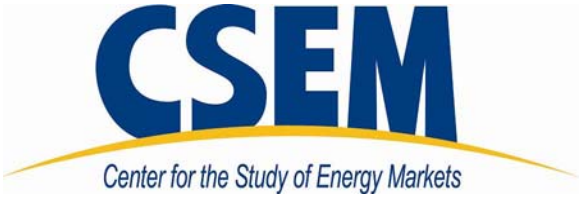

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Program Evaluation and Incentives for Administrators of Energy-Efficiency Programs: Can Evaluation Solve the Principal/Agent Problem?

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Program evaluation and incentives for administrators of energy-efficiency programs: Can evaluation solve the principal/agent problem?

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Abstract

This paper addresses the nexus between the evaluation of energy-efficiency programs and incentive payments based on performance for program administrators in California. The paper describes problems that arise when evaluators are asked to measure program performance by answering the counterfactual question, what would have happened in the absence of the program? Then the paper examines some ways of addressing these problems. Key conclusions are 1) program evaluation cannot precisely and accurately determine the counterfactual, there will always be substantial uncertainty, 2) given the current state of knowledge, the decision to tie all of the incentive to program outcomes is misguided, and 3) incentive programs should be regularly reviewed and revised so that they can be adapted to new conditions.

Keywords

energy efficiency, incentives, principal/agent

Introduction

California policy puts energy efficiency "first in the loading order" (CPA, CEC and CPUC 2003). This policy has led to substantial funding for energy-efficiency programs aimed at reducing the consumption of electricity and natural gas. In California funds for most of these programs are derived from payments made by consumers for electricity and natural gas. The funds are collected and the programs are administered by electricity and natural gas utilities. In 2009 funding for these programs was about $1.4 billion,[1] which was approximately one third of all utility program expenditures in the US (Nevius et al. 2010). Utility programs are a key element in California's plans to reduce green house gas emissions from today's level to the level of 1990 (CARB 2008).

Utility administration of energy-efficiency programs has given rise to a principal/agent problem. This paper focuses on difficulties with the principal/agent problem that confront utility regulators in California. But similar principal/agent problems in resource management are likely to arise in other contexts—for example, when incentives are used to induce individuals and institutions to conserve forests in order to reduce carbon emissions.

In the principal/agent problem one party, the principal, hires another party, the agent, to take actions on his behalf. The principal wants the agent to take actions that will make the size of some performance criterion, such as the net value of saved energy, as large as possible. The outcome depends on the agent's actions and decisions, his technological and economic

[1] About 85% of this was provided by regulated investor-owned utilities and the remainder by publicly-owned utilities.

opportunities, and on chance. The principal can observe none of these directly though he may know some information about the range of technological and economic opportunities and he may know the probabilities attached to the possible chance outcomes. The principal's problem is to design a mechanism for compensating the agent that will induce the agent to come as close as possible to maximizing the principal's performance criterion. This description of the principal/agent problem is a shortened paraphrase of the description given in Joskow and Schmalensee (1986). A more precise, but narrower economist's definition of the principal/agent problem is given by Ross (1973). Useful constructs for the analysis of the principal/agent problem in an economic framework can be found in Milgrom and Roberts (1992). The problem itself is pervasive and is addressed by other disciplines besides economics using a variety of formulations (See, for example, Shapiro 2005).

In our case, the principal is the regulator (the California Public Utilities Commission (CPUC)) and the agents are private corporations—the regulated energy utilities—often called investor-owned utilities (IOUs).[2] The principal/agent problem is how to design an incentive mechanism that will cause the IOUs to maximize some performance criterion for the energy-efficiency programs that they administer.

An obvious initial problem is that IOUs are in the business of selling energy. Historically, at least to some degree, IOU profits have depended on the volume of sales. This disincentive for the promotion of energy efficiency has long been addressed in California and a number of other US states by "decoupling" (See, for example, Eto *et al*. 1997). Decoupling breaks the link between IOU sales and IOU earnings by adjusting rates when actual sales differ from projected sales. If sales are above expectations, rates are lowered to hold earnings constant; if sales are below expectations, rates are increased to hold earnings constant. Under decoupling a successful energy-efficiency program will not directly cause a decrease in IOU earnings.

