Synapse
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The Other Side of Competitive Markets: Developing Effective Load Response in New England's Electricity Market

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Executive Summary

Introduction

Electricity markets in New England are lacking a critical component of efficient markets: the ability of customers to respond to the availability and price of a good. Mechanisms are not now in place to enable customers to determine on an hourly or daily basis the amount of electricity that they would like to buy at a given price. This is unlike other markets. For example, when the price of airline tickets rises, customers can decide not to travel, or to travel at another less expensive time. This omission of a "demand" response from the New England electricity markets is a universally recognized fundamental flaw that prevents the markets from being efficient and competitive. The purpose of this report is to explain the goals of load response programs and detail existing programs in the Northeast (section 2), describe in general terms the mechanisms available to meet those goals (section 3), present issues that could be barriers to efficient programs, and offer recommendations for moving toward a market in which demand can influence the supply curve through customer opportunities to respond to peak prices and reliability concerns (section 4).

Overview of load response

In recent years there has been an increasing awareness that retail electricity demand does not have to be static with zero elasticity in the short-term. Retail customers can and will respond to prices and other incentives in the wholesale power markets, given the opportunity and the tools. Retail customers can ease tight capacity situations and mitigate reliability concerns by reducing consumption. They can discipline markets, reducing the opportunity for market power exercise, by choosing not to purchase when prices rise. The activities of a small proportion of customers can provide value to all consumers in New England. Individual customers also derive specific benefits from changing their usage in response to wholesale markets. The ability for retail customers to respond to prices in the wholesale electricity markets, or to short-term reliability concerns in bulk power supply, is a critical element of efficient markets and reliable electricity supply.

Recent efforts in New England have focused on developing a load response program that includes an economic component as well as a reliability component. Stakeholders in New England have developed a load response program, approved by FERC and currently being implemented, that would enable NEPOOL Participants to get paid for arranging for load to be available for interruption as well as for actual load interruptions in response to reliability concerns or market prices. These proposals represent an important first step to developing demand elasticity through load response in New England.

There will be a review of the summer 2001 program implementation in the fall of 2001. That review will permit both the improvement of the current ISO-administered load response programs and an opportunity to consider further expansion of load response activities beyond the bounds of the ISO administered program.

Load Response Mechanisms

In the long term the critical elements of load response include giving customers financial incentives to vary their consumption in response to wholesale market conditions, giving them the tools to modify their electricity usage in response to those signals, and developing mechanisms for detecting changes in their electricity usage in response to the market signals. There are a variety of pricing options ranging from real-time hourly prices, to fixed rates with a variable component that provide economic signals to customers based on wholesale markets. In the short term, ISO New England and market participants have developed administrative load response programs designed to foster price responsive demand from large electricity customers. There are a variety of mechanisms for customers to respond to price signals. These mechanisms include managing load using sophisticated communications and control equipment, installing energy efficiency measures, and shifting electrical demand to small customer-site generation.

Issues and Recommendations

It is critical to the proper functioning of competitive markets in New England that comprehensive and effective load response programs be put in place. These programs must spur meaningful customer response to reliability concerns and peak prices. Several steps are necessary during program review in fall 2001 for this to begin to happen:

- Stakeholders must be involved in program review.
- Programs must be simplified.
- Load bidding should be allowed.
- Programs should include appropriate financial incentives.
- Programs must allow broad participation.
- The environmental impact of load response must be mitigated.
- A variety of communications and control device providers must be eligible.

Over the long term it will be necessary to balance the goals of developing demand elasticity, ensuring that customers (particularly small customers) are not exposed to price volatility that they cannot practically manage, and maintaining environmental quality. Long term issues include the need to explore a variety of options for customers to see the real price of electricity, consistent with the tools available to manage their demand. As long as customers have no direct information about price variations, they will have no interest in managing their load to avoid system price peaks or reliability threats. It will also be important to consider a variety of metering and load measurement issues. Further, program review should be on-going to enhance programs as new information and opportunities become available. These issues should be monitored on an on-going basis and should inform decision-makers as load response programs develop.

Conclusion

Load response activities represent a significant opportunity for innovation and improvement in the electricity industry. They are an essential component of the "competitive markets" being developed across the country in that they allow for the core interaction of supply and demand curves embodied in all economic models. Effective programs, and active load response initiatives undertaken by customers and their suppliers, will ensure that load response can truly be a vibrant and integral component of wholesale electricity markets in New England. While load response is not the answer to all the difficulties we face in electricity restructuring and wholesale market design, it is a necessary element of all proposed solutions.

1 Introduction

In the last several years the electric industry in Maine, New England, and other areas of the country has been "restructured" at both the wholesale and at the retail levels with the hope that competitive market forces will bring benefits to electricity consumers. In fact, the Federal Energy Regulatory Commission is promising "light handed regulation" if stakeholders in wholesale electricity markets establish certain basic wholesale market structures. However, to date, a critical element of competitive markets has been missing at both the wholesale and the retail level--that is customer's ability to decide *not* to buy if a desired good or service is not available at a price they are willing to pay. Without the ability for load to *respond* to supply conditions, the markets cannot be adequately competitive.

According to basic economic theory of supply and demand, the market for any product will reach the "optimal" level of price and sales volume where the product's demand curve intersects with the supply curve.[1] Customer choice about the amount they are willing to pay for a product, and at what price, is supposed to lead to the appropriate balance between demand and supply, and to ensure that markets are sufficiently competitive. Unfortunately in today's electricity industry, customers receive little or no price information and have very few options for changing their level of usage on a daily or hourly basis in response to market conditions. This leads to a demand curve that is essentially vertical in the short-term – i.e., customers purchase a certain level of power regardless of the price. Consumers' demand for electricity is assumed to be inelastic.

In recent years there has been an increasing awareness that this does not have to be the case – that retail electricity demand does not have to be static with zero elasticity in the short-term. Retail customers can and will respond to prices and other incentives in the wholesale power markets, given the opportunity and the tools. Not only can retail customers ease tight capacity situations and mitigate reliability concerns by reducing consumption, they can also discipline markets by choosing not to purchase (or selling back) when prices rise.[2] It is not necessary for *all* customers to participate in load response; even the response of a small percentage of customers can produce significant benefits for all customers.

There are a number of reasons for the lack of load response in New England markets. One of the most significant problems is that most customers in New England are charged for electricity on a flat, average retail rate. The rate does not vary in real-time with market conditions; therefore it does not provide customers with a varying price signal related to the cost of purchasing electricity in wholesale markets at any specific time. A kilowatt-hour consumed in the early morning hours of an autumn night (when wholesale prices are typically low) costs the same as a kilowatt-hour consumed on the afternoon of a hot summer day (when wholesale electricity prices are typically higher). Another

[1] Of course, due to externalities and a host of other market failures this theory rarely holds up in practice.
[2] Note that prices could rise due to capacity shortage or due to inefficient market conditions that permit suppliers to raise prices above competitive levels.

significant problem is that most customers are charged for their consumption on the basis of pre-set load profiles, rather than based on their actual consumption at different times of the day. Therefore, a customer who consumes all of their electricity at night, is still assumed to consume their electricity throughout the day and night in the same proportion as other average customers of a particular type. Third, because most electric rates have historically been average rates and most customers have historically been assumed to consume electricity in a generic, rate-class specific pattern, there has been little attention to developing options for customers to modify their electricity consumption in response to circumstances (such as price or reliability concerns) that arise on any given day. It is important to remember, as discussed in more detail below, that the value to all electric consumers from load response exceeds the sum of the value to individual consumers who participate in load response. There is a net (and large) societal benefit to each individual consumer's choice to reduce consumption.

The absence of a vibrant demand response to tight capacity conditions and prices in the wholesale electricity markets has emerged as a major shortcoming, perhaps even a fatal flaw, in the current structure of wholesale electricity markets in New England, in California, and elsewhere. The Federal Energy Regulatory Commission ("FERC") has identified the lack of demand response as a "major impediment to the competitiveness of electricity markets;" and required that ISO and NEPOOL file a load response program by early April, 2001.[3]

The purpose of this report is to describe what load response is and how it works, including a summary of load response programs in the Northeast, and to identify next steps in creating a truly vibrant load response to market and supply conditions. The first section presents an overview of the reliability and economic benefits of load response. The second section describes some of the mechanisms for load response. Finally, the last section identifies issues that must be resolved in current load response programs in New England; it contains short-term and long-term recommendations.

2 Overview of Load Response

Retail customer response to wholesale electricity prices or other market incentives can serve several important system-wide functions. For example, emergency load response – reducing electrical consumption in response to specific tight capacity situations – can ease reliability concerns. Economic load response – reducing electrical consumption in response to price signals or other financial incentives – can reduce peak wholesale electricity prices, mitigate price volatility, and reduce opportunities for market manipulation.[4]

[3] Order on Complaint and Conditionally Accepting Market Rule Revisions ("NSTAR Order"), July 26, 2000, page 23.

[4] To many "load response" may connote a reduction in the total amount of electricity that a consumer uses. However, "load response" typically encompasses any reduction by retail customers in their consumption of electricity from the transmission grid at key times where such reduction is triggered by factors in wholesale markets.

As a general matter, load response requires an incentive to electricity consumers to reduce their load in response to market conditions, and, in many instances, a mechanism for determining how much the electricity consumer used at specific times. The incentive can come from exposure to real-time prices, from payments not to consume, or from an opportunity to sell unused electricity into the markets. The measurement of the load response can be through an interval meter that measures a consumer's electricity use at short intervals throughout the day, or through an alternative such as a statistical method or attachment to the meter.

Both emergency and economic load response can be implemented with readily available technology. For example, load response software can be installed in a building (e.g., an industrial facility, an office building or commercial establishment, or even a home) that would connect the outside world (market signals sent by the ISO) with building control systems (e.g., thermostats, light dimmers). The building owner or operator could choose to respond to the market signal or not. With currently available software, building operators could be notified through email, cellular phone, and alpha-numeric paging of an expected price spike (or reliability threat) and could respond as simply as pressing a "yes" or a "no" button included with the system. An affirmative response would trigger predetermined changes to building systems (e.g., the lights could dim 20 percent, the AC thermostat could rise 2 degrees) for a set time.

Emergency load response to serve a reliability function is not new. For years electric utilities and system operators have offered special rates to customers who were willing to curtail their load upon request from the utility or the system operator to avert short-term reliability problems. On hot days when demand threatens to overwhelm the available capacity on the system, customers willing and able to lower the amount of electricity they draw from the grid offer a resource that can be tapped to delay or avoid the need for more drastic measures, including rolling brown outs or rolling blackouts. Load response can also provide a more long term reliability benefit. For example, the North American Electric Reliability Council ("NERC") cites economic incentives for customers to voluntarily reduce loads as one example of an approach to address transmission system limitations; however NERC states that voluntary load response would not be sufficient to ensure resource adequacy.[5]

Widespread recognition of the value to *all* customers of having *some* retail customers modify their demand for electricity from the grid in response to wholesale electricity prices is more recent.[6] Economic load response focuses on creating a link between the retail and wholesale markets through a retail customer's response to variations in wholesale market prices. The idea of real-time pricing, or "spot pricing," for retail customers and the fundamental change such pricing can imply for the electric industry have been considered for many years.[7] However, it is only more recently that these ideas

[5] NERC 2000, at 33.
[6] Hirst and Kirby 2000, provides a very good overview of load response.
[7] For example, Schweppe, Caramanis, Tabors, Bohn 1988 provides an in depth and comprehensive examination of theoretical and practical details pertaining to "spot pricing" for retail consumers.

have been widely considered and explored among a variety of market participants, regulators, and other stakeholders. See Attachment A for a review of some recent research on the topic.

