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Designing Shared-Savings Incentive Programs for Energy Efficiency: Balancing Carrots and Sticks

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Designing Shared-Savings Incentive Programs for Energy Efficiency: Balancing Carrots and Sticks

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Executive Summary

Traditional regulation of utilities is biased against utility activities that have the effect of reducing utility sales. Reduced sales reduce utility earnings. The only financial incentive for utilities to pursue conservation is the threat that regulators may disallow other, non-conservation expenses. Given that energy conservation often represents the most cost-effective means for supplying consumer's demands for energy services, there is an inherent conflict between society's desire for a least-cost mix of energy services, ratepayer's desire for lower energy bills, and shareholder's desire for reliable profits. The National Association of Regulatory Utility Commissioners now formally recognizes this conflict and has resolved to "ensure that the successful implementation of a utility's least-cost plan is its most profitable course of action."

One promising approach for stimulating utility participation in the acquisition of cost-effective demand-side resources is called shared savings. In a shared-savings arrangement, the difference between the cost of a demand-side resource and its value measured in avoided supply-side resources is "shared" by the utility shareholders and ratepayers. While sound in principle, implementation raises a number of issues for regulators to ensure an equitable allocation of risks and rewards between ratepayers, shareholders, and society. This paper draws from the experience from the 1989 California collaborative process, where several shared savings programs were proposed, to illustrate some of these considerations.

A shared-savings incentive mechanism consists of three major components: the cost of the demand-side program, the amount of energy saved by the program, and the value of the supply-side activities avoided by the program. In the California collaborative, discussions centered on which program costs should be included, how energy savings should be measured, and how benefits and their recovery should be determined. Resolution of these issues led to the development of additional incentives to pursue the acquisition of demand-side resources aggressively and at the same time minimize program costs. Finally, the discussions also clarified the types of demand-side activities most appropriate for shared-savings arrangements.

In a shared-savings arrangement, demand-side program costs can be based on utility costs or total costs (i.e., utility plus participant costs). Utility costs are easier to measure and using them provides a direct incentive to the utility to minimize its costs. However, the use of total costs is theoretically superior from the standpoint of cost-effectiveness to society, although it may dilute the incentive for utilities to minimize its own costs. The collaborative decided that either could be used subject to certain restrictions. If only utility costs are used, programs must first pass the total resource cost test (which relies on the total costs of the program). If total costs are used, utility costs are first subject to caps that limit the maximum per unit costs for selected program elements (such as the cost of the energy conservation equipment).

Measuring energy savings is an imperfect science. In principle, it should be performed after a demand-side program has been put in place and observed for some time. A particularly difficult measurement issue lies in properly accounting for effects that are not within the control of the utility but which affect energy savings (such as weather or occupant behavior). The collaborative decided to rely on pre-specified engineering estimates of savings for individual measures, but to base aggregate savings on the actual numbers of installations made by the utility. This decision protects the utilities from uncertainties in the performance of individual measures while providing an incentive to increase program participation. The utilities also agreed to initiate comprehensive measurement programs to improve future estimates of the performance of energy efficiency measures. However, these findings will only serve to modify savings estimates for future programs.

Avoided costs, like conservation program performance, are a subject to a large number of influences, only some which are under the control of the utility. Furthermore, recovering the benefits of demand-side programs over a time period that closely parallels the realization of savings, means the utility will have to wait a considerable period of time before recovering its full share of the savings. The collaborative resolved this issue in a manner analogous to contractual agreements that pay qualifying facilities for non-utility generated power. In effect, the utility is allowed to recover the entire avoided cost benefits of a single year's program over an accelerated time period (3 years). This procedure, in turn, calls for a forecast of future avoided costs that is determined in a separate regulatory proceeding, which already exists.

Concern over the prospect that utilities might agree to the terms of a shared-savings arrangement, but then pursue some demand-side programs only half-heartedly (justified in part by observed underspending by utilities of their authorized conservation budgets during the last several years) led to the introduction of minimum performance standards for each demand-side program. The standards were typically set at an agreed fraction of the overall program goals for number of measures to be installed, homes to be weatherized, or audits to be completed, depending on the program. Utilities that fail to meet the minimum performance standards would be subject to penalties on their earnings.

The collaborative also agreed that shared-savings arrangements were only appropriate for demand-side programs that have readily apparent resource value to the utility system. These include primarily programs offering mature technologies in the retrofit and new construction markets. For other types of demand-side programs, shared savings are not appropriate. These include programs that introduce new technologies whose performance is uncertain, programs that may reduce loads, but which are introduced primarily to help customers control their bills (such as energy management services or direct assistance programs), and finally programs for which it may be impossible or very difficult to determine load impacts (such as information programs, innovative tariffs, or measurement and evaluation activities).

In summary, the success of financial incentives to spur utility participation in demand-side programs rests ultimately on the unambiguous specification of the new "rules of the game." These rules must fairly allocate risks and rewards between ratepayers, shareholders, and society.

The collaborative process in California confirmed the value of establishing these rules in a relatively informal (i.e., non-adjudicatory) setting where the relative merits of various approaches could be freely discussed and refined to the satisfaction of all parties.

