Shouldn't We Be Analyzing the Cost-Effectiveness of Our Evaluations?

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Background

In New York, the utilities have formed a system of committees and sub-committees to coordinate and develop joint research support. In 1992, the New York Public Service Commission (PSC) requested that the Program Evaluation Task Force investigate reporting and evaluation issues with regard to the Utility Low-Income Energy Efficiency Programs (ULIEEP). The Low-Income Evaluation Task Force is directing this effort.

The Low-Income Evaluation Task Force consists of members from the nine investor-owned electric and gas utilities. These utilities are: Brooklyn Union Gas Company; Central Hudson Gas & Electric Corporation; Consolidated Edison Company of New York, Inc.; Long Island Lighting Company; National Fuel Gas Distribution Corporation; New York State Electric & Gas Corporation; Niagara Mohawk Power Corporation; Orange and Rockland Utilities, Inc.; and Rochester Gas and Electric Corporation.

This paper concerns one task of the second phase of one of four work efforts being done as part of the Low-Income Evaluation Task Force's three-year work plan. The work plan has four main objectives, with projects being conducted to accomplish each of them. These objectives are:

- Develop reporting protocols;
- Develop data collection protocols;
- Assess methods to quantify “hard-to-quantify” costs and benefits of the ULIEEP programs; and
- Compare the evaluation results for the pilot programs among the utilities of New York.

The first phase of the hard-to-quantify project provided a review and search for methodologies to quantify the six hypothesized social benefits of low-income

energy efficiency programs.[1] A literature search and a telephone survey of national contacts regarding low-income energy programs were conducted. These were used to search for methods previously used or to discover what methods might prove fruitful to quantify and monetize these benefits. The greatest inventories of previous work, for the six areas examined[2] were found in the reduced arrearages and the economic impacts areas. The other focus areas proved less likely to have viable methods that could be applied at a utility level.[3]

Citings of these prior works, and an overview of the various methods used and their short-comings were made. As part of this review in the area of arrearages, the study identified a series of decision-points to be analyzed, data desired, and study issues and difficulties to be addressed. It was found that the costs for undertaking an arrearage study could vary greatly by utility, primarily depending upon the difficulty in obtaining the required data. The conclusion for this focus area included "Small utilities or small programs will probably not find this analysis to be cost-effective....In these cases, using or adjusting another utilities' findings might be the most cost-effective action for obtaining estimates of these benefits".

Current Undertaking

Given this finding from the Phase 1 study, the follow-up project is including the following as one of its four primary objectives: "Develop a procedure for determining when the arrearages and economic impact analyses are cost-effective to undertake, and the procedure to follow when the analysis is not cost-effective (assuming an adaptation from another study)."

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[1] See Cambridge Systematics, Inc. 1994. Hard to Quantify Benefits and Costs of Low Income Energy Efficiency Programs, and Megdal, L. and Piper, M. 1994. "Finding Methods to Estimate Social Benefits of Low-Income Energy Efficiency Programs."

[2] These areas were: reduced arrearages, uncollectibles, termination and reconnection costs; reduced public transfer payments; reduced foreclosures and evictions, and delaying elders movement out of own homes; increased health and safety; increased housing stock value and neighborhood preservation; and impact on the local economy.

[3] There did not appear to be methods to quantify these impacts. This is not to say that qualitative analysis would not be useful. Qualitative analysis could be performed and used to ascertain how program modifications have changed the customer's perception of the amount of benefits they are receiving in each of these focus areas.

At this writing, there are six steps being planned to conduct this study. These are:

1. A literature review will be conducted. The search will include related work in both demand-side management (DSM) program evaluation and, particularly, evaluation efforts in other fields.[4]
2. Telephone interviews with each New York utility evaluation manager will be conducted to determine how decisions are made concerning the following areas: the analysis methods to be used, the amount to be spent on a DSM evaluation, and how these decisions interrelate with New York Public Service Commission policy and utility policy.

3. Focused discussions will be conducted with leaders in evaluation, both in evaluation of DSM programs and in a few other representative areas.

4. Guidelines and a flowchart will be drafted of the analysis decision steps necessary to assess the cost-effectiveness of conducting the special additional evaluation studies for low-income energy efficiency programs examined in this project.

5. The draft guidelines, the methods used to produce these guidelines, the sources of information used, and the basis for the guidelines will be produced in a section of the draft, revised, and final reports for the overall project. The draft version will be reviewed by every utility's evaluation representative on the Low Income Evaluation Task Force. From this review, the revised draft will be produced. The revised draft will be reviewed and presented in a forum including the utility representatives, other interested parties in New York, New York Public Service Commission staff. From these comments and edits, the final report will be produced.