As discussed in Attachment A, the system-wide benefits from load response can be realized in the form of reduced peak prices, reduced volatility, market power mitigation and enhanced reliability. In addition, individual customers can derive individual benefits from reducing their usage of grid electricity at peak pricing times. Customers can avoid the purchase of high priced electricity. For example, if they pay rates that are tied to wholesale markets, they avoid peak prices. In addition to avoiding peak prices, load response enables a customer who is exposed to wholesale prices to "self-insure" against market volatility. Specifically, the customer can manage its own load to shield itself from peak prices rather than paying a premium to a supplier for shielding it from wholesale prices.[8] Even if the customer is served by a load serving entity at fixed rates, it may derive financial benefit from contractual arrangements with its supplier when the customer's reduction of peak grid consumption reduces the supplier's obligation to purchase at peak prices.

Customers don't just avoid costs associated with high prices or market volatility; they can receive payments from "selling" the power they don't use at market prices. In simple terms, the electricity that the customer decides not to use at peak times can be sold back into the energy market at peak prices. In fact, load response activities need not be focused only on peak price times. At certain off-peak times, energy clearing prices in New England are zero; a customer shifting their load to these times might only incur transmission, distribution, and other non-generation charges, essentially receiving generation for free.

In order to remedy the lack of load response in New England market structures and in response to FERC directives, ISO New England and NEPOOL have developed a load response program for Summer 2001 that will have two main components, a reliability component and an economic component.[9] The summer 2001 program is intended to overcome the lack of market incentives for load response due to flat retail rates, and load profiling, and to capture some of the system-wide benefits of load response. This program, as well as programs developed in New York and in the PJM Control Area, are described in more detail in Attachment B.

3 Load Response Potential in New England

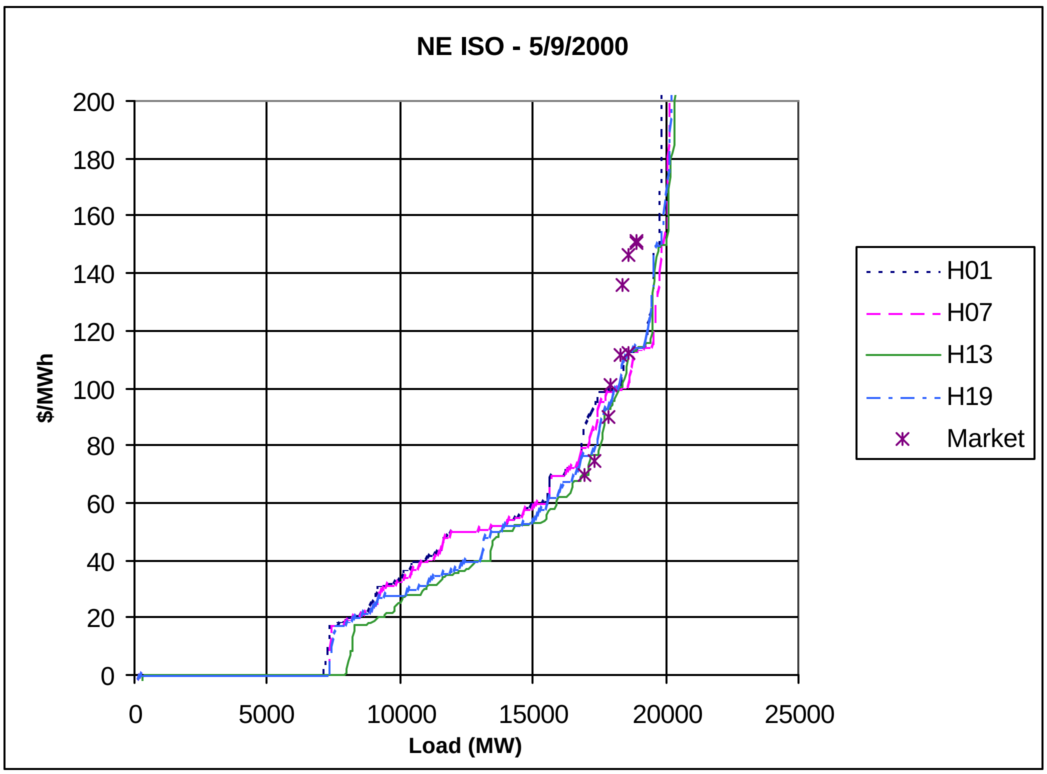
Although wholesale electricity prices in New England are not as high nor as volatile as in California, there are still many times during the year when energy prices rise to very high levels. During 2000, there were 66 hours in 22 days during which the NE ISO energy

[8] Hirst and Kirby 2000, at 2, 10.
[9] NEPOOL March 19, 2001

price exceeded $100/MWh (Attachment A). The energy prices ranged as high as $6000/MWh on May 8, but the median price over $100 was $131/MWh.

At such price levels, the New England supply curve is very steep so that a modest reduction in demand could produce a substantial lowering in the market clearing price. To obtain a quantitative measure of the load response effect on market prices, we took a fairly typical high price day of May 9, 2000. Figure 1 shows the supply curves derived from day-ahead bid data for four selected hours on this day.[10] Note that even though the peak demand on this day exceeded that on the previous day when the prices rose to $6000/MWh, the highest price on this day was $151/MWh.

Figure 1. NE ISO Supply Curves For Selected Hours on May 9, 2000



The issue then is what effect a reduction in demand can have on the market clearing price represented by these derived supply curves. For the points that fall on the curve, a direct calculation suffices. For those points that are to the left of the derived supply curve, we

[10] To develop the supply curves for this day we used the day ahead bids data. This represents hourly bids for up to ten blocks from approximately 290 assets. Not all assets are be available on any given day and the bid prices may vary by hour. Note that the supply is slightly less expensive during the middle of the day. We have overlaid on these supply curves the actual market clearing prices and loads for the peak period hours. The correspondence is fairly close except for the highest load hours where the clearing prices lie to the left of the derived supply curve. There are several likely explanations for this. The first is that some of the resources may be experiencing unexpected forced outages. The second is that insufficient slow-start resources were committed to meet this level of load, so that higher-cost quick-start units were brought up instead.

mathematically shift the curve to the left to match the market price and calculate the price effect on that basis.

To estimate the potential value for load response, we take the 7 hours for this day during which the energy price exceeded $100/MWh and calculate the market price effect of a 500 MW load reduction. This calculation is presented in Table 1.

Table 1. Potential Value for Load Response on May 9, 2000

Hour	Load (MW)	Market Price ($/MWh)	Price Reduction ($/MWh)	Percent Reduction	Potential Revenue Savings
11	17,891	100.70	7.40	7.3%	$132,394
12	18,326	111.58	11.86	10.6%	$217,352
13	18,623	112.49	11.86	10.5%	$220,866
14	18,883	151.36	26.30	17.4%	$496,611
15	18,864	150.56	33.46	22.2%	$631,177
16	18,617	146.68	27.91	19.0%	$519,604
17	18,344	135.60	14.32	10.6%	$262,685
					$2,480,689

This is a substantial potential price reduction in each hour, and significant potential savings for just one day. The actual economic impacts of load response are somewhat more complicated. Most of the energy sold in New England is under bilateral contracts. Thus during the hours of high market prices only a fraction of the energy is actually purchased at those prices. However, high spot market prices influence the prices of bilateral contracts so that they could have a carry-over effect into other hours.

This is of course only a preliminary illustrative calculation. A more complete analysis would look at other high price periods and consider existing market arrangements such as bilateral contracts and supplier bidding behavior.

4 Load Response Mechanisms

In order to participate in load response, customers need tools to assist in reducing their usage at the appropriate times. The two main categories of tools are communications devices that enable customers to see price variations in real time, and mechanisms for modifying usage of grid electricity at peak. Already many communications options are available, an increased focus on retail consumers as an integral component of wholesale markets will foster the development of new options. These communications and response mechanisms are described in more detail below. Communications devices are described primarily in the section on load management; however, the same or similar devices can be used regardless of how the customer chooses to respond to market conditions. Customers have two basic mechanisms for reducing their demand on the local electricity grid. They can simply reduce their use of electricity at key times through load management or energy efficiency, or they can shift their source of electricity from the grid to on-site generation, thereby reducing their use of grid electricity, but not their overall use of electricity.

4.1 Peak electrical load reduction – load management

One option for customers to respond to prices that reflect market conditions is to avoid using electricity from the grid at peak hours by managing their electrical load either with outright reductions in consumption or by shifting consumption to non-peak hours. Customers need not necessarily watch price variations and make decisions each hour. There is an increasing variety of automatic control options available to assist customers in managing their electrical usage in response to price variation in the wholesale market. This section highlights but a few of the options. The use of control technologies can significantly increase customer responsiveness to price variations. In one pilot time-of-use program that used EPRI's Automated Energy Control System "the customers' price responsiveness was found to be twice as great as in most previous studies of TOU price response, where no such control technologies were involved."[11]

There are a variety of suppliers that offer tools for customers to work with their energy service provider to manage their usage in response to market conditions.[12] For example, Silicon Energy sells load curtailment software that allows end-users, energy suppliers, ISOs and others to communicate about pricing and usage in real time. One possible use for this software is for an energy supplier to notify its end-use customers, via email, PCS phone, and alpha numeric paging, of a price spike and allow the customers to respond (by decreasing or curtailing their usage).[13] ISO New England uses Silicon's software, which was installed by an application service provider Retx.com, in its load response pilot program.

Retx uses its own Load Management Dispatcher ("LMD") that monitors hourly prices and the end-user's usage. The LMD allows automatic responses so that certain actions can be initiated from a central location based on specific prices being reached (load reduction at one price, complete shutdown at a higher price).[14] Such an arrangement means that an individual customer need not monitor real-time prices, and that decisions can be made up front about a customer's intended response to certain pricing levels (e.g. reducing lighting intensity, cycling chillers and others).

Although not approved for use in the New England load response program for summer 2001, other applications exist. Stonewater Software Inc.'s subsidiary Energy1st provides infrastructure to ISOs, energy suppliers, and end-users by installing a gateway computer at a customer's building that is connected to that customer's meter, and then provides

[11] Braithwait and Faruqui 2001

[12] Numerous companies involved in load response, including gateway providers, are listed on the California ISO website at www.caiso.com. Other websites to look at include www.stonewatersoftware.com, www.sixthdimension.com, www.envenergy.com. Synapse Energy Economics does not specifically endorse any of these companies or their products, but we provide them as an additional source of information.

[13] Personal communication with Giro Iuliano, Northeast Sales Manager, Silicon Energy; March 13, 2001.

[14] See Retx.com website.

ongoing service and information. Energy1st's gateway costs $1500 with a monthly fee of about $100. The system can be directly connected to a company's Ethernet cable or other communication device and is integrated with the building's control systems. An example of this application is a program in the Sacramento Municipal District in which a building's lighting and HVAC systems were set to automatically ramp down (lights dimmed 30% and the AC temp increased 2 degrees) during peak price periods. Later, when workers were surveyed, all but one responded that they didn't notice anything different from the reduced consumption. [15]

Options are also emerging for small customers, although, again, these options are not yet eligible for participation in the summer 2001 load response programs in New England. One residential time-of-use program that used an interactive communication device demonstrated that participants reduced usage by almost 50% during hours with the highest wholesale price.[16] Nexus Energy Guide software is another example of a load response tool for small customers. Nexus Energy Guide software uses currently available internet-based communications equipment and load control equipment such as radio controlled appliances and internet-controlled thermostats to enable residential customers to participate in load response programs and wholesale markets through responding to real-time pricing.[17] For residential customers to benefit from such software they would need time sensitive rate structures (or at least an option to get a credit for a sell-back), control equipment that is cheap and reliable, appliances with built-in controls and, in most cases, advanced metering.

