Applying Cost Allocation Principles to Demand-Side Resources: A Case Study of Industrial Opt-Out Proposals

Paul A. Centolella, Science Applications International Corporation

In 1993, the New York Public Service Commission approved a Niagara Mohawk subscription service offering which allows industrial and large commercial customers, who remain eligible for a shared savings program, to elect to be ineligible for rebate programs and to avoid being allocated some costs for the utility's DSM resource programs. This decision was hailed by industrial customers who have been critical of utility rebate programs. The case raised fundamental policy questions: How should the cost of DSM resource programs be allocated? How should rate impacts on non-participating customers who are paying rates in excess of marginal costs and exhibit significant price elasticity be addressed? How will DSM survive in competitive power markets?

Using such a proposal as a case study, this paper describes the application of accepted cost allocation principles to DSM resource programs, taking into consideration cost causation, alternative notions of equity—including flow of benefits (costs should follow eligibility to participate) and consumer sovereignty (consumers cannot be held responsible for any given consumption level) concepts, and practical considerations. It examines how such proposals move some customers rates closer and others further away from marginal cost, the policy questions raised by these impacts, and a framework for DSM cost allocation in increasingly competitive power markets.

Introduction

In 1993, the New York Public Service Commission approved a subscription service offering which permits industrial and large commercial customers to elect to become ineligible for DSM rebate programs and to avoid being allocated incentive costs for the utility's rebate programs. Customers electing the subscription service programs were required to have energy audits and remained eligible for a shared savings program (New York Public Service Commission 1993). This paper examines whether allowing a class of customers the option of not paying for certain DSM resource costs is consistent with accepted cost allocation principles and the impact of the Niagara Mohawk subscription service plan on the rates of those customers who elected the subscription service program, who chose not to take the subscription service option, and who did not have an option to elect the subscription service but nevertheless experienced rate impacts from the program.

This paper does not address the separate issue of the effectiveness of shared savings programs (PacifiCorp 1992; PacifiCorp 1992a; Flaim et al. 1989; JRB Associates 1984). Niagara Mohawk had proposed an industrial shared savings pilot program prior to the development of the subscription service offer and other parties supported

implementation of this pilot program (Niagara Mohawk 1992). Whether the shared savings program offered to customers on the subscription service will capture significant savings is a question which may be answered when the evaluation of the subscription service program is complete.

This paper begins by summarizing the Niagara Mohawk subscription service plan and how costs associated with Niagara Mohawk's DSM resource program are allocated. The second section describes how accepted principles of cost allocation can be applied to utility DSM resource programs. The third section analyzes the impact the Niagara Mohawk subscription service has had on the allocation of costs to different customer classes. A final section addresses DSM cost allocation in increasingly competitive energy markets.

The Niagara Mohawk Subscription Service Program and Allocation of DSM Costs

Niagara Mohawk's Subscription Service Program was approved as part of a settlement in the Company's 1992 rate case proceedings (N.Y. Public Service Commission 1993). The settlement agreement was supported by the utility, Commission staff, and several large commercial and industrial interveners. The Administrative Law Judge recommended disapproval of the subscription service provisions of the settlement, on grounds that allowing some customers to opt-out of paying for a rate element was discriminatory, and that it would discourage adoption of cost-effective energy saving measures (N.Y. Public Service Commission 1992). The full Commission overruled the recommended decision and adopted the stipulation including the subscription service program with certain modifications to ensure achievement of demand-side savings (N.Y. Public Service Commission 1993).

The settlement agreement provides separate treatment for rebate costs, lost revenues, and administrative expenses. DSM rebate costs continue to be collected through the Company's Demand-side Incentive Rate Adjustment Mechanism (DIRAM). Prior to 1993, there were individual DIRAM rates for each service classification. Following the settlement, a single DIRAM pool was established for all non-residential customers eligible for rebate programs, while a separate DIRAM rate was retained for residential customers. The settlement agreement provided for the recovery of lost revenues in base rates through adjustments to the forecasted sales for each customer class to reflect expected DSM savings. Administrative costs for DSM programs were also recovered in base rates. While average rates increased and some DSM costs were shifted into base rates, some large commercial and industrial rate classifications (including Service Classification (SC) 3A Transmission and SC 4) were not allocated any of the increase in base rate revenues. This determination was made as part of the agreement on base rate cost allocation generally and was intended to reduce inter-class crosssubsidies.