In addition to direct effects on IOU earnings, energy-efficiency programs have what Eto *et al*. (1998) call "hidden" costs. According to Eto *et al*., hidden costs consist of both the very real, but unobservable, management costs associated with the additional effort and organizational changes required to implement successful energy-efficiency programs, and the opportunity costs associated with net lost revenues from activities [like the construction of new plant] foregone because of the pursuit of energy-efficiency programs. There may also be hidden benefits to the IOU for administering energy-efficiency programs. These might include a larger base over which to spread overhead costs and the avoidance of competition from other entities that might interfere with future business opportunities. However, these benefits are associated with the control of program resources, not necessarily with good program performance.

Efforts to find incentive mechanisms that will counteract the hidden costs of good program performance and align IOU interests with the public interest have been underway for some time. Interest in the problem in the first half of the 1990's waned as a result of the trend toward industry restructuring and deregulation in the US (CPUC 2003). Failures of restructuring, particularly the failure of the California electricity market (Blumstein, *et al*. 2002), and increased concern about climate change have reinvigorated the search for improved incentive mechanisms (see, for example, Jensen 2007).

In California the search for better incentive mechanisms is far along with new rules promulgated in 2007 (CPUC 2007a). The new rules were designed to reward good performance by an IOU by giving the IOU a share of the customer savings that result from the IOU's energy-efficiency programs. But, although there is disagreement about what is wrong, there is a general consensus

[2] Publicly-owned utilities, which supply about 25% of California's electricity (EIA 2010), are not regulated by the CPUC. Some publicly-owned utilities are departments of municipal governments with rates, budgets and policies governed by city councils. Other publicly-owned utilities are special districts governed by boards of directors.

that things are not working well in California. Recently the CPUC suspended the 2007 rules and initiated a new rulemaking to re-examine the incentives (CPUC 2009a).

When the agent is risk neutral,[3] solution of the principal/agent problem can be straightforward if three conditions hold: *First*, the principal has a single objective with a value that can be accurately quantified and the agent's contribution to achieving the objective can be easily separated from the contributions of other factors. When this condition holds, the value of the agent's contribution can be unambiguously determined at a low cost. *Second*, increased effort by the agent can be expected to produce improved results for the principal. *Third*, the proper alignment of financial incentives is necessary and sufficient to ensure that the agent will act in the principal's interest. When this condition holds other factors, such as organizational inertia, do not have to be considered. Under these conditions, Milgrom and Roberts' (1992) *incentive intensity principle* argues for strong reliance on performance incentives because they are likely to be effective and the *monitoring intensity principle* argues for careful monitoring of performance both because the agent's compensation will be very sensitive to the results of performance measurement and because accurate performance measurement can be achieved at low cost.

Unfortunately, neither the first nor the third of the above conditions holds for the IOUs that are administering energy efficiency programs in California today. This has created difficulties in implementing the incentive mechanisms for IOUs. At the heart of these difficulties are problems of evaluation.

The regulator's objective in California is to "maximize achievement of cost-effective energy efficiency" (CPUC 2008). To encourage this the CPUC developed a Risk Reward Incentive Mechanism (RRIM) that tied IOU compensation to IOU performance. An IOU's performance was to be determined by an evaluation of the savings achieved by its energy-efficiency programs. In the three-year period 2006-2008 about $2 billion was made available for IOU energy-efficiency programs. Approximately 5 percent of these funds were dedicated to program impact evaluation.[4] The problem in evaluating an IOU energy-efficiency program is to determine a counterfactual—that is, what would have happened if the IOU program had not existed. Unfortunately, as this paper discusses, this problem is proving to be difficult to solve. Attempts to determine counterfactuals are consuming very substantial program evaluation resources in California without doing much, if anything, to improve program outcomes.[5] As the CPUC stated in its order suspending the incentive mechanism, "The controversies raised concerning [initial evaluation efforts] show that methodologies of the RRIM process are quite complex and are not as easily or as timely resolved as we had hoped. We believe it is necessary to consider a more transparent, more streamlined and less controversial RRIM program." (CPUC 2009a, p. 4)

An assumption implicit in California's approach to IOU incentives is that the principal/agent problem will be solved solely by providing financial rewards for good outcomes. This is almost certainly too simple a view about how complex organizations like IOUs behave. As Eto *et al.* (1998) point out, organizational changes are needed when a corporation adopts new objectives. Failure to make these changes can seriously compromise energy-efficiency program performance. For example, when energy-efficiency programs are placed too far down in the corporate hierarchy, programs may be subject to inappropriate controls by low-level

[3] A risk neutral agent values potential gains the same as potential losses and therefore would not pay a premium to avoid a potential loss.

