THE CALCULATION AND APPLICATION OF THE NON-PARTICIPANT TEST WITHIN THE COST-BENEFIT ANALYSIS OF UTILITY LOAD MANAGEMENT PROGRAMS IN CALIFORNIA, 1981-1985

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ABSTRACT

The Standard Practice for Cost-Benefit Analysis of Conservation and Load Management, developed by the staffs of the California Energy Commission and California Public Utilities Commission, was published in February, 1983, for use by all utilities and by both Commission staffs. The Standard Practice provides benefit cost ratio and net present value calculations from five perspectives: program participant, non-participant, all ratepayers, utility, and society.

The Standard Practice offers consistent financial evaluation methods, but is silent on the issue of which of the five perspectives takes precedence for funding decisions. There has never been a formal statement on this issue by either Commission.

The staffs of the two Commissions are re-evaluating the Standard Practice, and particularly the non-participant test, to determine if that test accurately reflects the impacts of utility programs on non-participants. Without resolution of several key policy issues surrounding the non-participant test, there will be continuing uncertainty in conservation and load management evaluation and funding.

INTRODUCTION

California's three largest investor-owned utilities spent $122 million on conservation and load management programs in 1983 and some $658 million since 1980. [1] This additional cost was absorbed by ratepayers. The California Public Utilities Commission and the California Energy Commission ordered the utilities to collect that money, in part, because they expected the programs to produce energy savings valued far beyond their cost. The method used to measure program value and cost has evolved over the past eight years. The current method used by both Commissions and the utilities is called the Standard Practice [2].

THE STANDARD PRACTICE

Impetus for Development

The California Energy Commission (CEC) was required by a 1976 state law [3] to adopt load management standards by July 1, 1978, requiring utilities to institute programs that deliberately reshape their load duration curves. Any

programs created by the standards had to be cost-effective in comparison to to the cost of new electrical capacity. This was interpreted to mean that the programs must cost the utility less to implement than an equivalent amount of new generation, transmission, and distribution capacity would cost to build or operate. Staff's cost-effectiveness analyses during the development of the standards compared the utility program costs required to achieve an estimated amount of load drop and the cost of constructing the same amount of load by the utility, but did not look at costs or benefits from any ratepayer perspectives. In addition, the incentives which all parties knew would be paid to induce participation were not included as discrete program costs or transfer payments. The utilities affected by the Standards questioned the validity of the analysis. They disagreed with the way staff treated incentive payments. They doubted the accuracy of the input assumptions. They also believed the lack of a production cost simulation within the analysis ignored system reliability and system expansion issues. Despite these criticisms, the CEC found the Standards to be cost-effective compared to the cost of an equivalent amount of new electrical capacity.

Even though the standards were adopted in May,1979, all parties realized that the method of evaluating the cost-effectiveness of load management programs had to be improved. Adding to this realization was the California Public Utility Commission's (CPUC) view that rate requests necessary for compliance with the CEC Standards should not be granted without their own independent cost-effectiveness evaluation. The question of funding programs required by the CEC Load Management Standards should never have been raised, however, because the law clearly states that utility expenses required because of the Standard must be considered allowable for inclusion in the rate base or as expense items. In the 1981 Pacific Gas and Electric Company (PGandE) rate case (D.83-12-068), the CEC staff had to intervene to insure that the funding levels required to meet the Load Management Standards in PGandE's service territory were provided. And in the 1983 San Diego Gas and and Electric Company (SDGandE) rate case (D.83-12-065), the CEC also had to petition to have funding restored for a program required by the Standards that had been disallowed by the CPUC.

The staffs of the CEC and the CPUC, as well as some utilities, understood that without some uniform method of analyzing cost-effectiveness, there would continue to be difficulty in formulating a consistent and coherent load management policy. With that in mind, the staffs began a series of meetings in 1982 to begin to put together a common method of analysis for rate case filings and actions before the CEC. This staff effort resulted in the joint Standard Practice.

Characteristics of the Standards Practice

The fundamental premise of the Standard Practice is that the formulas used should be policy neutral. That is, they provide objective financial indicators of net present value and benefit-cost from the five perspectives of ratepayers and society without establishing policy on equity and efficiency issues. Nor does the Standard Practice posit which of the perspectives should be dominant. This premise has been its strength. It has allowed the analysts who use it to to develop objective results and has given decision-makers the widest latitude for policy development. This has created problems, which will be discussed.

