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Ratemaking for Conservation: The California ERAM Experience

C. Marnay and G.A. Comnes

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RATEMAKING FOR CONSERVATION: THE CALIFORNIA ERAM EXPERIENCE

Chris Marnay

Applied Science Division
Lawrence Berkelely Laboratory
Berkeley, CA 94720

G. Alan Comnes

Division of Strategic Planning
California Public Utilities Commission
San Francisco, CA 94102

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Abstract

The Electric Rate Adjustment Mechanism (ERAM), adopted by the California Public Utilities Commission for the major investor-owned utilities in the state, represents a major departure from traditional rate-of-return ratemaking. ERAM removes the anti-conservation bypass of ratemaking by ensuring the utility will fully collect its authorized revenue requirement irrespective of the level of sales. Over or undercollections of revenues accrue to a balancing account and are amortized into future rates. This mechanism protects the utility from the risk of sales deviating from expectations for all reasons. Shielding the utility in this way can confound other policy goals which rely on the utility facing incentives other than those created by ERAM.

INTRODUCTION

Since the adoption of the Electric Revenue Adjustment Mechanism (ERAM) by California, the introduction of ERAM-like mechanisms has been contemplated by other jurisdictions.[1] ERAM removes an anti-conservation bias of traditional rate-of-return regulation by guaranteeing that a utility will collect its authorized revenue requirement, irrespective of its level of sales.[2] ERAM enjoys wide support in the industry in California and is particularly enthusiastically endorsed by conservationists.[3] The California utilities have opposed the removal of ERAM, and the National Association of Regulatory Utility Commissioners Energy Conservation Committee stands on record as supporting ERAM-like ratemaking reforms.[4] However, some members of the California Public Utility Commission (CPUC) staff have recommended the elimination of ERAM, and a few policy analysts outside the State have also expressed reservations.[5]

In this paper, it is assumed that encouraging energy conservation and fostering competition in the supply of electricity are both established California energy policies, and the cases for and against such policies will not be argued. Within this context, the goal here is merely to describe the history and the mechanics of ERAM in some detail, drawing on the formal records and using a simple model of ERAM's operation. Hopefully, some appropriate lessons from the California experience can be learned.[6]

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1. See, for example, Jones 1989, Moskovitz 1989, and Weil 1989.

2. decoupling of utility earnings from sales was only one of the motives for the initial implementation of ERAM. Notably, ERAM was intended to bolster the financial health of the utilities. See the History of ERAM section for more details. However, the decoupling motive is emphasized here because it is the motive that concerns most jurisdictions currently considering ERAM.

3. Cavanagh, 1988

4. *NARUC Bulletin*, 8 August 1988, page 19

5. Sissine, 1989

6. To demonstrate the policy problems that can result from ERAM, an example from recent California regulation is developed in the appendix.

BACKGROUND

In 1982, the California Public Utilities Commission introduced a unique regulatory procedure called the Electric Revenue Adjustment Mechanism, which tends to eliminate a recognized anti-conservation bias in prior California regulation.[7] The bias results from the phenomenon that, under California regulation, utilities gain when actual sales exceed those forecast, and vice-versa. This creates an anti-conservation incentive because conservation programs that prove more effective than anticipated hurt utility earnings, while ones that fail benefit the company. ERAM eliminates this incentive by automatically ensuring that utilities collect their exact authorized base revenue requirement over time, irrespective of the volume of sales. Consequently, ERAM reduces company risk and tends to keep profits more stable while maintaining the incentive to cut costs and improve productivity. While ERAM is conceptually straightforward, implementation in California has inevitably evolved into accounting procedures that are confusing at first glance. Therefore, some understanding of California ratemaking practice must precede understanding of ERAM mechanics.

ERAM periodically adjusts the non-fuel part of rates, *base rates*, to ensure that the utility actually collects its full authorized revenue requirement. ERAM achieves this parity by maintaining a balancing account in which miscollections of revenues accrue. This accounting procedure mimics the conduct of the California Energy Cost Adjustment Clause (ECAC), a familiar process in many states.[8] Both ERAM and ECAC balancing account mechanisms address the problem of actual revenues straying from authorized levels between general rate cases. ECAC adjustments attempt to account for unanticipated fluctuations in fuel costs, while ERAM accounts for unanticipated fluctuations in sales volume. Note that ECAC ensures that most actual fuel costs are recovered, while ERAM ensures that authorized non-fuel costs are recovered; that is, the existence of these mechanisms together considerably reduces utility risk exposure.[9] The utility can still exceed its authorized rate of return on rate base by improving productivity, that is, lowering non-fuel costs below auth-

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7. The major electric utilities regulated by the CPUC are Pacific Gas and Electric (PG&E), Pacific Power and Light (PP&L), San Diego Gas and Electric (SDG&E), Sierra Pacific Power (SPP), and Southern California Edison (Edison).

8. also often called fuel cost adjustment or fuel offset mechanisms

9. This not exactly true. See the discussion of AER below.

orized levels. Conversely, poor productivity performance is penalized by a lower rate of return.

A third California mechanism, the Attrition Revenue Adjustment (ARA, or simply, *attrition*) also prevents a wedge from developing between a utility's costs and its authorized revenue requirement during years between general rate cases. Attrition attempts to take account of several specific sources of such a wedge, notably, inflation, changes in plant costs, and fluctuations in the cost of capital. ARA and ERAM work together; ARA adjusts the revenue requirement and ERAM guarantees its collection.

ERAM protects utilities from the consequences of sales deviating from those forecast, the fluctuations of most concern to the drafters of ERAM being sales losses resulting from successful conservation programs. In the absence of ERAM, they successfully argued, regulatory incentives unnecessarily discourage adoption of beneficial conservation by the utilities because encouraging sales beyond those forecast is rewarded with a higher rate of return on rate base, while lower sales depress earnings. This phenomenon exists because generating and selling an extra kWh imposes little cost on the utility relative to the additional revenue collected. To appreciate just how small the incremental cost of generation is, notice that ECAC guarantees the collection of the extra fuel cost, which becomes just a pass-through. The incremental cost borne by the utility consists of only labor, transmission, accounting, etc.[10]

The guarantee of collecting authorized revenue requirement was also intended to bolster the failing financial health of the California utilities in a troubled time. During the mid-1980's, however, California utilities achieved comfortable reserve margins as the San Onofre and Diablo Canyon nuclear stations came on-line, non-utility generation appeared in unexpectedly large amounts, and fuel prices fell precipitously. All these factors considerably weakened the conservation imperative.[11] Further, some troublesome aspects of ERAM surfaced and, as part of an extensive review of California electric ratemaking, the

10. Note that this another way of saying that ECAC has made a bad situation worse by forcing prices to further deviate from marginal cost.

11. See, for example, Calwell and Cavanagh, 1989. Messenger, 1989, and CEC/CPUC, 1988

elimination of ERAM was recommended by the CPUC staff. California utilities and various lobbyists, however, vigorously opposed ERAM's elimination, and, for now, the Commission has elected to retain it. For the moment, ERAM remains embedded in the State's regulatory structure.

Some other states have or have had automatic mechanisms that routinely adjust rates to ensure that rate-of-return targets are met. In New Mexico, for example, a Cost of Service Indexing (COSI) system that automatically adjusted rates between hearings to ensure that rates of return kept within a half percent of the target rate was in effect from 1975 to 1982.[12] While the COSI system was overturned by the New Mexico legislature, a similar arrangement in Alabama called the Rate Stabilization and Equalization process continues in effect. Nonetheless, rate-of-return stabilizing measures are rare and the adoption of ERAM by the CPUC marks an historic deviation from traditional rate-of-return regulation. While ERAM does not guarantee the California utilities can earn their allowed rate of return on rate base, in effect, it does the next best thing by ensuring collection of their authorized revenue requirement whatever the volume of sales. ERAM can actually be more favorable to the utilities than a rate-of-return guarantee because the cost minimizing incentive remains in place and the utility can, in fact, exceed its allowed rate of return on rate base by effective cost control. ERAM, therefore, represents a highly favorable departure from traditional ratemaking, from the utility perspective.

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12. Radford, 1988, page 240.

CALIFORNIA RATEMAKING

Introduction

Most rate-of-return ratemaking uses a test year approach, but California is unusual in that the test year is in the future and all test year parameters used in regulatory proceedings are based on forecasts.[13,14] California regulation also deviates from the norm in that general rate cases (GRC's) are conducted at regular three-year intervals, rather than whenever the utility chooses to initiate a proceeding by filing for a change in rates.[15] The two years in which GRC's are not held are called the *attrition years.* In the GRC, the revenue requirement of the utility for the test year are forecast, and they are simply divided by forecasted sales to find the rate necessary to recover the approved utility's costs, which includes the approved rate of return. In the case of electric utilities, the CPUC intends the utility to collect all non-fuel costs through this basic process. Non-fuel costs include depreciation, return on investment, taxes, salaries, and other expenses. The rate that emerges from the calculation is called the *base rate.* However, since fuel costs are considered more volatile, regulators separately calculate a fuel component to rates in the more frequent ECAC proceedings.

ERAM concerns only the recovery of base rate revenue requirement; that is, it has no effect on the ECAC component in customer rates. However, determination of the ERAM adjustment occurs within the proceeding that determines ECAC rates, simply for convenience.

General Rate Case Cycle

While the base and ECAC rates are the two major conceptual components of customer tariffs, any reference to real historic data would show that base rates, far from being fixed between the triennial GRC's, actually change frequently over time, exclusive of ERAM.

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13. California is by no means the only state that uses forecast test years; however, most states use historic test years.

14. The purpose of this discussion of forecast test years is not intended to imply that ERAM is applicable only in jurisdictions with forecast test years. Rather, the intent is to set the regulatory stage on which ERAM plays. Note also that the forecast gaming problem that ERAM attempts to address exists wherever forecasting is used in ratemaking, irrespective of whether the test year is in the future or the past.

15. In most jurisdictions a proceeding can also be instigated by commission staff.

California has an attrition mechanism which adjusts rates in all non-GRC years. Also, the prudence review of a major utility project typically occurs in a proceeding separate from the GRC. When a decision comes, the authorized revenue requirement adjusts accordingly. Less generically, the start-up of nuclear power plant decommissioning funds has caused revenue requirement changes as have changes in tax expenses resulting from the 1986 Tax Act.

In summary, the sources of rate base adjustments include the following: 1. the initial base rate is not fixed but is adjusted for attrition and changes in sales forecasts; 2. the CPUC conducts prudence reviews of new plant additions or other utility decisions that can result in base rate changes. California currently has a policy of a fixed three-year GRC cycle, the first year of which always serves as the test year.[16] In all years, including the GRC year, the authorized revenue requirement is updated by the *attrition* process. The ratemaking cycle, then, is as follows:

year 1: This is the year following the GRC and always serves as the test year in that case. A financial attrition hearing is also held to set the financial attrition adjustment for year 2. An ECAC hearing including the ERAM adjustment takes place.

year 2: A financial attrition hearing for year 3 is held. An ECAC hearing including the ERAM adjustment takes place.

year 3: Both the GRC and an attrition proceeding are conducted. An ECAC hearing including the ERAM adjustment takes place.

Additionally, there is an ECAC hearing and an ERAM adjustment every year, using a forecast test year.

Attrition

Many states have introduced attrition mechanisms, although implementations differ widely. The notion of attrition emerged during the late 1970's, when rapidly rising costs eroded earnings because revenues are fixed between rate cases. California attrition has two main components, operational and financial.

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16. The regular cycle was adopted in 1984, but is beginning to break down because of the ongoing merger proceeding for Edison and SDG&E.

