighting of each criterion by a PUC requires a combination of subjective judgment and acknowledgment of statutory and constitutional mandates. State statutes may require regulators to consider certain objectives and even mandate that they prioritize others (Filipink, 2009). The above illustration shows that the PUC assigns the most weight to fairness[55] – a weight four times as heavy as the weight assigned to economic efficiency.[56] It allots the next highest weight to revenue sufficiency. At the other extreme, the PUC assigns the lowest weight to economic efficiency. It considers revenue sufficiency to be three times more important in serving the public interest than economic efficiency, and one and a half times more important than incentives for utility-initiated energy efficiency.

The next step involves combining the performance scores and "criterion" weights to compare and rank the different options. One common strategy or decision rule is to add up the scores for each option, weighted by the significance attached to each criterion, and rank the options based on the weighted scores.[57] We can express this so-called additive linear (i.e., decision) rule as: [58]

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[54] While the assumption that we are making is that the utility expects to recover its costs, including earning a suitable rate of return under any rate mechanism, the regulator knows that the chances of the utility achieving this outcome varieswith the rate mechanism. For example, revenue decoupling increases the chances, although it does so by shifting the demand risk from utility shareholders to customers. A rate mechanism, not discussed here, price-cap regulation has the opposite effect of shifting demand risk and other risks to utility shareholders.

[55] Fairness can pertain to the distributive effects across different customers or the distributive effect between customers as a group and utility shareholders.

[56] This is not unreasonable. The main goal of regulation is not merely to promote *economic efficiency*: regulation originated and developed prior to the ideas of economic efficiency and the principles of welfare economics. Most enabling legislation mandates just, reasonable, and fair rates, not efficient rates per se. Throughout the history of state utility regulation, for example, "fairness" is a major consideration in ratemaking. Reasons for why regulators would not maximize economic welfare (i.e., take the most efficient actions to correct market failures), which, incidentally, some analysts associate with the public interest, include: (1) individuals have, besides economic objectives, non-economic objectives (e.g., due process) that are affected by regulation but not accounted for by welfare economics; and (2) political institutions and administrative processes influence regulatory actions. These two reasons can explain why a rational regulator would be unlikely to seek to maximize conventional measures of economic welfare (i.e., the sum of consumer and producer surplus).

On the other hand, one can argue that the primary objective of utility regulation should be to promote economic efficiency. While other objectives may be important, they can best be addressed by legislatures and other entities of government. For example, affordability of gas service is a legitimate concern but regulators, as some have argued, should support the most efficient, rational rate design (where all customers receive the right price signals) and treat the affordability concern separately. Legislatures could provide funding to assist low-income households, or utilities could offer low-income households a rebate or some lump-sum assistance (funded by other customers), or even a lower fixed charge. This would have a lesser effect on economic efficiency than persisting with rates that are economically irrational and antithetical to society's welfare.

[57] This simple arithmetic approach is only appropriate if the criteria are mutually preference independent (Department forCommunities and Local Government: London, 2009). In this paper, independence occurs when performance scores assignedto the rate mechanisms under one criterion are not affected by the scores assigned under another criterion, which we assume and seems reasonable.

[58] Sometimes analysts refer to the equation as the additive multi-attribute value rule. Non-linear equations that are also applied in MCDA models include multiplicative functions.

$$V_j = \sum w_i S_{ij}$$

where w_i represents the weight assigned to the ith criterion and s_{ij} is the score ascribed to the jth option for the ith weight. The overall value for each option (Vj) equals the performance score for each criterion (for example, the performance score of SFV for promoting economic efficiency, which in our example equals five times the weight of that criterion), summed across all criteria. In other words, the overall score for each option is a weighted average performance metric, where the weights represent the relative importance of each criterion. The additive linear rule is appropriate only if the scores assigned to one criterion is independent of the scores assigned to other criteria (e.g., the performance score assigned to revenue sufficiency is independent of the score assigned to economic efficiency); that is, the criteria are mutually exclusive.