[4] Evaluation was carefully separated from program implementation. In an effort to ensure that evaluators were unbiased agents of the regulator, evaluators were selected by the regulator and were not allowed to have any engagement with the IOUs (CPUC 2005).

[5] That there are difficulties in determining counterfactuals certainly does not mean that evaluation should be abandoned. Evaluation can and does play an important role in assisting program administrators in improving the design and conduct of the programs that they administer. (See, for example, Vine 2008 and Peters and McRae 2009)

procurement officers and risk managers. Without immediate access to top management, decisionmaking can be impaired and innovation can be stifled. Failure to make the necessary organizational changes can occur even when the changes are in the IOU's interest. One reason this may happen is that such changes create both winners and losers among the corporation's employees. This can result in an internal principal/agent problem for the corporation. Because they stand to lose from change, some of the corporation's employees (its agents) resist change and obscure the need for change from the corporation's leadership.

The rest of this paper is organized as follows, first, a discussion that provides more detail about what's not working and then a discussion of possible ways that the situation can be improved. Key conclusions are that 1) program impact evaluation cannot precisely and accurately determine the counterfactual, there will always be substantial uncertainty, 2) given the current state of knowledge, the decision to tie all of the incentive to program outcomes is misguided, and 3) the incentive programs should be regularly reviewed and revised so that they can be adapted to new conditions.

What's not working?

Bias in favor of measures that produce quantifiable results

A well-recognized problem is that the current incentive mechanism biases the IOUs' efforts in favor of results that can be quantified by program evaluators. Under the current California rules, incentives are tied to customer savings. These incentives create a bias in favor of IOU programs that produce direct effects on customer energy use as opposed to programs that have indirect effects. In practice, this means that the incentive mechanism encourages the IOUs to favor programs that directly result in the installation of energy-efficiency measures as opposed to programs, like public education or contractor training, that lead only indirectly to energy-efficiency actions because customer savings from programs with indirect effects are more difficult for program evaluators to quantify.[6]

This is an example of the long-standing tension between "resource acquisition" and "market transformation." In resource acquisition energy utilities "acquire" energy efficiency as a substitute for new supply. In market transformation the objective is to change conditions in the market so that energy-efficient actions are taken without the need for subsidies or other interventions. As discussed below, market transformation and resource acquisition are complementary strategies because resource acquisition programs create conditions that lead to market transformation and market transformation programs create conditions that lead to participation in resource acquisition programs. If energy prices and energy-efficiency technology were static, market transformation would be an end point for energy-efficiency efforts. In practice, prices and technology are changing and the promotion of energy efficiency involves repeated cycles of subsidy, education, training, and the promulgation of performance standards (see, for example, Blumstein *et al*. 2000).

The bias in favor of quantifiable measures makes it unlikely that the balance between resource acquisition and market transformation will be near the optimum. What typically happens now is

[6] For example, a recent study that conducted interviews with personnel involved in the operation of IOU energy-efficiency programs found, "The interviews did show that key program staff generally view new and innovative forms of customer communication and supply chain intervention as important and warranting continued development. However, regulatory requirements are repeatedly cited as obstacles, with serious *attribution* problems for non-device centered expenditures – or expenditures that cannot be directly traced to an end-user and a meter." (Lutzenhiser *et al*. 2009, p. 25). The CPUC staff agrees with this assessment and has concluded that, "The incentive mechanism acts to discourage the pursuit of strategic initiatives and market transformation activities envisioned by the California Energy Efficiency Strategic Plan." (CPUC 2009b. p. 4)

that at the beginning of a program cycle funds are set aside for market transformation programs and IOUs earn a small fixed percentage of program costs.

Difficulties in measuring "free riders" and "spillover"

A key evaluation issue that must be addressed in dealing with the principal/agent problem is identification of the consequences of the agent's actions as opposed to the consequences of other factors. In California one of the ways this is playing out is debates about "free riders" and "spillover."