This project may be the first in the demand-side management (DSM) evaluation field to develop a systematic procedure to assess what type of analysis is cost-effective to undertake and, if not, what information should be used in its place. As utilities many utilities are significantly cutting costs in anticipation of competition that could represent commodity markets for some types of customers, they may push for haphazard slashing of DSM evaluation efforts. However, it would be seem more prudent for us to expand the type of work being performed by New York to operate throughout DSM evaluation.

The Need for Cost-Effectiveness Examinations of Evaluation

[4] The initial preliminary examination of the DSM literature provided little prior work in establishing guidelines and decision-tree analysis for cost-effectiveness consideration of evaluation method and effort decisions. Therefore, this project will place a heavier emphasis in attempting to find relevant transferrable efforts from other fields of evaluation.

Unfortunately, the move to try and "improve" evaluation over the last five years has often been accompanied by a push to require a high level of evaluation effort to be performed in all evaluations and by all utilities. All experienced DSM evaluators probably know of many specific examples where this philosophy has been followed to a degree of unreasonableness. The authors alone know of several.[5] There are cases in which:

- small utilities have been required to follow evaluation guidance by regulators that is not differentiated by program size and the evaluation costs themselves push the programs to being not cost-effective to operate;

- small programs being over-burdened with accounting and evaluation costs, needless given the level of expense (where the consequences and ranges in the confidence levels of larger DSM efforts, that utilize the same evaluation techniques, are far greater than the entire expenditure on the small program);

- a program that has remained relatively constant in its operation over several years and, yet, the exact same type of relatively costly evaluation is repeatedly conducted every year; and

- evaluations being designed, conducted, and paid for by what is expected rather than how the information will be used, or if it will truly be used in a decision-process at all.

Recent Related Efforts

In the New York effort described above, we will search for prior efforts in DSM evaluation to construct guidelines and procedures for determining what analysis efforts may be cost-effective to pursue. At this stage, our preliminary examination has not found efforts like this. There are, however, related efforts that can be used as a starting point of reference for a development in this direction.

Recent related efforts can be grouped into five areas. These are those that:

1. Develop ways to make specific-types of DSM evaluation more cost-effective;
2. Efforts to reduce evaluation costs through the use of meta-analysis techniques;

[5] We do not wish to highlight specific cases as to avoid embarassment to the utilities involved or their regulatory commissions. Yet, we believe this phenomonon is so common as their is no need to cite specific cases as all experienced DSM evaluators will recognize these cases from their own experience.

3. Efforts to reduce evaluation costs through the use of joint research efforts;
4. Evaluation standards and protocols, depending on their design and usage guidelines;
5. Uncertainty analysis efforts can be designed to assist in assessing the cost-effectiveness of evaluation analyses; and
6. "Value of information" analysis and its use in decision-planning.

Sampling and sample design issues have always been used in evaluation planning. These techniques and their improvements over time are some of the first ways in which evaluations were made more cost-effective. The focus has often been on achieving greater statistical precision, but these issues can also be used for reducing evaluation costs.

Another approach to increasing cost-effectiveness is to develop less-expensive evaluation methods that are (or have previously been) calibrated to a more-expensive method but reliable method. This approach has been used in both engineering-based and econometrically-based DSM evaluation.

There are a large number of engineering-based evaluations that operate in this manner. We have included descriptions of two examples that the authors were involved. These are the 1992 City of Austin's Direct Weatherization, Appliance Efficiency Program's (AEP), Whole House Rebate and Loan Program evaluations and the 1994 Large Commercial/Industrial (C/I) Retrofit Program Evaluation for Boston Edison Company. Recognize, however, that there are probably hundreds of DSM evaluations making use of these types of cost-saving approaches.

The City of Austin, along with assistance from Oak Ridge National Laboratory, performed an extensive end-use metering project on a small sample of Austin residential homes in the late 1980's. This data was used to supplement other data available to construct simulation models for an average Austin house and with program participant information to construct average calibrated simulation models for each residential program. These calibrated models have been used for program evaluation, program design, and program modification analysis.

The 1994 Large C/I Retrofit Program Evaluation for the Boston Edison Company was conducted by Cambridge Systematics, Inc. and SBW Consulting, Inc. The engineering portion of the evaluation, conducted by SBW Consulting, included adjusting prototype load-shapes for Boston conditions of building characteristics, thermal integrity, thermal usage characteristics, and weather. The base prototype models that were used included prior work performed by SBW in the Pacific Northwest. This prior effort provided fully calibrated load-shapes, using samples that would be statistically accurate for the sectors they represented.