Operational attrition adjusts for the utility's cost of service in years between rate cases. It is generally separated into two portions, expense and capital. The expense portion of attrition essentially adjusts operating expenses for inflation. The capital portion, sometimes called *rate-base* attrition, accounts for expected changes in real plant resulting from forecasted plant additions and customer growth.[17] While certain details regarding operational attrition are litigated in the GRC, the actual operation during attrition years is not and is generally uncontroversial. Operational attrition serves to reduce the company's risk from factors it presumably cannot control, such as growth in the number of customers, material prices, etc., while leaving the company at risk for factors it can control, notably, productivity.

Financial attrition examines a utility's debt and equity returns in light of changing financial markets. Financial attrition aims to keep the company earning the same real rate of return on rate base despite changing nominal costs of capital. Financial attrition generates far more controversy than operational attrition. Unlike operational attrition, financial attrition is not an automatic mechanism but is determined in a hearing held in every non-GRC year. The original intention of this hearing concerned compensating the utility for changes in financial conditions, notably interest rates, which are a large factor in utility costs, and which are beyond the company's control. However, in recent years, the hearing has generalized to include a review of the company's earnings, relative to market conditions, and rates are changed if witnesses convince the Commission that such a change is justified. Therefore, the financial attrition hearing has become a separate annual rate case that reviews the overall performance of the utility, although its rate of return is measured using authorized expenses and rate base. That is, there is no re-review of costs, and, if the company proves more efficient than what was foreseen for the test year, it can still earn returns higher than authorized. This annual realignment of the rate of return further reduces the company's risk exposure.

Note the important synergism between operational attrition and ERAM. Consider the situation if ERAM existed, but attrition did not. Suppose the number of customers grows during attrition years but the authorized revenue requirement stayed at last year's levels. While the increased number of customers results in added costs to the utility, its chances of

17. Major plant additions are handled separately in a special proceeding.

cost recovery, via the implied increase in sales, are eliminated by ERAM because any overcollection gets mechanically repaid to customers. This synergism leads to the conclusion that ERAM would not be fair in the absence of attrition. Operational attrition is needed, in part, it is argued, because under an ERAM regime, no increase in base revenue requirement can be recouped, even if a sales increase requires the utility to increase its output capacity. Operational attrition once determined in the GRC is not sensitive to sales, so it should not reintroduce the gaming or anti-conservation behavior that ERAM was designed to eliminate.

Another current characteristic of attrition is that whenever there is a revision to rates due to attrition, the latest sales forecast is used, usually from the last ECAC proceeding. Thus, forecasted miscollections in base rate revenues are minimized. In previous years, the attrition adjustment relied on the sales forecast adopted in the latest GRC, sometimes guaranteeing a miscollection of base rate revenues from the moment the rate change was made.

ECAC & AER

Fuel costs and purchased power costs are recovered in an Energy Cost Adjustment Clause (ECAC) and Annual Energy Rate (AER) proceeding.[18,19] This proceeding covers all fuel related production expenses. Most of the fuel expenses are recovered in the *ECAC rate*, while the rest are covered in the AER. Like base rates, both the ECAC and the AER rates are determined on a forecasted, or test year, basis. The difference between the two mechanisms lies in the *ex-post* treatment of the result. In the ECAC, differences between authorized and actual fuel costs are tallied in a balancing account and are, ultimately, amortized in future rates. Thus, the Company is not at risk for rising fuel prices for most of its fuel budget. The AER, on the other hand, does not receive balancing account treatment. Thus, the company is at risk if actual fuel costs exceed forecasted for the fraction of fuel costs assigned to the AER; however, even this risk is limited by a ceiling and floor, although they are rarely reached in practice. Without AER, the utilities would have no incentive to

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18. For simplicity, these ECAC and AER proceedings are referred to here as simply *the ECAC proceeding.*

19. An excellent history of the evolution of the AER appears in Ameer, 1989.

practice fuel efficiency because all costs would simply be passed through to customers. The fraction of fuel costs covered by the AER varies by utility, ranging from 8 to 22%.[20] The differences are intended to reflect the overall company exposure to risk from fuel price changes.

Each of the major electric companies is authorized to make one ECAC filing per year on a regularly scheduled basis. The utilities must file a second ECAC application if the sum of the ECAC and forecasted energy costs would increase or decrease present-rate revenues by more than 5 percent.[21] Because of the nature of the filing requirement, this type of ECAC filing is known as a *trigger* filing. Trigger filings have occurred but are generally infrequent. In the most recent trigger filing, ERAM rates were also updated because the commission argued that ERAM rates should be updated every time a new forecast is available; however, there has been no clear Commission policy in this regard.

Forecast Test Year

As noted above, unlike many other jurisdictions, all California ratemaking depends on a test year that is in the future, rather than a known historic year.[22] The use of a forecast test year has the advantage that circumstances that will obtain during the period for which rates are being set are better reflected in the rates, that is, to the extent that the forecast is accurate. Note that future test years are used for both the GRC and the ECAC cases. A separate forecasting effort is conducted at least once a year.

Forecasting, in the absence of ERAM, is problematic in that it creates an incentive for gaming on the part of the utilities with regard to their forecasting. Notice that conditions will never be forecast correctly for the test year; that is, the revenue requirement allowed in a rate case will never be collected exactly. Furthermore, since any base-rate revenue collected in excess of the allowed revenue requirement minus incremental AER fuel cost constitutes profit to the utility, a perverse incentive results, namely, to increase sales as much as possible between cases that set base rates. After the rates are set, the utility is

20. The AER fractions of the four major utilities are: Edison 11%, PG&E 9%, SDG&E 8%, and SPP 22%.

21. CPUC Decision 83-02-076, as referenced in CPUC Decision 89-06-049

22. Phillips, 1988, p. 188

encouraged to raise extra revenues by any means possible, thereby increasing its rate of return on rate base.[23] The gaming opportunity arises in the forecast year approach because the utility is rewarded for the adoption of a low sales forecast by the Commission. That is, the utility's best GRC strategy is to dramatically underforecast sales in the hope of pulling down the Commission's adopted sales forecast, as far as possible.[24,25]

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23. There is actually a small caveat here. Since in California the utility is liable for the AER fraction of fuel costs, if the AER fraction of per kWh fuel cost ever exceeded the base rate of electricity, which is highly unlikely, it would no longer benefit the utility to stimulate additional sales.

24. This argument assumes that electricity demand is inelastic over the period between rate cases, which is a reasonable assumption.

25. A tricky complication not covered in detail here results from the calculation of AER, which, although the AER is a rate, comes via a budget calculation. This means the utility can gain if its actual AER budget is less than forecast, creating an incentive to *over-forecast* sales. However, the size of this gain is small compared to the incentive, the absence of ERAM, to under-forecast sales. It is also unclear, without careful study, how changes in output might change the AER. The outcome depends on the magnitude of marginal fuel costs relative to average fuel costs, which is a complex question because fuel supply contracts usually contain both fixed and variable terms.

JUSTIFICATIONS FOR ERAM

The complexity of the regulatory process has lead to rather convoluted arguments in favor of and in opposition to ERAM that are not easily unwound into a neat list. Furthermore, the debate has evolved as the State's priorities have changed. Hence, any listing of arguments, such as the following, is somewhat arbitrary.

1. *ERAM eliminates the disincentive to conservation.*
   The conservation argument holds that without ERAM, California utilities would face two perverse incentives with adverse implications for achieving conservation policy goals. First, once the costs of a conservation program have been added to base rates, the utility's best interests are served by making the program fail to deliver the conservation promised.[26] In this way, the utility recovers the costs of the program yet avoids the revenue loss its success implies. Second, between rate cases, the utility further faces an incentive to sell as much power as possible, virtually irrespective of the costs of generating it. In both cases, the revenue gained from selling a kWh above the forecast level represents an almost direct contribution to the company bottom line.

2. *ERAM removes the incentive to game in forecasting.*
   The incentive to underforecast sales before a rate case and promote sales after it was of particular concern during the late 1970's and early 1980's. By guaranteeing that the utility will recover its revenue requirement, the incentive to game with the sales forecast is eliminated.

3. *ERAM encourages the financial health of the utilities.*
   The guaranteeing of revenue collections significantly contributes to the financial health of the utilities by reducing the variability of earnings. The primary benefit of utility financial health to the ratepayer accrues through a lower cost of borrowing for the utility, although, clearly, other benefits could be listed. ERAM not only eliminates the potentially adverse effects of losses of sales from conservation, it also automatically adjusts for many other perturbations on sales, including weather fluctuations and the business cycle.

4. *ERAM permits innovative ratemaking.*
   One potential source of revenue variability merits special mention, namely, the consequences of imperfect, or experimental ratemaking. Notice that if the base rate set in the rate case is incorrect, the subsequent miscollection of revenues will accrue in the ERAM balancing account together with all others. That is, the utility is not hurt by ratemaking inaccuracy.

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26. California practice permits both expensing and ratebasing of conservation program costs.

5. *ERAM contributes to regulatory efficiency.*
With regard to both the elimination of the incentive to game with forecasts, and the elimination of fear of inaccurate ratemaking, it merits repeating that the presence of ERAM reduces the contentiousness of regulatory proceedings.

HISTORY OF ERAM

Introduction of ERAM

To eliminate the utility disincentive to conservation, ERAM was introduced for the four major California electric utilities beginning with the Pacific Gas and Electric Company (PG&E) in 1982. The introduction came about as part of a landmark GRC for PG&E, which took place in late 1981.[27] In the case, PG&E pleaded for significant rate relief and for the adoption of various regulatory reforms that would ease the company's debt burden and raise its rate of return. In addition to the generally unfavorable business climate and high interest rates of the times, these were the darkest days of the company's long and painful experience constructing the Diablo Canyon nuclear station. When the plant was nearly complete in 1981, an engineer had discovered a fateful design error which resulted in the Nuclear Regulatory Commission withdrawing the plant's low-power licence. The company was forced to engage a new construction manager for the project and extensively redesign and repair the plant, a process that ultimately doubled the cost of a plant that had already been under construction for 14 years. The prime interest rate stood at 19%, so avoiding the costly borrowing needed for capacity additions was the paramount goal of the time. The State also faced the danger of an immediate capacity shortfall due to the further delay of Diablo Canyon, and, hence, the need to eliminate disincentives to conservation was imperative, as was the need to stimulate development of independent sources of generation.

The following statement from the Commission's ruling, however, reveals that the desire to foster conservation was not the only benefit the Commissioners foresaw from ERAM.

> In this decision we reject PG&E's proposals for various ratemaking changes such as allowance of CWIP in rate base and changed depreciation policies that many other regulatory commissions permit to offset risk and reduce cash flow. In declining to grant these measures which reduce risk to the utility by shifting it to the ratepayers, we recognize that a somewhat higher return on equity is reasonable. It should be noted that the authorized return on equity can be actually earned by the utility only if it succeeds in aggressive management of its costs of operation. We do not, however, grant the high rate of return of 18% PG&E requested. The additional cash flow resulting from the Tax Act

27. CPUC Decision 93887

as well as the revenue stability from the Energy *[sic[28]]* Revenue Adjustment Mechanism (ERAM) adopted herein should reduce PG&E's risk and thus the size of the return. [29]

The emphasis of the Commission on the promise that ERAM would improve the financial condition of PG&E makes an interesting historical note.[30] Although PG&E had proposed ERAM in its filing, the support for ERAM was broad. In addition to PG&E, the CPUC staff and the California Energy Commission staff endorsed the concept, although their proposed mechanisms differed slightly. ERAM was later adopted for the other major California investor owned utilities (IOU's), Southern California Edison (Edison) in 1983, San Diego Gas and Electric in 1984, and finally, the Sierra Pacific Power Company.[31]

OIR Reviewing ERAM

Conditions in the industry looked very different by 1985, when the Commission initiated a seminal review of ratemaking in the State, of which a thorough analysis of the incentives created by ERAM was a central part.[32,33] A far-reaching survey of the issues in the review, which was conducted under the general banner of an Order Instituting Rulemaking (OIR), appears in the paper by Mark Ziering, which appears as an appendix to the OIR record.[34] The addition of two large nuclear plants in the State, San Onofre and Diablo Canyon, in 1985 and 1986, and the rapid emergence of independent power supplies had pushed the State into a comfortable capacity situation. Futhermore, energy prices had fallen, and creeping deregulation of the industry was taking hold. The financial health of the State's

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28. The accepted name became the *Electric* Revenue Adjustment Mechanism, but it is not clear exactly how, why, or when the change took place. From the beginning, however, the actual balancing account was known as the *Electric* Revenue Adjustment Account.