1. Introduction

In 1989, the National Association of Regulatory Utility Commissioners (NARUC) formally acknowledged that traditional regulation discourages utility participation in least-cost planning (LCP) activities (NARUC 1989 and Wiel 1989). A subsequent NARUC "white paper" succinctly identifies the disincentives (Moskovitz 1989):

a. Each kWh a utility sells, no matter how much it costs to produce or how little it sells for, adds to earnings;

b. Each kWh saved or replaced with an energy efficiency measure, no matter how little it costs, reduces utility profits;

c. The only way regulation directly encourages utilities to pursue cost-effective conservation is the risk that dissatisfied regulators may disallow costs; and

d. Purchases of power from cogeneration, renewable resources or other non-utility sources add nothing to utility profits, no matter how cost-effective these resources are.

Coupled with growing consensus that increased LCP activities make good economic and environmental sense, the NARUC resolution urges member commissions to "ensure that the successful implementation of a utility's least-cost plan is its most profitable course of action." The NARUC report evaluates some of the theoretical properties of various proposed incentive approaches, such as rate-of-return adjustments, bounties, and shared savings.[1]

The focus of this work is on the practical issues that emerge when regulators review utility incentive proposals for energy efficiency programs. We examine one particular type of incentive mechanism--shared savings, in which the net benefits from the energy efficiency investment are shared between ratepayers and utility shareholders. The primary basis for the analysis is the shared-savings mechanisms recently put in place by two California investor-owned utilities, Pacific Gas and Electric (PG&E) and San Diego Gas and Electric (SDG&E). The discussion centers on the regulatory concerns and resolutions that arose in reviewing the shared-savings mechanisms proposed by these two utilities. The problems included establishing the basis for determining net benefits, establishing minimum levels of utility performance, rewarding cost-

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[1]Although there are many variations on these three basic types of incentives (see Moskovitz 1989), the differences between them can be broadly summarized as follows. Rate-of-return adjustments increase utility earnings by raising the percentage of rate-based costs recovered by the utility. Bounties increase utility earnings by directly rewarding utilities with cash bonuses for demand-side activities. Shared savings increase earnings through an explicit formula that allows the utility to keep some of the difference between the cost of demand-side resources and the subsequent value of the resources avoided on the supply side.

minimizing and resource-value-maximizing behavior, and equitably allocating the risks associated with uncertainty in the performance and value of demand-side programs. We suggest that in some cases practical implementation considerations override the theoretically superior choice when addressing these issues. We also argue that important differences between utility demand-side programs make it unreasonable to apply the same incentive mechanism uniformly to all types of DSM programs.

Although different circumstances among states and utilities are likely to influence the details of shareholder incentive mechanisms, we believe the evaluation principles identified can be applied by regulators who must review proposals which provide utilities with incentives in order to encourage investments in energy efficiency.

2. The California Collaborative Process

In 1989, California initiated a statewide collaborative process involving each of its four major investor-owned utilities and 11 state agencies and intervenor groups. The process was intended to address falling utility budgets for energy efficiency programs (Caldwell and Cavanagh 1989). Utility energy efficiency program activities were declining despite the existence of a unique regulatory mechanism, the Electricity Revenue Adjustment Mechanism (ERAM), that effectively decouples utility profits from sales (see Marnay and Comnes 1990 for a detailed description of ERAM and its role in California utility regulation). Although this decoupling removes disincentives from DSM programs that reduce utility sales, ERAM does not provide positive incentives for utility investments in customer energy efficiency programs that are comparable to investments in electricity generation. In other words, ERAM (or similar mechanisms which de-couple the short term effects of reduced sales from utility earnings) makes the utility indifferent in the short term to effects of energy efficiency programs, but does not address the longer term profitability issue of utility earnings opportunities for only supply-side investments.

A major outcome of the collaboration was agreement by California's utilities and other participants to conduct pilot programs that would provide incentives to utility shareholders for investments in energy efficiency (CPUC 1990a, CPUC 1990b). Negotiations to work out the details of the utility plans followed the collaborative process, and Commission approval (Decision 90-08-068) came in August, 1990.

Both the PG&E and SDG&E proposed incentive programs exhibiting features of what has come to be called "shared savings."[2] As with the shared-savings mechanisms adopted for utilities in New York, Rhode Island, and New Hampshire, the central feature of the PG&E and SDG&E shared-savings mechanisms is the sharing of the net benefits from energy efficiency

[2]The other major California electric utility, the Southern California Edison Company (SCE), proposed the use of a performance-based rate-of-return adjustment as an incentive.

investments between ratepayers and shareholders. The regulatory and implementation issues that arise with this type of mechanism are discussed in the following sections.

3. Regulatory Objectives for Utility Incentives

Providing incentives for utility investments in energy efficiency programs is a new tool for regulators seeking to promote the transformation of utilities from electricity suppliers to providers of energy services. Shared-savings mechanisms such as those adopted for the two California utilities provide important links between the notion of energy services and least cost planning. More specifically, shared-savings incentive mechanisms can be developed which will facilitate the pursuit of three important objectives related to implementation of utility DSM programs:

a. *Resource Value Maximization* - to pursue the total amount of cost-effective energy efficiency improvements to the stock of energy-using durables (buildings, appliances, etc.) as an alternative to supply-side resource options.

b. *Program Cost Minimization* - to implement DSM programs in the most cost-efficient manner possible.

c. *Minimum Performance* - to increase the certainty that a cost-effective and "authorized" program will be implemented by establishing disincentives (penalties), if minimum performance levels are not realized.