One example, again of many that are available in DSM evaluation, of a similar econometric approach can be found in Megdal, Haynes, and Rammaha (1993).

The City of Austin conducted a series of residential DSM evaluations involving econometric and engineering simulation analysis. The evaluation of the Direct Weatherization Program included extensive development of a new engineering-based method to estimate program savings and to measure takeback and comfort increase (the hybrid duel engineering evaluation technique or HDE). This allowed new information to be available from a DSM evaluation, but the technique was very time-consuming and expensive. At the same time, econometric techniques were developed to provide more accurate billing analysis and further single-period calibrated engineering simulation modeling was performed for the other residential evaluations. These two estimates (for each program) were subtracted to arrive at an estimate of takeback (referred to as Engineering/Takeback/ANCOVA or ETAS). Comparisons between the results from the HDE and the ETAS analyses allowed the evaluators to verify the reliability of the less expensive method, ETAS.

An additional recent econometric-based evaluation technique examined for increasing cost-effectiveness was the article by Fels, et. al, 1994 on how to select the appropriate PRISM model to use.

There has also been a significant beginning to find ways to metering more cost-effective. Roger Wright has generally led the effort to use statistically methods to select sites to be metered or in using metering data in a most cost-effective manner. (See, for example, Wright, 1994.)

Meta-analysis was introduced into DSM evaluation from other fields of social research and medical research as a way to combine the results from different evaluations. This technique has received increasingly more attention from 1992 through the present. (See Violette et. al., 1992; Greene et. al., 1993; and Lagerberg et. al., 1993.)

There are two movements in the DSM evaluation industry that could be used to increase DSM cost-effectiveness or could cause it to decrease. These are the work in evaluation standards and protocols, and the work in uncertainty.

There is an increasing focus on the development of DSM evaluation standards and protocols (Freeman, et. al., 1993; Parfomak, et. al., 1993; and Solomon, et. al., 1993). Evaluation standards and protocols can make DSM evaluation more cost-effective by reducing the expenditures in three ways. These are by reducing expenditures for: researching what techniques to use, minimizing the preparatory and set-up of the techniques, and to minimize the number of evaluations that are not used as the evaluation was not appropriate for the question or was conducted inappropriately. At the same time, however, evaluation standards can contribute to the problem cited earlier or requiring costly evaluations in areas where they are not cost-effective.

Somewhat similarly, uncertainty analysis can be used as the first step in analyzing the value of further information, a necessary component in assessing the cost-effectiveness of an analysis technique. At the same time, uncertainty analysis can create more sophisticated and expensive evaluation techniques. New techniques can often be viewed as the "best" techniques. They can easily become expected without an assessment of whether it is cost-effective to use them. (For a few recent articles on DSM evaluation uncertainty analysis see Buller and Miller, 1992; Sedmak, et. al., 1993 and 1994.)

The closest we have moved towards developing the guidelines and procedures for analyzing the cost-effectiveness of evaluation has been in efforts concerning the value of information and strategic DSM evaluation planning. A few recent works in these areas include Dion and Ball, 1993; Hummel, 1993; Kiefer, 1993; McKellar, et. al. 1993; McRae, et. al., 1992; Reed, et. al., 1993.

Next Steps for the DSM Evaluation Industry

As noted above, there are many different moves towards improving the cost-effectiveness in DSM evaluations. There are also a handful of papers that have begun to emphasize the need to analyze the cost-effectiveness of our evaluation investments. This can be the starting points in the development of guidelines and procedures that will help utilities and regulators decide in agreement on what evaluation efforts are cost-effective to perform.

The development of these types of guidelines and policies could prove critical in order to obtain the maximum benefits from DSM evaluations. This is especially true given the current climate of cost in fear of a more competitive electric service market.

References

Buller, S., and Miller, W. 1992. "How Should We Treat Factors Contributing to Uncertainty in Measurement and Evaluation of DSM?", Proceedings from the 1992 ACEEE Summer Study. American Council for An Energy Efficient Economy, Washington, D.C.

Cambridge Systematics, Inc. 1994. Hard to Quantify Benefits and Costs of Low Income Energy Efficiency Programs, sponsored by The Low Income Evaluation Task Force of the Utilities of New York. Cambridge, Massachusetts.

City of Austin, Environmental & Conservation Services Department. 1992. Appliance Efficiency Program Evaluation. Austin, Texas.
City of Austin, Environmental & Conservation Services Department. 1992. Direct Weatherization Program Evaluation. Austin, Texas.

