MARKET SEGMENTATION AND TARGETING FOR REAL TIME PRICING

Glen Weisbrod and Ellen Ford

Printed in the Proceedings of the Electric Power Research Institute's Innovative Pricing Conference, San Diego, March, 1996.

Abstract

While there is growing interest in Real Time Pricing as a competitive tool, its adoption to date has been constrained by wariness on the part of many utilities and many of their customers. That wariness is not misplaced, for Real Time Pricing is not for everyone. In order for both utilities and their customers to benefit, the pricing system must be properly tailored for, and offered to, the appropriate audience. This paper discusses needs for identifying targets, implications of targeting of Real Time Pricing to various types of customers, and implications for design and marketing of such pricing systems. Examples from utility experiences are provided, and recommendations are offered for development of improved targeting of Real Time Pricing.

Introduction

Real time pricing (RTP) has been variously described as the wave of the future and a rational response to competition. In theory, it is a means for utilities to provide their customers with efficient price signals which allow both to manage loads, reduce costs and maximize profitability. It is thus a potentially useful technique for utilities to increase their competitiveness and support the retention and growth of their customer base.

Yet in practice, the application of RTP has remained limited. Many utilities remain wary of its complexity and risks. Experiences from some of the pilot programs have shown that it is actually not hard for utilities to lose money on RTP. A recent survey confirmed while RTP plans have been around for over a decade and over two dozen utilities have been experimenting with RTP, still only seven utilities in the U.S. actually have a permanent (not a pilot test) RTP program and only three of them have more than 30 customers on the plan (E Source, 1995). While new RTP pilot programs are being added at some utilities, others that have had pilot RTP programs have decided not to move forward with a full program.

The difference between the theory and the practice is an indicator of remaining issues relating to the market, design and application of RTP. A common thread among these areas of issue is the need for improved "targeting" of RTP programs. This includes: (1) market --identifying the appropriate target customers, (2) design -- setting of prices appropriate to those specific types of customers, so that the utility does not inadvertently lose money, and (3) application -- ensuring that those customers respond appropriately so that they (and the utility) benefit from RTP. This paper discusses needs for identifying targets and implications of targeting RTP to various types of

customers. The discussion is organized around three primary issues:

- Utility View: What customers should be targeted for RTP?
- Customer View: Who should be interested in RTP?
- Facilities Issue: Who is equipped to properly utilize RTP?

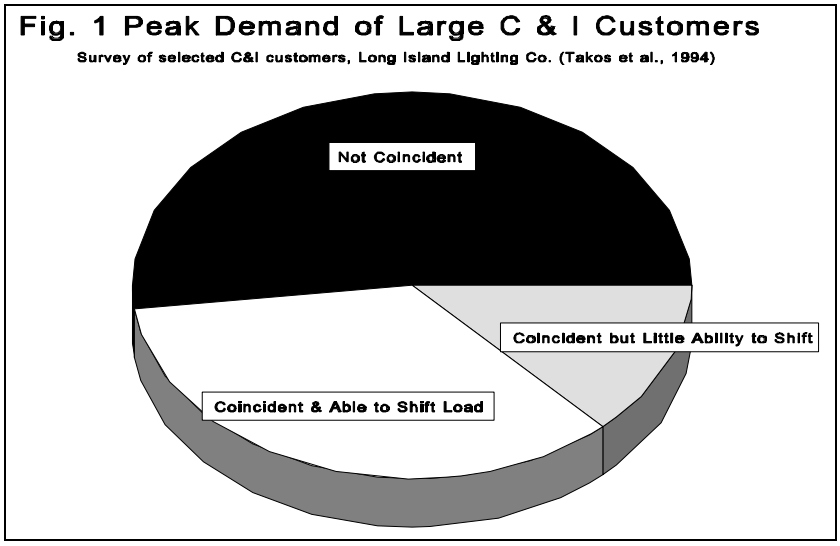
Utility View: What Customers Should be Targeted for RTP?