29. CPUC Decision 93887

30. The Commission's focus on utility financial health is made more poignant by the fact that, because eight years have passed, supporting testimony to the case has now been purged from the historic record at the CPUC, and only the decision itself remains. That is, the documents that argued for the introduction for ERAM in the pursuit of conservation goals are lost while the Commission's claim that ERAM would serve the utilities's financial interests remains.

31. The first three companies currently account for about 75% of electricity consumption in the state. Pacific Power and Light was instructed to adopt ERAM, but it has not yet complied, and there are also several municipal utilities over which the CPUC has no jurisdiction.

32. CPUC Decision 85-12-076

33. CPUC OIR 86-10-001, later redesignated Investigation I.86-10-001

34. Ziering, 1986

IOU's was also looking decidedly brighter. ERAM was being reviewed, then, in an environment quite different from the one into which it was introduced.

Ziering argued that the era of ERAM was over, and the pressing need of the time was preventing uneconomic bypass from the State's utilities, that is, preventing large customers generating their own power if they could be served by the State's IOU's for any price above marginal generation cost.[35,36] Some analysts believed that bypass could develop into a death spiral as the departure of customers raised the rates of those remaining on the system, prompting more to leave, etc.[37] Customers would be best served, Ziering argued, if the IOU's were freer to make the kinds of favorable agreements with customers that bypass prevention required. Such a role for the utilities is, however, quite inconsistent with ERAM.

> The current ECAC and ERAM mechanisms, however, largely insulate utility earnings from changes in sales volumes. If utilities fail to take actions or to grant discounts where these are needed, or grant larger discounts than are required, there is no immediate effect of their earnings. Therefore, under current circumstances, there is a strong argument for tying utility hearings in a cost-effective way. [38]

Ziering foresaw a strong incentive for the utilities to actively market their power if ERAM were eliminated. Removing ERAM would encourage the utilities to find customers for the power from their *excess* capacity, and this would benefit all ratepayers. Given the importance placed by all parties on uneconomic bypass avoidance, the desire to fully utilize the State's adequate supply resources, and the alleged conflict of ERAM with these goals, Ziering placed the elimination of ERAM firmly at the top of his list of priorities: ". . . the most pressing changes to the current regulatory system is the elimination of ERAM and attrition mechanisms."[39] The emphasis given to this proposal is remarkable in a document that reviews virtually every aspect of ratemaking in the State. Ziering's emphasis on bypass and ERAM's role in the bypass issue further demonstrates the perceived importance of this issue at the time.

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35. Ziering, 1986, p. 40
36. The appendix test case example expands on the problem of bypass in the State.
37. Marnay, 1990
38. Ziering, 1986, p.41
39. Ziering, p.3

The Commission, after a lengthy period of consideration, including a pivotal *en banc* hearing in March 1987, decided upon a partial adoption of Ziering's recommendation that ERAM and ARA be eliminated.[40] The Commission explicitly recognized that for a considerable period the conservation efforts of the CPUC would be scaled back, and, consequently, the need for ERAM was diminished.[41] It also recognized the need for lower industrial rates. The ratio of industrial rates to residential rates in the CPUC jurisdiction is nearly the highest in the U.S., and industrial rates themselves are virtually the highest in the U.S.[42] What the Commission, however, failed to recognize was that ERAM provided a boon to the utilities in the mid 1980's because it shielded them from the danger that high industrial rates would result in earnings losses.

Elimination of ERAM was consistently opposed by environmental groups, notably the Natural Resources Defence Council (NRDC). In particular, the NRDC questioned the conventional wisdom that the State's capacity glut would last for some time.

Post-OIR Period

The Commission chose to distinguish the large customers, the Large Light and Power customer class (LL&P), from other ratepayers. The Commission ruled that ERAM would be eliminated for LL&P but retained for commercial and residential customers. The target date set for the elimination of ERAM was set as 1 April 1988.[43] This compromise, the Commission argued, would retain the correct conservation incentives for the latter classes of customers, while exposing and conditioning the utilities to competition among LL&P customers.[44] The option of partial ERAM elimination had been considered by Ziering, who predicted that such a policy would result in ". . . the most complex system to date."[45] In the same decision, the Commission reaffirmed its support of private contracting between utilities and LL&P customers that threatened bypass.[46] The separation of LL&P customers from the

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40. CPUC Decision 87-05-071
41. CPUC Decision 87-05-071, p. 4
42. Marnay, 1990
43. CPUC Decision 85-05-071, p. 18
44. CPUC Decision 85-05-071, pp. 8-9
45. Ziering, 1986, p.111
46. CPUC Decision 85-05-071, p.10

other rate classes is a natural one, and most of the arguments in favor of ERAM elimination had focused on the LL&P customers. These customers were both the problem in that they have the most credible bypass threat, and the potential solution in that their elastic demand could rise to exhaust the excess supply expected from the new generating capacity.

Despite the apparent logic of the Commission's decision, it was actually quite radical. What it proposed to do was, in effect, create a *split utility* which was to act in the manner of a traditional utility with traditional ratemaking including ERAM for some of its customers, and, simultaneously, act like a tough competitor towards its LL&P customers. It is the Commission's vision of the partially regulated utility which was a radical concept. An explanation of why the utility would want to compete for its price-elastic customers can be found in any economics text book. The Commission's vision for the industry, while radical, was in line with changes simultaneously being made in natural gas regulation in the State. The CPUC has significantly restructured that industry in the last three years.[47] The purpose of the restructuring was to bring the benefits of the competitive fuel market to fuel-sensitive, or *noncore*, customers while preserving traditional utility service for smaller, *core* customers. The earnings of the gas utilities basically receive the benefit of a partial ERAM. For noncore customers, the utility is at risk for the base-rate revenues allocated to those customers. Alternatively, the authorized base-rate revenue requirement allocated to core customers receives balancing account treatment. Costs between core and noncore customers are allocated in Annual Cost Allocation Proceedings (ACAP's). Allocation of common costs between the core and noncore is always somewhat arbitrary and, obviously, the gas utility has a strong incentive to have costs allocated to the core where recovery is assured and demand is inelastic. Not surprisingly, the ACAP's have been highly contentious, somewhat justifying the warnings of economists, and, more recently, the utilities have pushed for more and more costs to receive balancing account treatment.[48]

The major accounting headache that has emerged in gas regulation because cost allocation between the competitive and regulated sections of the company is now necessary was averted in electric regulation. Such a cleavage of a company is a sizable undertaking,

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47. CPUC I.86-06-005 & R.86-06-006

48. Winifred C. Walters, *et al*, 1989

and may still prove infeasible.[49] Such a cleavage would pit stockholders directly against ratepayers. These underlying problems emerged in the attempt to revise accounting procedures and the revision turned out to be more traumatic than the Commission staff, or the utilities themselves, could accommodate. However, the exact nature of the difficulties does not emerge from the written record. While parties were expressing their acceptance that times had changed and a new competitiveness was necessary, they recognized that the regulatory restructuring necessary to achieve this competitiveness would create a highly contentious cost allocation proceeding.

Implementation was to begin with hearings scheduled for July, 1988. The definition of the LL&P class became generalized to included all customers with peak demands over 1 MW, and the implementation date slipped to 1990. However, the hearings were never held, and one by one the interested parties began appealing to the Commission to reverse its ruling. The CPUC staff advocated pursuing ERAM elimination in the GRC's rather than in an *en masse* hearing.[50] The staff also pointed out the many definitional and cost allocation problems that the Commission's approach implied.

The following months saw considerable behind-the-scenes bickering on how ERAM should be eliminated. The tangible evidence that the Commission's policy had failed comes in a decision.[51] This decision reports a *stipulation* between parties active in the OIR process. The stipulation essentially abandons the attempt to remove ERAM. It reports four points from the stipulation that justify its change of heart. The two key points of interest here are

> First, it *[the stipulation]* concludes that "the likely level of any future uneconomic bypass can be dealt with under current procedures" without developing different treatment for a newly created less restricted class (LRC) of large customers.

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49. Note that the unusual settlement between PG&E and the CPUC on regulatory treatment of theDiablo Canyon plant requires just such a cleavage between Diablo Canyon costs and other company expenses. The accounting details of this cleavage proved a contentious issue in PG&E's 1989 General Rate Case.

50. CPUC, 1988

51. CPUC Decision 88-12-041

Second, the stipulation states that segregating the LRC for different treatment requires "a very complex ratemaking structure with potentially conflicting incentives," and the parties recommend that the Commission not pursue its development of the separate LRC. 52

The first assertion is supported by the failure of the feared rush of bypass to materialize. Fears of massive hemorrhaging of utility customers that had dominated thinking on ratemaking two years earlier had certainly been unfounded. In fact, more generally, this statement reflects the growing acceptance among all parties that the CPUC's moves towards more cost-based ratemaking structures have not caused major disruption in the industry. Ziering's prediction of complexity was borne out by the second assertion, although the parties to the hearing were probably merely seizing on his argument as a useful weapon with which to thwart the elimination of ERAM.

In later comments on the rulemaking proceeding filed with the CPUC by the three major IOU's, the depth of their determination to keep ERAM emerges. PG&E argues vehemently for a *status quo* approach.

In PG&E's view, the current ratemaking mechanism is a progressive approach to regulation that has been proven to be beneficial to ratepayers by providing utilities with incentives to keep rates down while offering innovative rates and demand-side management options. 53

Lost somewhere in this debate is Ziering's recommended option of completely removing ERAM and attrition, which would simplify the mechanics of ratemaking and shift the sales risk back to utilities. While the distinction between the less restricted and other classes is sensible in abstract, as mentioned above, the practical barriers to implementing a partial elimination of ERAM are probably insurmountable. Therefore, given the failure of that approach, it is unclear why total ERAM elimination died as an option, but the answer, in part, must be the continued, if weakened, interest in conservation. In any event, the nature of the debate over ratemaking reform has taken a different direction in 1989. The main focus of attention has shifted from ERAM towards concerns that demand-side bidding be given a proper standing, towards performance based ratemaking, etc. Consequently, it seems reasonable to assume that ERAM will be embedded in California ratemaking practice for the foreseeable future.

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52. CPUC Decision 88-12-041, pp. 1-2

53. PG&E, 1989

ERAM EXAMPLE

Simple ERAM Model

In this section, a simple model of the ERAM process is developed. To make the model tractable, several simplifying assumptions are necessary. Firstly, ratemaking is reduced here to a simple, discrete, lock-step process. An ERAM adjustment of base rates is made once a year. This model takes place in discrete time. For the purposes of understanding the logic, it is best to perceive of the calculations as taking place precisely at the end of a period, when events that happened during the period are all known to the ratemaker. Rates for period t are being determined at the end of period t-1. The ratemaker faces the job of setting base rates for the upcoming period. The ERAM adder, which can be either positive or negative, is included in base rates. The *effective base rate* seen by customers, e, is the sum of the latest *base rate*, r, and an *ERAM balance rate*, b. That is, the *effective base rate* seen by the customer is calculated at the end of t-1, as follows.

$$e_t^{t-1} = r_t^{t-1} + b_t^{t-1} \qquad \text{eq.1}$$

where, e_t^{t-1} is the effective base rate
r_t^{t-1} is the base rate
b_t^{t-1} is the ERAM balance rate

Notice that b represents a rate, that is, an adder to customer tariffs expressed in ¢/kWh.[54] In this and the following equations, the superscript denotes the end of the period in which the variable is forecasted and the subscript denotes the forecast period, which is about to begin. If the superscript and subscript are identical, then the variable is not a forecasted value, but rather, it is the known actual historic data. Remember that everything is assumed known about the current period.