City of Austin, Environmental & Conservation Services Department. 1992. Whole House Rebate and Loan Program Evaluation. Austin, Texas.

Dion, S. and Ball, D. 1993. "The Evaluation Planning Challenge: Keeping In Step With Program Planners", Proceedings of the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Fels, M., Kissock, J.K., and Marean, M. 1994. "Model Selection Guidelines for PRISM (Or: Now That HC PRISM Is Coming, How Will I Know When to Use It?), Proceedings from the 1994 ACEEE Summer Study. American Council for An Energy Efficient Economy, Washington, D.C.

Freeman, L. (moderator), Hicks, E., Holmes, C., Cuccaro, J., and Faigle, A. 1993. "Panel on Business Ethics in DSM Evaluation", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Greene, P., Davis, R. Violette, D., and Feldman, S. 1993. "A Meta-Analysis of Commercial and Industrial Lighting Programs", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Hirst, E. and Reed, J. eds. 1991. Handbook of Evaluation of Utility DSM Programs. ORNL/CON-336. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

Hummel, P. 1993. "Resource Allocation and DSM Program Evaluation Planning", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Kiefer, K. "Framework For Strategic Evaluation Planning", Proceedings of the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Lagerberg, B., Schueler, V., and Leistner, P. 1993. "A Meta-Analytic Approach to Estimating Natural Gas Conservation Savings - Preliminary Weatherization Program Findings", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

McKellar, B., Jenkins, J., and Lefkowith, D. 1993. "Practical Guidelines for Developing 'Strategic' DSM Evaluation Plans", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

McRae, M., Henneberger, T., and Hanser, P. 1992. "Now That
We've Got Their Attention: Guidelines for Producing Useful and Used Evaluations", Proceedings from the 1992 ACEEE Summer Study. American Council for An Energy Efficient Economy, Washington, D.C.

Megdal, L., Haynes, G., and Rammaha, H. 1993. "Estimating Takeback (Comfort Increase) For A Low-Income Program, Loan Program, And A Single Family Rebate Program", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Megdal, L. and Piper, M. 1994. "Finding Methods to Estimate Social Benefits of Low-Income Energy Efficiency Programs", Proceedings from the 1994 ACEEE Summer Study. American Council for An Energy Efficient Economy, Washington, D.C.

Parfomak, P., Sabo, C., and Sandman, E. 1993. "Blue Ribbon Today, Golden Carrot Tomorrow: Issues in Joint-Utility Program Evaluation", Proceedings of the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Reed, J., Hall, N., and Calhoun, R. 1993. "Evaluation and Implementation: How Long An Arm Is Needed In The 'Arms-Length' Relationship?", Proceedings of the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Sedmak, M., Uhlaner, R. and Powers, J. 1993. "Building a Reliable DSM Resource With Strategic Program Evaluation", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Sedmak, M., Uhlaner, R. and Smith, B. 1994. "Building Reliable DSM Resources with Program Evaluation", Proceedings from the 1994 ACEEE Summer Study. American Council for An Energy Efficient Economy, Washington, D.C.

Solomon, B. (moderator), Keating, K., Quigley, D., Hicks, E., and Cummings, M. 1993. "Panel on Conservation Verification Protocols: Guidance or Standards?", Proceedings from the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Spinney, P., O'Rourke, P., and Peters, J. 1992. DSM Process Evaluation: A Guide to Current Practice. EPRI TR-100394. Electric Power Research Institute, Palo Alto, California.

Violette, D., Brakken, R., Schon, A. and Greer, J. 1993. "Statistically-Adjusted Engineering Estimates: What Can The Evaluation Analyst Do About The Engineering Side Of The Analysis?", Proceedings of the 1993 International Energy Program Evaluation Conference. Evanston, Illinois.

Violette, D., Greene, P., Feldman, S., and Hanser, P. 1992. "Applications of Meta-Analysis to Methods of DSM Research", Proceedings from the 1992 ACEEE Summer Study. Washington, D.C.

Violette, D., Ozog, M., Keneipp, M. and Stern, F. 1991. Impact Evaluation of Demand-Side Management Programs. Volume 1: A Guide to Current Practice. EPRI CU-7179. Electric Power Research Institute. Palo Alto, California.

Wright, R., Horowitz, M., Obstfeld, I., and Buller, S. 1994. "Double Ratio Analysis: A New Tool for Cost-Effective Monitoring", Proceedings of the 1994 ACEEE Summer Study. American Council for An Energy Efficient Economy, Washington, D.C.