In the following sections, we discuss how these objectives can be met by establishing shared-savings mechanisms for energy efficiency programs. We begin with a brief overview of the shared-savings approach and a discussion of its applicability for rewarding utilities for demand-side activities. We then proceed to discussions that link the general principles identified above and the three key elements of the shared-savings approach: program costs, program load impacts, and avoided costs.

4. Shared-Savings Incentives for Utility Participation in Demand-Side Markets

Many types of incentive mechanisms for utility investments in energy efficiency are predicated on the assumption that the difference between lower cost demand-side resources and higher cost supply-side resources can be shared. However, shared-savings incentives specify explicitly the magnitude of the savings and their value. Other types of bonuses (e.g., higher rates-of-return and bounty-type incentives) can encourage utility efforts to promote energy efficiency, but these incentives are not necessarily related to the net benefits of the programs as an alternative to supply-side options. Shared-savings incentives are touted for their ability in principle to reward performance in implementing energy efficiency programs as a resource option, not merely company effort as measured by through-put of ratepayer dollars spent on DSM programs (Moskovitz 1989).

In general terms, the central characteristic of a shared-savings mechanism is defining "net resource value". Viewed as a resource, the value of an energy efficiency investment is the product of several components, as represented by the following simple formula:

$$NRV = (LR \cdot AC) - C$$

where,

NRV = Net Resource Value ($)
LR = Load Reduction (kW or kWh)
AC = Avoided Cost ($/kW of $/kWh)
C = Cost of the Energy Efficiency Investment

The preceding formula should produce a positive value which represents the net benefit of the investment relative to a supply-side resource addition. This net benefit is then "shared" between ratepayers and shareholders. There are, however, other reasons for utility involvement in demand-side activities and there are also demand-side activities whose net resource value may be difficult to measure. For these two reasons, we do not believe the use of shared savings is an appropriate incentive for all utility demand-side activities.

5. Applicability of Shared-Savings Incentives

Several examples illustrate the difficulties and inappropriateness of applying shared savings to all types of DSM programs. In the case of low-income assistance programs, the assistance, often in the form of paying all costs of installing energy efficiency materials, is often justified on equity grounds because these customers are unlikely to be able to participate in "mainstream" programs that offer rebates or other forms of partial payment for the energy efficiency investments. In California, such programs have been authorized and even encouraged without demonstration of cost-effectiveness from a net resource perspective. Since, in many cases, these programs are without net resource savings to share, they are not appropriate for shared-savings incentives.

Other DSM programs do not fit well with shared-savings mechanisms, but for different reasons. Energy service programs (i.e. "audits" of customer facilities), for example, can provide useful information to customers about how to reduce their bills (and utility loads) by behavioral changes such as turning off lights or thermostat setpoints. Severe measurement problems is often associated with such programs, however, because these behavioral changes may not be enduring or may be retained only with continued utility encouragement in the form of repeat information.

Another example of severe measurement problems is the indirect utility costs necessary to operate a large scale portfolio of DSM programs. Examples would include general administration costs and some measurement and evaluation activities which involve more than one DSM program. These kinds of costs are typically part of an overall utility DSM budget, but it is extremely difficult to allocate these costs to specific savings or establish performance requirements.

For the reasons noted above, we believe shared-savings programs are best suited for programs that: (1) involve the inducement of energy efficiency hardware (as opposed to behavioral changes); and, (2) are intended to serve as least-cost resource options. These programs should typically offer mature technologies even if they are not yet widely available. Examples of these programs include residential appliance efficiency incentives, residential weatherization retrofit incentives, and commercial/industrial energy management incentives. To a lesser extent, we believe that shared-savings incentives may also be appropriate for programs that have resource value but emphasize new technologies or building practices that make advance estimation of load impacts and customer acceptance difficult. Examples include new construction programs.

Programs which are likely to reduce loads but which are authorized primarily for purposes of helping customers control their bills (such as energy management services and direct assistance programs) are not recommended for shared savings. In California, these types of programs are being given "cost-plus" treatment, meaning that the incentive to shareholders is pegged simply at 5% of costs incurred by the utility to implement the programs. To minimize the obvious dangers of inviting "gold-plating" and a simple desire to spend money, the California treatment of cost-plus programs includes minimum performance standards (e.g. 75% of expected program goals) that these programs must meet to be eligible. In each case, goals and performance are not tied to energy savings, but to some other indicator which can be readily verified--number of audits, number of low-income families assisted at a specified level, etc. With this kind of performance requirement, the "cost-plus" treatment is better described as a "Performance-Based Earnings Adder" mechanism.

We also do not recommend shared savings for programs for which it is impossible or extremely difficult to estimate load impacts, either prior to or subsequent to implementation. Examples include information programs, time-of-use rate (TOU) programs, measurement and evaluation projects, and general administration. While these programs and costs are important components of an overall package of DSM programs, it is extremely difficult to establish meaningful indicators of performance or net resource value.