In this model, it is assumed that R embodies the revenue requirement from non-ERAM adjustments to base rates. That is, R represents the full post GRC and post attrition proceeding base revenue requirement. The base rate, r, is simply the rate that would be in effect in the absence of ERAM, namely the authorized revenue requirement averaged over forecast sales.

54. In keeping with CPUC practice, the rate is here called the ERAM *balance rate*. Edison calls this value the ERAM billing factor, a poor name because it implies b is a multiplier to base rates rather than an adder. PG&E does not distinguish this quantity in rates. ERAM recovery is simply rolled directly into base rates.

$$r_t^{t-1} = \frac{R_t^{t-1}}{Q_t^{t-1}}$$

eq.2

where, R_t^{t-1} is the authorized revenue requirement
Q_t^{t-1} is the latest sales forecast

Now consider the second component on the right-hand side of eq.1, the ERAM account balance adjustment, *b*. This term simply aims to clear the ERAM balancing account over the next time period, *t*, and it is calculated as follows.

$$b_t^{t-1} = \frac{B_{t-1}^{t-1}}{Q_t^{t-1}}$$

eq.3

where, B_{t-1}^{t-1} is the ERAM account balance[55]

As eq.3 shows, *b* is exactly the collections rate necessary to totally clear-out the existing ERAM balance, *B*, during the next time period, *t*. If the forecast proves perfectly correct, the collections by *b* will equal the closing ERAM balance from *t-1*.[56] In practice, the forecast will rarely be correct and *B* rarely come close to zero.

The *ex post* discrepancies between the authorized revenue requirement and the actual collection of base-rate and ERAM balance rate revenues perpetually accrue to the balancing account. The actual calculation of *B* at the end of period t is as follows.

$$B_t^t = B_{t-1}^{t-1} \cdot (1+i) + \left[R_t^{t-1} - e_t^{t-1} Q_t^t\right] \cdot \left(1+\frac{i}{2}\right)$$

eq.4

where, i is the authorized interest on ERAM balances

The balance at time *t* consists of two components. The first term on the right-hand side of eq.4 represents the opening balance in the account plus interest accrued at the interest rate

55. Notice that *B* never appears with different super and sub-scripts because, by assumption in this model, the balance in the ERAM account balance always enters ratemaking as historical data.

56. This does not mean the account will actually zero out because of the interest accrual. See the numerical example, below.

i on that balance. The second term takes care of all the change that goes on in the balancing account between the two time periods. This term simply says that miscollections, that is, differences between authorized revenue requirement, R, and actual collections, $e{\cdot}Q$, will accrue in the account, and that at the end of the period, interest will be due the utility at half the interest rate on this part of the balance. The interest rate is halved because the average balance over the period, in this discrete model, is one half of the change during the period. If the utility did not have to pay for the time value of money, it would have an incentive to undercollect, thereby effectively borrowing from ratepayers interest free. Notice that e depends on the balance and miscollection that existed at the end of the previous period. In a limited sense, therefore, ERAM is adaptive, and large balances cannot accumulate in the ERAM account. However, ERAM aims only to clear out the account over the upcoming period. Any improvement in the accuracy of collection comes only through more accurate forecasting, not through ERAM.

If the account is positive, it is an undercollection, and money is owed to the company. Notice that a positive B results in a positive b, that is, an increase in rates. This signing represents more than convention because, from the accounting perspective, uncollected revenue must be a positive entry in the account and appear as an accounts receivable on the utility's balance sheet. The base-rate revenues recorded on the books are the authorized amounts, not the actual amounts, which may be higher or lower. If the company undercollects, the balance is positive and it is as if the company has provided electricity to its customers on credit. The rate-of-return equalizing effect of ERAM rests on this accounting treatment of revenues. In this model, since authorized revenues are reported rather than actual, the utility's authorized rate of return on rate base will fail to be realized only if base-rate costs deviate from forecasted authorized levels.

Numerical Example

i. introduction

The following description leads the reader through a spreadsheet example of the operation of the above ERAM model. The starting point loosely represents applicable numbers for the Southern California Edison company, but, beyond the first year, the example is totally fictitious. First, it is worthwhile to examine a typical Edison tariff.

California has increasing block residential tariffs. Baseline rates are charged for an initial block of kWh. For a non-electric single family home in the Bay Area, this block contains approximately 500 kWh/month, but varies by the customer's local climate, type of residence, and stock of appliances. Any consumption above the baseline quantity is charged at the higher non-baseline rate. In addition to the prices above, the tariff calls for a minimum customer charge of $0.10 per day. This particular tariff has no demand charges nor any time-of-use component.

Table 1
Edison Domestic Service Tariff[57]
(¢/kWh & % of total)

	Baseline (¢/kWh)	Baseline (%)	Non-baseline (¢/kWh)	Non-baseline (%)
base rate (*r*)	6.17	74	6.17	48
ERAM balance rate (*b*)	-0.30	4	-0.30	2
effective base rate (*e*)	5.87	70	5.87	46
ECAC rate	2.46	30	6.89	54
total customer rate	8.33		12.76	

The following ERAM example shows how the effective base rates might evolve over time. For simplicity, it is assumed that all Edison customers are on the above tariff. The key parameter of interest, the ERAM balance rate, *b*, represents 4 and 2 percent, respectively, of the total tariff. In 1989 tariffs, it is negative, implying that sales exceeded forecasts for the prior period. Finally, notice that the effective base rate is the same for baseline and non-baseline sales, and the difference between the two comes entirely from the distribution of fuel costs. Since the concern here is base rates, this method of rate design considerably simplifies the task at hand.

In this simplified example, sales are forecasted once a year, on a per year basis, just before rates are adopted on January 1 of each year. In other words, the ratemaking for year

57. source: Edison Schedule No. D. Cal. P. U. C. Sheet No. 11248-E

t takes place precisely at the end of year *t-1*, and all actual data for year *t-1* are known. In addition, the following important assumptions are made:

1. The ERAM rate is adjusted just once a year and is effective for the entire following year, as are the General Rate case and attrition adjustments to base rates.[58]
2. All customers on the system are on a tariff whose base rate and ERAM balance rate are identical, and of the form shown in Table 1.[59]
3. Base operating costs are insensitive to sales. That is, an increase in sales does not imply an increase in base operating costs. This is equivalent to assuming that the only incremental cost of generating another kWh is the fuel burned.
4. The effect of any miscollection of fuel costs is ignored. That is, the model is concerned only with base rates.

The full example appears in Table 2. The table contains two parts. The upper part demonstrates the ratemaking done at the end of year *t-1*, and the lower part reflects the events that actually occurred in year *t*. In other words, what appears in the upper area reflects what is known or forecast at the beginning of year *t*, and what appears below reflects what is known at the end of year *t*.

ii. base rate

Focus first on the first full year of the example, 1989, and the derivation of each line will be explained below. Lines 1 and 2 show the sales forecast for each year, *t* = 1989-1996, made in the previous year, *t-1*. Notice that to the left of the line number, the names of quantities that appear in the spreadsheet are shown in the notation of the algebra above. For example, the forecast for *t* = 1989 sales made in *t-1* is 68,640 GWh. The authorized interest in line 3 is the rate, *i*, that must be paid on outstanding balances in the ERAM account. Line 5 shows the authorized rate of return for this company. Line 6 shows the dollar value of this rate of return, which is added to the forecast base operating costs to form the authorized revenue requirement. Lines 10 and 11 show that, in 1989, if base rates are not increased beyond the *t-1* level, then forecast revenues will not meet the revenue requirement. Rates are, therefore, adjusted upwards by the calculation of line 12, which is

58. This timing of ERAM adjustments is representative of actual practice because they follow the annual ECAC hearing, but actual attrition and General Rate Case adjustments tend to be more erratic.

59. This assumption frees the reader from the complexity and contentiousness of the class allocation of the revenue shortfall that occurs in the example.

equivalent to eq.2 above. The rates shown in line 12 for each year are equivalent to the base rate, *r*, shown in Table 1.

iii. ERAM balance rate

The block of lines 14-18 shows calculation of the ERAM balance rate, which as noted above, is actually an adder to rates, usually representing a quite small part of the overall tariff. As with base rates, the mechanics of ERAM ratemaking can be characterized as the simple recomputation of the balance rate needed to zero out the account over the next time period. Thus, the new balance rate is shown in line 18.

iv. effective base rates

The final calculation made at the end of t-1 reveals the actual effective base rates, *e*, seen by the customer, which are simply the sum of lines 12 and 18, equivalent to eq.1 above. The result represents the value here called the *effective base rate*.[60]

60. This naming assumption overlooks considerable confusion in actual tariffs. The rate collects current authorized base revenue requirements as well as past under- or overcollections. As noted in Table 1, Edison uses the term *base rate* only in reference to the current base rate. The ERAM rate is called the electric revenue adjustment billing factor (ERAMBF), which is identified separately in the tariffs. For PG&E, the two rates are combined in the tariff and are called simply *base energy rates*. This confusion offers a good example of how a conceptually simple idea gets quite confusing once implemented by diverse institutions.

TABLE 2: BASE CASE: EXAMPLE OPERATION OF THE ERAM BALANCING ACCOUNT

(M$, unless noted)