The subscription service proposal provided that large commercial and industrial customers (in SC 3A, 4, 7, and 8) could elect to forego participation in the utility's base DSM rebate programs and by exercising the election optout of having to pay any DIRAM charges. Customers electing to opt-out of the rebate programs would continue to share in the recovery of lost revenues and DSM administration costs to the extent those costs had been incorporated in base rates for their service classification. In the absence of the subscription service program, these customers would have been required to pay DIRAM charges of 1.4 roils per kWh, which representing at least 40% of the total DSM costs included in the rates of these customers. Subscription service customers, while ineligible for rebate programs, could participate in a shared savings program under which virtually all of the cost of DSM

measures would be borne by the individual participating customer. The subscription service program was proposed for a three year trial period and offered to customers accounting for over 27% of the company's sales (Niagara Mohawk Power Corporation 1992a).

In approving the stipulation, the Commission placed the following conditions on the subscription service program:

- To take advantage of the subscription service option, a customer would be required to undergo within six months and pay for a comprehensive energy audit of premise and process energy use;
- Any customer electing the subscription service option must be allowed to shift back to rebate programs at any time upon payment of retroactive DIRAM charges;
- The Company must retain the option of offering additional incentives to customers in the subscription service program, if it deems this necessary to secure energy savings;
- There must be an open and cooperative effort to evaluate the subscription service program, including the extent to which customers participating in the program implement cost-effective energy efficiency measures; and
- The Commission retained authority to terminate the program, should it determine that DSM goals are being undermined, before there is a risk of losing any substantial DSM benefits.

In approving the program the Commission relied on Niagara Mohawk's commitment to increase its nonresidential DSM goals by 20% (60,000 MWh in 1994, and 115,000 MWh in 1995) for savings from customers electing the subscription service option, and its agreement to make \$1 million in performance incentives dependent on achieving these savings. The Opinion's treatment of cost allocation was somewhat more cryptic. The Commission continued to endorse: "As a general principle, DSM programs are to be treated on a basis of equivalence to supply-side resources." But, it also noted that it had in the past encouraged utilities, "to consider approaches that would allocate DSM costs more directly to the customers deriving the greatest benefits from the program." The Commission found that it was, "not inappropriate, in this case, to confine the recovery of [DIRAM] costs to the customers eligible for rebates" (N.Y. Public Service Commission 1993).

Principles of Cost Allocation Applied to DSM Resource Programs

How the costs of conservation programs should be allocated among customer classes has become an increasingly controversial issue because: (1) utility DSM spending has increased substantially during the last five years and (2) for utilities where average embedded costs substantially exceeds marginal costs the rate impacts of lost sales can be particularly significant.

How DSM costs should be allocated depends, in part, on the function of the underlying DSM programs. The rebate programs whose costs were reallocated by the subscription service plan represented the lowest cost resources available to the Niagara Mohawk for meeting energy and capacity requirements (Niagara Mohawk 1993). They were regarded by the utility and Public Service Commission as resource programs and were undertaken because of their contribution to lowering total resource costs. To focus on the cost allocation issue, this analysis accepts the implicit premises of the New York resource planning process that these rebate programs: (1) represented the lowest cost approach to reliably capture the energy savings in question, (2) are among the lowest cost resources (supply or demand-side) available to meet the utility's resource requirements, and (3) will secure cost-effective savings that would not have been achieved in the absence of the program. The implications of these premises are that these DSM rebate programs are overcoming market imperfections to produce an economically more efficient level of consumption and that the program costs are incurred because of the programs' resource value to the utility. The energy saved in this case has more the character of a public good, purchased to reduce society's total energy service costs, than of a service undertaken primarily to benefit participating customers.