This aggregation rule involves simple arithmetic and has intuitive appeal as an indicator of the public interest. The total-score concept coincides with the utilitarian theory that options with the highest scores would have the most beneficial effect on the public interest.[59] The additive linear rule provides a cardinal ranking of options, revealing both the order and the "outcome" distances between options. The weights reflect the trade-offs between different objectives. By pursuing the SFV option, for example, a PUC impedes the "fairness" objective.[60] Comparing and ranking the options based on total scores account for the importance of all criteria collectively. Under the rule, maximizing the weighted sum of the criteria leads to a desirable option, at least relative to the other contending rate-mechanism options. [61]

Table 2 illustrates the construction of a performance matrix applying the weights and performance scores given above. Scores for performance range from one to five, with a higher score indicating better performance. The boldface score in each cell equals the performance score for the rate mechanism for a criterion times the weight of the criterion. The weighted score for the revenue-sufficiency performance of the standard rate mechanism, for example, equals 2 x 30% =.6.

The example shows that the RD rider has the highest total score with SFV rate structure having the lowest score. The reason for the attractiveness of the RD rider, relative to the standard tariff option, is its better performance in advancing the objectives of revenue sufficiency and utility-funded energy efficiency. The trade-off is that the PUCs deem the RD rider to have lower fairness. If PUCs choose the RD-rider option, implicitly they are willing to risk the possibility of public disapproval – and perhaps have planned to take measures to address the disapproval by explaining the long-term benefits of its decision – to advance what they deem objectives that are more important.

Regarding the SFV option, in this example it ranks the lowest because of the combination of the high weight assigned to fairness and its low performance for this criterion. From the standpoint of economic efficiency, the SFV

[59] The caveat here is that, although the best overall score reflects the preference of a regulator, it may not represent society's best choice. The reason is that the regulator's ranking of ratemaking objectives (i.e., the relative weights of the identified objectives) may differ from society's. There is a large literature on why regulators would pursue their own or private interest over the public interest. See Peltzman (1976), Posner (1969) and Rossi (2009).

[60] The rationale for a low "fairness" score for the SFV option is that this rate mechanism passes demand risk to customers plus disproportionally hurt low-usage customers, many of whom are low-income households. Much of the criticism against SFV rates lies with its perceived unfairness (Lazar and Gonzalez, 2015; and Costello, 2014).

[61] Since obviously individual commissioners assign different objectives to ratemaking and place different weights on them, not all commissioners are going to agree on what is the preferred option. A commission decision hinges on the majority choosing a particular rate mechanism. So the previously discussed performance score applies to each individual commissioner rather than for the commission collectively.

One thing to note is that each commissioner would impute weights to individual objectives when it decides a case. While it would be appropriate for commissioners to identify ratemaking objectives at a prior time (e.g., in a rulemaking forum), it would be asking too much for them to assign weights to each one at that time. A reason is that circumstances change over time that could change the relative weights. For example, if economic times become tough, commissioners may want to assign a higher weight to affordability of utility service. Another example is revenue sufficiency becoming more critical if a utility needs to invest in large project in the future. In other words, weights are dynamic, susceptible to fluctuation because of the changing political and economic landscape.

option outperforms the other options. Yet, this outcome contributes little to its total score because of the low weight assigned by the hypothetical PUC to economic efficiency. The preference of RD riders over SFV suggests that, with these two options neutralizing each other for the objectives of revenue sufficiency and incentives for utility-funded energy efficiency, fairness dominates the economic-efficiency criterion.[62] For convenience, our illustration simplifies the real world, where PUCs may frown upon SFV for other reasons. These reasons can include the adverse effect it would have on low-usage customers and the radical change in rate structure that it represents.[63]

Table 2. An Example of a Performance Matrix for Three Rate Mechanisms.