Equa-tion	nota-tion	line #	year (t) ->	1988	1989	1990	test yr. 1991	1992	1993	test yr. 1994	1995	1996
			RATEMAKING FOR YEAR t AT THE END OF YEAR t-1									
			BASE RATE									
		1	forecast sales change		4.0%	3.0%	2.0%	1.0%	2.0%	2.0%	2.0%	2.0%
	Q_t^{t-1}	2	forecast sales for year t : (GWh)		68640	70699	72113	72834	74291	75777	77292	78838
	i	3	authorized interest rate		8.0%	7.5%	7.0%	8.0%	8.5%	9.0%	10.0%	9.0%
		4	rate base		6000	6150	6304	6461	6623	6788	6958	7132
		5	authorized rate of return		12.5%	12.0%	11.5%	12.5%	13.0%	13.5%	14.5%	13.5%
		6	target earnings : (4 x 5)		750	738	725	808	861	916	1009	963
		7	forecast base operating costs including attrition adjustments		3500	3623	3749	3881	4016	4157	4302	4453
	R_t^{t-1}	8	authorized revenue requirement : (6 + 7)		4250	4361	4474	4688	4877	5073	5311	5416
	r_{t-1}^{t-2}	9	base rate in t-1 : (¢/kWh)		6.170	6.192	6.168	6.204	6.437	6.565	6.695	6.872
		10	forecast revenues at current rates : (2 x 9)/100		4235	4378	4448	4519	4782	4975	5175	5418
		11	forecast revenue shortfall: (8 - 10)		15	-17	27	169	95	98	137	-2
eq.2	r_t^{t-1}	12	base rate in t : ((8/2) x 100): (¢/kWh)	6.170	6.192	6.168	6.204	6.437	6.565	6.695	6.872	6.870
		13	change in base rate over year t-1		0.4%	-0.4%	0.6%	3.7%	2.0%	2.0%	2.6%	0.0%
			ERAM BALANCE RATE									
	B_{t-1}^{t-1}	14	ERAM balance end of t - 1		-178	-131	-160	-6	0	0	175	158
	b_{t-1}^{t-2}	15	ERAM balance rate in t-1 : (¢/kWh)		-0.304	-0.259	-0.185	-0.222	-0.008	0.000	0.000	0.226
		16	forecast ERAM revenues at current billing factor : (15 x 2)/100		-209	-183	-133	-162	-6	0	0	178
		17	forecast ERAM revenue shortfall : (14 - 16)		31	53	-27	156	5	0	175	-21
eq.3	b_t^{t-1}	18	ERAM balance rate in t : ((14/2) x 100) : (¢/kWh)	-0.304	-0.259	-0.185	-0.222	-0.008	0.000	0.000	0.226	0.200
			EFFECTIVE BASE RATES									
eq.1	e_t^{t-1}	19	effective base rate : (12 + 18)	5.866	5.932	5.983	5.982	6.429	6.565	6.695	7.098	7.070
		20	change in effective base rate over year t-1		1.1%	0.9%	0.0%	7.5%	2.1%	2.0%	6.0%	-0.4%
			ACTUAL EVENTS IN YEAR t									
			GENERAL RESULTS									
	Q_t^t	21	actual sales in t : (GWh)	66000	70640	73199	72113	72834	74291	73277	75292	77838
		22	actual sales relative to forecast		higher	higher	equal	equal	equal	lower	lower	lower
		23	error in sales forecast		2.9%	3.5%	0.0%	0.0%	0.0%	-3.3%	-2.6%	-1.3%
		24	actual base rate revenues in t : ((12 x 21)/100)		4374	4515	4474	4688	4877	4906	5174	5347
		25	actual ERAM revenues in t : ((18 x 21)/100)		-183	-135	-160	-6	0	0	170	156
		26	total revenues in t : (24 + 25)		4191	4380	4314	4683	4877	4906	5344	5503
		27	actual base operating costs		3500	3623	3749	3881	4016	4365	4518	4676
		28	actual base operating costs relative to forecast		equal	equal	equal	equal	equal	higher	higher	higher
		29	error in operating cost forecast		0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%	5.0%
			EFFECT ON ERAM ACCOUNT									
		30	initial ERAM balance at beginning of t		-178	-131	-160	-6	0	0	175	158
		31	miscollection in t : (8 - 26)		59	-19	160	6	0	167	-33	-87
		32	ending balance at end of t : (30 + 31)		-119	-150	0	0	0	167	142	71
		33	interest accrued during t : (avg(30, 32) x i)		-12	-11	-6	0	0	8	16	10
eq.4	B_t^t	34	closing ERAM Balance at end of t : (32 + 33)	-178	-131	-160	-6	0	0	175	158	81
			cross check by formula from eq.4		-131	-160	-6	0	0	175	158	81
			EFFECT OF ERAM ON EARNINGS									
			without ERAM									
		35	actual earnings : (24 - 27)		874	892	725	808	861	541	656	671
		36	actual rate of return : ((35/4) x 100)		14.6%	14.5%	11.5%	12.5%	13.0%	8.0%	9.4%	9.4%
			with ERAM									
		37	actual earnings : (26 + 31 - 27)		750	738	725	808	861	709	794	740
		38	actual rate of return : ((37/4) x 100)		12.5%	12.0%	11.5%	12.5%	13.0%	10.4%	11.4%	10.4%

v. cycle of values

Before moving on the lower area of the table, consider the column marked 1988. The values in this column demonstrate how the key values from the past year, *t-1*, enter into the ratemaking for the current year, *t*. Most important of these values is the balance in the ERAM account, which at the end of 1988 is -178 M$. This number represents the tangible connection between the periods. In this instance, the balance is a negative number; that is the company owes money to its customers. Notice that the ERAM balance rate that emerges in line 18 is also negative; that is, the intent of ERAM for 1989 is to return some money to customers with interest. The other three values that are shown as passing from year to year represent much less significant activity and are shown only to clarify the process shown. Looking at lines 1 and 2, the reader will recall that in California a new forecast is conducted every year. In this simple model, that forecast is simply a percentage change over the prior year, so the arrow shows that the prior year's sales are a component in the calculation of the forecast.

vi. test years

Two test years occur during the period shown, 1991 and 1994; however, in this simple model, that tends to have rather little importance and the reader should note only that these years do not represent any significant deviation from the pattern that appears in the other years.

vii. actual events

Actual results of the company in year *t* will always deviate from those forecasted. Sales may be higher or lower than expected, and ERAM ensures the company collects its authorized revenue requirement irrespective of sales levels. The authorized revenue requirement, once set, does not change. Thus, the company is at risk for increases in non-fuel costs, but is not at risk for the reduced revenues resulting from lower-than-expected sales to customers. How this works in the simple model can be seen in the lower area of Table 1.

viii. general results

The actual sales that materialize in year *t* appear in line 21, and the base rate revenues generated are calculated in line 24. Notice that in 1989 these are higher than the authorized amount shown in line 8. This shows the effect that sales exceeding forecast deliver revenues beyond authorized to the utility. However, in lines 25 and 26, the effect of the ERAM adjustment is shown. The adjustment has had the effect of reducing revenues below authorized.

ix. effect on ERAM account

As shown by line 31, the utility at the end of 1989 is owed money by its customers, despite sales having exceeded forecasts. The effect of this addition to the ERAM account and the interest earned over the period result in a new closing balance shown in line 34.

x. effect of ERAM on earnings

The final block shows how the existence or non-existence of ERAM has changed the financial performance of the utility over the period studied. The only difference between the two cases concerns the treatment of the miscollection shown in line 31. In the non-ERAM case, this miscollection is treated in the same way as all other revenues. That is, without ERAM, the base rate revenue collections tell the whole story and the company can report line 24 as its revenues. In this year, sales exceeded forecast, so the company collects earnings, line 35, beyond authorized, line 6, and hence reports a rate of return, line 36, far above authorized, line 5. This case demonstrates the power of the sales incentive. Although actual sales are less than 3% above forecast, line 23, the overcollection results in the company reporting more than two full points of rate of return on rate base above authorized.[61]

By contrast, in the ERAM case, the revenues reported are the actual revenues, line 26, accounting for the fact that 183 M$ was paid back to customers; however, the company is allowed to report the miscollection, line 31, as if it had already received it. Notice again that a positive value in line 31 implies money owed to the company by the customer as a result

61. Note the distinction between rate of return on rate base and return to stockholders. Since much of the rate of return will cover bonds with fixed yields, the return to stockholders who own common equity in the utility will be further inflated.

of operations in year *t*. That is, it is an accounts receivable as far as the company books are concerned and can be reported as revenue. This calculation, by definition, makes the company's revenues appear on the books as exactly equivalent to those authorized, line 6, and, by definition, the rate of return is then exactly as authorized.

xi. example results

Focusing now on the events that transpire during the period of this analysis, forecasts of sales are too low in the first two years, line 22, but are exactly correct for the next three, and are too high for the last three. Notice on line 36, that without ERAM, these misforecasts have exactly the expected results. Underforecasting of sales, or, equivalently, unexpectedly high sales benefit the utility, and vice-versa. That is, the company shareholders lose when sales are below expectations, and they lose disproportionately much. In the ERAM case, line 38, on the other hand, authorized rates of return are exactly realized. Given the rules on reporting of earnings and treatment of the miscollection, line 31, this is true by definition. Note, however, that in years 1994-1996, rates of return fall about 3 points short of authorized. This occurs because operating costs exceed expectations, as shown by lines 27-29. In this example, with costs exceeding expectations by only 5%, rates of return fall by three points. This demonstrates the argument in favor of ERAM *vis-a-vis* direct rate-of-return guarantees that the efficiency incentive is retained. Poor management that results in higher than expected costs dramatically reduces company earnings, and vice-versa. ERAM allows the actual rate of return to deviate from authorized to reflect such changes in productivity, but does not allow earnings to fluctuate due to unanticipated changes in sales volumes.

Turning to the sales deviations problem that ERAM was intended to address, remember that ERAM cuts both ways. In 1989 and 1990, sales are higher than expected, yet in the ERAM case, earnings are exactly as authorized. In a conservation example, sales would be below expectations and earnings would still be exactly as authorized. The perfect sales forecasts that are made in years 1991-1993 zero out the balancing account, as shown by line 34. Notice also that in these years the no-ERAM and ERAM cases result in identical earnings. In a world where everything is known in advance, ERAM is unnecessary.

LESSONS

The following statements encapsulate the lessons that should be learned from California's experience with the ERAM mechanism.

ERAM Removes the Anti-Conservation Ratemaking Bias

Little doubt remains that ERAM does do the job for which it was, in part, intended. Under ERAM, the utility should be indifferent to the level of its sales. Therefore, the utility is not punished for effective conservation, and the incentive to market power after a rate case is eliminated. However, the incentive to underspend on conservation programs remains because the utility can still improve its rate of return by cost cutting. The importance of this problem depends, in part, on the regulatory treatment of conservation costs. In California, most conservation-related costs are expensed and not ratebased. That is, spending less than budgeted on a conservation program increases earnings, just like any other cost cutting measure. However, the ability of the utility to underspend is limited by the fear of prudence reviews and audits.

The existence of an ECAC mechanism makes the company indifferent to the bulk of fuel costs and will, therefore, continue to benefit from marketing power even when the marginal fuel cost exceeds the marginal revenue. This situation arises because the fuel cost will automatically be recovered by ECAC. Although in times of comfortable capacity margins and low fuel costs, the distinction may not be important, if times return in which marginal fuel costs exceed marginal revenue, removal of ECAC could provide at least some brake on the incentive to market power. In other words, the incentive to market power that ERAM was, in part, intended to redress was made potentially worse by the adoption of ECAC.

ERAM is Preferable to Rate-of-Return Guarantees

As a conservation policy, an ERAM mechanism certainly appears preferable to a cost of service indexing (COSI) type of mechanism that directly guarantees a rate of return. This is because COSI shields the utility from the consequences of poor productivity, whereas, under ERAM, the utility still benefits as much cost cutting as it does in the absence of ERAM.

This argument can be made even stronger by virtue of the fact that the existence of ERAM is likely to focus the utility's attention more squarely on cost cutting as a means to increase returns, rather than on marketing. Nonetheless, ERAM is a highly favorable mechanism to the utilities, adding great stability to their rates of return. It should also be noted that California's financial attrition mechanism also prevents the rate of return from straying from industry averages. In other words, California utilities enjoy a double layer of rate of return protection.

ERAM Reduces Forecast Gaming

Where ratemaking relies on a forecasting, gains can be made by effective sales forecast gaming. That is, an unforecast sale is as good as an additional sale from the utility perspective. ERAM serves to make this aspect of the ratemaking process less contentious and, potentially, more efficient. However, an aspect of California regulation should also be taken into consideration. The regularity and frequency of forecasting limit the utilities' opportunity to game, even in the absence of ERAM. Remember that a forecasting exercise is carried out every year in the ECAC hearing, so that any persistent bias in utility forecasts would quickly become apparent.

ERAM Reduces Utility Risk Exposure

Improving the financial health of the utilities represented one of the primary motives for the original introduction of ERAM. The stability of revenues guaranteed by ERAM must, logically, have improved the financial position of the California utilities. However, no attempt has been made in this paper to quantify this beneficial effect of ERAM because separating the effects of ERAM out from all the other ever-changing conditions represents such a daunting task. The CPUC clearly takes some pride in the fact that California's IOU's are generally considered financially healthy, although there is no clear reason to believe they are more profitable than utilities in most other states. Certainly, the aggressiveness of prudence reviews in the State and the proactive regulatory approach temper the generosity of the various California ratemaking mechanisms. ERAM would likely be a bigger boon to utilities in states that do not share in this tradition. The vehemence of utility opposition to the elimination of ERAM serves, at least, to demonstrate their conviction that ERAM serves their interests. Note, however, that ERAM by no means guarantees utility financial health. ERAM represents merely one of a myriad of of factors that can influence the financial position of a utility.