In addressing cost allocation issues, it is useful to set aside the interests of individual customer classes and examine the basic principles affecting cost allocations: cost causation, equity, and practical considerations (Centolella et al. 1993).

Cost Causation

The concept that rates should reflect the cost of providing utility service has become integral to the notion of reasonable ratemaking. In its most precise formulation, a rate may be said to be cost based if the price which is charged for an additional kilowatt (kW) of demand or kilowatt hour (kWh) of energy is based upon the cost of making available that increment of capacity or energy. This strict marginal cost notion of cost causation reconciles concepts of economic efficiency and equity. In an economically efficient market, prices would ration consumer demand by discouraging consumption of utility services when the marginal cost to society of producing those services exceeded their relative value to consumers and encouraging consumption when the value which consumers place on electricity consumption exceeds the sum of the marginal private and social costs involved in providing the service. It may be presumed that rates which are costbased in this strict sense, absent other market imperfections, would tend to encourage the efficient use of resources. Similarly, rates which are cost-based under the strict notion of cost causation meet an objective standard of equity by mirroring the effects of pricing in competitive markets. In his classic treatise on utility rates, Professor Bonbright declared, "The golden rule of socially optimal rate making is that, whenever possible, prices should track all the identifiable marginal (private and social) costs occasioned by a service's provision." (Bonbright et al. 1988). Because customers make long-term decisions regarding location, fuel choice, or self-generation based on total expected energy costs, marginal cost considerations are relevant to cost allocation, as well as to the design of tail block rates.

The concept of cost-based ratemaking has acquired a broader meaning that encompasses both marginal and embedded cost allocation and takes into consideration the additional functions that rates play in utility regulation, to:

- enable the utility to attract capital and insure a fair return to investors;
- ration consumer demand to enhance social welfare;
- achieve an equitable relative distribution of costs among different groups of customers; and
- provide an incentive for the most efficient delivery of services.

While the broader definition of cost-based rates does not necessarily carry the same efficiency or equity implications as the narrower marginal cost concept of cost causation and may encompass arbitrary conventions for the allocation of embedded costs, it generally contemplates that energy resource costs will be allocated based on the energy and demand requirements of different customer classes. In most cases, the majority of costs avoided by cost-effective DSM resource programs would be broadly allocated among customer classes.

Economic welfare theory suggests that to maximize economic efficiency, rates should be set equal to marginal costs. It is only by chance, however, that a utility's embedded costs will equal its marginal cost revenue requirements. Thus, states which use marginal cost allocation reconcile the utility's marginal cost revenues and revenue requirements based on an equiproportional methodology which minimizes the differences between rates and marginal costs (or based on Ramsey pricing principles to minimize the economic distortions created by this reconciliation) (Malko 1981; Bonbright 1988; NARUC 1992).

Whether a given jurisdiction follows a marginal or embedded cost approach to cost allocation, the strict marginal cost concept of cost causation can help clarify the application of cost causation principles to conservation and load management costs. This strict notion of cost causation suggests that the price of a kWh of energy or kW of demand within any given time period should reflect the cost to society of producing the next increment of energy or capacity within that time period. For costs related to conservation and load management programs which have been implemented on a least cost basis and which serve a resource function, cost causation is generally not related to participation in, eligibility to participate in, or the receipt of benefits from such programs. Such expenditures would not have been incurred except for their contribution to meeting system-wide or regional kW and kWh requirements. Although the program participant's level or timing of service consumption may change, strict cost causation for the services being priced, i.e., the marginal cost per kW or kWh, is largely unrelated to any individual consumer's program participation. Marginal resource costs, either the costs of the DSM resource program, or the cost of another more expensive resource, would have to be incurred to meet the utility's marginal resource requirements regardless of the individual customer's election to participate or not participate.

