Revised

Utility - Tailored Incentive Programs for Energy Efficiency and Conservation

by

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1.Introduction

Recently, several states including New York, New Hampshire, Rhode Island, Maine, Wisconsin, Massachusettes and California have instituted innovative shared savings programs for utility conservation. These programs offer significant monetary incentives for utilities to develop and sponsor conservation measures for their customers. To date the utilities have been quite receptive to these plans, and companies like PG&E and the New England Electric System are commiting large expenditures to fund energy efficiency over the next decade.

Critics of these programs argue that customers can invest in energy conservation themselves, and that utility sponsored programs may serve only to displace and possibly exceed the efficient private level of expenditures on energy efficiency.[1] The argument in support of the utility programs is that utilities are ideally suited to administer conservation programs because they possess first hand knowledge of conservation options and of their customers' needs and habits. In this way utilities can overcome information and contracting problems which allegedly create market barriers to efficient investment in energy efficiency by offering conservation programs directly to their customers.

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[1]For example see Ruff (1988)

Utility conservation is obviously a controversial issue. I am not inclined to debate the pros and cons of demand side management (DSM) in this memo. Rather, it is my view, that experience with utility sponsored conservation programs is too limited to know yet whether such programs are cost effective and desirable. However given that programs for utility conservation have already or will soon be implemented in most states, it makes sense to endow these programs with incentives structures which encourage utilities to operate most effectively. The purpose of this memo is to discuss and identify some desirable features of incentive regulation which should be incorporated into utility DSM programs.

I proceed in my analysis by adopting the same set assumptions which have been used to justify the recent utility conservation programs such as the California Collaborative process.[2] A careful consideration of these assumptions leads me to conclude that: (i) utilities should be compensated *based on performance* as measured by the net benefits created (value of KWH's and KW's saved) by their conservation investments. (ii) decisions regarding the level of funding and the types of conservation measures to be undertaken should be *delegated* to the utilities, and (iii) utilities should be allowed to pick different compensation schemes to suit their special circumstances. I refer to DSM programs having these attributes as *Utility-Tailored Incentive Programs,* (U-TIPS).

2. The Premise Behind DSM

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[2]As to whether these assumptions are correct must await further analysis.

The logical argument for relying on utilities to promote energy efficient investment and conservations rests on these assumptions:

1. *Market Imperfections prevent private energy service companies from providing consumers with energy efficient investment.*

This is the most controversial and perhaps the most difficult of the assumptions to verify. Proponets of DSM point to the high implicit discount rates which consumers employ in making conservation decisions and investments as direct evidence of market failure in providing energy efficient investment.[3] The alleged market failures include, landlord-tenant problems, consumers' lack of information about conservation possibilities, financial and liquidity constraints, and the mispricing of energy.

2. *Utilities are ideally suited to deliver energy efficient services.*

Here the argument is that utilities who have established networks for dealing with customers and who have intimate knowledge of conservation options, and customer characterisitics are ideally situated to deliver conservation services. In particular they can overcome the market barriers mentioned above by providing customers with information about different energy efficient

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[3]See Dubin and McFadden (1984) and Hausman (1979) for estimates of implicit discount rates used by customers in the purchase of energy efficient investment.

investments, by overseeing and guaranteeing privately provided conservation investment, and by subsidizing investments to overcome market imperfections and financial constraints.

A third assumption which is not crucial to the argument for DSM but is important in constructing incentive programs for utility conservation is:

3. *Utilities differ in their costs of Providing DSM*

The cost to the utility of providing energy efficient investment includes the direct costs of the program, like the rebates offered on efficient appliances, as well as indirect costs associated with administering these programs which divert time and energy away from other activities that the utility might wish to undertake. These latter costs are opportunity costs, and they are not readily observed or measured. Opportunity costs are determined by the utility's knowledge and experience in delivering conservation services, by it's customer base, and by the opportunities it has to engage in supply side activities. Utilities differ in these repsect and as a consequence some utiliites are low cost providers and other utilities are high cost providers of DSM

If one accepts these assumptions, (as I do here for the sake of argument) then the logical implication is that utilities rather than private markets should be relied upon as the primary vehicle to promote energy efficient investment. Specifically, decisions regarding the type and level of investment in energy efficiency

should be delegated to the utility who is presumably better able to evaluate and implement conservatiuon measures for the customer. Furthermore, since utilities differ in their ability to offer energy efficient services, they should be allowed to choose among different compensation arrangements which encourage the lower cost utilities to provide more conservation services.