A second premise of the Standard Practice is that as conservation and load management programs become a more significant component of the resource planning process, the need to carefully weigh the benefits and costs of programs with those of traditional utility resource alternatives becomes increasingly critical. The staff believed that a set of cost-effectiveness criteria and procedures could provide a clear economic basis for making resource and program decisions.

The Standard Practice provides tests for five central points of view: the customer who participates in a program, the non-participating customer, all ratepayers as a group, the utility, and society at large. The utility revenue requirements test is optional; the rest are required. The all ratepayers test has been added within the last two years. Overall, these tests facilitate analysis of both equity (participants, non-participant, and all ratepayers tests) and efficiency (societal) issues involved in the economics of conservation and load management programs.

The Five Perspectives

The Participant Test compares the hardware and operating costs borne by the participant, net of tax credits and incentives, against his bill reduction from energy and demand savings. In addition to calculation of the net present value and benefit cost ratio, a discounted payback analysis is required.

The Non-Participant Test weighs the costs and benefits of those not involved in the utility program. In this calculation, the cost of incentives and the cost created by the shift of revenue requirements are allocated to all customers. The test estimates the effect of the program on the rates paid by those customers not participating in the program. Non-participant benefits are the same as those accruing to the utility. Non-participant costs are the same as those accruing to the utility, plus revenue losses resulting from the program. Revenue losses include two factors. One, they are the product of the reduction in energy sales times the average rate per kWh. Two, revenue losses include incentive payments to participants. Revenue losses are considered transfer payments, which affect customer rate levels and are accounted for in the revenue requirement.

The All Ratepayer Test has not been explicitly included in the Standard Practice but has been used by staff since 1984. It represents the sum of the participant and non-participant tests. This is done to accurately reflect the spreading of costs and benefits to each customer. The participant will receive benefits which will be spread to all ratepayers equally. Furthermore, it produces a society test with boundaries drawn around the service territory only.

The Societal Test estimates the overall economic impact of a program on society as a whole, i.e., inside and outside a specific utility service area. The societal test is similar to the utility test, but broader in scope. The societal benefits accrue from avoided costs because of the program. Societal marginal costs are almost identical to utility marginal costs. Societal marginal costs differ because of differing costs of marginal fuel between the price paid by the utility and its true societal replacement cost. The discount rates for the utility and society also differ substantially. Society can also

benefit from externalities: environmental improvements, reduction of the dependence on foreign oil, and national security improvements.

The Utility Test is optional under the Standard Practice. Whereas the non-participant test measures the impact on rates, the utility test measures the impact on revenue requirements apart from their distribution. This optional test is infrequently used.

The Standard Practice posits no policy as to whether equity or efficiency goals should receive priority if the two goals conflict. The proceedings of the two Commissions are believed to be the proper venues for determining these issues in each individual case. These tests also can be used to determine the level of incentive that will maximize efficiency subject to the constraint that the welfare of the non-participant not be reduced. The Standard Practice as used by the staffs does not necessarily recommend adherence to this constraint. The relative value given to different tests is left entirely to the decision-maker. The tests as presented in the Practice are intended to be placed within a larger policy framework that includes sensitivity and probability analyses, and an appreciation of the value of the information that is available. Sensitivity analysis is especially important owing to the often large margin for error in critical input data. The decision about when to perform sensitivity analysis is left to the discretion of the analyst.

THE NON-PARTICIPANT TEST

Purpose

The purpose of the non-participant test is to predict the impact of a program or measure on the non-participant's rates.

The Fundamental Question

An important effect on the non-participant is the distribution of increased revenue requirements which results from a program. The intention of the non-participant test is to answer this question: if it is cost-effective for the individual ratepayer to participate in a utility program, is it cost-effective for ratepayers not participating to pay for that person to participate? An example may suffice. It is cost-effective for customers to buy more efficient refrigerators because of the reduction in energy use over the life of the appliance. But is it cost-effective for ratepayers to subsidize utility incentives to refrigerator buyers who buy more efficient refrigerators which they should find cost-effective to purchase in the first place?

This fundamental question was not a critical issue until the utilities began to regain economic health within the last three years. The case for most of the 1970's and early 1980's was that the marginal cost of new supply was higher than the average cost to the customer. In this case it is always cost-effective to the non-participant to fund programs that will defer new capacity additions unless the program cost is outrageous or the program will not be successfully marketed. In the past two years, with the vast increase in in out-of-state economy energy from the Northwest and Southwest utilities,

the increasing amount of third-party power, and the leveling off of demand growth, the trend has been towards average costs higher than marginal costs. This situation will by definition render all programs non-cost-effective to the non-participant. It will never be in the non-participant's interest for utilities to subsidize anyone's energy savings. Faced with this short-run phenomenon, the Commissions's decisions have placed a great deal of emphasis on how to handle programs that do not pass the non-participant test. Yet the staffs who drafted the Standard Practice anticipated this problem.