Our recommendations are summarized on Table 1.

Table 1
Matching Types of DSM Programs with Shareholder Incentives

Program Category	Incentive Treatment
CATEGORY 1 (retrofit incentives)	SHARED SAVINGS
CATEGORY 2 (new construction)	SHARED SAVINGS OR COST PLUS
CATEGORY 3 (low-income, services)	EARNINGS ADDER (with minimum performance)
CATEGORY 4 (general advertising, general administration measurement & evaluation	NO SHAREHOLDER INCENTIVES

6. Designing Effective Shared-Savings Incentives

Achieving the objectives for utility incentives outlined above requires a delicate balancing of the carrots and sticks available to regulators. On the one hand, the incentives, both their levels and, as important, the utility's perception of certainty of their recovery, must be sufficient to stimulate utility participation in the aforementioned demand-side markets. On the other hand, regulatory sticks for minimum performance are also appropriate to ensure that resource savings opportunities are being aggressively pursued. In California, a major issue lay in clearly identifying which party (the utility or its ratepayers) would bear the risks for the underlying factors affecting the net resource value of a utility's demand-side activities. The assignment of risks and rewards relates in turn to which aspects of a utility's performance in delivering demand-side resources are within the control of the utility (and therefore appropriate for rewards or penalties) and which ones are not. The ensuing discussion of how the shared-savings components (program costs, load impacts, and avoided costs) were defined for PG&E and SDG&E illustrates how this balance was struck in 1990. We anticipate that this snapshot will change as both the utilities and their regulators gain experience in delivering energy services.

6.1 The Cost of the Energy Efficiency Investment

In California, as elsewhere, two different definitions of costs have been considered--costs based on only the amount that it costs the utility or costs which include any participant costs beyond the financial assistance provided to the customer by the utility. In the vernacular of the California "Standard Practice Manual for the Economic Evaluation of Demand-Side Management Programs" (CPUC/CEC, 1987), this difference is comparable to the difference between the

Utility Revenue Requirements test (utility cost-based, UC) versus the Total Resource Cost (TRC) test (the cost of a measure plus utility administrative costs).

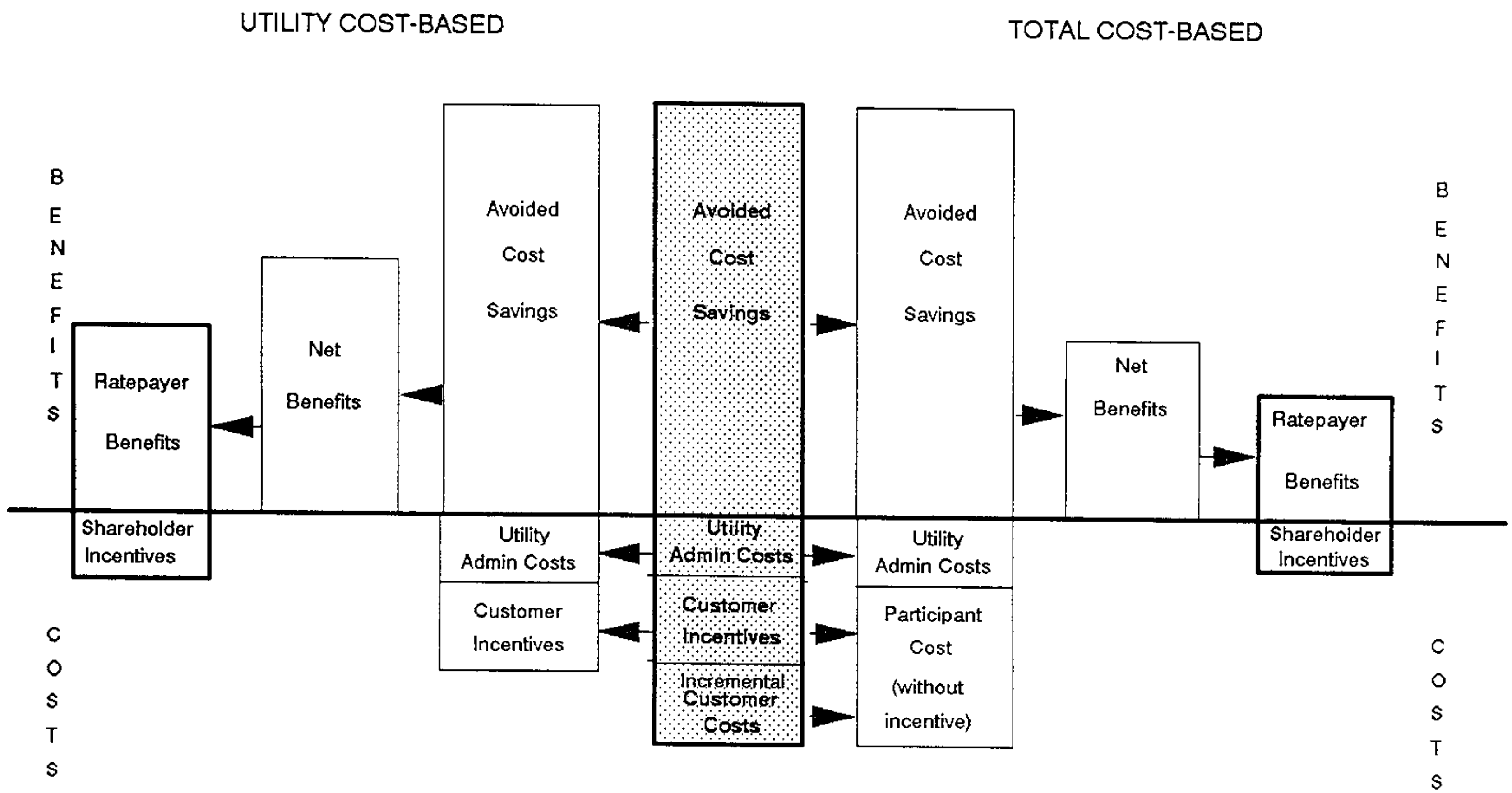
Figure 1 illustrates this fundamental difference in costs as it relates to a shared-savings incentive. As depicted in the graph, an energy efficiency investment induced by a utility program has the same resource value (avoided cost savings in the graph) but significantly different net values because "costs" are defined differently for the TRC and UC tests. In the TRC test, the costs consist of those borne by all parties, including both the participant and utility. In the UC test, only those costs borne by the utility are included. Because the net values are different, there are different levels of savings to share, depending upon which definition of costs is chosen.