4.2 Peak electrical load shifting – on-site generation

Some customers may decide to respond to price variations by shifting to an alternate source of power, such as an on-site generator, rather than reducing their electrical consumption at a time of high prices.[18] Many large customers have small generators on their site. This generation has typically been used for emergency back-up generation purposes; however, system operators, customers and their suppliers are quickly realizing that on-site generation could provide an important alternative in some hours to purchasing electricity from the interconnected grid.

There are a variety of options that currently exist for customer on-site generation. Photovoltaics, wind turbines, fuel cells, biomass, microturbines, and internal combustion engines (ICE's) fueled by natural gas or diesel are all either available today or expected to

[15] Only one of the approximately 50 employees who were working in the controlled section of the building noticed any change, and he was walking from an uncontrolled are to the controlled area at the moment the lights were dimmed. Personal communication with Kim Weaver, EVP, Stonewater Software, March 14, 2001.
[16] Caves, Eakin, and Faruqui 2000, citing S.D.Braithwait, "*Residential TOU Price Response in the Presence of Interactive Communication Equipment*" in Pricing in Competitive Electricity Markets A.Faruqui and K.Eakin, eds., Amsterdam: Kluwer Academic Press, in press as of April 2000).
[17] Presentation of Harvey Michaels to Massachusetts Electricity Roundtable, March 23, 2001.
[18] There are several terms in current circulation such as "distributed generation" "customer-site generation" "on-site generation" and "dirty little diesels."

be available by 2003.[19] These technologies can vary in size, use, and efficiency and can be used to meet a portion or all of a customers' load during selected hours or even most of the time. This report does not address the issue of using on-site generation as a primary or exclusive source of electricity, but focuses on the use of on-site generation as a tool for load response to wholesale market prices and/or reliability concerns.

Customer-site generation can be particularly appealing from a reliability perspective as a resource for addressing capacity deficiencies.[20] Many of these generators can be turned on fairly quickly and, consequently, they can meet the stringent time requirements for a resource to be useful in potential system emergency situations. There's a particularly strong push in New York City for the use of customer-sited generation, or distributed generation, during summer of 2001 to ease reliability concerns (see, e.g. New York Times article March 20). Many stakeholders also see customer-site generation as a useful alternative for customers purchasing electricity from the grid during peak pricing times. ISO New England projects that two thirds of the load response in the summer 2001 economic program would be from customer-site generation.[21] Significant environmental concerns associated with certain uses of distributed generation technologies as load response are discussed in a later section of this report.

An electricity consumer's decision whether to use an existing on-site generation facility in a load response program is not as simple as just flipping a switch and may involve a variety of factors, some of which still must be resolved. For example, some on-site generators have been permitted for use as back-up emergency generators only. Such generators are prohibited, under their current permit, from serving a peak-shaving function. Further, the potential increased use of on-site generation for load response, rather than only emergency situations, raises issues associated with distribution system tariffs and back-up supply rates. More attention is being focused on what are appropriate back-up and stand-by tariffs for customers with on-site generation, as well as reasonable interconnection requirements, and distribution rates. These issues are receiving increased attention in state environmental regulatory forums, and will have a bearing on the use of on-site generation in load response programs.

4.3 Energy efficiency

Energy efficiency is one mechanism that electricity consumers have used, and will continue to use, to reduce their overall electricity consumption, and therefore their electricity costs. It is different from load management and the use of on-site generation in that it doesn't provide a tool for customers to respond to varying market conditions on a daily or hourly basis. Nevertheless, we mention it in this report in the context of load response, since it is a mechanism for modifying electricity consumption timing and patterns. In fact, it is the most readily accessible load response option for small customers, pending the development of more sophisticated rate structures, advanced metering, and end use control tools. It is a tool that can provide benefits to individual

[19] Greene and Hammerschlag2000.
[20] See, Arthur D. Little, 2000.
[21] Presentation by Steve Whitley, ISO New England, to environmental regulators, November 30, 2000.

electricity consumers as well as providing system wide benefits of peak electrical load reduction.

In a recent report ACEEE looked at energy efficiency opportunities as an alternative to expensive, polluting and politically difficult solutions that have been proposed (such as new power plants and expanded T&D) to address recent electric system reliability problems.[22] This report recommends six specific energy efficiency programs that could reduce peak electrical demand by 64,000 MW over the next ten years if aggressively pursued. Those programs cover efficient HVAC equipment, proper large building maintenance, and commercial sector lighting, which the authors identify as areas with the most potential for peak reduction.

Home air conditioning represents the largest single residential contribution to peak load demands. In New Jersey, residential central air conditioners are estimated to make up about one sixth of residential peak demand. Regrettably, about three-quarters of the 6 million residential air conditioners sold annually in the US are rated at the lowest efficiency rating available on the market (at or near SEER 10). ACEEE's recommended national program for new and replacement residential cooling systems, modeled after similar programs in New Jersey, seeks to make proper installation and maintenance of highly efficient equipment (that is currently available) a common practice.[23]

Improper installation and maintenance of cooling systems greatly reduces efficiency. The authors identify steps to 1) improve the accuracy of refrigerant charging and adequacy of airflow over coils and 2) correct duct leakage problems (which could save "14% of the contribution to peak demand made by the average central air conditioner or heat pump"). The steps for residential cooling systems tune-up and repair include incentives for consumers to have problems identified and treated, marketing to promote qualified contractors, direct marketing to contractors to participate in program, providing contractors with tools to identify and treat problems, a mechanism to ensure the quality of participating contractors and a referral mechanism for customers to find qualified contractors.[24]

Commercial and Industrial HVAC equipment may be the largest contributor to summer peak demand. An obstacle to efficient equipment is that many developers have no interest in operating savings so they install cheap systems; therefore, mandatory standards may be necessary. In cases where the people who occupy and maintain a building also pay the energy bills, voluntary programs would help reduce demand. Therefore, this program focuses on the selection and installation of efficient HVAC equipment in C&I applications.[25]

The other programs that offer potential for peak load reduction include Commercial Building Retrocommissioning and Maintenance, which helps optimize energy-using

[22] Nadel, Gordon, and Neme, 2000.
[23] Nadel, Gordon, and Neme at 8-9.
[24] Nadel, Gordon, and Neme at 10-11.
[25] Nadel, Gordon, and Neme at 11-12.

systems in commercial buildings, C&I Lighting Retrofit Acceleration, and C&I Lighting Design Enhancement. All of the above programs are modeled on existing, successful program designs.[26]

Load response efforts compliment energy efficiency efforts, but do not supplant them.

5 Issues and Recommendations

Implementing a load response program in New England for summer 2001 is a necessary early step toward demand elasticity. As approved by FERC, the current program contains some improvements over the previous program; yet barriers, such as complex triggers and threshold eligibility criteria, still persist. Nonetheless, the experience has been valuable in highlighting some of the complexities of using load response as a reliability tool and of incorporating price sensitive load into wholesale and retail markets. The summer experience will prove useful in the fall of 2001 when the programs will be reviewed and revised. This section identifies areas to consider in that review and includes recommendations for next steps that consumer advocates should support and encourage. For a more in depth discussion of these issues, see Attachment C.

Near term improvements should focus on ensuring that programs elicit sufficient load response to bring meaningful reliability enhancement, and market power and price mitigation. Near term improvements to the load response program will occur within the context of seeking greater consistency between New England and PJM markets due to ISO New England's proposal in March, 2001, to develop a Standard Market Design, based largely on the market design currently implemented in the PJM Interconnection. On a more long-term basis, it will be necessary to address some of the complex issues associated with more widespread involvement in load response, such as whether and how to provide financial incentives and advanced metering to all customers.

5.1 Get involved in program review

The programs could best be improved with the input of all stakeholders in the process. An important sector that seems largely missing from the discussion is the largest, most affected group – consumers. Therefore, consumer advocates should be encouraged to participate in the fall 2001 program review process since they can provide the valuable public policy and public interest perspective that often gets lost in the debate. Consumer advocates should contact ISO New England and request to participate in the program review in the fall. Consumer advocates should also work with individual NEPOOL Participants as the program is implemented to identify barriers and disincentives to participation, and to determine how the program could be changed to become more effective.

[26] Nadel, Gordon, and Neme at 12-16.

5.2 Simplify the load response program

The current New England programs rely on specific program triggers, such as price thresholds, times of day, and requests from the ISO on days of tight capacity. These program features make the program confusing and are a deterrent to participation. In addition, program triggers may not be appropriate for the economic program, since participants should be able to respond to prices that they determine are favorable to them at any time of day and at any price level. The program should be simplified to ensure meaningful participation.

5.3 Develop a load bidding alternative

There should be an alternative for more sophisticated customers to participate actively in markets. It is important to find ways for load to participate in the energy markets rather than just being a price taker. For example, load should be able to submit a bid to reduce load at a certain price and with conditions, or bid parameters, such as a minimum curtailment period. Under a bidding option, load that does not reduce as bid should be penalized. Careful review of load bidding implementation should ensure that load bidding is not subject to gaming. Load bidding would offer load more control and certainty to customers; consequently it is likely to provide more flexibility and load responsiveness. This alternative should not be delayed until the implementation of the multi-settlement market system; instead options for offering a bidding component next summer should be explored.

5.4 Provide appropriate financial incentives

Financial incentives to encourage customer participation in load response programs are a necessary part of the start-up of these programs. There are several reasons that paying customers is justified. First, when the ISO calls for load reductions in order to avoid blackouts, there is a system-wide benefit of enhanced reliability that should be shared with those curtailing their load. Second, when a customer is paying average rates, there is no incentive for that customer to modify its demand because of market conditions; a payment to that customer could overcome such a barrier to participation. Third, financial incentives raise awareness and increase interest in this "new" concept. Finally, some payment is justified in situations where a participant's actions can contribute to an overall system benefit, such as reducing the opportunity for market power exercise or lowering the energy clearing price. To date, there are indications that the economic incentives contained in ISO New England's load response programs are not sufficient to enable load response to be a meaningful factor in the New England markets. Without adequate incentives, the load response program will merely exist on paper, without offering any system-wide benefits.

5.5 Expand participation alternatives

The summer 2001 load response program, as currently proposed, would allow participation only by the largest customers, those with an interruptible load of at least 100 kW and with an interval meter. These limits raise issues of equity and reduce the value of results that can possibly be achieved from the programs. While allowing all end –use customers to participate in a load response program is not feasible at this time, there are steps that can be taken to increase the range of possible participants. In the absence of widespread interval metering, a variety of load profiles could be used, specifically for smaller customers with certain types of controllable appliances (e.g., water heaters, air conditioners). In addition, stakeholders should encourage the development of alternatives to interval metering and should support the option of aggregating customers for load reduction.

5.6 Mitigate environmental impact

Increased interest in load response raises potentially significant environmental issues associated with how small scale generation will interact with the existing electrical system. In some instances there could be costs, such as where increased generation from small dirty generators adds to overall emissions during the year or during particular hours of bad air quality. In some instances there may be benefits, such as where the availability of customer-site generation to cover rare contingencies permits more optimal dispatch of larger generating stations. Load response programs introduce incentives that did not previously exist for the operation of small scale, customer-site generation.

It is critical for wholesale market participants and government entities to support the efforts of environmental regulators to keep step with developments in wholesale electric markets and bulk power system operation. From a market efficiency standpoint, the efforts to develop appropriate permitting procedures for the use of customer-site generation in load response would ensure that customer-site generation does not have a competitive advantage over larger central generation facilities that are subject to a variety of environmental regulations. Environmental regulatory efforts should not be seen as hindering load response but instead as supporting efficient competition in a fashion consistent with citizens' demands for a clean healthy environment.