3. Designing U-TIPS: Opportunity Packages

Utility DSM is most effective when the utility is afforded lattitude in choosing which energy efficient investments to provide and market to its customers. This is most easily accomplished using opportunity packages.[4] Opportunity packages work as follows. Typically a DSM program will consist of several measures like efficient appliance rebates, subsidies for energy efficient homes, insulation assistance, and energy management audits. For each of these measures the utility is required to achieve a certain participation rate in order to reach its goal and to avoid being penalized for poor performance. However, at the beginning of the program it is often difficult for the utility to predict the success of any one or group of these measures without knowing how its customers will react to the services it offers. For example, participation in an energy efficient heat pump program for new construction may prove to be disappointing if new construction is dampened by a local recession. On the other hand, a refrigerator

[4]The concept of Opportunity Packages was first introduced by Landon and St. Marie (1990)

rebate program may prove to be unexpectedly successful because of the dealer's advertising campaign.

When individual program goals and stipulations are rigidly set in advance it is not possible for utilities to profitably shift resources away from unpopular programs into the more effective conservation options. However with opportunity packages utilities are encouraged to make these substitutions by basing their shared savings on the total energy saved for all the programs offered as a package. That is with opportunity packages, the utility is evaluated based on its performance on the entire package of programs offered. As the utility learns which programs are more successful, it may reallocate resources into the more attractive options. Opportunity packages afford the utility an extra degree of freedom to decide how it is best able to achieve any given level of desired energy savings from DSM. If we accept the premise that utilities are best informed about which conservation options are most effective, then it only makes sense to allow the utility to choose the conservation package it wishes to support.

Ofcourse some care should be exercised in the regulatory design of opportunity packages. Specifically, a measure of the costs and benefits for each program in the package needs to be agreed on in advance. Reasonable energy saving goals and a formula for shared savings need to be specified before the opportunity package is adopted. There should be an expectation that the package taken as a whole will generate excess benefits over costs, and that the utility will receive sufficient revenues from the package to justify its participation.

4. Designing U-TIPS: Compensation Menus

Assuming utilities differ in their cost and ability to delivery conservation and energy efficient investment, it makes sense for the regulator to offer different compensation plans, a menu of plans if you like, which cater to the utilities different needs and abilities. To illustrate, suppose that the regulator oversees DSM programs for five or six different utilities. Some fraction of these utilities are superior providers of conservation and energy efficiency in that they can offer and administer DSM programs at a relatively low cost. The regulator doesn't know which of the utilities are the low cost suppliers, and the low cost utilities are reluctant to reveal their inherent advantage at DSM for fear that their performance goals will be ratched up. How then can the regulator tailor individual DSM programs to the abilities of the utility so as to induce the lower cost utilities to perform at a higher level?

By offering a menu of different compensation schemes the regulator may sort out the low cost providers of DSM from the high cost providers, and may induce the more capable utilities to supply a higher level of DSM services. To illustrate,[5] suppose that the payments received by the utility consist of a fixed payment , T, which reemburses the utility for the direct and administrative costs of the program, and a share ,b, of the net savings generated from the DSM package. Net savings are calculated as the difference between

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[5]The details of designing menus of compensation schedules are contained in Lewis(1991) and Lewis and Sappington (1991)

the total energy saved and the total utility and customer cost of the program. In Figure 1 payments, P, received by the utility are plotted as a function of measured net savings, NS. Two schedules are depicted, each offering the utility a different fixed payment and a positive share of the net savings. Notice that the steeper schedule, the one which provides for a larger shared savings, is designed to attract the utility who is a lower cost provider of conservation services. This type utility should be able to generate large net savings from conservation. Thus it is induced to accept a lower fixed payment for expenses in order to earn a higher share of net savings which are anticipated to be large. The high cost type utility would prefer the flatter schedule. This utility prefers to trade some shared savings, which are anticipated to be relatively small in return for a larger fixed fee to cover its expenses.