At one level, the use of either the utility or total cost basis can be viewed as a policy matter. If the TRC test has been established as the basis for establishing cost-effectiveness of a DSM program, for example, it would seem to make sense to use total cost as the basis for establishing net value and therefore earnings levels. To establish the cost-effectiveness of energy efficiency relative to supply-side options based on total costs yet provide utility shareholder incentives based on utility costs (or vice versa) might create serious inconsistencies.

Policy considerations, however, may be offset by other considerations concerning the implementation of the program. It can be argued, for example, that utility costs are much easier to establish and track than total costs, thereby making the implementation of the mechanism less ambiguous. Similarly, it can be argued that utilities should be held responsible for their costs, but not for the other elements of total costs. If net value is based on utility costs, the shared-savings mechanism will have a built-in cost-minimization function because the savings to be shared will increase if the utility reduces its costs by offering the lowest possible level of financial assistance to customers to induce participation. If net value is based on total costs, the link between utility program costs (i.e., incentive payments to customers plus program administration costs) and utility earnings is less direct, potentially weakening the ability to meet the objective of cost-minimization. We will comment on this issue below.

Although it is necessary to establish clearly the basis for cost in a shared-savings mechanism, the importance of selecting utility or total costs as the basis in practice may not be so critical for several reasons. First, concerns about the potential inconsistency between resource selection based on total costs and earnings linked to utility DSM costs can be mitigated by establishing an agreement that only measures which "pass" the TRC test will qualify for inclusion in the mechanism, even though levels of utility earnings are based on utility cost only. Second, if it is necessary to give customers incentives which approximate the full cost of the measure, there is no difference between a utility or total-cost based mechanism because the only difference is the customer contribution, which in this case is zero. Also, if total resource costs are used as the basis, an additional cost-minimization element can be added to the shared-savings

Figure 1
Comparison of Shared Savings Concepts



mechanism to adjust the utility earnings depending on the amount actually spent compared to the expected expenditures. This provision increases the earnings if the program can be implemented at lower-than-expected costs and decreases the earnings if the opposite occurs.

In California, the utility-cost approach was proposed by PG&E and the total-cost based approach was proposed by SDG&E. The proposals were agreed to, however, only after supplementing the specifics of the mechanisms with provisions which addressed the concerns noted above. Therefore, the shared-savings mechanism adopted for PG&E is based on utility costs (with agreement on TRC eligibility) and the SDG&E mechanism is based on total costs (with a supplementary cost-minimization element). With these modifications, the objectives of resource value maximization and cost-minimization are both met by each shared-savings mechanism.

Several other issues related to the costs of DSM programs need to be addressed by utilities and PUCs. For example, the timing and procedures for program cost verification and recovery need to be established. For both shared-savings mechanisms in California, it was agreed that: (1) program costs would be expensed, with flexibility to spend more than initially authorized (up to a cap) and to shift expenditures among programs and program elements (within pre-specified boundaries); (2) verification would be part of a general, annual verification of utility performance; and (3) under- or over-expenditure of authorized costs will be tracked in a balancing account with any subsequent changes to rates being accommodated at the end of the rate case cycle; (4) the General Rate Case, which typically occurs every three years, will be the forum for reviewing the terms and conditions of these mechanisms, and considering them for extension with or without modification.

In addition, total costs involve additional considerations because these include costs that are not formally part of the utility accounting system. As suggested above, both a utility- and a total-cost based system can be affected by total costs in different ways. A central consideration, therefore, is how to treat deviations in these costs after the programs are put in place (i.e., deviations between expected total costs and actual total costs).