5.7 Provide open access for suppliers of load response communication and control

Only one provider of load response communications and control devices has been approved for the summer 2001 load response programs in New England. This is a serious program flaw that must be eliminated in the future so that customers in New England can benefit from all the available technologies that are currently being tested in California, NY and PJM. Stakeholders should encourage the ISO to approve a variety of software and hardware providers that can provide the data in the form required by the ISO. In addition, program review should include an opportunity to learn from a variety of suppliers, incorporating lessons learned from their experience in other regions and applications. Enabling participation from multiple suppliers will facilitate program development as it will provide a more central forum for compiling a specific understanding of emerging load control tools, systems and communication devices.

5.8 Enable a variety of incentives for end use customers

Most customers in New England are insulated from wholesale market price variations; and thus do not have an incentive to manage their electricity consumption on an hourly or daily basis. The current load response programs should create a load response incentive for some customers; however, additional mechanisms to create incentives for load response should be explored and facilitated over the next few years. While it is not necessary for all customers to participate in load response in order to derive important system-wide benefits, it is important over time to enable participation from a wide range of customers who are interested.

Real-time pricing is clearly one incentive for load response; payments not to consume, and the opportunity to sell unused electricity into the markets are other options that can be developed, as well as a variety of pricing structures. All of these options should be explored and encouraged in order to facilitate load response in New England. While interested customers should be able to participate, it is important, particularly for small customers, to ensure that they are not exposed to price volatility that they have no practical ability to manage.

5.9 Explore metering issues

A common misperception about load response is that, in order for it to work, all customers must be exposed to real-time prices and have interval meters. As discussed above, even load response from a small percentage of customers can have significant benefits to all customers; therefore it is not necessary for *all* customers to participate in load response in order to achieve widespread benefits. In addition, there may be some mechanisms for enabling non-interval metered customers to participate in load response programs, such as alternative load profiling and load reduction aggregation. However, it will be important in the next few years to consider metering issues associated with enabling more pervasive load response. Issues include considering whether advanced metering is necessary for all customers to participate in load response for either equity reasons or market efficiency reasons, what metering options are available, and what the cost of installation is. Advanced metering need not imply real time pricing; however, advanced metering can facilitate the measurement of a customer's usage at specific time intervals.

5.10 Ensure on-going review to continue program improvement

Review of the load response program should not just be a one-time effort. On-going program review will provide an opportunity to improve the program in response to new information and opportunities. On-going program review should include a concerted effort to gather information on experiences from entities that have participated in the program as well as from those who have not. There are a number of program details that must be worked out for the program to be effective, and actual experience with program implementation will provide critical information.

6 Conclusions

The electric industry in New England has changed significantly in the last five years. Now that the dust has begun to settle from the initial round of activities in restructuring wholesale and retail electric markets in New England, it is clear that a significant and critical component is missing. For the most part, demand for electricity is still treated as static and inelastic in daily markets. However, there is increasing attention to the critical role that more dynamic and elastic consumer electricity demand can play in ensuring reliable and competitive electricity supply.

This report focuses on currently proposed load response programs as a platform for increasing the elasticity of electrical demand and developing greater load responsiveness to wholesale markets and reliability concerns. Development and implementation of load responses programs highlights the complexities of using load response as a reliability tool and of incorporating price sensitive load into wholesale and retail markets. Information and experience gained in the development and implementation of the load response programs for summer 2001 will provide a solid foundation for improving the programs in the future as well as for expanding load response opportunities beyond the current programs offered by ISOs.

Load response programs developed by ISO New England and NEPOOL represent important and critical steps towards greater demand elasticity in New England markets. It is essential that the programs trigger real price responsiveness in order to afford some relief to customers in New England from the existing dysfunctional markets. It is also important that such relief not be accompanied by unacceptable health and environmental impacts, as would occur if all of the load response comes from customer-site distributed generation.

Efforts to improve the programs following implementation in summer 2001 should include specific efforts to ensure that the programs are not needlessly complex and unappealing, ensure a load bidding alternative, develop alternative load profiles and other alternatives to interval metering for certain load response measures, offer load reduction aggregation, address environmental impacts, and provide open access to suppliers of load response communications and other services.

Considering these issues based on program implementation during summer 2001 will provide a strong foundation for improving the load response program for implementation in subsequent periods. Resolution of these issues will also have bearing on the expansion of load response opportunities beyond ISO administered load response programs. As customers and retail providers (including suppliers and aggregators) gain experience with load response, they are likely to discover myriad arrangements for deriving benefits from active load management in response to wholesale market signals. Not all load response activities need flow through ISO administered load response programs.

The current load response programs focus primarily on large customers. Beyond the refinement of ISO administered load response programs, significant questions remain regarding the eventual pervasiveness of load response opportunities. While load response from a few large customers is likely to bring significant economic benefit to all customers in New England, it will be important to consider expanding load response opportunities for all customers to ensure that all desirable load response opportunities are captured. For example, aggregating demand reductions from hundreds of small customers could provide the same economic benefit while having much lower environmental impact than a single customer using a small generator for load response. It is also important to ensure equitable treatment and opportunities for large and small customers alike. Load response will become an increasingly important element of customer choice, so that customers will choose not only their electricity supply option, but will seek electricity demand options such as load management and energy efficiency that can reduce their overall consumption as well as their bills.

Of course, load response is not the magic response to all of the structural problems that exist in the New England markets and to the difficult issues facing the region. Developing load response programs and opportunities must be one of the many on-going activities to effect the transition from regulated vertically-integrated electric utilities to competitive wholesale and retail electricity markets. A market that allows load to respond to prices and reliability needs could spur further development or improvement of new and exciting compliments to bulk power supply such as advanced building control technologies, and clean on-site generation technologies. Without thoughtful initiatives based on a comprehensive approach, the full potential benefits of load response to wholesale markets and reliability concerns could remain untapped as market participants and customers rely on simple load curtailment and existing dirty on-site generation from large customers.

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Appendix A
Some Recent Findings On Load Response

A September 1998 study of the design of electricity markets in New England first emphasized the importance of economic load response in New England Markets. The report identified demand-side bidding as a critical component in economic efficiency both for short-term demand elasticity and to spur long-term investments in price-sensitive demand reduction technologies. The report also emphasized that demand-side bidding is important for market power mitigation and to improve system operations. The report concluded that the absence of demand-side bidding "is an artifact of the era of regulation, which focused on the supply side," taking short-term demand as given.[1,2]

Since 1998, the need in New England for a demand response to prices in the wholesale markets has become apparent to all market participants and observers. There has been an increasing urgency among regulators, consumer representatives, and market participants to create more elasticity of demand. For example, last year the Federal Energy Regulatory Commission placed a very strong emphasis on demand elasticity as an essential element of efficient wholesale electricity markets in New England. FERC stated in June 2000 that "it is becoming evident that a successful transition to competitive electricity markets will necessarily involve an increased participation of the demand side of the market in making resource decisions. Such participation can serve to discipline prices by bringing supply and demand into balance and thereby reduce calls for intervention in markets through price caps." (CMS/MSS order, June 28, 2000 at 15-16). In July 2000 the Commission stated that "lack of price-responsive demand is a major impediment to the competitiveness of electricity markets." (NSTAR order, July 26, 2000, at 23).

A recent report from the Regulatory Assistance Project summarizes the system-wide economic benefit of economic load response: "In competitive, wholesale markets where all power plants receive the market clearing price for each hour of operation […] the ability to reduce peak demand reduces the power costs paid to every unit running at the time of the peak. [….] Now the benefit of demand reduction has jumped from the value of avoiding a marginal unit to a system-wide multiple of that value."[3] Some estimates of the impact of load response show large price decreases from even a small reduction in consumption during peak hours. For example, a recent article shows the lower prices that would result during "spike" periods if varying percentages of customers (at varying levels of price elasticity) participated in a load response program.[4]

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[1] Cramton and Wilson 1998, at 27

[2] Note that the emphasis is on the inelasticity of short-term demand. This does not denigrate the many years of successful work in Maine and New England to improve energy efficiency in electricity use.

[3] RAP 2001, at 1.

[4] Caves, Eakin, and Faruqui 2000.

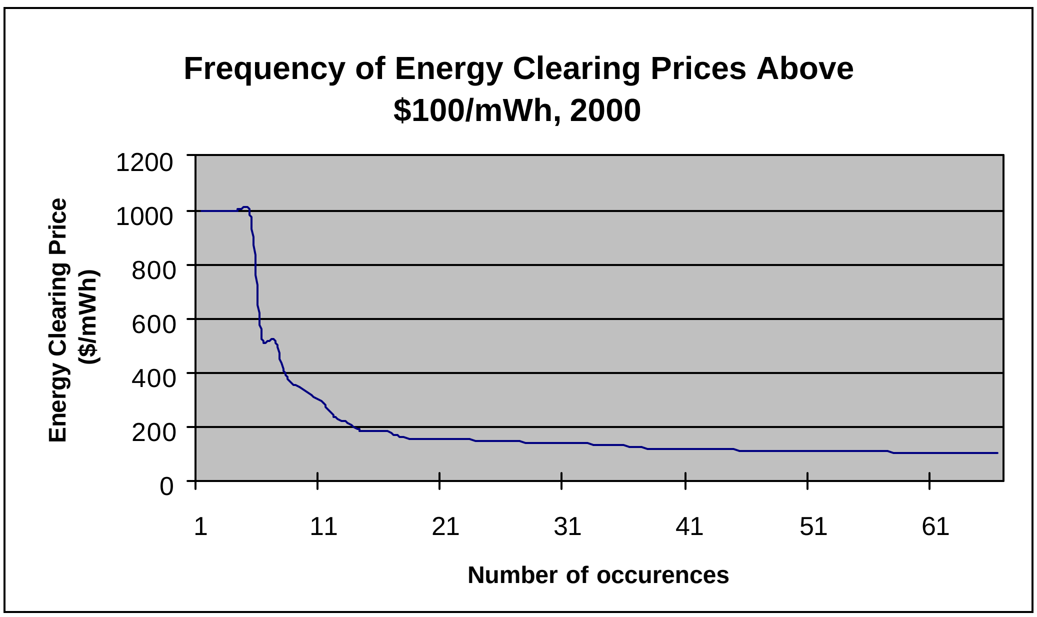
Table A.1. Lower Prices During Spike Periods Due to Load Response Program

Market Share	Price Elasticity of Demand				
	0	0.1	0.2	0.3	0.7
0%	$10,000	$10,000	$10,000	$10,000	$10,000
5%	$10,000	$6,189	$4,765	$4,063	$3,182
10%	$10,000	$4,141	$2,656	$2,021	$1,253
15%	$10,000	$2,945	$1,667	$1,180	$620
20%	$10,000	$2,199	$1,146	$776	$373

Source: Caves et al. "Mitigating Price Spikes in Wholesale Markets." The Electricity Journal, April 2000.

In a recent joint submission to the FERC, NEPOOL and ISO New England state that "wholesale energy prices generally are stable for the vast majority of hours. For that reason, the most effect from a load response program would reduce the electricity market clearing price (ECP) in those few hours each year when demand is high and the price supply curve is steep. During these times, very small reductions in demand can dramatically reduce clearing prices."[5] As shown in Figure A.1, prices exceeded $100/MWh in less than one percent of total hours in 2000. Consequently, reduction of grid electricity usage in one percent of hours could significantly reduce the total annual cost of electricity purchases in New England.

Figure A.1. Frequency of ISO NE Energy Clearing Prices in 2000



Customers' ability to decide not to purchase electricity when market prices are very high reduces the opportunities of the exercise of market power. As noted in the PJM Market Monitoring Unit's State of the Market Report for 1999: "Low price elasticity of demand, price-inelastic demand, is a significant contributor to the market conditions which make

[5] NEPOOL and ISO New England, February 2001, at 5.

the exercise of market power possible."[6] When demand is inelastic, and demand is near available capacity, generators can be fairly sure that the system operator will have to accept all offers for generation, including offers at high prices.