In the parlance of energy-efficiency programs, free riders are participants in a program who receive an incentive payment or other assistance but would have acted even without the program. To first order, payments to free riders do not accomplish anything, they are just transfers from one set of consumers (the non-participants) to another (the free riders).[7] It is not desirable to reward IOUs for the energy savings of free riders for two reasons: 1) the payments are unearned and 2) payments for free-rider savings would bias IOU programs in favor of programs in which consumers already had a strong predilection to participate.

But, identifying free riders so that free-rider savings can be excluded from the calculation of incentive payments is easier said than done. Current practice is to determine who is a free rider by asking program participants a series of questions to determine if it was their intention to act even in the absence of the program. But this is not reliable. As Peters and McRae (2008) point out,

> "The self-report method for measuring free-ridership assumes intentions are [perfect predictors of] behavior. If someone reports, "I would have done it anyway," they are assigned a free-ridership value of 100%. Yet any student of behavior knows that, while better than attitudes and beliefs, intentions are only a weak predictor of behavior."

Evaluation of free-ridership can be more sophisticated than simply asking a direct question about intentions. For example, the New York State Energy Research and Development Authority (NYSERDA) employs a multi-question survey approach that has evolved from its own experience and insights from similar research in other states. NYSERDA relies on experienced interviewers who are knowledgeable enough to probe respondents for details of program influences and who can characterize the responses in quantitative terms (Saxonis 2007). However, in spite of their greater sophistication, these methods continue to suffer from the difficulties associated with determining counterfactual behavior from self-reported intentions.

"Spillover" is the other side of the free rider issue. Spillover occurs when the effects of an energy-efficiency program spill over to affect other behavior. Examples of spillover would be a consumer taking action as the result of an energy-efficiency program but not receiving any of the incentives offered by the program (non-participant spillover) or a program participant stimulated to pursue additional energy saving actions that are not subsidized by the program (participant spillover). Spillover might occur because a consumer was persuaded by advertising associated with the program, or as a result of contact with satisfied program participants, or because the existence of the program has caused suppliers to change the products and services that they offer. The idea here is that the existence of large-scale energy-efficiency programs has a transforming effect on the market. Consumers see efficient technologies at work, practitioners learn by doing, and suppliers change their stock of goods and services.

[7] Possible second order effects include that the free rider's experience with the program might cause him to encourage others to participate in the program.

Although spillover is obviously desirable, it is not taken into account in the California incentive mechanism.[8] This is, at least in part, because spillover is difficult for program evaluators to quantify. One way to determine spillover effects is to look at cross-sectional data. Horowitz (2008) compares consumption data from US states with strong commitments to energy-efficiency programs to data from US states with weak commitments to energy-efficiency programs. He finds evidence of substantial spillover within the states with strong commitments to energy-efficiency programs.

Identifying the spillover from a specific energy-efficiency program or portfolio of programs is more challenging. Hoefgen *et al*. (2008) describe an effort to assess spillover from a program to promote the sale of compact fluorescent lamps (CFLs) in Massachusetts. In the evaluation two methods were used to construct a counterfactual. Here the counterfactual, called the "baseline" by Hoefgen *et al*., is the CFL sales that would have been made if there had been no program promoting the sale of CFLs. The first method relied on state-level sales from selected states with active programs, including Massachusetts, along with national CFL shipment data. The evaluators subtracted sales in areas with active programs from total national sales and treated the per-household CFL sales level in the remaining states as the counterfactual for per-household sales in Massachusetts. The second method used a single-state comparison area, Michigan, to construct the counterfactual. Hoefgen *et al*. find a very large spillover—they estimate that CFL sales due to spillover are *greater* than CFL sales subsidized by the program. However, the two methods produce estimates of the counterfactual that differ by about 20 percent—not especially large as these things go, but very consequential when millions of dollars in incentives are on the line.

More detail about free riders and spillover can be found in the review by Skumatz *et al.* (2009). The review, which was based on a survey of the literature and interviews with practitioners, concluded that, "Documenting what 'would have happened' is the most significant biggest challenge in evaluation, this challenge is ongoing and finding a true baseline [the counterfactual] for outreach/behavior programs will continually be more difficult as energy-efficiency measures become more prevalent in the US" (p.58).