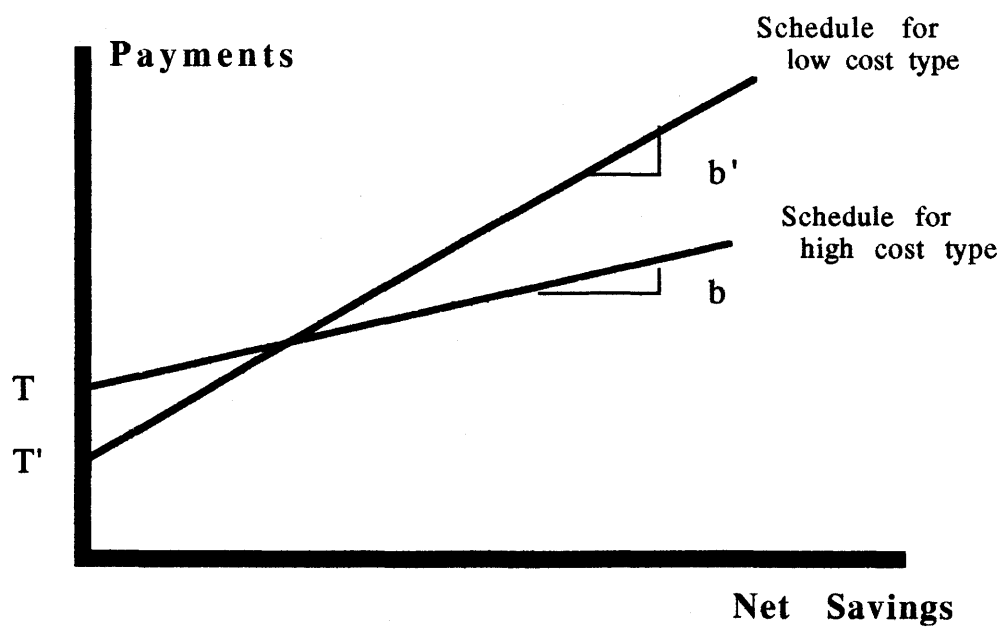

Figure 1 Compensation Schedules

The principle for constructing compensation menus for U-TIPS is clear: utilities who are the most effective conservation suppliers are encouraged to provide more service by allowing for greater sharing in the net savings generated.[6] The advantage of offering a menu of incentive plans rather than just one is that it allows the regulator to tailor the shared savings incentives to the utility's privately observed cost information.[7] Simulations comparing total net savings under U-TIPS and under single incentive programs reveal that total net savings may be significantly higher with U-TIPS. With higher total net savings, there is a larger suplus to be split between ratepayers and utility shareholders.

5. Conclusions

In this short memo I have attempted to offer some suggestions for designing desirable incentive regulation for DSM programs. In considering these programs I have adopted the premise that utility sponsored conservation and energy efficient investment is desirable because of imperfections in private markets for energy services, and that utilities are knowledgeable about conservation options and customer needs and habits. Whether these assumptions are justified

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[6]This is analogus to the different insurance constracts that one observes. Individiuals who can self insure at a low cost usually opt for contracts with a low premium and a high deductible and coinsurance provisions. Those who are unable to self insure elect to purchase contracts with lower deductibles and higher premiums.

[7]The advantage of offering menus of incentive programs over a single one has been analyzed in the accounting literature by Baiman and Evans (1983) and Melumad and Reichelstein (1989)

is yet to be determined. However, the logical implication flowing from this premise is that utilities should be afforded maximum latitutde in designing conservation strategies.

U-TIPS are a new incentive program for DSM which incorportate two novel features. One of these features is the opportunity package, whereby the utility is allowed to adjust expenditures among different programs as it learns about its various conservation options. The other novel feature of U-TIPS is the menu of different compensation schemes which allows the regulator to tailor compensation to individual utility needs and abilities, and encourages lower cost utilities to supply more DSM services.

U-TIPS are a win-win-win proposition. The rate players are winners because U-TIPS generate larger total savings to be split between ratepayers and shareholders. Those of us who are concerned about the environment are also winners because with the compensation menu's offered under U-TIPs low cost utilities are encouraged to provide greater demand side services. And finally the shareholders are winners with U-TIPS because it affords utilities greater latitude in structuring DSM and provides clear incentives for utilities to profit by becoming more efficient at providing conservation services.

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