Caveats Presented in the Standard Practice

The staffs realized during the writing of the Standard Practice that the non-participant test was essential for a complete analysis of the effects of utility programs on all ratepayer groups. Yet, the staffs also realized that the non-participant was full of subtleties and potential pitfalls if the results were used without regard to the greater context of the analysis. The caveats for the non-participant test are in the Practice as follows:

1. Results of this test are less certain than those of other tests because of the sensitivity to the change in marginal and average cost. It is very difficult to project marginal and average cost streams with accuracy.

2. Every program has equity impacts regardless of its benefits and of the size of the marginal and average cost differential. Equity between current and future ratepayers is not reflected.

3. All customers potentially are able to be participants in some program, making it more appropriate to assess the composite equity impacts of all programs rather than of individual programs. Furthermore the ultimate objective is to reduce customer's bills, which, if there is widespread participation, may be lower than before even if rates are higher.

4. These equations do not include feedback effects caused by changes in revenue requirements that affect average prices, and in turn, energy and demand savings and system sales. The effects of program savings on the marginal cost of energy and demand which result from the delaying of additional capacity are also not included in the formula.

5. There is no real focus on equity impacts from the program/no program scenario. That is to say that there is no consideration of the equity impacts of alternatives, i.e., externality costs associated with supply-side resources. Generation resources assumed by the utility in the calculation of of marginal cost would be used in calculating these externalities. There has never been a good accounting for externalities in the non-participant test or any other test for that matter. Externalities should be added as a benefit as a separate term and the test should be done with and without this term.

The acknowledgment of these caveats by staff during the creation of the Standard Practice brought into question the degree to which the two Commissions could rely on the non-participant test results as a true measure of rate impacts on ratepayers. As we shall see, neither Commission has made decisions solely based on the non-participant test results.

APPLICATION OF THE NON-PARTICIPANT TEST

CPUC Decisions

The application of the non-participant in utility conservation and load management programs has been debated before the CPUC in several general rate cases and special rate proceedings over the last five years. The decisons of the CPUC regarding the non-participant have varied considerably, but all have recognized the problems inherent in using the non-participant test as the sole decision criteria.

In Decision No. 92653, January, 1981, which decided on PGandE's request to start the ZIP program, a zero interest loan program for conservation improvements, the CPUC staff and PGandE agreed that the societal test should rule because the non-participant test is too subject to variations caused by uncertainty over the number of non-participants, the level of marginal cost assumed, and in what rate block savings occur. The CPUC decided that a conservation measure must only meet the tests of cost-effectiveness to the customer, the utility, and society. The CPUC rejected using the non-participant test exclusively because of difficulties in using marginal cost minus average cost as a measure of non-participant benefits. This position was made much easier to defend because PGandE's marginal cost in 1981 was significantly higher than their average cost. This circumstance was not to hold in the succeeding years.

Two major cases were heard in 1983, PGandE (D.83-12-068) and SDGandE (D.83-12-065). In the PGandE case, all programs failed the non-participant test, with benefit-cost ratios ranging between 0.81 and 0.97. The CPUC staff devoted considerable discussion to why the non-participant results should be judged with extreme caution. These reasons parallel the caveats in the Standard Practice: if all programs are taken as a package, the average residential customer's annual bill would only increase by 56 cents; the forecasting of marginal and average cost streams, which drives the results, is very difficult; the societal test should be given more weight when the impact on the non-participant is minimal, because a portion of the societal benefits accrue to the non-participant; market research conducted for the case showed that more than 75% of all PGandE ratepayers had participated in some form of conservation program. The Commission found many of the CPUC staff's criticisms of the non-participant test valid and agreed that the non-participant test should not be relied upon exclusively. However, the Commission also noted that that there will always be non-participants, and that the effect of utility program costs must always be a concern. The Commission did not deny funding of any of PGandE's programs but did put a limit on the overall funding level. PGandE was further instructed to work within their total funding allowance to direct funds at those programs least likely to impact the non-participant.