In states which have historically relied on marginal cost allocation (e.g., California and Oregon), DSM costs are included in the reconciliation of marginal cost revenues and revenue requirements. In these states there has been significantly less controversy surrounding the allocation of DSM resource costs than has occurred in states such as New York which traditionally relied on embedded cost allocation (Centolella 1993).

Equity

Various parties inevitably have very different subjective notions of what is equitable. One notion which, in part, forms the basis of subscription service concept is that:

Unlike supply-side resources which serve all customers, conservation and load management programs provide direct benefits through bill savings to participating customers, Consumers should not have to pay for programs in which they do not have any opportunity (or elect not) to participate and secure these direct benefits.

Some industrial customers argued that rebates were benefiting potential competitors. The flow of benefits argument is not, however, the only, or even the primary, concept of equity used in rate regulation.

In examining the equity implications of DSM, it is important to understand that DSM resource expenditures have two effects on non-participating customers. First, nonparticipating customers may be allocated a portion of the utility's program costs. Incurring these costs allows the utility to defer capacity investments and avoid generation and other costs. If all else were held equal, DSM program costs would have the same impact as the cost of heat rate improvements, more efficient transformers, or other efficiency improvements on the utility side of the meter. Direct program costs represent a small and declining portion of the rate impacts of DSM in New York state (Subbakrishna 1994). The equity arguments regarding DSM generally are related (directly or indirectly) to a second effect: participating customers reduce their inefficient consumption or do not increase their energy use as rapidly as would otherwise occur. This reduction in inefficient energy use reduces the energy bills paid by participating customers, results in a loss of revenue to the utility, and means that fixed costs which otherwise would be recovered through the sale of this energy must be recovered through rates charged for other utility sales. The fact that rates may be higher than would occur in the absence of participating customers cutting back on their energy use is the natural price effect for a regulated utility of a reduction in the level of energy sales. The same effect would have occurred if energy consumption declined in the absence of any conservation and load management programs. The issue, then, is whether the effect on rates of reduced energy use is in some way inequitable to customers who have not reduced their consumption. The flow of benefits equity argument is inherently based on an assumption that non-participating customers have a right to expect rates based on participating customers making the quantity of energy purchases which they would have made in the absence of a DSM program. This assumption is inconsistent with an alternative concept of equity based on consumer sovereignty:

No group of customers should have a hold over energy consumption by other customers or derive any rights from the selection of an economically efficient level of energy consumption by any other group of consumers. The fact that a lower and more efficient level of energy use by some consumers may lead to relatively higher prices does not by itself mean that other customers have been treated unfairly. Nor does the fact that this more efficient level of energy use was the result of a utility program designed to overcome market imperfections and produce a level of consumption which might occur in an efficient market represent a meaningful distinction. Utilities have an obligation to serve the changing requirements of their customers and to minimize total costs to their customers (or to society).

Industrial customers may come to rely on the same consumer sovereignty concept of equity in arguing that utility lost revenues associated with retail wheeling or selfgeneration should not be allocated directly to the industrial class.

Practical Considerations

In allocating costs, a rate analyst also must take into consideration the practical implications of the resulting cost distribution. In the Niagara Mohawk case, two considerations should have been particularly important: (1) rates for all commercial and industrial service classifications were disproportionately above service classification marginal costs in comparison to residential rates; and (2) Niagara Mohawk was not proposing to reduce their expenditures on rebate programs based on the adoption of the subscription service plan. Thus, election by some customers of the subscription service plan had the effect of reallocating DSM program costs to other commercial and industrial customers with the potential to push their rates even further away from marginal costs. The extent to which a system for allocating costs results in some rates being disproportionately in excess of class marginal costs is a key indicator of the economic efficiency and equity of the resulting allocations. One issue was whether the subscription service program, which affected less than two percent of large commercial and industrial rates, or reassessing cost allocations generally represented the more effective means for addressing cross-subsidies among customer classes.