Targets Depend on Objectives

A utility's target for RTP should depend on its objectives for offering RTP. This seems obvious, yet utility staff often have mixed internal views about why they are offering RTP and can face multiple but conflicting objectives. The objectives can include any combination of the following:

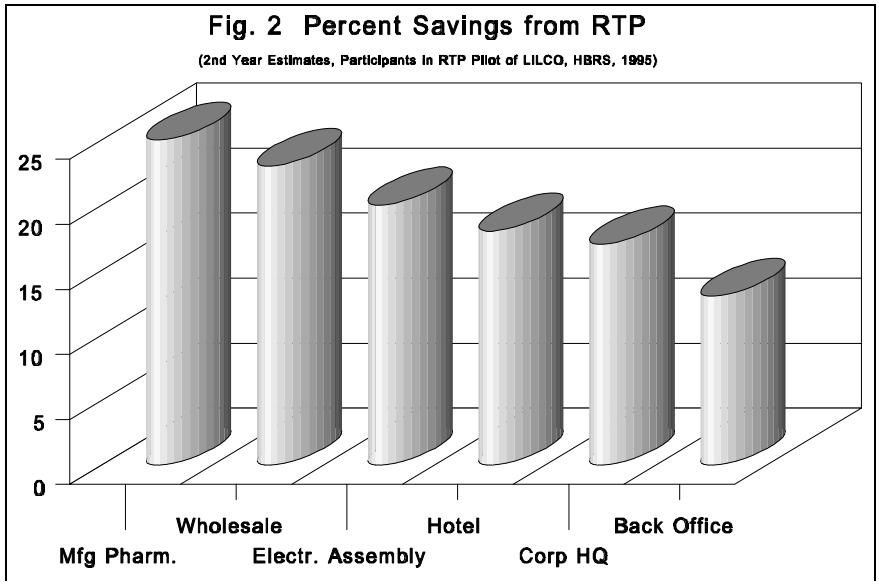
1. Load Management -- Many early RTP programs, such as that of PG&E, grew out of demand-side management (DSM) programs, and were motivated (along with interruptible rates) as an incentive for beneficial load shifting. Accordingly, these programs were evaluated as DSM programs (e.g., HBRS, 1989; Takos et al., 1994).

Issue -- Not surprisingly, it is found that RTP can accomplish load management goals when offered to customers who have both: (a) high demand coincident with systemwide peaks and (b) an ability to curtail demand at those times. However, offering RTP to customers not meeting those criteria can represent merely a transfer of money between the utility and the customer with no appreciable impact on load shape (although possible impacts on other goals, described below). Figure 1 illustrates the incidence of these criteria at one utility; it shows that most large commercial and industrial customers do not meet both of them.



2. Business Retention & Expansion -- Since RTP provides existing customers with a potential means to lower their energy bills, its value for business retention has been recognized. Some utilities such as Long Island Lighting Co. (LILCO) have exclusively targeted their RTP to customers that were at risk of moving outside of their service territory or shifting to alternative power supply options. Followup surveys have confirmed that RTP can have a positive influence on customer retention (HBRS, 1995).

Issue -- In fact, one-part RTP designs such as LILCO's provide potential discounts on all energy purchases, while two-part designs offered at some other utilities provide potential discounts only for incremental demand above historical "baseline load;" their benefits are primarily for expanding (rather than stable) businesses. Both types of RTP designs are being modified. Utilities with one-part RTP have found need for redesign of revenue reconciliation multipliers and adders to better balance rate volatility, customer satisfaction and utility revenue issues (see Ford et al., 1995). With increasing competition, utilities with two-part designs (e.g., Florida Power & Light) have also moved to redefine the baseline load concept. Individually negotiable RTP designs, as now offered by Niagara Mohawk in place of its earlier fixed RTP, can further broaden business retention benefits by allowing for negotiation of the rates and access charges. The example shown in Figure 2 illustrates how RTP benefits can differ by type of business. (In this particular example, the energy-intensive pharmaceuticals and electronics manufacturing firms have a higher potential RTP savings than the office buildings.)



3. Business Recruitment -- A set of national surveys by the Edison Electric Institute (1989 and 1993) confirmed that utilities are utilizing a variety of incremental cost pricing and load management rate mechanisms as tools for economic development. These include interruptible rates, time of use rates and real time rates, which are being marketed as cost-reducing options for business expansion and business recruitment purposes. Economic development riders may provide additional incentives for new load by allowing for rate discounts, applied to standard tariffs or hourly/real-time rates, for a limited number of years.

Issue -- Special rates offered to attract footloose industrial businesses can directly generate additional energy sales as well as "multiplier" benefits associated with further expansion or attraction of supplier business activity. However, there may be little or no marginal benefits of special rates if the business attracted is a "population-serving" commercial business such as a retailer (insofar as either it or a substitute competitor will end up serving that population in any case).