The SDGandE case presented the CPUC with a slightly different problem from the PGandE case because SDGandE took the position that the only test that should determine funding levels is the non-participant test, and further, if the results of the non-participant test were negative for all programs, there should be no funding. SDGandE's rate structure had changed in the early 1980's to the point that their marginal cost was significantly below their average cost. They, in effect, were calling for the elimination of

conservation and load management programs in their service area.

The cost-effectiveness results using the Standard Practice, indicated that all programs passed the participant test, no programs passed the non-participant test, all programs but two weatherization programs and an information program passed the societal test, and all programs passed the utility test. The Commission noted that there was no difference between the utility and the staff as to the calculations of the tests but there was considerable differences as to the recommended use of the tests. SDGandE stressed the non-participant test as the only test; staff believed that all tests should be used. The Commission agreed with staff. However, they established specific policy guidelines for funding based on the decision that SDGandE's situation warranted a "less aggressive approach to conservation" and load management. The Commission established the policy that programs which are required by law governmental mandate, by past Commission decision, which provide conservation services needed by customers, and which are clearly shown to be cost-effective should be funded. Those programs which require incentive payments borne by all ratepayers but are cost-effective only to participants, and which because of potential for reduced billings will probably be undertaken without incentives should be phased out. The CPUC also proposed maintaining programs that served broader equity considerations such as programs that serve low-income groups that are not, in and of themselves, cost-effective.

The Commission's policy resulted in funding of $19.5 million, mid-way between the CPUC staff's recommendation of $29 million and SDGandE's request of $15.9 million. More importantly, for the first time, the CPUC had formally stated its intention not only to "stay the course" but actually reduced funding back to the 1982 level. In addition, this decision brought into question the appropriateness of funding incentive programs, which had been a key feature of utility program packages.

The Southern California Edison Company (SCE) case (D.84-12-068) focused on two other features of the Standard Practice. The Commission developed the notion that conservation and load management should be evaluated as resources against a "common yardstick" and the all ratepayer test was used for the first time, which had recently been incorporated by both staffs into the Standard Practice. The Commission also expressed concern about the methodologies and approaches used by both parties. The Commission was concerned about the measurement of savings that accrue exclusively from utility programs versus those from price effects. This concern also had been raised in the SDGandE case. In addition, the CPUC went along with the SDGandE case in that they found a "need to significantly curtail" Edison's incentive programs, especially in the residential sector. However,the CPUC funded the vast majority of SCE's programs.

The results of the CPUC's most recent rate cases presents several policy positions vis-a-vis funding of programs which are not cost-effective to the non-participant. This series of cases from 1981 through 1984 has not produced a totally consistent policy but the following ideas are salient. One, the non-participant test is an important measure of rate impacts but should not be the sole dterminent of cost-effectiveness. Two, programs that are not cost-effective to the non-participant, particularly those which serve greater equity concerns, i.e., low-income programs, should be funded regardless of the cost-effectiveness and results. Three, the situation in which utilities now

find themselves, namely, that marginal cost is less than average cost, must dictate a slowing down of increases funding, i.e., stay the course. Four, serious research is needed in the areas of externality calculations, incentive payment treatment, and marginal and average cost projections for the non-participant test before it can have more influence than it has now. In addition, the issue of price-induced conservation and load management versus utility-financed programs must be investigated. These policy positions have caused a serious reexaminaton of the validity of the utility role in providing conservation and load management services. Should the utility continue to provide those services or should the "marketplace" through higher rates be the mechanism for energy and demand savings.

CEC Load Management Decisions

The CEC Load Management Standards required each covered utility (Pacific Gas and Electric, Southern California Edison, San Diego Gas and Electric, Los Angeles Department of Water and Power, and Sacramento Municipal Utility District) to experiment with residential central air conditioner direct control before the CEC decided whether to continue or terminate the programs. Because the Standards require all programs to be cost-effective compared to the cost of new electrical capacity, the CEC had to focus predominantly on cost-effectiveness issues, moreso than for technical or marketing issues.

The first two load management cases came before the CEC in June, 1983.[4] PGandE had a very large experiment (55,000 units) testing several direct control strategies. Their cost-effectiveness results indicated that none of the strategies passed the non-participant test. The best results the CEC staff could produce was a 1.02 benefit-cost ratio for the most severe strategy--shedding of all load ten days per summer. The poor non-participant results were due in part to the relationship of marginal to average cost as was the case for other utilities. However, staff proposed that even if it is desirable to minimize the extent to which the non-participant benefit-cost ratio is less than one, an otherwise successful program should not be jeopardized to satisfy the non-participant test. Staff proposed, instead, that PGandE continue to experiment at a slightly higher level than 55,000 units, and take several measures to increase load drops and reduce programs costs, which would improve the cost-effectiveness for all perspectives. The CEC agreed with staff's recommendation and declared that the non-participant results were not the exclusive decision criteria.