Difficulties in determining cost effectiveness (the non-energy benefits problem)

"All cost-effective energy efficiency" is easier said than measured. The problem arises because it can be difficult to separate the costs of energy-efficiency actions from other costs. In California, cost effectiveness is determined by the Total Resource Cost (TRC) test. In this test the net present value of supply costs avoided by an energy-efficiency measure are compared to the total cost of the measure. The total cost of the measure includes both costs paid by the energy-efficiency program and costs paid by the program participant.

For example, if an energy-efficiency program provides a subsidy of 20 percent for the incremental cost of installing double glazed windows, then the total cost includes both the 20 percent provided by the program and the 80 percent provided by the participant. The problem in this example is that people install double glazing for a number of reasons in addition to energy saving. These other reasons include reduction in interior noise and greater comfort when sitting near windows because of reduced radiant heat loss. It is appropriate to allocate all of the cost paid by the energy-efficiency program (that is, the IOU's costs) to saving energy. However, it is not appropriate to allocate all of the program participant's costs to saving energy—some of these costs should be allocated to the other benefits (often referred to as non-energy benefits) that motivated the participant's expenditures. Other examples of non-energy benefits include positive

[8] In a Decision in October 2007 the CPUC (2007b) directed its staff to explore during 2008-2009 the ability to credibly quantify and credit non-participant spillover. The CPUC intends to modify its evaluation protocols to include spillover if this proves to be feasible.

impacts on occupant health and productivity and reduced maintenance costs from installation of energy-efficient equipment and the adoption of energy-efficient practices (Birr and Singer 2008).

The consequence of the difficulties in separating out non-energy benefits is a bias in favor of simple measures where non-energy benefits tend to be small. Opportunities where relatively small subsidies could cause design changes that promote both energy efficiency and non-energy benefits are lost. An example is comprehensive whole-house retrofit programs in which investments are undertaken by homeowners to gain a range of non-energy benefits (Knight *et al*. 2006). The review by Skumatz *et al*. (2009) concluded that non-energy benefits were large, commonly exceeding the value of the energy savings. They report that, "This is especially true for whole-house / whole-building programs, new construction, and similar programs in both the residential and non-residential sectors" (p. 90). These lost opportunities are serious because a key part of the energy-efficiency agenda is to make energy efficiency an integral part of processes like home renovation.

Delays in obtaining results

Evaluation takes time. For instance, in California program impact evaluations for program activities conducted in the 2004-2005 period had yet to be fully completed as of January 2009. This kind of delay in completing evaluations causes delays in incentive payments based on performance and weakens the link between incentives and performance.

What might be done?

Just do it. Pick some indicator such as the difference between actual and forecast and forge ahead

One potential way forward is to simply commit to some "good" performance evaluation procedures and be done with it. This approach would make sense if there were a few roughly equivalent alternatives and the gain that could be realized from choosing the best alternative would not be worth the cost to determine which alternative was, in fact, the best. But, this is not the case in California. As discussed above, current incentive schemes in California are biased in favor of resource acquisition strategies that are easy to quantify. Finding a better alternative for compensating the IOUs would have a big payoff because easily quantified resource acquisition is not all or even most of what needs to be done.

Do it better. (For example, use randomized controlled trials)

Evaluators, when confronted with the difficulties in evaluating the performance of IOU energy-efficiency programs and, especially, the free-rider problem, often respond with suggestions for improvements in evaluation methods. One approach that is often recommended is randomized controlled trials (RCTs). In an RCT a population is randomly divided into two groups, a treatment group and a control group. The treatment group is treated (for example, with the offer of an incentive to take some energy-efficiency action) and the control group is not treated. Subject to some conditions, comparison of the behavior of the treatment group with the behavior of the control group will allow us to identify the effect of the treatment.

The key condition that must hold is that control group is not influenced in any way by the treatment. In practice this means that the treatment group and the control group are completely isolated from each other—the groups must be small enough so that the likelihood of interaction between them is very small. That is, the opportunity for spillover is very small.

If an RCT is designed so that the control group is not influenced by some intervention to encourage energy efficiency, then the results of the RCT will go far in answering the question, what is the effect of this energy-efficiency intervention on the treatment group? Unfortunately,

an RCT that satisfies this non-influence condition is not likely to be of much interest in the evaluation of the impact of IOU programs. The problem is that, as noted above, the treatment group in an RCT that satisfied the non-influence condition would necessarily be quite small. But, what the regulator is trying to accomplish *requires* large programs. Programs need to be large because spillover and structural change in markets are essential parts of the desired program outcomes.