4. Transition to Competition -- Deregulation is expected to mean a movement towards dynamic, market-based prices such as the "pool purchase prices" in England and Wales. In the U.S., RTP is commonly seen as a step in that direction. Some RTP plans, such as the "flexrate" offered by New England Electric, are pilot efforts to offer more market-based hourly pricing to interested parties.

Issue -- Until full deregulation emerges, many of these RTP plans will face limited interest as other existing rates (such as separate interruptible rates) remain even more attractive to high load factor customers. Some utilities (e.g., Connecticut Light & Power) have moved to integrate rate policies by offering hybrid RTP/interruptible rates.

Who Should Not be Targeted

From a utility's point of view, there is no advantage to offering RTP to a customer if it does not meet one of the preceding objectives. In fact, there is a decided disadvantage to offering RTP if the result is just a loss of revenue. A classic example is the newspaper printing plant that incurs most of its load during off-peak hours, at night. The business may reap the benefits of lower off-peak rates under RTP and never have to reduce, reschedule or otherwise shift load. The nature of its business may also make it unlikely to move out of the region. Yet while there may be no positive value from offering RTP to this particular customer, it is nevertheless important to recognize that there may be other cases where positive long-term value is created which more than offsets the short-term revenue loss. That can occur in cases where the pricing scheme helps lead to net load growth (by encouraging expansion of customer activity, new customer attraction or retention of a customer that would otherwise shift energy supplier or move away).

Customer View: Who Would be Interested in RTP?

Interest Depends on Options Available

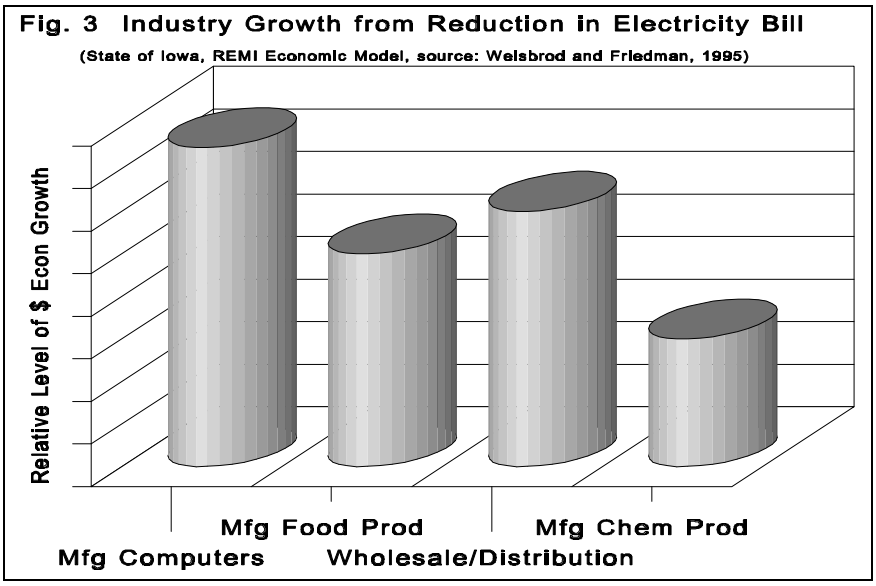
From the viewpoint of a customer, interest in RTP depends on three issues: (1) the risk/reward structure of the pricing scheme offered, (2) the availability of other pricing options and (3) the calculation of baseline load.

Pricing Scheme: Form of RTP Pricing Signals. Price volatility risks also vary depending on whether the price signals are provided a week ahead, a day ahead, or an hour ahead. There is substantial variation among types of businesses in the willingness and ability to absorb various degrees of price volatility shifts, and that can be revealed through surveys. Earlier studies have

shown that RTP customers tend to desire a high degree of energy use forecasting and monitoring data, so that they can best make plans to minimize their own risks (HBRS, 1989)

It is therefore not surprising that when offered the option of high guaranteed rates or volatile real-time rates, many businesses continue to choose the former. Recent experience in England and Wales demonstrates the risk aversion of most businesses. While market-based "pool purchase prices" are offered there, a majority of load is now met by preset prices established through bilateral "contracts for differences" between utility customers and financial intermediaries (E Source, 1995). With the advent of better energy planning and management tools (discussed later), that risk aversion may diminish. Interest in RTP in the US may also be expected to increase as organizations here start to widely offer instruments for customers to pay for volatility hedging.