ERAM is Counter to the Business Cycle

ERAM tends to keep utility bills constant. Since the revenue requirement must be met, if it is spread over a fixed number of customers, the burden per customer remains constant. Therefore, customers suffer in times of recession when they are partially denied the benefit of lower electricity bills that should accompany their lower usage. On the other hand, they benefit in expansionary times by not having to pay so much for their extra consumption. Weather conditions create a similar effect.

ERAM is Cheap to Administer

ERAM involves some additional accounting steps and creates some confusion in rate-making because of different implementations adopted by the various utilities. However, from the conservationist perspective, these are trivial costs compared to attempting to police the utilities conservation programs in the field or oversee the day-by-day cost allocations made in the utility companies. Given the goals of ERAM, it is an administratively cheap policy for achieving those goals.

ERAM is Unfair Without Rate Base Attrition

This argument that ERAM is unfair without rate base attrition appears valid. The problem boils down to the fact that increases in the number of customers will likely lead to more sales and, hence more utility costs. Without ERAM in place, the company might recoup the extra base-rate costs of serving the new customers from the additional sales to those customers. ERAM eliminates that link, while a rate base attrition mechanism reestablishes it.

ERAM is Incompatible with Deregulation

Today, utilities are not natural monopolies in all sectors of the electricity market but, rather, face stiff competition from bypass and independent power production. As the contracts example in the appendix shows, the existence of ERAM is confounding at least one of the CPUC's attempts to make appropriate policy adjustments to pave the way for increasing competition. A company that is protected from the effect of sales variations from whatever cause simply cannot be considered a fair competitor in a free market.

On the other hand, the *status quo*, including ERAM, could be maintained, at least in part. Under a regime in which customers can buy only from one supplier who generates all the power it sells, ERAM, by reducing the riskiness of the utility, should result in lower rates, all else equal. However, while the rates are lower, the customers rather than the bond and stockholders are bearing the sales risk, therefore, they are not getting a free benefit from the lower rates.

ERAM Survives Because of Institutional Inertia

Like any other policy, ERAM has taken on a life of its own in California. ERAM is now a familiar and trusted friend that has provided significant benefits to the utilities, so resistance to its proposed removal was understandably fierce. Conservation groups, CPUC staff, and other California state agencies have all testified in favor of keeping ERAM. However, many of those opposed to removing ERAM did not argue the merits of ERAM themselves, but, rather, argued that the administrative task of reorganizing procedures without ERAM poses too much of an administrative burden. The power of this argument was enhanced by the difficulties experienced reforming natural gas regulation in the State.

ERAM Encourages Experimental Ratemaking

ERAM, as part of its general tendency to reduce the general contentiousness of hearings, provides the important side benefit that experimental ratemaking faces less rigorous scrutiny by the utilities than it would in the absence of ERAM. It has been argued, especially by the utilities themselves, that this benefit of ERAM has improved the efficiency of the regulatory process by minimizing ratemaking disputes. With regard to experimental rates, certainly, the CPUC has been a national leader in introducing marginal-cost ratemaking and individually negotiated bypass-preventing contracts. These innovations may not have come about had the California utilities not had ERAM as a failsafe against ratemaking inaccuracies.

ERAM Account is Convenient for Ratemaking.

The ERAM account has been used as a convenient catchall account for minor ratemaking adjustments. Small corrections to rates are made by credits or debits to the ERAM account in the knowledge that these sums will eventually get rolled back into rates in future ERAM adjustments.

CONCLUSION

The ratemaking and regulatory structure of California, like that of any other state, consists of a unique collection of procedures, policies, and mechanisms. Lessons from the operation of ERAM in the State can be only derived within this specific context.

ERAM protects the utilities from rate-of-return reductions that result from sales losses. The erosion of earnings can be significant, and, in the absence of ERAM, this must act as a deterrent to the successful conduct of conservation programs. However, sales losses come from many sources, and it is far from clear that current California policy goals justify the protection of utilities from all sources of sales loss, or gain. Conservation programs are different only in that they pose only a downside risk to utilities. Unlike weather, the business cycle, and other causes of sales fluctuation, if conservation works, it affects sales only in one direction. While trying to correct for this phenomenon may be a reasonable policy goal, ERAM does this by providing blanket protection against all sales risk, some aspects of which should properly be borne by the utilities, even within the traditional framework of rate-of-return regulation. Note, however, that there is no clear accord in the industry regarding the appropriate split of risk bearing between utility and customer. Allowing the utility to bear additional risk has some negative effects, notably higher costs of borrowing and, as a result, higher rates. On the other hand, shielding the utility from risk tends to diminish its interest in operating efficiency and to make it an unfairly advantaged competitor to independent power producers.

When other jurisdictions contemplate the introduction of ERAM, they should evaluate its effects relative to those experienced in California with caution. No regulatory mechanism operates in a vacuum, and the importance of deviations in local conditions from those prevailing in California must all be taken into account. The use of the forecast test year, the annual financial attrition hearing, and the existence of rate base attrition, in particular, are conditions that have an impact on the operation of ERAM. California regulation, perhaps, represents an unusual regulatory environment because of the proactive-yet-protective nature of its ratemaking and oversight. In the California case, it can be argued, the effect of ERAM is muted. When forecasts are made and litigated annually, how wrong can they be, and how could any party consistently submit a biased forecast? When the authorized rate of return is reset annually, how much could it deviate from industry averages? Without ERAM, would rate base attrition be necessary? In other words, the effect of an ERAM mechanism might be quite different in another state, and the effect would likely be more dramatic.

Looking forward, ERAM can be seen as the source of potential conflicts in policy. The aim of cleaving large customers from small ones and applying ERAM only to revenues from the latter category has not been realized in California. Not only does such a plan impose significant administrative burdens, it would represent a radical departure from traditional ratemaking, leading to complex cost allocation and oversight problems. Such a scheme, however, is not out of the question. Finally, it must be recognized that ERAM is a mechanism that belongs to the era of the highly-protected utility under fire. Given that the financial health of the industry has improved, and that the overall trend in regulation is to make utilities more competitive, perhaps, ERAM runs counter to wider regulatory goals of shifting the risk burden towards the utilities, rather than towards the customers.

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Appendix
SPECIAL CONTRACTS

Introduction

ERAM represents a major departure from traditional rate-of-return regulation. ERAM was, in part, intended to protect utilities from the between-rate-case revenue loss resulting from successful conservation programs, yet in practice it protects utilities from sales deviations resulting from any cause. The all-encompassing nature of ERAM protection portends potential conflicts with CPUC policy in some areas, where the CPUC would prefer to see the utilities bear sales risk. One such example concerns the emergence of special customer contracts, which are used in California to discourage large customers from leaving the traditional utility network.

Bypass in California

The opportunities for large industrial customers to self-generate their own power and *bypass* the traditional utility power network are growing in the U.S., particularly in California. Regulatory changes, improvements in cogeneration technology, low prices of natural gas and other light fuels, and cross-subsidies by the industrial rate class of the residential class all tend to make bypass an attractive option to large customers.

Bypass, it is argued, adversely affects the capacity utilization and fuel mix of utilities, increases the State's dependence on imported fossil fuels, wastefully duplicates the State's generating capacity, confounds industry planning, and has negative environmental consequences. The most strident argument against bypass, however, is that rates of customers remaining on the system rise because the burden of fixed cost recovery falls more heavily on a reduced customer base. Thus, the bypasser evades the common customer responsibility to keep the social contract of cost recovery. Furthermore, since bypassers in California can sell excess power, either to the utility or, to a limited extent, to other utility customers, the economic health of the traditional utilities can be further eroded. On the other hand, since most bypass projects cogenerate power and heat, they can contribute to improved overall energy efficiency, and, to the extent that such projects can provide both forms of end-use energy more cheaply than alternative commercial suppliers, economic efficiency can also be improved. Additionally, freely permitting bypass has also been advocated as a means of easing the industry towards a deregulated future.

To date, the short-run problems that bypass creates have dominated the thinking of the CPUC and the utilities, and a concerted effort to limit bypass has been mounted. Both the California utilities and the CPUC hope to limit the bypass phenomenon to those customers they consider *economic* bypassers. These are customers for which the average cost of bypass is below their utility's short-run marginal cost. To discourage customers from bypass, PG&E has, since 1986, been negotiating individual long-term sales contracts with a few large customers that have threatened bypass. The other California utilities have been slower to adopt bypass preventing contracts, but both Edison and SDG&E are now following suit. These negotiated contracts are currently approved by the CPUC on an individual basis, although by an accelerated process. This form of electricity pricing represents a departure from traditional U.S. utility regulation which has, generally, imposed publicly-known tariffs for all but a few select customers, usually public agencies. The emergence of this non-traditional ratemaking poses a difficult policy problem for the State, a problem without any convenient precedent or model to follow. While there are some examples of similar activities in other states, the situation in most cases is somewhat different from that in California. Similarly, there are few examples in other industrialized nations of investor-owned utilities that are permitted to make private contracts with their large customers.[1] Therefore, bypass-preventing contracts are thus far, like ERAM, a California phenomenon.[2]

In California, the contracts may also prove to be a short-lived phenomenon. The excess capacity era, arguably, came to an end upon the closure of the Rancho Seco nuclear plant near Sacramento in June, 1989. Also, the first CPUC rejection of a major contract proposal came in July, 1989. Thus, while the duration of the excess capacity

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1. In West Germany, private contracting does take place. However, for the most part, the majority of stock in German utilities is in public hands.

2. This is not to say that other states have not attempted to stem bypass. Policies in other states, however, have followed more traditional ratemaking formulas, usually by offering favorable tariffed rates, often called *development rates*, to threatening bypassers.

situation was always expected to be no more than a decade, it may actually last only about half of that time.

CPUC Policy

The CPUC has thus far favored the signing of private contracts between the utilities and their large industrial customers. The CPUC has further encouraged the practice by establishing in 1987 an Expedited Application Docket Procedure to facilitate the rapid approval of contracts. Certain guidelines for contracts were established. The ground rules limit contracts to 5 years, emphasizing the expected short-term nature of excess capacity. However, all contracts are subject to subsequent CPUC prudence review.

Three arguments have been the most persuasive in the ongoing debate over the desirability of special contracts.

1. Large capacity additions made in the early and mid 1980's, coupled with the rapid emergence of non-utility generation pushed the State into an excess capacity situation that remained for several years. Since the large capacity additions have to be paid for by ratepayers in any case, it is argued, it is worth keeping a threatening bypasser on the system if it is willing to pay a price high enough to cover the avoidable costs of generation and also make a contribution, however small, towards recovering the unavoidable costs.

2. Allowing the utilities to negotiate sales contracts forms a necessary preparatory step towards making the utilities able to compete in the deregulated electricity market of tomorrow.

3. The contract represents an opportunity for the industry to deliver lower rates to its most price-elastic customers, the industrial rate class. The trend towards cheaper large-customer rates has been evident in recent years and the private contract offers a useful vehicle for making reduced industrial rates politically feasible. The justifications for lower industrial tariffs are that there has been an historic cross-subsidy from the industrial customer and towards the residential, and that the high costs of doing business in the State require that a break be given to industrial electricity customers to compensate.