The primary component of total costs is the cost of the energy-efficient measure (see Figure 1). An "ex-post" approach would alter utility earnings if post-implementation measurement showed changes to the costs of any measures promoted by the programs. In California, these costs are pre-specified, meaning that costs of all measures are agreed upon prior to program implementation and fixed for purposes of subsequent performance review. New information on costs of measures will be collected and used for programs in the future, but deviations from the pre-implementation estimates will not affect shareholder earnings retroactively. In short, although the utility is held accountable for changes in costs due to changes in the mix of elements and the mix of programs, changes over time in the cost of an *individual measure* (e.g. a compact fluorescent) will not retroactively affect the calculation of earnings for programs put in place in that year.

6.2 Load Reduction Estimates

A second factor integral to calculating net resource value (and therefore utility earnings) in a shared-savings mechanism is the reduction in energy and peak demand from energy efficiency investments. In contrast to other profit-making mechanisms such as traditional rate-basing, shareholder earnings from a shared-savings mechanism are directly related to the reduction in load from the energy efficiency measures installed because of the utility programs. As a result, energy and peak demand reductions must be made explicit.

A major issue associated with load reductions when developing a shared-savings mechanism is whether to: (1) "fix" estimates for each measure to be promoted by each and every program; (2) agree prior to implementation on an explicit savings methodology; or (3) agree that load reductions will be established after program implementation, based upon a particular method and schedule for monitoring. In California, it was agreed that option (1) would be used for most programs. For a few programs, where a priori estimates were very difficult to establish, option (2) would be used.

Relying on measured and verified savings after program implementation has considerable appeal (option 3). This approach, adopted in Massachusetts, seems to come closest to being a true performance-based mechanism since utility earnings are approved after the true load reductions from the program are measured. However, this approach was rejected in California for several reasons. First, although California utilities have been implementing energy efficiency programs for over a decade, many important measurement issues remain unresolved. For example, it remains unclear whether it is possible (let alone practical) to obtain reliable energy savings values from analysis of customer bills from all participants or only by (sub) metering the loads of high efficiency appliances.

Largely because of the continued difficulties and uncertainties associated with establishing definitive load reductions for energy efficiency programs, the approach in California relies on pre-specification of load reductions in its shared-savings agreements. California regulators and utilities felt that the reliance on post-implementation "real measurement" would subject these activities to considerable pressures and concerns about gaming and to prolonged disputes about the accuracy of the measurements. Utility earnings would be withheld pending the resolution of these disputes with the outcome being dependent on a regulatory litigation process ill-equipped to address complex measurement issues. This prospect had little appeal for either the utilities or regulatory staff. Meanwhile, there was some support for the belief that, in most cases, reasonably reliable savings estimates could be made for most measures being promoted by the major programs.

The result of these considerations was an agreement on a kWh and kW reduction value for each major DSM measure to be promoted by each of the major energy efficiency programs. The agreement included establishing estimated values for all of the major elements that affect cumulative load reduction from a DSM program, including useful lives of measures and "free rider" adjustments.[3]

As with total cost estimates, therefore, the utility's actual earnings per participant or measure from programs implemented in the next few years will not be affected retroactively by new studies or measurements, which may produce alternative load reduction values. Earnings can only be affected by the level of participation. Thus, to establish performance and shareholder earnings, the focus is on *verification* of utility records that show how many of what type of energy efficiency measures were installed, not on the after-the-fact *measurement* of actual load reductions from specific measures or programs.

The approach adopted in California does not mean an abandonment of efforts to obtain better load reduction estimates for measures and programs. Improved estimates will remain a central and critical objective in making energy efficiency a reliable alternative to supply-side additions. Toward this end, the adoption of the shareholder incentive mechanisms included a multi-year measurement plan for each utility, with the specific objective of improving the accuracy of energy efficiency savings estimates. More accurate savings estimates from these studies will be used for any future shareholder incentive agreements and to revise the load reduction effects included as part of future utility resource plans.

6.3 Avoided Costs

The third primary component in calculating net resource benefit to be shared by shareholders and ratepayers is avoided costs. Current conventions for evaluating the economics of DSM programs rely on projections of the utility system marginal (or avoided) costs in order to determine whether reducing energy and capacity demand is more cost-effective than meeting load requirements with supply-side options on the margin from only a planning perspective. With a shared-savings mechanism, however, projections of avoided cost become more critical because these estimates directly affect shareholder earnings. The issue is not only the degree of accuracy associated with avoided cost projections, but also their consistency with avoided costs used for other resource evaluation purposes.

As with the other two components (load reductions and costs), estimates of avoided cost can be pre-specified (agreed upon prior to program implementation and fixed for a specified period of time) or developed and revised after or during program implementation to reflect the most up-to-date projections. The issue is similar to one raised in establishing the terms and

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[3]Free riders are program participants who would have engaged in a DSM activity in the absence of a utility program to stimulate participation. For these individuals, the utility inducement was not necessary. Although the presence of free riders leaves the total cost of the resource unchanged, their participation cannot be properly credited to the utility's efforts. Consequently, conventional practice holds that the utility should not be rewarded for the savings from these participants.

conditions for paying Qualifying Facilities (QFs)--who should bear what levels and types of risks in the face of uncertain avoided costs in the future?