Availability of Other Pricing Options. Business customers at some utilities currently face a range of options, including standard tariffs, special business expansion rates, and interruptible/ curtailable rates, as well as the option of RTP. For instance, at some utilities the customers with high load factors and the alternative of backup generation may find that interruptible rates offer deeper discounts and greater savings potential than RTP. However, customers with lower load factors and an ability to reschedule load may find RTP more advantageous. It is also notable that, as utilities have started to promote RTP as a business expansion or attraction tool, some power marketers have responded by actively promoting their own low flat rates as an alternative to RTP. In fact, business sensitivity to prices differs by type of business, and that is related to factors including competitiveness and profit margins in the specific industry, ability to relocate and still serve the same customer base, and flexibility of internal operations, as well as the reliance on electricity as a portion of total costs. This is illustrated, utilizing an economic model, in Figure 3. (In this particular example, the computer/electronics industry in Iowa appears to have a particularly high sensitivity to electricity-related business costs.)



Base Load Calculation. Standard two-part RTP plans that only apply to incremental demand above an historical baseline level are of interest to growing businesses, which may otherwise be particularly likely to be considering alternative energy sources. However, such RTP plans are of no value to stable existing businesses unless there is some renegotiation of the baseline level (which is becoming an option at some utilities). In addition, there is no historical baseline for new businesses, so alternative schemes for RTP rates and charges must be applied in those cases. Thus, it is clear that the design and form of the RTP can significantly affect the relative level of interest between new, expanding and stable existing customers.

Examples of Interested Customers.

RTP is of clear value to more than just growing businesses. It is also of value to business customers that have the ability to shift activities (increasing as well as decreasing load) among alternative sites and locations. For instance, oil and gas pipelines are a type of electric customer for which operations cross more than one utility service area. While electricity costs of pumping stations can account for as much as 40% of total costs, there is also typically over-capacity at pump stations and an ability for flexible scheduling of various pump unit operations at different locations. This affords an opportunity for minimization of costs by utilizing pumps in different service areas depending on the real time prices in effect at those locations at any given time. Other industrial businesses with plants around the country can effectively accomplish the same type of optimization by reallocating production among different plants on a daily or in some cases hourly basis. In fact, recent models to calculate these cost options and apply this type of optimization have been developed and successfully utilized for both a pipeline company and an industrial gas supplier.

Facilities Issue: Who is equipped to properly utilize RTP?

Experiences with RTP indicate a wide variation in ways that customers respond to pricing signals. Examples cover the following range:

- a large hotel uses an energy management system to adjust energy use in response to RTP;
- an office building switches to its own diesel generator in response to high price signals;
- a pharmaceutical manufacturer responds to RTP day-ahead high price signals by having the work force arrive and depart earlier during the next day; and
- a car crusher reschedules the days of crushing activities depending on day-ahead RTP prices.

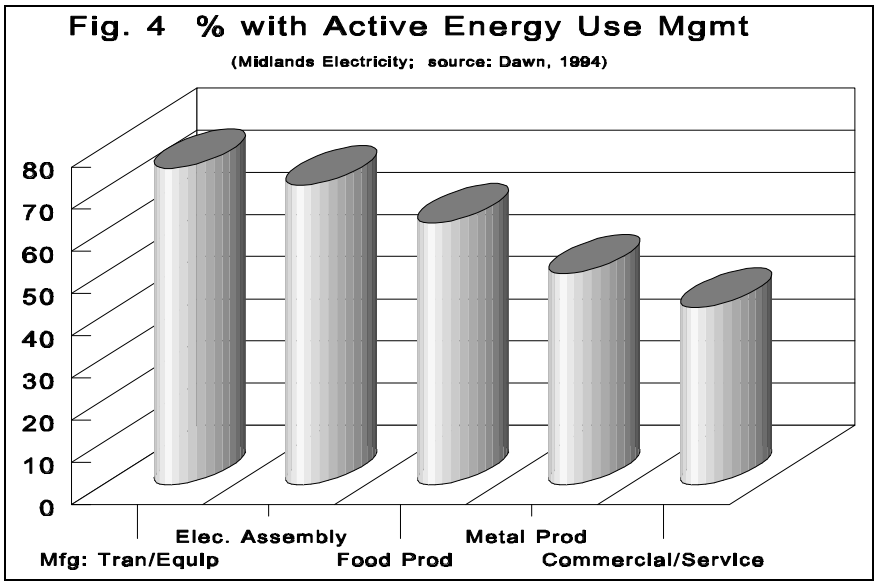
From RTP experiences to date, it is clear that some types of industrial and commercial customers are able to manage their energy use patterns. However, analyses of RTP programs have shown that not all applicants necessarily have the knowledge and capability to optimize their response to RTP, or even to save money from it. In reality, a customer should not be interested in RTP unless it has at least one of the following:

1. Capability to reschedule load, and knowledge of how to do so to take advantage of RTP.

2. Capability to apply an energy management system or thermal storage system, together with control systems to effectively shift load and take advantage of RTP.