Rate Mechanism/Criterion	Revenue sufficiency w = 30%	Incentives for utility-initiated energy efficiency w = 20%	Economic efficiency w = 10%	Fairness w = 40%	Total score
Standard tariff	2 0.6	1 0.2	3 0.3	5 2	3.1
RD rider	5 1.5	3 0.6	3 0.3	3 1.2	3.6
SFV	5 1.5	3 .6	5 0.5	1 0.4	3.0

In determining the robustness of the relative scores for the different rate mechanisms, regulators can vary the weights assigned to the criteria in addition to the performance scores for each option-criterion combination.[64] Assume first that regulators view SFV as having the same fairness as the RD-rider option. SFV would then have the highest score. (In Table 2, assigning a performance score of three to the SFV-fairness cell brings the total score for SFV to 3.8.) Assigning a higher weight to economic efficiency could also improve the score for SFV relative to the other options.

The previous illustration applying MCDA simplifies the complexities of real-world ratemaking decisions by regulators. It shows, perhaps more than anything, how this decision-making tool provides a conceptual framework for better understanding why regulators prefer some rate mechanisms over others. If a regulator leans toward a particular rate mechanism scoring poorly in all categories other than fairness, the regulator will know that fairness implicitly dominates all others.[65] The regulators might then want to reevaluate this predisposition, knowing that it would jeopardize other objectives also deemed important (although lesser so).

To summarize, applying a systematic approach like MCDA can help make regulatory decisions, and the underlying reasoning, more explicit, rational, efficient and transparent. It can assist regulators in making trade-offs among multiple objectives by allowing them to consider the implication of different value judgments on the relative importance of each objective (i.e., whether changing the weights for the objectives will change the ranking of options). Solving a multi-criteria problem, such as ratemaking, usually involves finding a solution by making trade-offs among the different objectives. Also from a utility perspective, knowing the trade-offs, values and rationale of

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62 This is not surprising (see *supra* note 56).

63 In other words, a PUC or any regulator may disfavor SFV because it violates a "fairness" standard and the "gradualism" objective. Past experiences in the US has shown that regulators do eventually adapt to a changed market, technological and political environment by throwing their support to new rate mechanisms (Joskow, 1974). Changes follow when the political equilibrium has been disrupted (i.e., stakeholders are so unsatisfied with the current situation that they expend substantial resources to change the status quo). But, from the author's casual observation, regulators don't take drastic action without first having a good idea of the effects. Regulators usually prefer a gradualist approach to rate design and ratemaking. After all, the longstanding legacy of utility ratemaking in the US and in several other countries is average-cost pricing or rates based on historical embedded cost.

64 The performance scores might not require sensitivity testing when based on objective analysis. Because of the uncertainties over some of the performance score, however, regulators may find sensitivity testing useful.

65 An elected regulator (Voters in eleven US states elect their public utility commissioners.) might assign a higher weight to fairness, believing that it would increase the electability of the commissioners in a future political race.

a regulator in using MCDA could help a utility to better understand and respond to regulator's policy from the outset. MCDA can therefore achieve greater success than if the decision-making process is done in a vacuum.

Table 3 illustrates the major tasks for regulators in executing MCDA. These tasks coincide with the seven steps of MCDA identified earlier in this section. A regulator might find it difficult to perform all of these tasks quantitatively. At the minimum, however, it can at least qualitatively undertake these tasks as part of its decision-making process. A regulator can assess whether a particular rate mechanism would hinder certain objectives while advancing others without knowing exactly the overall effect on the public interest.

Table 3. A Generic Multi-Criteria Approach for Evaluating Rate Mechanisms.

Step	Task
Framing the decision problem	• What is the nature and consequences of problems with the existing rate mechanism? • How would the situation look under ideal conditions? • How would alternative rate mechanisms address the problems? • In general terms, what effect would the ratemaking options have on individual regulatory objectives?
Defining the objectives and evaluation criteria	• Articulating ratemaking principles underlying "just and reasonable" prices • Identifying criteria of ratemaking consistent with those principles
Specifying the options	• Identifying ratemaking options that can address current problems
Developing the performance matrix	• Collecting unbiased information • Analyzing each candidate rate mechanism for each specified criterion • Ranking or measuring the performance of each rate mechanism for each criterion
Identifying regulators' preferences	• Ranking or weighting of criteria by regulators
Selecting a strategy or decision rule	• Combining the information from the performance matrix with the regulator's preferences for each criterion • Comparing each rate mechanism based on a decision rule (e.g., additive linear rule)
Interpreting the results and applying sensitivity analysis	• Evaluating each rate mechanism based on the decision rule. • Identifying the stability of the relative rankings with varying criterion weights and performance assessments