For a shared-savings mechanism, a more direct question is, if projections of avoided costs turn out to be different than projected, should utility earnings from a measure installed as a result of prior year's program activities be adjusted to reflect these actual avoided costs? As with load impact and total cost estimates, there is appeal for a procedure which directly links shareholder earnings to subsequent variations in avoided costs. How direct the links should be is affected by several practical considerations.

The first consideration is related to the litigation burden noted above for after-the-fact revisions to load impacts. However, in this case, the burden might be eliminated by relying on procedures and regulatory proceedings that establish avoided costs for other purposes (such as "as-available" energy and capacity payments for QFs). Here, the primary issue would be whether the avoided costs calculated for "other purposes" are appropriate for properly valuing energy efficiency investments. Absent such a linkage to a pre-existing regulatory proceeding, adjustments to shareholder earnings based on subsequent deviations in avoided costs are likely to be contentious.

Even with acceptable methods and regular proceedings to adjust avoided costs and therefore shareholder earnings, additional problems detract from the theoretical appeal of doing so. Because the benefits of an energy efficiency investment are likely to persist for 10 to 20 years or more, theory suggests that shareholder benefits should be adjusted throughout the useful life of the energy efficiency measure. Programs typically involve numerous measures with highly varied useful lives, so the bookkeeping requirements of the utility and the regulatory agency would become enormous in order to track, review, and adjust earnings to reflect changes in avoided costs.

In addition, if earnings from a shared-savings mechanism were directly linked to an on-going update of avoided costs over the life of the effects of the energy efficiency investments, the level of earnings for utility shareholders in any given year would be "diluted" to relatively low levels, even if the program is relatively large.[4] A relatively modest level of annual earnings is not likely to attract nearly as much interest as an agreement to permit the accelerated recovery of earnings. Even though accelerated recovery would produce earnings for fewer years, the importance and visibility of the earnings from the energy efficiency programs would likely be much greater.

The approach adopted in California reflects these considerations with provisions that fix the avoided cost projections used in valuing the energy efficiency programs during the next few

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[4]For example, if the net present value of the resource benefits of an energy efficiency program is $15 million, and the shareholder share is set at 15% of the benefits, the utility earnings would be $2,250,000. If the utility earnings are recovered for some period over which the resource benefits are realized (e.g. 15 years), the annual earnings would amount to roughly $150,000 per year (neglecting for the moment the time value of money).

years and allow accelerated (three year) recovery of the utility earnings from these programs. To a large degree, these features were designed to increase the utility's and the regulators certainty expected program impacts. If the financial risk to the utility is reduced, the utility may be willing to accept a smaller share of the net benefits.

On the surface, the treatment of demand-side programs appears very similar to the front-loaded standard offer contracts made with California small power producers in the early 1980s. The unlimited availability of these contracts contributed to a perceived over-commitment to QF power and ultimately the suspension of the standard offers. For the newly adopted energy efficiency programs, the likelihood of a glut of these demand-side resources is reduced for two reasons: first, all projects must pass the TRC test to ensure that they are cost-effective; and second, the amount of the energy efficiency investments is capped by limits placed on the amount that can be invested during a designated period. This cap ensures that the pace of energy efficiency programs will be compatible with utility system resource needs.

7. Penalties for Non-Performance

Agreeing on the definition of costs, load reductions, and avoided costs for use in a shared-savings mechanism is a necessary but not sufficient basis for stimulating utility participation in demand-side markets. That is, virtually any variation of the shared-savings mechanisms described in the previous sections will be "performance-based" in the sense that earnings will depend on the ability of utility managers to attract participants for the energy efficiency programs. However, even if a shared-savings mechanism offers equal or greater opportunities to increase earnings than a supply-side project, program goals may not be accomplished for reasons other than an inability to obtain sufficient customer participation.

One way to increase the likelihood that program objectives will be met is to supplement the features of shared-savings mechanisms noted above with additional performance features which sharply reduce earnings and/or establish penalties in the event program objectives are not met. That is, if earnings opportunities prove insufficient to sustain utility management commitment to achieving energy efficiency goals, perhaps certain "downside" features will. By increasing the likelihood that program objectives will be met, downside features can help to improve the reliability of the energy efficiency programs as a resource alternative to supply-side options.

There are many ways to incorporate minimum performance standards and downside adjustments in the event of failure to achieve objectives. In California, the two shared-savings mechanisms reflect different approaches. For example, PG&E's incentive mechanism incorporates relatively high minimum standards, a "dead-band" for reduced performance levels whereby no earnings (but no penalty) result, and penalties to shareholders if less than 50% of program objectives are not met in any given year.