[6] PJM June 2000, at 23.

Appendix B
Existing Load Response Programs

Market participants and system operators in New England, New York and the PJM Interconnection have taken the first step in increasing demand elasticity. They have been developing both emergency and economic load response programs for the summer of 2001. These programs are described below. The primary focus is on New England; however New York and PJM are included because of the importance of increased coordination between the control regions. Also, the load response programs in other regions can provide useful ideas for the further improvement of programs in New England.

B.1 New England

Stakeholders in New England have been working in recent years to develop some degree of load response in this region. This section describes previous reliability programs, current proposed programs, and load-bidding that is anticipated as part of the multi-settlement markets that are currently under development.

Previous programs

For the past two summers ISO New England has developed a "curtailable load program" as a tool to use during times of capacity deficiencies.[1] Under this type of program, customers sign up in advance of the summer period for the option to reduce load, when notified by ISO-NE, in exchange for hourly payments at specific amounts. When called upon, customers may reduce the amount of power they draw from the grid by decreasing their electricity consumption or by shifting to small on-site generators to supply their electricity demand. Customers may choose not to curtail load when called upon, but would then not be eligible for any payment. The Summer 1999 program provided a fixed hourly payment for curtailed energy. It was initiated on an expedited basis in August 1999 in response to several severe capacity deficiency events in June and July of 1999. Approximately 120 MW of customer load was enrolled. The Summer 2000 program provided for hourly payments at three different minimum thresholds, or at the hourly energy clearing price, whichever was greater. For the Summer 2000 program, over 900 customers signed up through NEPOOL Participants for a total of 240 MW.[2] In Summer 1999 and Summer 2000 ISO New England did not have to call upon customers to reduce load due to the lack of any capacity deficiency events that would have triggered implementation.

[1] A "capacity deficiency event" occurs whenever ISO-NE's hourly forecast indicates that available generation resources cannot meet pre-established reliability criteria for specific quantities of energy and reserves.
[2] ISO New England presentation to NEPOOL Markets Committee January 23, 2001.

Programs for summer 2001

ISO New England and NEPOOL have developed a load response program that will be ready for implementation in Summer 2001 that will have two main components, a reliability component and an economic component.[3] The reliability component is expanded for 2001 and the economic component of the program has a more market-based design. In addition, both components are intended for year-round operation, in contrast to the two previous programs that operated only during the summer period.

Demand Response Program

The Demand Response Program would use load response to alleviate tight capacity situations and to maintain adequate reserves for responding to the sudden failure of a major generating unit.

For 2001 the ISO proposes to expand the use of load response for reliability purposes to explore how the potential for grid load curtailment can assist in meeting mandatory reliability requirements. ISO New England, and other control system operators, must be prepared to respond within specific and brief time periods (10 to 30 minutes) to major supply interruptions caused by the sudden loss of the control area's largest or second largest source of supply. In the past few years, in order to meet its reliability requirements and due to a shortage of generating units that can start up very quickly, ISO New England has been forced to run several large units at less than full capacity in order to be able to boost production quickly should the need arise. This "over-commitment" policy has created significant uplift costs, inefficient operation of generating units, and increased air emissions.[4] Now, the ISO is considering how the ability to quickly drop load, rather than increase supply, can be used to meet these reliability requirements. Under this type of program, customers who are able and willing to reduce their demand for electricity from the grid in less than thirty minutes would sign up and would be expected to reduce their demand if called upon by the ISO. Customers would be eligible for a daily payment as an operating reserve for their potential to reduce load, and would be eligible for an hourly payment as energy for any actual curtailment. Customers who did not respond to an ISO request for curtailment would be dropped from the program. Details of eligibility and payment are described in more detail below.

To be eligible for the Demand Response Program customers must have interruptible load of at least 100 kW, must be capable of interrupting within thirty minutes of an ISO request, must have interval metering, and must use an ISO certified internet-based communication supplier.[5] Program participation requires real-time metering technology (interval meters) tied to an internet vendor-supplied program that allows the ISO to provide the resource owner with five minute real-time price signals. Interval meters permit documentation of the customer's response in real-time, thus confirming that a load reduction

[3] NEPOOL March 19, 2001

[4] ISO New England estimates that daily reserves overcommitment is approximately 1300 MW. The costs for these "extra" reserves is socialized among all NEPOOL participants as an "uplift" cost. ISO-NE presentation to air regulators 11/30/00.

[5] The 100 kW threshold was chosen since it essentially correlates with the use of an interval meter. Presentation by Robert Burke to NEPOOL Markets Committee, January 23-24, 2001.

has occurred. Without this technology the ISO would not have the capability of identifying and quantifying an individual customer action. NEPOOL has agreed to cover the costs of the first 1000 installations of the internet-based communications equipment necessary for participation in the program.[6]

Customers may reduce the amount of power they draw from the grid by reducing their electricity usage or by shifting to small on-site generators to supply their electricity demand. Customers must sign up for the program through a NEPOOL Participant, and it is the NEPOOL Participant who receives payments under the program. Payments to the customer would be governed by a contract between the customer and the NEPOOL Participant. The NEPOOL Participant would receive reserve payments at the reserve market clearing price for the amount of load it signed up for interruption, and it would receive the energy market clearing price for the amount of load that actually interrupted at the request of the ISO. The customers' baseline usage profile would be based on actual hourly usage in the previous ten business days, with an adjustment based on pre-interruption loads.

Price Response Program

Under the economic component of the program, customers would be paid to voluntarily curtail their consumption of grid electricity during certain periods when ISO New England declared that the load response program was in effect. The Price Response Program would be in effect on any non-holiday weekday where the ISO forecasts that the energy clearing price in at least one hour between hours 8 and 23 (i.e. 8 a.m. and 11 p.m.) would exceed $100/MWh. The ISO could declare the program operational either based on its day-ahead forecast, or if it determined within a particular day that the price in a later hour would exceed $100/MWh. Entities signing up customers would be paid the actual energy market clearing price (ECP) for each hour of interruption. Payments to the load responsive customer would be determined through a contractual arrangement with the entity signing up the customer. A customer could sign up through the NEPOOL Participant that serves their load, or through a third party NEPOOL Participant.

Eligibility for this program is largely the same as the Demand Response Program without the requirement for a thirty minute response time. NEPOOL has agreed that half of the cost of the first 1000 internet communications devices for the economic load response program (estimated at about $2000 each) would be covered by market participants.[7] As in the Demand Response Program, customers could implement load reductions, shift to on-site generation, or use a combination. ISO New England has projected that approximately 2/3 of the participants in the reliability and economic components of the summer 2001 program would shift their electrical consumption to on-site generation.[8]

Both programs will be reviewed after the summer to evaluate how well they functioned during the summer and to examine opportunities for improving and expanding the

[6] NEPOOL March 19, 2001 at 5.
[7] NEPOOL March 19, 2001 at 2-3.
[8] Presentation of ISO New England to environmental regulators, November 30, 2000.

program. Recommendations for changes will be made to the NEPOOL Participant's Committee at its November meeting, currently scheduled for November 2, 2001.

Table B.1. Summary Of New England Load Response Program For Summer 2001

	Demand Response Program	**Price Response Program**
Load size	End user must have 100kw-5MW of interruptible load	End user must have 100kw-5MW of interruptible load
Program availability	Between 0800 and 2200 on non-holiday weekdays and upon ISO request for interruption.	When ISO forecasts that ECP will exceed $100/MWh in one or more hours between 0800 and 2200.
Response time	Within 30 minutes of ISO request	None
Duration of interruption	Usually two hours, but could be longer during capacity constraints	Up to customer
Participation requirements	Interval meter ISO-approved internet-based communication device	Same as Demand Response Program
Payment to Customer	Determined by through contract with NEPOOL Participant	Same as Demand Response Program
Payment to NEPOOL Participant	Participant receives availability payment, based on reserves market price, for load that is available for interruption between 0800 and 2200 on non-holiday weekdays. Participant receives energy clearing prices for actual interruptions.	Participant receives energy clearing prices for actual interruptions.
Penalty for non performance	Forfeit reserves-based payment back to most recent of last interruption or first of month.	None.
Cost of communications equipment	NEPOOL funds 100% of first 1,000 installations	NEPOOL funds 50% of first 1,000 installations

B.2 NY ISO- 2001 programs

Stakeholders in New York have also developed programs to enable load response to play a role in addressing reliability concerns as well as respond to wholesale market prices.

Emergency Program
The Emergency program is open to Load Serving Entities, NYISO direct customers, aggregators, and end-use customers with a minimum of 100 kW reductions that can be implemented within two hours. Participating entities must have interval meters and can achieve the reductions by reducing actual loads or turning on stand-by generation, including diesels. The program will be initiated by NYISO based on the "in-day peak hour forecast" indicating a reserve peak shortage or a sudden major emergency. Customer payments will be based on measured reductions compared to a "baseline" established by an average of the five highest hourly loads in the previous ten workdays. The baselines will not be weather-adjusted. Payments will be for a minimum of four hours, assuming the customer reduced load in each of those hours, based on the higher of $500 or the locational-based marginal price (LBMP) for each hour. There are some adjustments if the "event" is less than four hours or longer than four hours.

Incentivized Program
This program allows for day-ahead bids of curtailable capacity that can include bid parameters of minimum load, minimum run time, start-up costs, and other features that enable load to be "just like a generator."[9] Load reducers get to bid as a "negative generator." For example, they can specify contiguous hours "stripped together" for which they want to be considered for load reduction; they can also specify "fixed load reduction costs" to be considered as a part of their bid. For this first year, only host LSEs can participate; work is on-going to allow any "customer service provider" (CSP) to participate. Entities can participate with actual load reductions or by starting up on-site generation, but diesel generators are specifically ineligible for this program. Small non-diesel generators on the owners' side of the meter can also bid in using the preceding "negative generator" format; but they will only get locational marginal price and will not get to keep their "price of electricity avoided."

Payments would be based on reductions compared to a baseline of recent use, as in the emergency program, and would be based on the LBMP. Load reduction bids that are accepted by the ISO will have to verify that they actually reduced their usage; if they do not, they will be subject to a penalty of ten percent of the higher of the day-ahead price or the real-time price. The entity's bid-price for load reduction would be eligible to set the LBMP, just as a generator's bid is eligible to set the LBMP. Failure to provide the "as bid" reduction would result in a penalty set at 110% of the day-ahead LBMP or the real-time LBMP, based on specific factors. The incentive part of the program expires after 3 years; the rest of the program continues until changed by a new NYISO vote. There will be thorough evaluations directed at improving program operations after each capability period.

[9] Presentation of David Lawrence, NY ISO, to NY ISO Load Response Conference, March 22, 2001.

B.3 PJM – 2001 programs

PJM has also developed emergency and economic load response programs that it filed on March 30 at FERC. The PJM Members overwhelmingly supported the emergency load response program; but were unable to come to agreement on the economic load response program. The PJM Board filed the economic load response program on its own initiative, attributing the PJM Members' inability to agree on the economic load program to disagreements over mechanics of the program and to the impacts of the program on the market position of specific groups of stakeholders.[10] PJM has designed its program as a pilot that is scheduled to terminate May 31, 2002.

Emergency Program

The Emergency Program would pay for actual load reductions during system emergency conditions. To be eligible for participation in the program an entity must be a PJM member, either under PJM's regular membership provisions, or under special membership provisions created for the load response program. A participant in the program must be capable of reducing at least 100 kW of load for a total of at least ten hours over the pilot period. Participants may participate with actual load reductions or by shifting load to an on-site generator. The participant must be available for interruption during any hours between 0900 and 2200 on any or all days of the week and be able to respond to an PJM's request for interruption within one hour of the request. Finally the participant must meet certain metering requirements. For actual load reduction, a participant must have an interval meter capable of recording integrated hourly values for the hour prior to the event and each hour during the event. For shifting load to an on-site generator, the participant must have an interval meter capable of recording integrated hourly values for the actual net generation. Participants must be capable of receiving PJM notification.