The SDGandE case did not raise the non-participant test issue because SDGandE showed benefit-cost ratios of 2.19 and the staff's were 1.22. The CEC ordered program expansion at the rate of 8,000 new participants per year for three years.

The Los Angeles Department of Water and Power (LADWP) case was heard in Janaury, 1984. LADWP's case rested on their reserve margin of over 40%, which meant that they would not need new capacity any time within the next twenty years, and would always have an average cost exceeding their marginal cost. Staff concurred with LADWP's position and the CEC ordered termination of their program.

SCE's case was heard in March, 1984. SCE believed their program was cost-effective to all perspectives and indeed requested a massive increase in funding. The staff's analysis also showed the program to be cost-effective, but found SCE's suggested implementation rate overly optimistic. However, the CEC ordered SCE to expand at a healthy 24,000 units per year for three years.

In the last case covering the experimental phase, Sacramento Municipal Utility District (SMUD), the non-participant test became a more important issue. SMUD's original analysis indicated a non-participant result of 2.15. Between the time of filing their results and the date of the hearing in May, 1985, SMUD had recalculated their system marginal cost, which made the non-participant benefit-cost ratio less than one. CEC staff questioned the accuracy of the new calculations and chose to maintain their position that SMUD should increase their program. The CEC decided that SMUD should continue to experiment and, indeed, should use more severe strategies.

The most recent case before the CEC was a re-evaluation of SDGandE's program for their 1985 rate case before the CPUC. SDGandE made a complete reversal of position from that of 1983. They now contended that none of their load management programs were cost-effective to the non-participant and that that test should rule. This was the first time that the non-participant test policy of the CEC had to be expressly confronted. The CEC decided that the all ratepayer test should take precedence and ordered SDGandE to continue at the current level of units but should market more severe strategies. Although the CEC order governing SDGandE's program does not explicitly state the CEC's preference for the all ratepayer test, the inference is clear. Staff of the CEC testified in the SDGandE rate case before the CPUC on this issue. Although the CPUC's decision will not be published until December, 1985, the CPUC staff testified in support of the CEC order.

CONCLUSION

The development of the Standard Practice and the policy implications of the non-participant test have been evolutionary, and were born out of the need for quantitative measures of cost-effectiveness. The decisions based on the results of the Standard Practice have varied, but have produced some consistent trains of thought.

Standard Practice results can only aid the decision-maker. They can not be definitive criteria devoid of politics and overriding social goals of equity and economic efficiency.

The short-term relationship between marginal and average cost is too volatile and unpredictable to be the determinant of cost-effectiveness. The fact that the general relationship between marginal and average cost has made a complete reversal within five years leads a prudent person to believe that it can just as easily reverse itself again.

'Non-participant' is a weak definition of a ratepayer group. Non-participants in one program can likely be participants in another. Non-participants at the time of the analysis can join the program during any year of the program life, which would make the analysis inaccurate. Also, almost all utility programs are available to all ratepayers in the class to which the program is directed.

Some have suggested that non-participants should bear some of the consequences for staying away from utility programs. The non-participant test is ignored anyway when socially-responsible programs, e.g., low-income weatherization, are conducted regardless of cost-effectiveness.

The staffs of regulatory agencies must continue to do research into issues affecting all ratepayer groups. There is no denying that someone pays for utility programs. The question still remains of how to realistically measure the long-term costs and benefits of utility programs. The short-term perspective has too many imperfections for the non-participant test to be taken as the bottom-line decision criterion. All concerned evaluators who deal in utility program areas must continue to perfect the tools of analysis so that the ultimate decisions can come closer and closer to wisdom.

REFERENCES

1. Presentation of the California Public Utilities Commission's Public Staff Division on Regulation of the Electric Utilities: Talking Points and Figures, California Public Utilities Commission, March 25, 1985.

2. Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs: Joint Staff Report, California Public Utilities Commission and California Energy Commission, February, 1982.

3. California Public Resources Code, Section 25403.5.

4. Docket 82-LMR-1 contains all reports and testimony heard by the CEC relating to the Load Management Standards. There is an Executive Director's Report and a utility Thirty Month Report for each of the five utilities covered by the Standards.