This is not to say that efforts to improve the evaluation of energy-efficiency programs should be abandoned. Although counterfactuals cannot be known with certainty, it may be that the development of improved evaluation techniques will allow us to narrow the range of uncertainty. Even if the range of uncertainty cannot be narrowed, it would be useful to have quantitative estimates of uncertainty to guide our use of evaluation tools and manage expectations for what can be accomplished through impact evaluation.

Evaluation also has an important role to play in improving the design and conduct of energy-efficiency programs (Vine 2008, Peters and McRae 2009). New approaches may be valuable in this regard. For example, although RCTs cannot tell us about spillovers, they can provide useful information for the design of energy-efficiency programs because it is useful for purposes of program design to know how isolated individuals will respond to a treatment such as an incentive or feedback. A recent example that shows both the potential value of RCTs and some of the difficulties in conducting them is Gleerup *et al*. 2010.

Outsource market transformation

Assuming, for the purposes of this discussion, that IOUs will continue to play a substantial role in California's energy-efficiency programs,[9] another approach to the bias toward resource acquisition in California's current incentive schemes is to create a separate market transformation organization. This could be a not-for-profit corporation that would be responsible for activities like social marketing and education and training. An example of this approach is the Northwest Energy Efficiency Alliance (NEEA, see http://www.nwalliance.org/). NEEA operates market transformation programs that are coordinated with a number of IOUs and public agencies that operate energy-efficiency programs in the US Pacific Northwest.

A difficulty with this approach is that resource acquisition and market transformation are not always easy to separate. Ideally, the two strategies are complements, not substitutes. For example, one might want to provide incentives to manufactures to develop and bring to market more efficient washing machines (a market transformation strategy) and also provide subsidies to consumers to purchase the more efficient washing machines when they come on the market (a resource acquisition strategy). Thus, there are obvious advantages to coordination between market transformation programs and resource acquisition programs. Although NEEA apparently coordinates market transformation efforts among many organizations with some success (Northwest Economic Research 2008), such coordination is typically easier inside a single organization as opposed to between two or more organizations. The case for a separate market transformation organization is best when the area encompassed by the market is much larger than the areas served by the resource acquisition programs.

The creation of an additional organization also increases the difficulty of the identification problem. In order to tie the incentive payment to the effects of an IOU's actions, it will now necessary to separate the effects of the work of the market transformation organization from the effects of the IOU's energy-efficiency program.

[9] See Blumstein *et al*. 2005 for further discussion of the advantages and disadvantages of alternative administrative arrangements.

Difficulties notwithstanding, the outsourcing option should not be taken off the table. It provides an opportunity to create a state-wide program as opposed to several IOU service area programs. The experience of NEEA demonstrates that a not-for-profit market transformation organization can be effective.

The existence of a separate organization for market transformation makes more tangible the possibility that an alternative organization could take over the operation of some or all of the IOU-administered programs. The threat of entry by competitors may create a stronger incentive for the IOUs to perform well. The importance of the threat of entry will depend on the extent to which the benefits to an IOU from administration of energy-efficiency programs derive from the control of resources (as opposed to good program performance). Of course, the threat of entry may also cause the IOUs to be reluctant to cooperate with potential competitors.

"Professionalize" the practice

The principal/agent problem is simplified if incentives are tied solely to outcomes and no special consideration needs to be given to good conduct (see, for example, Ross 1973). If what needs to be done to obtain a good outcome is known or knowable, then a good outcome is sufficient to show that the agent's conduct was good. Tying incentives solely to outcomes is what the CPUC's now suspended incentive mechanism attempted. But, as experience has shown, it is often difficult to tie good conduct to good results in an unambiguous way. This being the case, it may be appropriate to find ways to identify and reward good conduct separately from outcomes.

Drawing an example from an apparently unrelated area, consider the treatment of disease. The physician's role in the treatment of disease is to supplement the body's own defenses, but sometimes this is not necessary and sometimes it is not sufficient. That is, sometimes the patient will recover without treatment (a potential medical free rider) and sometimes the patient will not recover even with treatment. Given the uncertain relationship between treatment and outcome, how should the physician be compensated? The answer is often that the physician's compensation is not dependent on outcome. Rather, in the US, she receives a fee for her services regardless of outcome. Fee-for-service compensation is effectively, in the language of utility regulation, a cost-plus arrangement.