For actual interruptions, the participant would be paid the higher of $500/MWh or the applicable zonal locational marginal price. Payments for the program will come from entities that purchase from the PJM energy market in the hour of interruption.

Economic Program

The Economic Program would pay for actual load reductions at the higher of $500/MWh or the zonal locational marginal price where the load is located, net of the retail rate that the customer would have paid for an equivalent amount of electricity. Eligibility for the program is largely the same as for the Emergency Program. However, participants must notify PJM of the price at which load reductions will occur prior to, or at the same time as, the load reduction. The metering requirements for customer load reduction are slightly different than for the Emergency Program. For actual load reduction, a participant must have an interval meter that measures load drawn from a specific process or application and shows that the process or application was halted for the purposes of a load reduction and not due to normal operations.

[10] PJM March 30, 2001, at 3-4

Table B.2 presents a summary of emergency and economic programs in the New England, New York and PJM ISOs.

Table B.2. Comparison of Load Response Programs Among Northeastern ISO's[1]

Aspect of program	PJM – ISO	NY-ISO	NE-ISO
Filed at FERC	Yes. 3/30/01 ER01-1671	Yes. Emergency Opt. 3/13/01 ER01-1520 (approved 4/26/01) Economic. Option 4/5/01 ER01-1740	Yes. 3/19/00 EL00-83-005 Approved 5/16/01
Prior ISO program experience	Implemented Emergency Program in Summer 2000 – .80 MW of participation.	No prior experience.	Curtailable load programs in summer 1999 (120MW enrolled) and summer 2000 (240MW enrolled).
Emergency Load Response Option?	Yes - Pays customer (or CSP) greater of $500/MWh or LMP where load response is located.	Yes. – Emergency Demand Response Program pays CSP greater of $500/MWh or LBMP with a 4 hour minimum payment[2]	Yes. Pays CSP Energy Clearing Price (ECP) for actual interruptions on non-holiday weekdays between 0800 and 2300.
Economic Load Response Option?	Yes – Real Time Economic Program. Pays customer (or CSP) LMP minus retail price of energy.	Yes – Day Ahead Economic. Load Curtailment Program allows load reducers to bid as a "negative generator."	Yes. Pays CSP ECP for actual interruptions when ISO NE has forecast an ECP greater than $100/MWh in at least one hour.
Types load response - Emergency	100kW minimum. Distributed generation (non synchronized) Load reduction (metered with an interval meter)	100 kW minimum. Distributed generation (non synchronized) (up to 200 hrs for diesel) Load reduction (metered with an interval meter)	Interruption of 100kW-5MW within 30 minutes of ISO request. Includes Load reduction, customer-sited generation, or a combination.

[1] Table prepared by Chris Cook, E3 Energy Services LLC, with input from Lucy Johnston, Synapse Energy Economics. Originally submitted as Attachment A to the Comments of the Public Interest Organizations regarding the PJM load response program, filed April 19, 2001 in docket ER01-1671. Included with permission of Chris Cook.

[2] The minimum payment provision is for $500 for the greater of 2 hours or the length of the emergency. If the emergency is less then 4 hours but greater then or equal to 2 hours the CSP is paid the greater of $500 or LMP for the length of the emergency and LMP for the remainder of the 4 hour period.

Types load response - Economic	Distributed generation (non synchronized) Load reduction (constant process metered with an interval meter).	Aggregated to 1 MW minimum. Non diesel distributed generation. Load reduction.	Same as emergency, but eliminates minimum response time of 30 minutes.
Payment to participant (customer/CSP) - Emergency	Greater of $500/MWh or LMP where load response is located. Payment based on load difference between hour before PJM calls Max. Emergency generation and that during the emergency. Payment made directly to customer (or CSP). ALM Customers limited to participation in excess of contracted amounts.	Greater of $500/MWh or LBMP where load response is located (four hour min. payment). Invoked when NYISO identifies an Operating Reserve Peak Forecast Shortage or Major Emergency. Payment made directly to CSP. No limitation on Special Case Resources participating.	Pays CSP for load available for interruption during peak weekday hours at operating reserve clearing price. Pays CSP Energy Clearing Price (ECP) for actual interruptions on non-holiday weekdays between 0800 and 2300. Payment from CSP to customer based on their contractual arrangement.
Payment to participant (customer/CSP) - Economic	LMP minus customer's retail rate. Payment based on metered generation output or load reduced from steady state. Customer/CSP decides when to operate load response.	If CSP bid is accepted by ISO, customer paid higher of bid or LBMP	Pays CSP ECP for actual interruptions on non-holiday weekdays between 0800 and 2300, when ISO NE has forecast an ECP greater than $100/MWh in at least one hour Payment from CSP to customer based on their contractual arrangement
Penalties for non delivery - Emergency	No.	No.	CSP must return availability payment back to more recent of first of month or last interruption.
Penalties for non delivery - Economic	No.	Imbalance charge plus penalty of 10% of the higher of the day-ahead price or the real-time price	No

Funding for customer payments- Emergency	Uplift charges on all load suppliers short during the declared emergency	Charges on loads in zones where emergency is invoked.	Reserve-based payments allocated to Participants with reserve obligation in the hour. ECP-based payments allocated to NEPOOL Participants based on Electrical Load. NEPOOL pays 100% of cost of first 1,000 communications systems.
Funding for customer payments - Economic	Charge to load serving entity that would have otherwise been responsible for supplying customer had customer not reduced load.	Market pass through of costs to all load serving entities taking power at the time of the load reduction.	ECP payments allocated to NEPOOL Participants based on Electrical Load. NEPOOL pays 50% of cost of first 1,000 communications systems.

Metering requirements - Emergency	Load reduction : Interval meter capable of recording integrated hourly value for the hour prior to the event and each hour during the event. Generator: Interval meter capable of recording gross output and separate interval meter recording net load	Generator: Interval meter measuring gen. Production . Load reduction: Interval meter on entire premises certified by Meter Service Provider.	Load reduction: Interval meter. Customer-sited generator need not be metered separately.
Metering requirements-Economic	Load reduction: Interval meter that measures load drawn from a specific process or application and shows that the process or application was halted for the purposes of a load reduction and not due to normal operations. Generator: Interval meter capable of recording integrated hourly values for generation running to serve local load, (net of that used by the generators).	Must be measured and verified[3].	Same as emergency option.

[3] The NYISO Technical Bulletins goes into detail on this issue.

Customer participation requirements - Emergency	♦Must be able to reduce at least 100 kW load at least 10 hours over the pilot period (May, 2002) ♦available between 0900 and 2200. ♦full load reduction within one hour of PJM's request to reduce. PJM Special Membership (no fees – no voting privileges).	♦Load reduction must be at least 100kW with 2 hours notice. ♦CSP can be: LSEs; Curtailment Customer Aggregators; Direct Customer of the NYISO; or an approved End Use Customer. Must be participant of NYISO but can do so as a "Limited Customer" which includes waiver of financial obligations and voting privileges.	♦Must be able to reduce at least 100 kW load for 2 hours or more. ♦available between 0800 and 2300, non-holiday weekdays. ♦full load reduction within 30 minutes of ISO NE's request to reduce. Must be a NEPOOL Participant. (can be a third party CSP).

Customer participation requirements - Economic	Same as Emergency Option except must be PJM Member (full fees).	♦Load reduction must be at least 1 MW bid. ♦LSEs only until 1/12002 then LSEs or Demand Reduction Providers.	♦Must be able to reduce at least 100 kW load. ♦available between 0800 and 2300, non-holiday weekdays. ♦Customer must notify ISO NE of intent to interrupt. Must be a NEPOOL Participant. (can be a third party CSP).
Customer baseline	Program includes place holder for "other" metering methodologies to be considered by PJM. Profiling may be appropriate if presented to PJM and approved by all relevant parties.	Historical operating data for load or on-site generator is required. For loads with existing interval meters 1 complete billing period of data immediately preceding the first operation is required. For newly installed interval meters, prior three month's kWh consumption and demand are required. Customer baseline is calculated based on formula provided by NYISO.[4]	Baseline profile based on previous ten business days actual hourly usage (averaged) with a further adjustment based on pre-interruption loads.
Transaction costs - Emergency	$10 transaction fee per account for each event.	None.	Determined by arrangement between customer and CSP.
Transaction costs - Economic	None.	None.	Determined by arrangement between customer and CSP.
Other Fees - Emergency	None.	None.	Determined by arrangement between customer and CSP.

[4] Manual goes into detail - based on highest 5 of the last 10 weekdays excluding price responsive days.

Other Fees - Economic	Customer/CSP must be a full PJM Member to participate (fee=$1500 + $5000/yr).	Must be full NYISO Member	Determined by arrangement between customer and CSP. CSP and/or customer must pay 50% of cost of communications system.
Duration of program-Emergency	Pilot until May 31, 2002.	Until Oct. 31,2002.	Program to be reviewed in fall 2001.
Duration of program-Economic	Pilot until May 31, 2002.	Until Oct. 31,2003.	Program to be reviewed in fall 2001.
Small Customer participation-Emergency	None unless aggregated into 100 kW blocks with interval meter.	None unless aggregated into 100 kW blocks.	None.
Small Customer participation-Economic	Not likely. Program includes place holder for "other" metering methodologies to be considered by PJM that may allow aggregated small customer participation. Standard load profiling is a barrier.	None.	None, but subject to case by case waiver by ISO NE.
Can load response set energy market price	No.	Yes (economic option only).	No.
Load response data submission	Data must be submitted within 45 days of the event. EDC's have 5 days to verify data.	Data submitted by participant w/in 45 days of event. NY ISO will accept data w/in 14 days.	

Compilation of program data	Nothing specified.. PJM will submit any required reports to FERC.	Nothing specified.	♦ Method of curtailment (load reduction or generation). ♦ Type and size of generation. ♦ Fuel type. ♦ Emissions rate. ♦ Permit status.
Environmental issues	Customer must have permit for generation or explain exemption from permitting. Information on permits will be provided to EPA.	Diesel generators cannot participate in Economic Program.	Customer must submit permit for generation or explain exemption from permitting. Environmental impacts to be reviewed with environmental regulators and NEPOOL Participants following summer 2001.

CSP - Curtailment Service Provider
LMP (PJM) – Locational Marginal Price. Real time market price for energy at specific locations in the ISO (busses).
LBMP (NYISO) - Locational Based Marginal Price. Real time market price for energy at specific locations in the ISO (busses).
ECP (ISO NE) - Energy Clearing Price. Real time market price for energy equivalent to LMP and LBMP without specific locational busses.

Based on information available as of April, 2001

Appendix C
Critical Issues for New England

The load response programs for summer 2001 are critical early steps in creating demand elasticity. Each iteration of load response programs in New England has been an improvement over the previous year. Summer 2001 programs allow customers to be paid the energy market clearing price for load curtailment rather than an administratively pre-determined price. The program for summer 2001 also incorporates the new components of using load response for meeting certain reserve requirements and expanding the load response program beyond the more traditional emergency-only application. Yet, with their complex triggers and threshold eligibility criteria, the programs cannot provide the load responsiveness necessary for competitive markets, and could give rise to significant environmental impacts.

Development and implementation of these programs highlights the complexities of using load response as a reliability tool and of incorporating price sensitive load into wholesale and retail markets. Summer 2001 should provide some important experience and participation data that will be useful in the fall 2001 review and revision of the program. Certain areas of the program will require further refinement and improvement as the program develops: ensuring the program provides anticipated system-wide benefits, expanding participation options, and avoiding potential significant environmental impacts. Next steps must also include the integration of price responsive load into wholesale electricity markets, addressing environmental impacts of load response, and improving customer understanding for customer protection.