3. Availability of backup generation, knowledge of when it is appropriate to shift to it and capability for it to go online and work effectively when called upon.

These capabilities differ by type and size of business. Figure 4 illustrates the systematic variation in the types of businesses managing their load in response to time-varying prices of Midlands Electricity in the UK. (In this example, the results are consistent with Figures 2 and 3 in showing that electronics manufacturing has a greater level of energy use management than food processing and commercial/service business.)



In general, manufacturing plants with very energy intensive processes --e.g., chemicals/ pharmaceuticals, plastics/rubber, aluminum processing and transportation equipment -- can be particularly motivated for, and capable of, rescheduling production activities in response to day-ahead RTP. A manufacturing response model can define the appropriate response to real time prices based on weekly or yearly scheduling of activities. It can also demonstrate potential costs and savings for an industrial customer under alternative assumptions of minimum cost, threshold price or average price criteria for scheduling. This type of program has, in fact, been developed and applied at various locations including an air liquefaction facility in Maryland.

Commercial businesses tend to be in need of more support systems and services in order to take advantage of RTP. This includes energy management systems with direct, RTP-based control. They can meet the needs of automatic scheduling of electricity use in buildings under RTP, which requires ongoing monitoring of conditions and continual communications as well as daily prediction of energy use patterns, real time calculation and decision/control systems. (A more complete description of such systems is provided in Daryanian et al., 1992.)

Utilities need to provide their current and prospective customers with planning tools to aid them in evaluating the benefits of RTP rates and in helping them responding appropriately. This includes both the previously-discussed manufacturing response models and the commercial energy management programs. A recent example of a system to aid building operators in responding to RTP rates is the ASHRAE RTP software package. It analyzes savings opportunities associated with RTP price incentives and then applies rule-based equipment control strategies (for thermal storage, equipment use timing and auxiliary generation) to determine appropriate responses and their cost impacts. The current demonstration version is applicable for a hotel or similar large commercial facility, but the basic concept of a system to aid building operators should be applicable for a much broader set of facilities.

Targeting RTP to the Right Groups

Not every business customer needs RTP. This point was recently made by a power marketer, who offered a full page advertisement on the back of a national business location magazine. It stated that "unless you've got a highly interruptible business and the patience of a Zen master, real time pricing probably isn't for you." (MEAG, 1995). The ad flowcharted the steps in applying RTP as follows:

(A) Check Hourly RTP Rate; is it affordable?
(B) If yes --> (1) Nervously begin production, (2) begin worrying about next hour,
(3) hope deodorant is extra strength.
If no --> (1) Send 400 Employees on a 45 minute coffee break, (2) pray,
(3) consider diesel mechanic school.

The point, while exaggerated in the ad, is of course that RTP is only advantageous for a business with the means to effectively reschedule activity, utilize backup power or otherwise shift load in

order to take advantage of real time pricing variations. It also is attractive only to businesses with the interest in taking risks on weather and prices, and the willingness to incur additional costs of RTP response, in return for energy price savings.