As in the case of the subscription service program, direct allocation of DSM costs to the program eligible customer group or rate class may protect non-participants in other customer groups or rate classifications by increasing rate impacts on non-participants in the group or rate class eligible to participate in the DSM program. Even over multiple rate cases, non-participants may not benefit significantly from reduced class allocators, because allocated costs will be spread over reduced class sales. Thus, interclass cost allocation is not an efficient means to protecting the interests of non-participants.

Additionally, the customer class or classes which tend to benefit from direct allocation of program costs to participating rate classifications will change with the components of the utility's DSM programs and utility cost characteristics. In some cases, industrial customers benefit from a broad allocation DSM costs.

Analysis at the Niagara Mohawk Subscription Service Program

Three-hundred-fourteen (314) large commercial and industrial customers in the following service classifications were offered the opportunity to elect the subscription service program:

- SC 3A: large general service time-of-use rates;
- SC 4: customers taking power from New York Power Authority projects; and
- SC 8: large general service hourly integrated pricing.

Customers in the remaining service classifications (including: SC- 1: residential; SC-2-non-demand: small general service; SC-2-demand charge: small general service; and SC-3: large general service) were not permitted to elect the subscription service program. Of the 314 customers in service classifications 3A, 4, and 8, 192 (60%), accounting for 45% of sales within these service classifications, elected to remain eligible for the company's base DSM rebate programs. The remaining 130 customers, accounting for 55% of the sales within these rate classes, elected to participate in the subscription service program. Customers electing the subscription service program purchase approximately 15% of the utility's total kWh sales. To the extent subscription service customers elect not to pay DIRAM charges, these rebate and incentive costs must be redistributed to and collected from other customers. Following the settlement agreement, the Company created a single DIRAM pool for all commercial and industrial customers who remained eligible for the base DSM programs. This resulted in higher DIRAM charges for those customers in service classifications 3A, 4, and 8 who elected to remain eligible for rebate programs and for customers in other commercial and industrial service classifications.

To understand whether this cost shift represented a reasonable reallocation of costs, it is important to consider how Niagara Mohawk's overall cost allocations compared to the marginal cost of providing service to different customer classes. Figure 1 presents 1993 proposed revenues under the settlement agreement, exclusive of impacts of the subscription service program, by service classification, as a percentage of the marginal cost of providing service to each rate class. The marginal costs were based on a marginal cost of service study performed by the New York Public Service Commission staff (Niagara Mohawk Power Corporation 1992).



Figure 1. 1993 Proposed Revenues by Service Classification as a Percentage of Marginal Cost Revenues (Based on Staff Marginal Cost Study)

The percentages appearing at the top of the bars in Figure 1 represent the percent of total 1993 proposed revenues which would be generated from each service classification. Rates for each of the largest commercial and industrial service classifications (SC-2-demand, SC-3, and SC-3A, as well as SC-4) were disproportionately in excess of class-specific marginal costs when compared to the rates proposed for residential customers.

Allowing customers who elect the subscription service program to avoid paying DIRAM charges has a modest effect of pushing the rates of subscription service customers towards marginal cost. But, doing so shifted costs to other commercial and industrial customers whose rates were also disproportionately in excess of marginal costs. This cost shift affected SC-3A, 4, and 8 customers who elected to remain eligible for rebate programs. It also impacted other commercial and industrial service classification, including both participants and non-participants in DSM rebate programs. Figure 2 compares the DIRAM charges for non-subscription service customers given current levels of participation in the subscription program and the proposed DIRAM rates in the absence of approval of the subscription service program (Niagara Mohawk Power Corporation 1993; Niagara Mohawk Power Corporation 1992).



Figure 2. DIRAM Rates for Non-Subscription Service Customers With and Without Subscription Service

Approval of the plan resulted in rate increases for customers in SC-2-demand, SC-3, SC-3A, and SC-4, all of which were already paying rates disproportionately in excess of marginal costs.