The New England programs will be reviewed in the fall of 2001. This section identifies issues that must be addressed in the next iteration of program development, and contains recommendations for next steps that consumer advocates should support and encourage. This section also identifies some areas to consider on a more long term basis. Information and experience gained in the development and implementation of the load response programs for summer 2001 will provide a solid foundation for improving the programs in the future as well as for expanding load response opportunities beyond programs currently implemented by ISOs.

In the near term it is critical that load response programs developed by ISO New England and NEPOOL be real programs that spur meaningful customer response to reliability concerns and peak prices. If the program exists on paper, but customers do not participate in the program, New England could be even worse off than without any load response program at all. New England would present the illusion of competitive markets, but load response would provide no effective price mitigation, market power mitigation, or reliability benefits. Near term recommendations focus on ensuring that load response programs attract sufficient participation to begin to provide the anticipated system-wide benefits of price mitigation, market power mitigation and reliability.

It is important to note that near term improvements to the load response program will occur within the context of seeking greater consistency between New England and PJM markets. In March 2001, ISO New England announced the development of a Standard Market Design that would be based largely on the market design currently implemented in the PJM Interconnection. While load response is not directly mentioned in the ISO's current proposal, it is clear that load response, as well as all other market initiatives, will have to be developed within the context of this effort to produce greater consistency between markets in New England and PJM.

1. Get involved in program review

The current load response programs have been designed by ISO New England in consultation with stakeholder groups. These groups will be reviewing the programs in the fall of 2001. Consumer advocates should contact ISO New England and request to participate in program review in the fall. Consumer advocates could provide a public policy and public interest perspective that often gets lost as the nitty gritty details of program design are worked out. NEPOOL Participants have pressed for resolution of many legitimate concerns, and some not so legitimate, over development of the program and the interaction of the program with other existing requirements and market procedures under which they operate. However, ultimately, retail consumers are the biggest losers from ineffective program design, and have the biggest stake in efficient markets. While there is widespread recognition among market participants that load response is an essential ingredient in competitive markets, the incentive to achieve effective load response is greatest for retail consumers, who ultimately must pay the costs of an inefficient market.

At a minimum, consumer advocates should be in direct contact with representatives from ISO New England to support efforts to achieve meaningful load response. Already, environmental regulators from several states have been involved on an on-going basis as the load response programs have been developed. More regular input from consumer advocates to provide ideas and a consumer perspective, as well as to push for the goal of meaningful load response, would be useful.

Consumer advocates could also work with individual NEPOOL Participants as the program is implemented to identify barriers and disincentives to participation, and to determine how the program could be changed to become more effective. For example, distribution companies, have many years of experience with interruptible load programs and they are responsible for reading electricity meters and reporting customer usage to ISO New England based on load profiles and time of use metering. Competitive suppliers, both those who participate in the summer 2001 program and those who do not, will have valuable insight into what incentives and program features are necessary to spur customer participation.

Program review, for both the emergency and economic load response programs, should include the following: (1) customers signed up vs. actual customer participation; (2) timing of customer participation (in relation to market prices, capacity constraints, and air quality indicators); (3) type of load response (e.g. load reduction vs. on-site generation);

(4) customer, supplier, and distribution company experience with summer 2001 programs; (5) refinement of baselines from which load reductions are measured.

2. Simplify the load response program

The programs that are currently proposed in New England for load response rely on a specific trigger for the program. In the case of the reliability program the trigger would be a request from the ISO for load curtailment in response to capacity shortage or in response to the occurrence of a second contingency. In the case of the economic load response program, the trigger would be an ISO declaration that the load response program was in effect in response to forecasted energy clearing prices for the subsequent day. In addition, the economic load response program is restricted to a specific window – non-holiday weekdays between 8 in the morning and 11 at night.

Event triggers are appropriate when using load response as a tool for addressing contingencies and maintaining system security on days of tight capacity. There are specific conditions in the operation of the bulk power system, such as the sudden loss of a large unit or high loads on hot days, that spur the need for quick load reductions to avert short-term reliability problems.

However, program triggers may not be appropriate for the economic program, particularly if they make the program so confusing and unpredictable that retail consumers are reluctant to participate. Restricting the program to peak hours of the day relies on the assumption that high prices are tied to scarcity. This is not necessarily true, and reduces the market power mitigation value of the program. The use of triggers for the economic program should be carefully evaluated in the long run in the context of developing a vibrant load response to wholesale prices. It is difficult to determine how much either component of the New England load response program will be implemented in the summer of 2001 and how customers will respond when the program is implemented. While the majority of market participants supported the economic program with a time window and a trigger of forecasted energy clearing prices over $100/MWh, these program features may result in a program that is seldom in effect, and may result in missed opportunities for lower cost load response.

Based on the energy prices in New England during the two previous years, it seems unlikely that the economic program will be invoked very frequently. In 1999 there were fewer than 15 days during which energy clearing prices in one or more hours between the hours of 8 a.m. and 11 p.m. exceeded $100/MWh. In 2000, there were 30 such days, many of them during the winter. Nevertheless, in considering a variety of options, NEPOOL Participants specifically rejected a $75/MWh forecasted price as a threshold for the economic program.[1] While effective load response for small percentage of hours per year that exceed $100/kwh is likely to bring overall economic benefits, it falls short of the more general goal of developing demand elasticity and seems like an unnecessary constraint. As originally proposed by ISO-NE, the economic program would have had no

[1] NEPOOL Markets Committee meeting February 23, 2001.

threshold, with customers able to curtail load at any price level. This type of "demand flexibility" is a goal that ISO-NE should continue to strive to implement.

In general, fear of gaming and reluctance to pay for load reductions lead NEPOOL Participants to insist upon restrictive program parameters. Evaluation of the program in the fall of 2001 will permit an assessment of whether such parameters were appropriate and whether they should be changed going forward. These early years of load response programs should be seen not only as a chance to address specific circumstances during a specific time period (e.g. summer 2001), but also as an opportunity to gain experience, gather information, and identify improvements.

Triggers are contrary to the goal of achieving a dynamic wholesale market where supply bid and load bids (negative supply) can compete on an equal basis. Restricting the load response program to a particular time of day is not consistent with the use of load response in mitigating the exercise of market power since opportunities for exercising market power may not be confined to peak hours. In addition, establishing a threshold price will eliminate the possibility of lower cost load response alternatives. For example, customers may be willing to reduce load and sell the resulting excess electricity at lower market clearing prices than $100/MWh.

3. Develop a load bidding alternative

The proposed summer 2001 program would enable customers working with load-serving Participants to self-initiate load reductions in response to anticipated market conditions, but puts load in the position of being a price taker. Customers cannot define any conditions of their participation. This uncertainty makes it very difficult for some retail consumers to participate in the program. For example, customers who must decide whether it is economic to cease production for a specific amount of time in exchange for payment rather than purchase high priced electricity must have some certainty in their cost benefit analysis. For these customers it is important that they be able to define certain parameters of their participation, such as a strike price, and minimum and/or maximum load interruption period.

Ideally, load bids would be incorporated into the energy management system that ISO New England uses to determine dispatch of resources in New England. ISO and NEPOOL are developing multi-settlement markets and have identified load bidding as an essential component of a multi-settlement system, but development of the multi-settlement system is extremely slow and laborious. In a status report filing on March 30, 2001, ISO New England estimates that full MSS functionality, including load bidding, will not be implemented until the first quarter of 2004 at the earliest. In a companion filing, ISO New England notes that it is investigating the potential for creating a "standard market design", in collaboration with PJM, that may allow for the full implementation of an MSS by 2003.[2]

[2] ISO-NE FERC filings of 3/30/01.

Further, incorporation of load response is difficult due to the fact that currently the minimum increment that the energy management system can handle is 1 MW, whereas the load response program is open to customers that can curtail 100kw or more. For example, in summer 2000 program, over 900 different customers provided the 240 MW of load enrolled in the curtailable load program. Most of these customers were smaller than 1 MW and consequently too small to be reflected in the energy management system.[3]

However, without the ability to bid into the day ahead and real-time markets just as supply does, load will not be on par with supply and cannot be deemed to be fully integrated into the market. FERC emphasized the importance of the move to demand bidding in its November order on California markets. In that order FERC stated "the difficulty with current demand response in California is that it is driven by administrative directive, not market prices," and directed the ISO and Scheduling Coordinators to "consider demand bidding programs in which load can bid offers of demand reduction directly into the market to compete with offers of supply." (FERC order on California Markets, November 1, 2000 at 30).

Nevertheless it is important to find ways for load to participate in the energy markets rather than just being a price taker. For example, load should be able to submit a bid to reduce load at a certain price and with conditions such as a minimum curtailment period. Such a mechanism would offer load more control and certainty; consequently it is likely to provide more flexibility and load responsiveness. It would be important, in a load bidding program, to establish penalties for non-performance. For example, customers who did not follow-through in real time upon a bid to curtail consumption could be required to pay the energy clearing price plus a certain percentage. The appropriate penalty should be worked out in consideration of the treatment of generation bids into the energy and other markets. Without such penalties, load bidding could be used in a non-competitive fashion to influence market outcomes.

In addition, customers should also be able to bid their load into reserve markets. This spring, the reserve market clearing price has risen as high as $750/MWh; using load as spinning reserve could mitigate such high prices. The NYISO load response program has incorporated many of these more desirable features, such as load bidding, into its Incentivized Day-Ahead program. ISO-NE should include a discussion of such features in its fall 2001 meetings on load response.

4. Provide appropriate financial incentives

The summer 2001 load response programs will pay for actual load reduction. Already many competitive suppliers have indicated to ISO New England that the load response programs do not provide sufficient economic incentive for participation.[4] In fact, the

[3] Discussion at NEPOOL Markets Committee January 31, 2001.
[4] Comments made at ISO New England load response meeting on May 18, 2001.

NEPOOL Participants' Committee recently approved additional funding to cover a portion of the costs of the program.[5]

The NEPOOL Participants' Committee approval of the economic load response program for summer of 2001 was contingent upon an understanding that the program would be reviewed in the fall to evaluate how to "move to more of a market-based program."[6] For example several Participants questioned whether it would be necessary to continue to pay load reducing customers for the load reductions and suggested that avoiding peak energy prices should be enough incentive for load response. Several Participants also proposed paying a percentage of the energy clearing price (e.g. 75%) for actual load reductions in the Price Responsive program; however, that proposal was not approved by NEPOOL. However, as long as significant barriers to load response exist, payments will continue to be appropriate.

There are several justifications for paying customers to reduce demand. First such a payment is deemed necessary to spur individual customers to reduce their demand for electricity from the grid to preserve short-term reliability of the grid. At such times the system operator calls for load reductions as a step to avoid blackouts. There seems to be less concern regarding payments for load curtailment in response to a reliability concern since the curtailing customer is providing a service that has a system-wide benefit.

The second major reason for paying customers to reduce load is to overcome barriers created by the current prevalence of standard offer supply at low average rates. Average rates insulate customers from market variations; consequently there is no incentive for customers to modify their demand in response to market conditions. There are also numerous situations where the consumer is not exposed to wholesale market prices (due to a fixed price contract with its supplier). Load response programs designed to pay a consumer to reduce its electric consumption by allowing that consumer (or its agent) to "sell" its unconsumed electricity at the wholesale hourly spot price will improve the competitiveness and efficiency of the wholesale market. Payments for load reduction can help to overcome this type of barrier.

The third major reason for paying customers to reduce load is essentially to spur interest and familiarity with the concept of price responsive load. This is a new concept to customers and suppliers and payments are recognized as an incentive mechanism to raise awareness and increase interest in developing the ability for load to be dynamic rather than static.