Conclusion: What a Utility Must Do to Maximize RTP Value

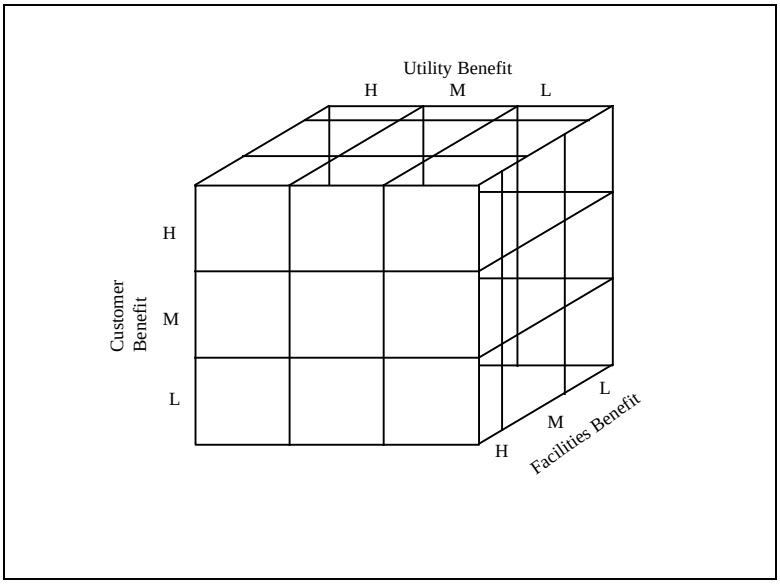
It is in the interest of utilities to maximize the value of RTP schemes by ensuring that they are designed and offered to the appropriate types of customers, so that they: (a) maximize net revenue from shifted and expanded sales and (b) avoid needlessly losing revenue from existing energy use patterns. This requires a careful segmentation of the market based on the intersection of three key criteria:

- Utility Benefit -- targeting to customers providing the appropriate load shape and/or sales retention/expansion opportunity so that net revenue is enhanced;

- Customer Benefit -- targeting to customers who have the motivation and potential benefit to take advantage of RTP incentives; and

- Customer Capability -- targeting to customers with the types of activity and facilities that can effectively respond to RTP.

Figure 5 illustrates the intersection of these three criteria, and how they can create to "Win-Win-Win" situations, "Lose-Lose-Lose" situations and other combination situations. The goal for utilities is clearly to target program designs and marketing to achieve the "Win-Win-Win" situations. That requires that they accomplish the following three steps:



1. RTP Value Screening -- Use economic simulation models to identify the types of businesses that are most sensitive to energy costs and most at risk of relocating out of the service territory. Use local load research and customer data to identify the types of businesses that have applicable load profiles.

2. RTP Facilities/Equipment Review -- Call upon customer account representatives and customer surveys to identify customers with appropriate backup generation, energy management systems or scheduling options, to effectively respond to RTP.

3. RTP Response tools -- Provide prospective users with RTP response and planning models that can be applied to provide the necessary information so they can become comfortable with RTP and be assured that they are effectively utilizing it to their benefit. This will also provide utilities with a greater assurance of more predictable customer responses.

The methodologies and technical tools to accomplish these three steps are now present. The challenge for utilities is to maximize the potentials of RTP by taking advantage of them.

References

Daryanian, Bahman. "RTP-Based Energy Management Systems: Monitoring, Communication and Control Requirements for Buildings Under Real-Time Pricing." *ASHRAE Transactions*, v. 98, pt.1., 1992.

Dawn, Tom. "Load Management: Is it Worth the Trouble?" *Electrical Review*., v.227, n. 20, October, 1994.

Edison Electric Institute. *Economic Development Rates and Programs*. Washington, DC, 1993.

Edison Electric Institute. *Economic Development Rates in the Investor-Owned Electric Utility Industry*. Washington, DC, 1989.

E Source. "Real Time Pricing and Electric Utility Restructuring: Is the Future Out of Control?", E Source Strategic Issues Paper. Boulder, Co, 1995.

Ford, E, G. Weisbrod, D. Hanna and M. Horowitz. "Using Efficient Pricing Structures to Retain Customers." Proceedings of the Seventh National DSM Conference, EPRI, Palo Alto, CA, 1995.

HBRS, Inc. (now Hagler Bailly Consulting). "Final Report: On Site Interviews with PG&E's Real-Time Pricing Customers.", Pacific Gas & Electric Co., San Francisco, CA, 1989.

HBRS, Inc. (now Hagler Bailly Consulting). "Final Report: 1994 Real Time Pricing Program Evaluation", Long Island Lighting Co., Hicksville, NY, 1995.

MEAG Power. "How Real Time Pricing Works" (advertisement), Atlas & Guide, *Expansion Management Magazine*, New Hope Communications, Overland Park, KS , 1995.

Takos, Y., M. Horowitz and E. Ford. "Gauging Customer Acceptance for Various Real- Time Pricing Configurations." Proceedings of the Innovative Electricity Pricing Conference, EPRI, Palo Alto, CA., 1994.

Weisbrod, G and H. Friedman. "New Approaches for Understanding the Economic Implications of DSM Programs: Rate and Competitiveness Impacts." Proceedings of the Seventh National DSM Conference. EPRI, Palo Alto., 1995.