4.4. Alternative decision strategies

In applying MCDA, regulators can choose from several strategies in deciding on which rate mechanisms to approve and reject. The previous discussion focused on one strategy, the additive linear rule, which considers all criteria, weights them, and multiplies them by the performance scores for each option. The decision-maker then ranks the options based on total scores.

Discussed below are strategies that deviate from the MCDA approach but contain some of its characteristics; for example, assign weights if not quantitively to some (e.g., the core) criteria and calculate performance scores. From this author's experiences, US regulators have adopted these strategies in one form or another in past ratemaking decisions. These strategies are less data intensive and complex than the core MCDA approach.[66] Whether they have produced inferior results is a thought-provoking question that merits further study.

[66] Some readers may consider these strategies as shortcuts, or simple heuristics or rules of thumb, to decision-making, at least compared with the MCDA approach. They are shortcuts in the sense that the decision-maker is content with her choice even though additional effort could yield higher benefits (Simon, 1955; and Kahneman, 2011). Simple heuristics can reflect rational decision-making, however, in that the incremental effort and cost (say, to collect additional information) would yield nominal or even no benefits.

Bounded rationality strategy: The regulator finds an option acceptable even if not optimal (Simon, 1955); this strategy avoids having to assign quantitative weights to each criterion. Regulators uses the rule of thumb that an option is acceptable, at least for further deliberation, when it meets or surpasses a threshold for the most important criteria. Assume that a regulator deemed fairness and revenue sufficiency as the only critical criteria. If an option seems not to violate fairness standards[67] in addition to allowing the utility a reasonable opportunity to earn its authorized rate of return, it can find the option acceptable if not the superior choice. Passing muster, for example, may mean that a rate mechanism achieves a minimum score (say 3 or 4) for the criteria equity and revenue sufficiency. The premise behind bounded rationality is that the effort required to reach the optimal choice is not worth the difference in the realized benefits between a satisfactory and an optimal choice.

Elimination-by-aspects strategy: This strategy is similar to the bounded rationality strategy in eliminating those options that fail to satisfy critical criteria or do not have highly desirable attributes (Mullet, 1992). It proceeds to set a threshold value for the most important criterion and then proceed to the next important criterion, and so forth. The regulator could exclude, for example, any option that received a score of two or lower on "economic efficiency." One outcome of this strategy, as well as of the bounded rationality strategy, is that an option could outperform another option for most of the criteria, but the regulator rejects it if it fails the most significant ones. This strategy becomes less problematic to the extent that the most important criteria overwhelm the other criteria (for which this strategy gives little consideration) in advancing the public interest. The regulator might assign extremely low weights to these other criteria, with the reasoning that they have little effect on the overall public interest.

Incrementalism strategy: This strategy compares the performance of new possible options with the option currently in place. The intent is to look for options that can best overcome the problems associated with the current option. The term "incrementalism" refers to the nature of this strategy to improve upon the status quo, rather than take a comprehensive review of all options in terms of their overall effect on the public interest (Lindblom, 1979). This strategy might limit the regulator's review of rate mechanisms, for example, to those that accommodate a utility facing competition and avoid the possibility of uneconomic bypass.[68] It might confine its review to rate mechanisms like special contracts, discounted tariffs, or value of service rates. The regulator might focus almost exclusively on the efficacy of a rate to allow the utility to compete on an equal basis with competitors (e.g., flexible and discount rates). By ignoring other rate objectives, or giving them inadequate consideration, the regulator risks approving a rate that, while promoting the objective at the center of attention, impedes other objectives that affect the public interest as well.