Figure 2
Earnings as a Function of Performance from Shared Savings Programs

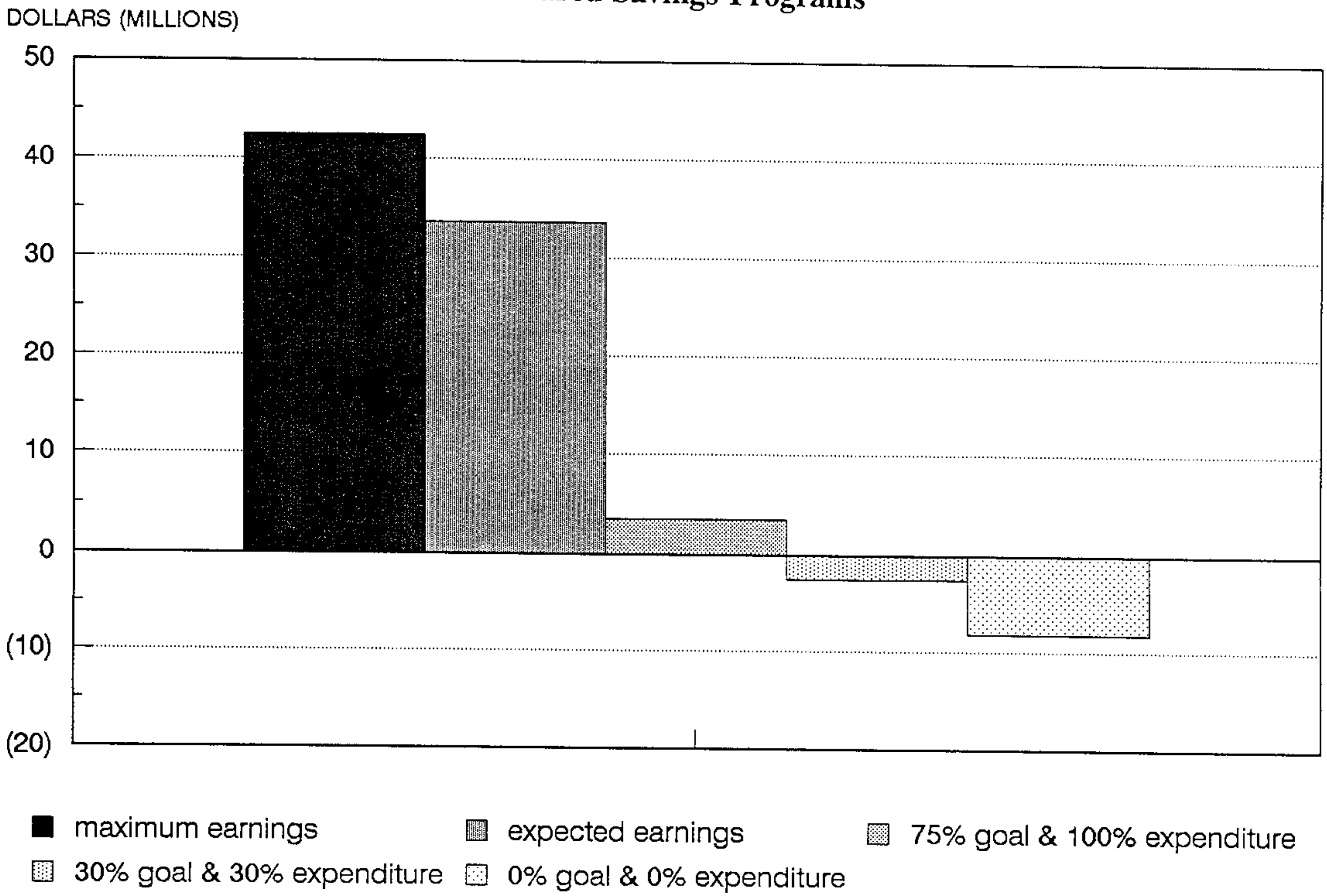

Figure 2 illustrates the effect of incorporating minimum performance standards and adjustments to shared-savings earnings under alternative levels of performance for the PG&E and SDG&E proposals. A central feature is agreement prior to implementation on program objectives, as measured by customer response to install the energy efficient measures, and agreement on how earnings are to be affected by various levels of performance. As reflected in Figure 2, the approach approved for PG&E and SDG&E includes opportunities to increase earnings relative to expected performance (the first and second bars on the graph, respectively), with adjustments for lower than expected performance (the third bar), and penalties for poor performance. The last two categories show that shareholders not only forego earnings opportunities if program performance falls far short of expectations, but would actually receive lower earnings. All of these adjustments fall within and build on the general features of shared-savings mechanisms, meaning that the primary goal of achieving the most cost-effective measures at the lowest cost is retained.

Clearly the incorporation of reasonable performance standards into a shared-savings mechanism involves a host of considerations, such as prior utility performance and whether the program involves new program design features or is based on familiar approaches. Particularly in the initial phases, developing appropriate and acceptable conditions for ensuring minimum utility performance will involve more art and political negotiation than hard science or economic theory.

8. Conclusions

Giving utilities incentives to develop energy efficiency programs for their customers can be a useful tool for regulators seeking to reap the benefits of least-cost plans for their state. Yet many factors affect the performance and value of demand-side resources, while the utility has control over only some of them. Thus, the goal of regulatory review should be to insure equitable balancing of these factors between participants, non-participants, and shareholders. At the same time, efforts to reduce some of the uncertainties associated with measuring the output of demand-side resources should be given high priority.

We also observe that inherent differences among demand-side programs call for different types of incentives. These differences suggest a continuing need for creative regulatory approaches to stimulate utility participation in using energy efficiency programs as a viable resource option.

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