The Test Case Policy Question

This question to be addressed in the test case is the following. Since the California electric utilities are allowed, or even encouraged, to make individual contracts with large customers that threaten bypass, how does the existence of ERAM change the effectiveness of the contracts policy. This issue is of particular interest because it is representative of many such short-run questions that will arise during the protracted piecemeal deregulation of the electric power sector that appears to be underway. During this period, the industry is faced with some special problems that the economics literature has only recently begun to address.[3]

Dow Contract

Edison has a large contract with the Dow Chemical plant in Torrance, CA.[4] The Dow contract, which was approved at the end of 1988, is described here merely as an example of the kind of contract assumed in test case example.[5]

The Torrance facility is the largest of its kind on the West Coast, occupying over 50 acres and producing polystyrene, styrofoam, and epoxy resins. The average electrical load of the plant is 2.8 MW, and the stable need for both power and process heat make it a good cogeneration opportunity. Further, Dow already operates 3,200 MW of capacity in the U.S., including a demonstration coal gasification plant, so there is no question that Dow has the technical expertise to install and run a cogeneration unit at Torrance. In other words, Dow posed a highly credible threat of load loss to the Edison system.

Edison's contract with Dow began on the first day of 1989, and it runs for five years. In addition to not building its own plant, Dow commits to buy all of its power from Edison, although only an amount equal to the power Dow could have generated itself is charged at the favorable Self-Generation Deferral rate. This rate is intended to duplicate Dow's costs of self-generation as accurately as possible. That is, it intends to make Dow indifferent between self-generating and buying from Edison. Edison's avoided costs form a lower bound on the rate, while the otherwise applicable tariff, TOU-8, provides an upper bound.

3. MacAvoy, *et al*, 1989

4. PG&E has been the most active California utility negotiating special contracts and has over 2/3 of the total contract capacity.

5. CPUC decision 88-12-097

TABLE 3: BYPASS CASE

line #	year (t) ->	1989	1990	test yr. 1991	1992	1993	test yr. 1994	1995	1996
	RATEMAKING FOR YEAR t AT THE END OF YEAR t-1								
	BASE RATE								
1	forecast sales change	4.0%	3.0%	2.0%	1.0%	2.0%	2.0%	2.0%	2.0%
2	forecast sales for year t	68640	70699	72113	72834	74291	75777	77292	78838
3	authorized interest rate	8.0%	7.5%	7.0%	8.0%	8.5%	9.0%	10.0%	9.0%
4	rate base	6000	6150	6304	6461	6623	6788	6958	7132
5	authorized rate of return	12.5%	12.0%	11.5%	12.5%	13.0%	13.5%	14.5%	13.5%
6	target earnings : (4 x 5)	750	738	725	808	861	916	1009	963
7	forecast base operating costs including attrition adjustments	3500	3623	3749	3881	4016	4157	4302	4453
8	authorized revenue requirement: (6 + 7)	4250	4361	4474	4688	4877	5073	5311	5416
9	base rate in t-1	6.170	6.192	6.168	6.204	6.437	6.565	6.695	6.872
10	forecast revenues at current rates : (2 x 9)/100	4235	4378	4448	4519	4782	4975	5175	5418
11	forecast revenue shortfall: (8 - 10)	15	-17	27	169	95	98	137	-2
12	base rate in t : ((8/2) x 100)	6.192	6.168	6.204	6.437	6.565	6.695	6.872	6.870
13	change in base rate over year t-1	0.4%	-0.4%	0.6%	3.7%	2.0%	2.0%	2.6%	0.0%
	ERAM BALANCE RATE								
14	ERAM balance end of t - 1	-178	-100	-129	27	35	36	178	158
15	ERAM balance rate in t-1	-0.304	-0.259	-0.141	-0.179	0.037	0.047	0.047	0.230
16	forecast ERAM revenues at current billing factor : (15 x 2)/100	-209	-183	-102	-130	27	35	37	181
17	forecast ERAM revenue shortfall : (14 - 16)	31	84	-27	157	8	1.0	141	-23
18	ERAM balance rate in t : ((14/2) x 100) : (24/2)	-0.259	-0.141	-0.179	0.037	0.047	0.047	0.230	0.200
	EFFECTIVE BASE RATES								
19	effective base rate : (12 + 18)	5.932	6.027	6.026	6.473	6.612	6.743	7.102	7.070
20	change in effective base rate over year t-1		1.6%	0.0%	7.4%	2.1%	2.0%	5.3%	-0.4%
	ACTUAL EVENTS IN YEAR t								
	GENERAL RESULTS								
20.a	base case sales in t	70640	73199	72113	72834	74291	73277	75292	77838
20.b	sales loss due to bypass	500	500	500	500	500	0	0	0
21	actual sales in t	70140	72699	71613	72334	73791	73277	75292	77838
22	actual sales relative to forecast	higher	higher	lower	lower	lower	lower	lower	lower
23	error in sales forecast	2.2%	2.8%	-0.7%	-0.7%	-0.7%	-3.3%	-2.6%	-1.3%
24	actual base rate revenues in t : ((12 x 21)/100)	4343	4484	4443	4656	4844	4906	5174	5347
25	actual ERAM revenues in t : ((18 x 21)/100)	-182	-102	-128	26	34	35	173	156
26	total revenues in t : (24 + 25)	4161	4381	4315	4682	4879	4941	5347	5503
27	actual base operating costs	3500	3623	3749	3881	4016	4365	4518	4676
28	actual base operating costs relative to forecast	equal	equal	equal	equal	equal	higher	higher	higher
29	error in operating cost forecast	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%	5.0%
	EFFECT ON ERAM ACCOUNT								
30	initial ERAM balance at beginning of t	-178	-100	-129	27	35	36	178	158
31	miscollection in t : (8 - 26)	89	-21	159	6	-2	133	-36	-87
32	ending balance at end of t : (30 + 31)	-89	-121	30	32	33	169	142	71
33	interest accrued during t : (avg(30, 32) x i)	-11	-8	-3	2	3	9	16	10
34	closing ERAM Balance at end of t : (32 + 33)	-100	-129	27	35	36	178	158	81
	cross check by formula from eq.4	-100	-129	27	35	36	178	158	81
	EFFECT OF ERAM ON EARNINGS								
	without ERAM								
35	actual earnings on rate base : (24 - 27)	843	861	694	775	828	541	656	671
36	actual rate of return on rate base : ((35/4) x 100)	14.0%	14.0%	11.0%	12.0%	12.5%	8.0%	9.4%	9.4%
	with ERAM								
37	actual earnings on rate base : (26 + 31 - 27)	750	738	725	808	861	709	794	740
38	actual rate of return on rate base : ((37/4) x 100)	12.5%	12.0%	11.5%	12.5%	13.0%	10.4%	11.4%	10.4%

TABLE 4: CONTRACTS CASE

line #	year (t) ->	1989	1990	test yr. 1991	1992	1993	test yr. 1994	1995	1996
	RATEMAKING FOR YEAR t AT THE END OF YEAR t-1								
	BASE RATE								
1	forecast sales change	4.0%	3.0%	2.0%	1.0%	2.0%	2.0%	2.0%	2.0%
2	forecast sales for year t	68640	70699	72113	72834	74291	75777	77292	78838
3	authorized interest rate	8.0%	7.5%	7.0%	8.0%	8.5%	9.0%	10.0%	9.0%
4	rate base	6000	6150	6304	6461	6623	6788	6958	7132
5	authorized rate of return	12.5%	12.0%	11.5%	12.5%	13.0%	13.5%	14.5%	13.5%
6	target earnings : (4 x 5)	750	738	725	808	861	916	1009	963
7	forecast base operating costs including attrition adjustments	3500	3623	3749	3881	4016	4157	4302	4453
8	authorized revenue requirement : (6 + 7)	4250	4361	4474	4688	4877	5073	5311	5416
9	base rate in t-1	6.170	6.192	6.168	6.204	6.437	6.565	6.695	6.872
10	forecast revenues at current rates : (2 x 9)/100	4235	4378	4448	4519	4782	4975	5175	5418
11	forecast revenue shortfall: (8 - 10)	15	-17	27	169	95	98	137	-2
12	base rate in t : ((8/2) x 100)	6.192	6.168	6.204	6.437	6.565	6.695	6.872	6.870
13	change in base rate over year t-1	0.4%	-0.4%	0.6%	3.7%	2.0%	2.0%	2.6%	0.0%
	ERAM BALANCE RATE								
14	ERAM balance end of t - 1	-178	-110	-140	15	24	25	176	155
15	ERAM balance rate in t-1	-0.304	-0.259	-0.156	-0.194	0.021	0.032	0.033	0.228
16	forecast ERAM revenues at current billing factor : (15 x 2)/100	-209	-183	-112	-141	16	24	25	179
17	forecast ERAM revenue shortfall : (14 - 16)	31	73	-28	157	8	1.0	151	-25
18	ERAM billing factor in t : ((14/2) x 100) : (24/2)	-0.259	-0.156	-0.194	0.021	0.032	0.033	0.228	0.196
	EFFECTIVE BASE RATES								
19	effective base rate : (12 + 18)	5.932	6.012	6.011	6.458	6.597	6.728	7.099	7.066
20	change in effective base rate over year t-1		1.3%	0.0%	7.4%	2.2%	2.0%	5.5%	-0.5%
	ACTUAL EVENTS IN YEAR t								
	GENERAL RESULTS								
21	actual sales in t	70640	73199	72113	72834	74291	73277	75292	77838
22	actual sales relative to forecast	higher	higher	equal	equal	equal	lower	lower	lower
23	error in sales forecast	2.9%	3.5%	0.0%	0.0%	0.0%	-3.3%	-2.6%	-1.3%
23.a	sales at the contract rate	500	500	500	500	500	0	0	0
23.b	contract base rate	2.0	2.0	2.0	2.0	2.0	0	0	0
23.c	contract revenues : ((23.a x 23.b)/100)	10	10	10	10	10	0	0	0
23.d	sales at the full effective base rate : (21 - 23.a)	70140	72699	71613	72334	73791	73277	75292	77838
24	actual base rate revenues in t : ((12 x 23.d)/100)	4343	4484	4443	4656	4844	4906	5174	5347
25	actual ERAM revenues in t : ((18 x 23.d)/100)	-182	-113	-139	15	24	24	171	153
26	total revenues in t : (23.c + 24 + 25)	4171	4381	4314	4681	4878	4930	5345	5500
27	actual base operating costs	3500	3623	3749	3881	4016	4365	4518	4676
28	actual base operating costs relative to forecast	equal	equal	equal	equal	equal	higher	higher	higher
29	error in operating cost forecast	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%	5.0%
	EFFECT ON ERAM ACCOUNT								
30	initial ERAM balance at beginning of t	-178	-110	-140	15	24	25	176	155
31	miscollection in t : (8 - 26)	79	-20	160	7	-1.0	143	-34	-84
32	ending balance at end of t : (30 + 31)	-99	-130	20	22	23	168	142	71
33	interest accrued during t : (avg(30, 32) x i)	-11	-10	-5	2	2	8	13	9
34	closing ERAM Balance at end of t : (32 + 33)	-110	-140	15	24	25	176	155	80
	cross check by formula from eq.4.a	-110	-139	16	24	25	177	158	81
	EFFECT OF ERAM ON EARNINGS								
	without ERAM								
35	actual earnings on rate base : (24 - 27 + 23.c)	853	871	704	785	838	541	656	671
36	actual rate of return on rate base : ((35/4) x 100)	14.2%	14.2%	11.2%	12.2%	12.7%	8.0%	9.4%	9.4%
	with ERAM								
37	actual earnings on rate base : (26 + 31 - 27)	750	738	725	808	861	709	794	740
38	actual rate of return on rate base : ((37/4) x 100)	12.5%	12.0%	11.5%	12.5%	13.0%	10.4%	11.4%	10.4%

The Dow contract demonstrates the salient features of the contracts in question.

1. The customer is a large industrial enterprise with a credible bypass threat.
2. The rate is clearly favorable to the customer; note, Dow cannot lose on this contract.
3. The floor price ensures utility fuel-related (ECAC) costs are covered.
4. The rate is loosely set to make the customer indifferent to bypass.