Lexicographic strategy: This strategy assigns a distinctly higher weight to certain criteria (Colman, 2008). It proceeds by ranking the options based on the most important criteria or those criteria dictated by statutory and constitutional requirements. If two options ties, the regulator then ranks them based on the second most important criterion, and so forth. If the regulator deems revenue sufficiency as the most important criterion, as an example, it could view the RD rider and SFV rate structure options as equals. If the regulator identifies incentives for utility-funded energy efficiency as the second most important criterion, they may again consider the two options as equals.

As noted by one Nobelist, "there are…situations in which skilled decision makers do better when they trust their intuitions than when they engage in detailed analysis." (Kahneman, 2003, 1469)

67 Undue discriminatory rates, and rates that shift all risks to customers when the utility can better shoulder those risks and have some control over them, would seem to violate a fairness standard.

68 Uneconomic bypass refers to the condition where a customer turns to a non-utility provider for one or more services when the alternative provider has higher total costs but lower prices. It is uneconomic because society incurs higher cost in meeting the demands of a customer. One major cause of uneconomic bypass is the inability of the local utility to lower its rates below fully allocated embedded costs, which under certain circumstances – for example, a utility has a high level of surplus capacity – could far exceed its marginal cost. Another cause of uneconomic bypass is faulty rate design where certain customers within a grouping, such as high-usage customers within the industrial class, pay more than the utility's cost of serving them and, thus, higher then competitive alternatives (Einhorn, 1989-1990.).

If then it deems fairness as the third most important criterion, they might then decide to choose the RD rider over SFV.

Conjunctive strategy: This strategy requires that for any single option to warrant non-rejection it must meet a minimum threshold for each criterion (Grether and Wilde, 1984). The regulator might reject outright a declining-block rate structure just because it violates the objective of encouraging price-driven energy efficiency.[69] A seasonal rate structure might also not pass muster because of the large effect it could have on increasing utility bills during the period of peak usage.[70]

The regulator can combine different strategies for selecting a rate mechanism. It can eliminate certain options[71], for example, using the bounded rationality strategy and then apply the additive linear rule to assess the surviving options. Taking our previous illustration, the regulator might outright reject the SFV option because of its low score for fairness, and then select either the standard rate option or the RD rider option based on the additive linear rule.

The regulator may also supplement any of these strategies by adapting them to new information. It can review a new rate mechanism in place for a few years to determine whether it has performed as expected. This review involves both monitoring performance and revisiting the objectives, the performance scores under those objectives, and the weights for the objectives. As an illustration, assume that the regulator previously approved a RD rider, but circumstances have changed in three years where the gas usage per customer has ended its historical downward trend (one rationale used by US regulators to approve RD riders), and utility-initiated energy efficiency has become less important because of sharply falling gas prices. This scenario should cause the regulator to pause and reconsider continuing with the RD rider.[72] By not reviewing periodically new rate mechanisms, especially in a dynamic environment, or even longstanding rate mechanisms for that matter, the risk is that the mechanism, although tenable when approved, might no longer serve the public interest.[73]

5. Summary and conclusions

The conflicting effect of different rate mechanisms on regulatory objectives exemplifies the complexity of regulatory decision-making in assessing the different practices. Regulators usually assign a set of objectives to ratemaking, each having a different effect on the public interest (Hanser 2012; and Costello, 2014). When the regulator considers different rate mechanisms it cannot ignore the trade-offs that are inescapable. In supporting marginal cost pricing, for example, the regulator advances the goal of economic efficiency while possibly impeding the goals of gradualism and fairness. The observation that regulators infrequently endorse marginal cost pricing infers that they consider the downsides of this pricing methodology to dominate any economic-efficiency benefits

[69] In recent years declining block rates have fallen out of favour in the US. because they encourage additional electricity and natural gas consumption. Declining block rates, however, have the benefits of providing a utility with earnings stability (by allowing it to recover its fixed costs in the lower-usage blocks) and of promoting economic efficiency when it sets tail-blocks charges at or close to marginal cost. (Economic efficiency requires only that the pricing of the unit of service consumed at the margin corresponds to marginal cost – not that all units of service do.)