What then prevents the physician from giving treatments to every patient, even patients who the physician knows will recover without treatment? The answer is that society relies on professionalism. Professionalism for the physician includes, in addition to scientific and technical knowledge about the practice of medicine, a set of norms about ethical practice. These norms proscribe unnecessary treatment. To the extent that this works[10], it is primarily because the physician internalizes the profession's norms. As Arrow (1963) observed in his classic paper, "the social obligation for best practice is part of the commodity the physician sells, even though it is a part that is not subject to thorough inspection by the buyer." There may also be external sanctions either from peer groups or from the legal system. But, external sanctions are usually associated with damage to the patient as a result either of treatment or failure to treat. This is not to say that self regulation based on professionalism is not facing challenges (see, for example, RCP 2005).

Is there any similarity between health professionals and the practitioners of energy efficiency? Although the analogy can certainly be pushed too far, I think there is some similarity. Consider this definition of "profession" from the Royal College of Physicians (2005),

[10] There is some evidence that patients in programs that compensate the physician based on the number of patients in the physician's practice (referred to in the US as capitation) receive less treatment than patients whose physicians are compensated on a fee-for-service basis (Gosden *et al*. 2000). In the US there is increasing interest in the establishment of plans that pay physicians for performance (Rosenthal and Dudley 2007).

> "An occupation whose core element is work based upon the mastery of a complex body of knowledge and skills. It is a vocation in which knowledge of some department of science or learning or the practice of an art founded upon it is used in the service of others. Its members profess a commitment to competence, integrity and morality, altruism, and the promotion of the public good within their domain."

This definition could fit the work of many energy-efficiency practitioners. Not only does the practice rest on a complex body of knowledge, but also many of the practitioners come to the profession for very altruistic reasons. It would be easier to use professional norms to regulate the quality of energy-efficiency programs if there were a better understanding of how such regulation works. But, although it is hard to imagine the practice of medicine without the guidance of strong professional norms, there is no simple prescription for creating normative structures for new professions. That said, it is now the case that regulators give no weight to professionalism of the staff in the construction of incentives to encourage good performance by IOUs. Given the obvious power of professional norms and the altruism of many energy-efficiency practitioners, this appears to be a serious mistake.

Include some non-quantitative measures in the evaluation of performance

Because some of the important characteristics of good energy-efficiency programs are difficult to quantify, it is probably desirable to include some non-quantitative measures in the evaluation of IOU performance. Examples of such measures are discussed below.

One characteristic that is hard to quantify is corporate commitment.[11] As noted above, organizational changes are needed when a corporation adopts new objectives. The organization that results from these changes is one measure of corporate commitment. Where in the corporation hierarchy is the energy-efficiency program placed? How many management layers are there between the energy-efficiency program's manager and chief executive officer? Does the energy-efficiency program have supportive arrangements for legal services, personnel, and purchasing? Characteristics like these may be difficult to quantify, but they are certainly observable and important to take into account.

Another characteristic that is difficult to quantify but observable is support for professionalism. An evaluation of support for professionalism could address questions such as, Has the corporation succeeded in hiring and retaining a strong cadre of energy-efficiency professionals? Are there career paths for professionals? Are there training opportunities that support professional development?

But, compensation for corporate commitment and support for professionalism are difficult to address using linear compensation formulas.[12] Milgrom and Roberts' *equal compensation principle* tells us that when an agent is asked to pursue multiple objectives, a profit-maximizing agent will give all of its attention to the objective with the highest marginal return and will only give attention to multiple objectives if their marginal returns are equal. Given the difficulties in quantification, it seems highly unlikely that a linear compensation formula could be devised that would result in equal marginal returns for corporate commitment, support for professionalism, and other indicators of performance.

But, although they are non-quantifiable, corporate commitment and support for professionalism can be graded—for example, judged to be poor, fair, good, or excellent. Grades might be

[11] See Itron 2008 for a discussion of corporate commitment and other factors that are important for effective energy efficiency programs.