The extent to which rates depart from marginal costs is a significant indicator of the economic efficiency of underlying cost allocations. To better understand the impacts of shifting DIRAM costs from subscription service to non-subscription service commercial and industrial customers, it is useful to look at how the allocation of DIRAM costs changed relative to a hypothetical allocation based on a marginal cost of service approach to cost allocation. Figure 3 presents the DIRAM rates which would have been set if DIRAM charges had been allocated in the reconciliation of marginal cost revenues and revenue requirements using an equiproportional methodology (Niagara Mohawk Power Corporation 1992).

This methodology implies that DIRAM revenues (or more generally, embedded costs of service in excess of marginal costs) would be allocated in proportion to the marginal costs of serving different rate classifications. Under a marginal cost approach, DIRAM charges to residential customers would have been significantly increased, but nonetheless below DIRAM charges which are currently being charged to non-subscription service commercial and industrial customers.

Figure 4 presents the DIRAM rates for non-subscription service customers, with and without the subscription service plan in place, as a percentage of the marginal cost DIRAM rates presented in Figure 3.

It illustrates that rates for SC 2-Demand, SC 3, and nonsubscription service customers in SC 3A and SC 4 were moved further away from the marginal cost of providing service to those customer classes. The percentages at the top of the bars in Figure 4 represent the percentage of total 1993 kWh sales going to non-subscription service customers in each service classification (Niagara Mohawk Power Corporation 1992). Looking at its overall impact, the subscription service program resulted in moving rates covering 15% of the utility's sales closer to marginal costs, and rates for service classifications representing 48% of the Company's sales further away from marginal cost levels. Increased DIRAM charges for SC 2-Demand, SC 3, and non-subscription service customers in SC 3A and SC 4 applied to both customers who did and customers who did not actually participate in DSM rebate programs.

This decision to shift costs from some large commercial and industrial customers to other large and smaller commercial and industrial customers occurred outside the context of looking at the overall allocation of costs to all customer classes. It suggests that treating DSM cost allocation as a "special case" could produce more efficient pricing for some customers, but is likely to result in less efficient pricing for others. One potential effect of treating DSM cost allocation separately from other cost allocation issues can be that such impacts are not carefully considered. Because the impacts in specific cases are likely to depend on the status of the utility's DSM programs and the relative clout of various parties to the proceeding, these effects may not consistently benefit any specific customer class.



Figure 3. Hypothetical DIRAM Rates Using Allocation in Proportion to Marginal Costs (Based on Staff Marginal Cost Study)



Figure 4. DIRAM Rates for Non-Subscription Service Customers as a Percent of Allocation in Proportion to Marginal Costs With and Without Subscription Service

Cost Allocation and Competitive Power Markets

As utilities become increasingly subject to competition, their ability to treat the allocation of DSM resource program costs as a special case, to rely on embedded costof-service allocation, and to sustain rates which depart substantially from marginal costs will become increasingly restricted. In this environment, some DSM is likely to become more information- and service-oriented. Program managers inevitably will pay greater attention to ensuring that utilities are paying no more than is necessary to capture DSM resources. While information and financing may play a greater role, the premise of many existing conservation and load management programs has been that information and financing alone are insufficient to overcome market imperfections blocking the achievement of cost-effective improvements in energy efficiency. Even under retail competition, incentive-based DSM programs should continue to the extent they represent the lowest cost means of overcoming significant market imperfections. Utilities, regulators, and/or legislatures will need to consider how the costs of such DSM resource programs, that are providing significant energy and environmental net benefits, will be recovered from ratepayers or the public generally. If classes of customers are permitted to opt-out of paying for such programs, the unfortunate result could be that no one individually will elect to pay for something that is collectively recognized to be economically beneficial. One appropriate approach would be to recover and allocate such costs in a manner which minimizes the differential between energy prices and marginal costs or the economic distortions which may be created when such differentials become significant. In the electric utility sector, this objective might be realized through a surcharge on the combination of spot market prices for generation services (given that the pool or coordination function will remain a monopoly service) and transmission and distribution charges. Such an approach would result in a smaller percentage uplift and reduce price distortions relative to a surcharge on transmission and distribution prices alone.

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