[70] Similar reasoning can explain the little use of real-time pricing for small electricity customers. Depending on the specific design, such pricing can result in highly volatile prices that the regulator believes would lead to widespread public opposition. Real-time pricing could also lead to customers having higher utility bills if they do not curtail their consumption during peak periods, again depending on the rate structure (Costello, 2004).

[71] These options may fail to satisfy statutory requirements, meet with strong political opposition, or are contrary to precedent.

[72] Such a review assumes the RD rider had negative features (e.g., risk shifting to customers) that the PUC judged to fall short of the positive features, with the PUC consequently approving the mechanism. Later, these positive features might no longer be relevant, thus calling into question the merits of the RD rider.

[73] While some regulators may do this, other may not. Some regulators may rationally delay their acceptance of a new rate mechanism because of risk-aversity: they may perceive a new rate mechanism to have uncertain outcomes that could make matters worse, which could happen with a poorly structured and executed new rate mechanism. It could also be that some regulators exhibit a high level of bureaucratic inertia, setting a high bar for a new rate mechanism to receive their approval.

(Bonbright, 1988). Countless other examples exist where a regulator has to contemplate the positive and negative outcomes of a rate-mechanism proposal before reaching a decision (Costello, 2014).

Regulators often react to the filings of utilities and the positions of other stakeholders in the absence of predetermined principles and criteria for ratemaking. Under this strategy, the utility takes the first step in framing the issues in line with its narrow interests, which may conflict with the public interest. As a preferred approach, the regulator should take the initiative, for example by rulemaking, by laying out ratemaking principles and by identifying the objectives /criteria of a good rate mechanism. Such action can help shape the form of a rate filing to be aligned with the regulator's preferences. Ratemaking principles would tend to be invariant over time, as they should represent a general guide to good ratemaking under a wide array of market, technological and political environments. Objectives/criteria, on the other hand, can change as markets evolve and the economic, technological and political landscapes change. New ratemaking objectives can emerge, with some old ones discarded or relegated to a lower status. How regulators weigh these objectives can change over time and vary among utilities as they face different circumstances (Joskow, 1974).

MCDA can improve regulatory decisions by making more explicit the relationship between different rate mechanisms and the public interest. It allows a regulator to assess systematically proposals based on both unbiased and subjective information. Under this approach, prior to a utility proposal, a regulator would have enunciated its ratemaking principles and objectives in a public proceeding. MCDA helps regulators to (1) recognize the overriding goal of serving the public interest, (2) articulate their objectives and the relative importance of each, and (3) apply a decision rule or strategy that takes as input unbiased information and analysis as well as the ratemaking principles and objectives previously enunciated. Under one application of this approach, regulators specify and weight the objectives, analyze the effects of each rate option on those objectives, and evaluate and rank each option in terms of satisfying the overall objectives (i.e., serving the public interest).

Under MCDA, regulators can also examine the robustness of rankings by varying the weights of each objective as well as the performance of each rate-mechanism option. After all, since these variables are highly subjective (e.g., the weights represent the regulator's relative preferences for the different ratemaking objectives) and subject to disagreement, it makes sense for the regulator to discern the sensitivity of the rankings as these variables take on different values.

To some readers, MCDA seems no more than a theoretical construct with limited application for the real-world of public utility ratemaking. While regulators may not want to or lack the resources to carry out all the steps presented in this article, MCDA can provide direction to regulators in evaluating new rate mechanisms and ultimately reaching decisions that are more transparent, rational and attuned with the public interest. As with most analytical tools, MCDA should not by itself determine a regulator's decision (Keeney and Raiffa, 1976). Regulators must still exercise judgment, relying on MCDA as a contributor to good decision-making.

Finally, as an added benefit MCDA can provide analysts with a better understanding of why regulators are more receptive to some rate mechanisms than to others. Do regulators assign an "unusually" high performance score for those objectives that favor a specific rate mechanism; or do they ascribe a high weight to those objectives that back certain rate mechanisms? How do regulators trade-off the different objectives? For example, how much are regulators willing to compromise economic efficiency by favoring a rate mechanism that advances fairness or achieves greater financial security for the utility?

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