From the policy perspective, the CPUC has determined that the short-run adverse consequences of bypass should take precedence over the longer-term goal of taking advantage of cogeneration opportunities and encouraging utility industry diversification. Since the lead time on cogeneration projects of this type is typically short relative to other capacity additions, delaying their introduction can also be interpreted as an effort to improve planning flexibility. Most contracts allow quite rapid outs for the customer, should it decide to proceed with cogeneration and abandon its favorable rate treatment.

Test Example

The complexity of the Dow contract and simplicity of the ratemaking model portrayed in Table 2 make it impractical to use this contract directly as a test example. Instead, a generic example is developed to show the effect of ERAM on the CPUC policy described.

In this example, 100 MW of special contracts are signed, resulting in lost sales of 500 GWh/y, that is, less than 1 % of Edison's sales. The contracts run for 5 years beginning in 1989, and *status quo* resumes afterwards.[6] It is assumed that the contracts ensure that ECAC costs are covered, and, further, that no rate effects result from the ECAC side. In other words, the full impact of the contracts appears in the effective base rate through the ERAM mechanism. The contracts are assumed to provide 2.0 ¢/kWh of revenue, instead of the full effective base rates.

Before moving to the effect of the contracts, consider Table 3. In this table, the rate consequences of allowing the bypass to proceed are presented. The result of simply allowing the 100 MW of threatened bypass to go ahead is the drop in sales relative to the base case that appears in line 20.b. The lost revenue resulting from the lowered sales is

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6. Note that this is an unrealistic assumption because many of the contractors will go ahead with their delayed bypass plans.

represented by the difference between the entries in row 26 of the base case and the bypass case. Notice that actual sales still exceed those forecast, but the ending balance in the ERAM account, line 34, is closer to zero than in the base case because the under-collection is more severe, 89 M$ versus 59 M$, line 31.

Notice that no change in revenue requirement has been made. That is, the departure of the bypassers is assumed to have no beneficial effect on non-ECAC costs whatsoever, in keeping with assumption 4. Clearly, under these simple assumptions, the remaining customers must be worse off because a fixed burden of the revenue requirement is spread more thickly across the reduced sales. Comparing the effective base rates in row 19 of Tables 2 and 3, the rates in the bypass case are higher in every year but the first and last. The first year's is set before the contracts have any effect, and the last is the first year that the bypass case returns to *baseline*. The ERAM account never zeros out in this case because the forecast is now always wrong, even in the 1991-1993 period. In the no-ERAM case, the utility still gains when sales exceed forecast, but since they now exceed forecast by less, the gains are less.

Now consider the contract case presented in Table 4.[7] In this case, contracts are successfully negotiated with the bypassers and they agree to remain on the system, but at a preferential rate. Before studying the details, consider the effective base rates that appear in row 19 of Table 4, and are reproduced as Figure 1. The effective rates of the base, bypass, and contract cases respectively are shown. Note the inflated scale necessary because the effects are small. Customers are always better off in the contracts case than in the bypass case, although, clearly, they are better off still in the base case. This comparison demonstrates the key argument in favor of permitting contracts. By keeping the bypassers on the

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7. Notice that eq.4 requires minor adjustment in this case because the revenues are now in two parts, a normal part and a contract part. It could be rewritten as follows:

$$B_t^t = B_{t-1}^{t-1} \cdot (1+i) + \left[R_t^{t-1} - e_t^{t-1} QT_t^t\right] \cdot \left(1+\frac{i}{2}\right) + ec \cdot QC_t^t$$

where QT_t^t are the sales on tariffed rates

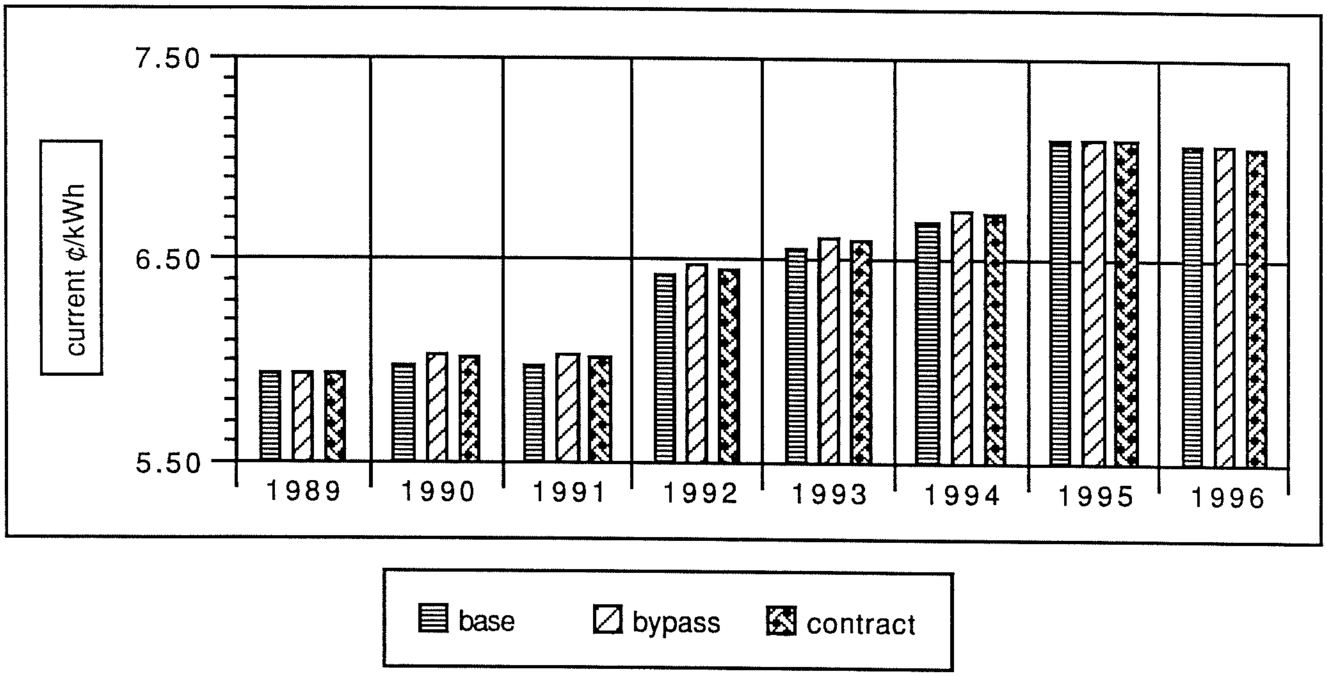
QC_t^t are the sales on contract rates

ec is the effective rate for contract sales

and $Q_t^t = QT_t^t + QC_t^t$

system, even at a favorable rate, the other customers benefit *vis-a-vis* the situation that would result from their bypassing. This result, to repeat, rests heavily on the assumption that the revenue requirement is totally insensitive to sales over the short-run, and that sales are totally inelastic with respect to price in the short-run.

Figure 1
Effective Base Rates In Each Case



Turning now to the details, consider rows 23.a through 23.d of Table 4. Since the bypassers stay on the system in this case, total sales are returned to the levels of the base case. However, the 500 GWh of sales under the contracts, line 23.a, are made at a lower base rate, 2.0 ¢/kwh, than the effective base rate. Remember that current CPUC policy essentially holds that as long as the contract base rate is positive, the contract is prudent. The revenues from the sales under the contract are shown separately in row 23.c The ERAM revenues are also lower because the ERAM balance rate does not apply to the contract sales. Notice that with no ERAM, the extra revenues earned from the contract would make the utility better off relative to the bypass case, as shown by the higher return in row 36. However, in the ERAM case, once again, ERAM dutifully takes care of all the revenue miscollections, and the rate of return matches those authorized.

Implications

If ERAM is in place, the utility should be indifferent to each of these cases. In each one, it collects exactly its authorized revenue requirement, as seen by identical results in line 38, as is the intent of ERAM. The customers are better off in the contracts case than the bypass case, but they would be better off still if the status quo of the base case could be retained. The problem that presents itself concerns change. The purpose of ERAM involves shielding the utility from the consequences of change. The designers of ERAM wanted to see the utility shielded from the negative consequences that conservation would bring to the utility. However, their mechanism protects the utility from all sales deviations and this has fouled the CPUC's contracts policy.

The model utility has no incentive whatsoever to negotiate a favorable contract with customers who bypass, or any incentive, actually, to negotiate any contract at all. If ERAM is in place, it should be financially indifferent to any of the three cases presented. Clearly, this situation is not what the CPUC intended with its contracts policy. Firstly, the policy was intended to keep threatening bypassers on the system as long as the other customers are better off than they would be if the bypass proceeds. The utility has no incentive to pursue such contracts. It should be indifferent to keeping or losing the bypassers. Second, given that the utility negotiates with potential bypassers, the CPUC intends it to negotiate toughly, obtaining the largest possible contribution towards revenue requirement, resulting in the lowest possible customer rates. But if ERAM is in place, the utility has no incentive to negotiate toughly, since it should be indifferent between any contract prices. Whatever the contract prices agreed to, the utility collects the same revenue requirement. A soft deal with a threatening bypasser is paid for by the other customers, not the utility. Finally, the CPUC contracts policy is shrouded in rhetoric about making the industry more competitive and preparing the utilities for the tough deregulated times ahead. However, the existence of ERAM not only shields the utility from competitive pressures, clearly, it disadvantages competing independent power producers whose return on equity could never be as consistent as the utility's. This consistency in return should lead to stockholders accepting a lower return.

Ironically, ERAM appears to have come full circle. The utility's best strategy, it seems, is to mount a costly effort to negotiate sales contracts and ensure that these costs are safely embedded in rate base. The costs embedded in revenue requirement will be collected by the utility whatever sales ultimately prove to be. After the rate case establishing revenue requirement, the utility should dramatically cut its negotiating effort. Whether or not contracts are actually signed, and at what rates, appears irrelevant. The utility should just make the minimum effort that will prevent a later prudence disallowance of the contracts sales effort.

Actual Utility Behavior

One question remaining concerns the current behavior of the industry in California. Although in the simple model used here, the utility emerges indifferent to the three cases, in fact, in California, the three utilities appear to be actively pursuing contracts, especially PG&E. And indeed, the companies vigorously assert that they do negotiate as toughly as possible, and that they see the expanded marketing effort that negotiating contracts has required as a step towards improving their future competitiveness. There are several possible explanations for this observed behavior, which apparently contradict the predictions of the simple model presented here. All of them involve strategic behavior on the part of the utility.

1. Perhaps utilities are pursuing contracts for other reasons than to improve their short-run financial performance. One motive that immediately springs to mind, is their desire to maintain their monopoly positions. That is, they believe they can stem the tide of cogeneration.

2. A second and important strategic consideration ignored by the model concerns the threat of a bypasser becoming a qualifying facility (QF) under the terms of the Public Utilities Regulatory Policies Act. If the bypasser has power available to sell, the utility will be required to buy it, possibly at rates quite unfavorable to the utility, and, again, its monopoly power is diminished.

3. The first experience with contracts took place in an era when the CPUC appeared to be leaning towards elimination of ERAM, that is, in the mid-1980's. The utilities, then, set up their contract negotiating effort in the belief that although they are protected from

revenue losses by ERAM in the short run, they had to prepare for the post-ERAM era in which lost sales would again be reflected in a lower rate of return.[8]

4. Perhaps, 3. could be generalized further by saying that the utilities, like all actors in the industry, are expecting and preparing for changed circumstances, so that short-run indifference does not govern their behavior.

Conclusions

The special contracts issue provides a valuable test case of the possible influence of ERAM on evolving regulation. It shows that compatible policy goals, such as conservation and expanded utility freedom to compete, can lead to ineffective, or even perverse, regulation.

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8. Some of the early contracts do explicitly state that they should be outside of the ERAM framework. However, such provisions were never enforced.

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