[12] The incentive mechanism (RRIM) established by the CPUC is not strictly linear, but it has one of the essential features. That is, compensation increases continuously as the quantified measure of performance (net savings) increases. [Non-linear features of the RRIM include a compensation cap and changes in the rate of compensation as performance improves.]

determined by a panel of expert reviewers and the grades could be used as a basis for non-linear incentives to encourage good performance. For example, some minimum grade could be required before any other incentive could be earned or a bonus could be earned for achieving a high grade. Less structured approaches can also encourage good performance. For example, good performance might be encouraged simply with an announcement by the regulator that it intends to consider corporate commitment and support for professionalism when it next examines what share of the responsibility for program administration should continue to remain with the IOUs.

Reduce performance incentives

The alternative to providing incentives is cost-plus compensation. Joskow and Schmalensee (1986), who are proponents of incentive regulation, are nonetheless wary of incentive schemes that get it wrong. In their view the greater the uncertainty in assessing an agent's performance, the less incentives should be part of compensation. As uncertainty grows they recommend moving toward (but never all the way to) cost-plus compensation.

Shifting toward cost-plus compensation would mean that most of the energy IOUs' earnings from the energy-efficiency programs that they administer would be based on program expenditures, not performance. That is, IOUs would be able to recover their costs plus an additional fee. The maximum allowed costs and the fee would be set in advance by the regulator. In California, where 100 percent of the IOUs' above-cost compensation is now based on performance, this could be viewed as a step backwards (see, for example, Wang *et al*. 2009, p. 3).

The problem for the regulator is that the regulator wants to reward performance but measuring performance depends on a counterfactual that cannot be known accurately for reasons discussed above. The regulator must find a balance between the desire to keep program incentives tightly focused on energy saving goals and the concern that the mechanisms for measuring program performance will create distortions in the conduct of the program and will cause uncertainty that frustrates program planning and discourages commitment to sustained effort.

Provide for regular review and, if necessary, adjustment of incentive mechanisms

When there are difficulties in assessing IOU performance Joskow and Schmalensee suggest, ". . . that incentive schemes must be regularly redesigned, just as tariffs are now." However, they also caution that, ". . . compensation rules must be kept fixed for reasonably long periods (and utilities must anticipate that this will happen) if they are to have noticeable effects on behavior." Unfortunately, finding the balance between "regularly redesigned" and "fixed for reasonably long periods" is easier said than done.

Conclusion

In California the focus of program evaluation has shifted from its original purpose, which was to learn what needed to be done to improve the design of energy-efficiency programs, to a new purpose, providing the basis for incentive payments to energy-efficiency program administrators. Because the stakes are large—up to $450 million in incentive payments for the 2006-2008 program cycle—discussions about evaluation are likely to become increasingly adversarial and more likely to become the purview of advocates whose job is not to seek the truth but rather to make the best case possible for their clients. This is the wrong direction to be heading.

To change this direction it is necessary first to recognize that program evaluation cannot precisely and accurately determine the counterfactual question, what would have happened in the absence of a IOU's energy-efficiency programs? There will always be substantial uncertainty.

Next, it is necessary to reduce the stakes. Given the difficulties in determining counterfactuals, the criteria developed by Milgrom and Roberts (1992, pp. 206-247) for strong reliance on incentives are far from being satisfied. The decision to tie all of the incentive to program outcomes was misguided. The advice of Joskow and Schmalensee (1986) about dealing with uncertainty in the measurement of IOU performance, although given in a somewhat different context, is very relevant. This suggests that most of the IOUs' compensation should be cost plus and only a relatively small share should be tied to the performance of the energy-efficiency programs that they administer.

This is not to say that performance incentives are unimportant. Rather it is to recognize the difficulties in quantifying good performance and to protect against the very perverse effects that can result from overreliance on poor performance measures. As long as the evaluation of performance continues to play some role in IOU compensation there will be opportunities for the regulator to encourage improvements in performance. This might be done by making changes in the incentive mechanism but could also use other regulatory tools such as increased supervision of efficiency programs or the introduction of competing program administrators.

Finally, it is necessary to create mechanisms that can deal effectively with changing circumstances and can exploit new knowledge. Again following Joskow and Schmalensee (1986), incentive programs should be regularly reviewed and revised so that they can be adapted to new conditions. These reviews will be less disruptive and less contentious if the amount compensation tied to performance evaluation is reduced.

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