Finally, some payment for load reduction is justified in the situations where the load reduction provides a system wide benefit that is much greater than the benefit to the individual customer. For example, Professor Paul Joskow suggests that paying for load response during peak periods may be appropriate due to the benefits for market power

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[5] NEPOOL Participants' Committee meeting, June 1, 2001.
[6] NEPOOL March 19, 2001, at 3

mitigation.[7] Another justification is the potential to reduce the hourly energy clearing price for all market participants.

While payments for reliability load curtailment will continue to be appropriate, it will be important to evaluate load response activities periodically to determine if payments continue to be necessary or appropriate for economic load response. Some stakeholders may argue that it may be possible, once customers are familiar with the concept of load response and the tools that are available, to reduce payments to customers. Such arguments should be carefully considered. It seems there will remain a legitimate argument that payments to customers are warranted where the public value of the load reduction far exceeds the value to individual customers of their own load reduction. Payments will also be appropriate for customers who do not experience any direct benefit from reducing consumption but are willing to "sell" their reduction to other consumers, essentially providing additional supply in the energy markets**.**

In general, load response customers should be paid the same as generation companies selling into the market (as long as the reductions are adequately verified), when they provide the same benefit to the system. Otherwise, we will continue the historical disparity in incentives and barriers for the supply-side and the demand-side. Poorly designed markets are a significant compelling reason to design load response programs correctly. However, additional analysis and quantification of these concepts would be very helpful in informing future debate on load response programs.

5. Expand participation alternatives

As currently proposed, the summer 2001 load response program would allow participation only by the largest customers, those with an interruptible load of at least 100 kW and with an interval meter. This restriction is currently necessary to meet ISO New England's and NEPOOL's requirements for measurable and verifiable data so that a customers' agent is paid only for measured load reduction. Although those customers will be relatively few in number, they will be responsible for a significant proportion of total electricity usage in New England, and their willingness and ability to participate in the load response program is likely to bring economic benefits to all electricity consumers in New England.

However, such a restriction narrows the range of options for load response to prices and confines load response opportunities to a few large customers. Such a restriction could prevent the development of certain load response opportunities that could be of tremendous public value. For example, radio-controlled water heaters or air-conditioners, that can be cycled from a central location with the push of a button, could offer the same predictability, control, and measured reduction as a single customer turning on an on-site generating unit. The radio-controlled load response would also not have emissions, unlike the on-site generating unit. However, under the program as filed, such an option is not eligible for participation in the load response program and can not receive payments because individual customers are too small, and they do not have

[7] Professor Paul Joskow presentation to the Massachusetts Electricity Roundtable, March 23, 2001.

interval meters. The eligibility requirements also introduce some issues of equity in that large customers can derive individual benefits from load response that are not available to smaller customers.

ISO New England has recognized this short-coming of the program. In a presentation to air regulators ISO staff expressed interest in expanding demand response to more demand-side options, including residential level applications such as thermostat turn back via the internet.[8] Similarly, a top ISO-NE executive stated in an interview on National Public Radio that the summer 2001 programs are a first step in building an infrastructure that will eventually allow residential customers the opportunity to participate.[9]

In the absence of widespread advanced metering there must be a mechanism for identifying changes in a customer's pattern of consumption. An important interim step could be the use of a variety of load profiles. The Regulatory Assistance Project recommends the use of multiple load profiles. For example, alternative load profiles could be created for residential customers who have controllable water heating or air conditioning or both. Such alternative load profiles would reflect the fact that two of the most readily controllable loads are water heating and air conditioning. Alternative load profiles would create an incentive for LSEs to seek out customers with controllable loads and to invest in equipment for controlling customers' loads.[10] The Alliance to Save Energy suggests the development of specific load profiles for key loads such as water heat, efficient air-conditioning and others rather than using average load profiles for customer types. Consumer advocates should work with state regulatory agencies to develop alternative load profiles for smaller customers with certain types of controllable appliances.

There are two additional options for expanding participation opportunities in load response programs in the next few years. First, ISO New England and NEPOOL Participants could develop acceptable alternatives to interval metering, or at least a process for considering proposed alternatives to interval metering. Programs under development in the other adjacent power pools are designed to provide more flexibility and allow alternatives to interval metering. For example, PJM's program description states that "PJM may consider a metering basis other than those mentioned above if the method accurately represents a customer's normal load profile during the event."[11] In the proposal, alternative methods for measuring load reductions will be considered on a case-by-case basis at first, but PJM would study alternative metering methods during the pilot program and report to stakeholders. Consumer advocates should support and encourage alternatives to interval metering for certain types of centrally controlled load control applications.

[8] Discussion between ISO New England staff, environmental regulators, and NEPOOL Participants, November 30, 2000.
[9] Stephen Whitley, Vice President of System Operation, interview on NPR, March 21, 2001.
[10] RAP 2001, at 5.
[11] PJM Load Response Pilot, version dated January 22, 2001.

Another option is to allow suppliers to aggregate multiple small customers who individually have small load response capability, but who collectively can offer significant load reduction. This approach is being explored in New York. The New York price responsive load program allows NYISO-approved curtailment aggregators to aggregate end users that are capable of load reduction and with whom they have a contractual arrangement.[12] EFI suggests that it is possible to aggregate 5-600MW of load response by creating 50 manageable 10 MW groups of 15-20 customers each. This group approach allows flexibility for customers within each group to determine how to meet the group's planned curtailment.[13] Consumer advocates should support and encourage the development of this alternative. For example, consumer advocates could work with individual suppliers who are interested in developing aggregated load reduction to ensure that concerns over load reduction measurements and other issues are worked out.

ISO New England has indicated that it will consider small customer participation in the Price Response Program on a case by case basis.[14] However, options that would enable participation by small customers should be explored and incorporated into revisions of the ISO New England load response programs on a wider basis.

6. Mitigate environmental impact

Increased interest in load response raises certain potentially significant environmental issues associated with how small scale generation will interact with the existing electrical system. In some instances there could be costs, such as where increased generation from small dirty generators adds to overall emissions during the year or during particular hours of bad air quality. In some instances there may be benefits, such as where the availability of customer-site generation to cover rare contingencies permits more optimal dispatch of larger generating stations.

Many of the environmental concerns associated with load response stem from the environmental attributes of small scale generation. Much of this generation was installed to be used in rare emergencies, if at all. In addition, many of the units are small enough to fall below current permitting thresholds. Because small customer-site generating units represented an emergency precaution, rather than a day-to-day component of the electrical system, environmental regulators have not required permits for the smaller units. To now create incentives to operate this generation during peak load and emergency situations, in place of grid electricity, requires a thoughtful and careful evaluation of the collateral impacts. Load response initiatives create a significant likelihood that customer-site generation will move from being emergency precautions to being an integral part of the electrical system. This represents an important change in the structure of the electric industry that must be addressed by environmental regulators.

Existing customer-site generation, which is largely diesel fueled, is for the most part significantly more polluting than larger central generating stations. Diesel engines emit

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[12] CITE NY ISO documents.
[13] Presentation of Russ Patel at "Enhanced Load Response Opportunities in Competitive Markets," Hartford, CT, October 16-17, 2000.
[14] Presentation at load response meeting, April 5, 2001.

about 100 times more NO_x than a new combined cycle unit does. Numerous recent reports and analyses evaluate the air emissions of small customer-site (or distributed) generation and reveal that they are significantly more polluting than larger central generating stations.[15] Their emissions profile is also worse than average and marginal systems emissions in New England. Average system NO_X emissions in the NEPOOL region are about 1 lb/MWh,, and NEPOOL system marginal emissions are about 2 lb/MWh. In contrast, a new diesel engine emits about 12-17 lb/MWh and older diesel engines can emit up to 40 lb/MWh. Diesel engines also have very high particulate emissions, approximately ten times the emissions from a large central generating station.

The high emissions rates from these existing units create an ominous threat that, as load response efforts increase, total emissions from these units could significantly worsen what is already a very large environmental footprint of the electric industry. If the use of customer-site generation increases and most of the increase is from dirty technologies rather than the more recent and clean technologies, the total emissions contribution from load response could be quite detrimental. Their usage remains to be seen. However, even if in the early years total use of customer-site generation is relatively small, and cumulative emissions represent a small fraction of total annual emissions from the electricity industry, these units present a problem on hot summer days.

The more immediate concern arises from the likelihood that the emissions will occur at times and in locations where incremental pollution has the most negative impact. The real issue in the next couple years is one of timing and location. Nobody knows exactly how customers will operate their on-site generation. However it is likely that their operation will coincide with hot muggy days in summer, many of which are days of very poor air quality. For example, in New England in 1999 the average energy price on days with ozone exceedences including May 8, 1999 was $72.75/MWh, the average energy price on days with ozone exceedances excluding May 8, 1999 was $50.28/MWh, and the average energy price on days without ozone exceedences was $35.30/MWh. The US EPA has also worked in recent years to identify times when peak load conditions coincide with poor air quality and pose a particular threat to sensitive populations.[16]

Because of the potentially significant environmental impacts of small-scale generation, market participants in New York have decided to exclude diesel generation from participation in the incentivised load response program. Despite a similar suggestion by the Union of Concerned Scientists and environmental regulators in New England, there is no restriction on the use of on-site generation in the ISO New England economic load response program for summer 2001.

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[15] Recent sources of data on emissions rates from on-site generators include "Can We Have Our Cake and Eat It, Too? Creating Distributed Generation Technology to Improve Air Quality", Jim Lents and Juliann Emmons Allison, University of California, December 1, 2000. "Small and Clean is Beautiful: Exploring the Emissions from Distributed Generation and Pollution Prevention Policies", Nathanael Greene and Roel Hammerschlag, Natural Resources Defense Council, June, 2000 issue of Electricity Journal. "Environmental Benefits of Distributed Generation" Joel Bluestein, Energy and Environmental Analysis, Inc., Draft December 18, 2000.

[16] Personal communication with Steve Rapp and David Conroy, US EPA Region 1, January 24, 2001.

In contrast, ISO New England states that relying on customer-site generation and load reduction to cover reserve requirements can result in significant environmental benefits as it enables ISO to dispatch the system in a more optimal fashion. In particular, if retail customers are standing by, ready to reduce their consumption electricity from the grid within a short time, ISO does not have to run large generating units at low operating levels just to ensure needed supply in the unlikely event of a the failure of a large generating unit.[17] In a presentation to environmental regulators in November 2000, ISO New England estimated significant economic and emissions savings from the use of load response to cover certain reserve requirements.

Environmental regulators in New England and other regions are aware of the threat to air quality posed by efforts to develop a more active role for load response in wholesale markets. In a February 2001 letter to ISO New England, Chris James (CT DEP) and Nancy Seidman (MA DEP) expressed their concerns over the potential environmental impacts of load response. In addition to being active in the development of the summer 2001 load response programs, they are beginning to take steps within their authority to minimize the potential air impacts of load response. For example, air regulators are considering both new permitting procedures and emissions standards for distributed generation.

Two on-going regional efforts pertaining to permitting and emissions standards for distributed generation are worth noting. First, the Ozone Transport Commission has been working on a resolution that contains principles regarding permitting of existing and new distributed generation. The resolution focuses on instruments that could be adopted throughout the ozone transport region, that would encourage clean distributed generation, and would discourage high emitting distributed generation. Such instruments could be put in place over the next 2-3 years.

Second, the Regulatory Assistance Project is running a distributed generation collaborative. The DG collaborative brings together state energy and environmental regulators to develop appropriate emissions standards for existing and new distributed generation. That effort is co-chaired by Nancy Seidman from Massachusetts and Chris James from Connecticut. The project is expected to be complete in August or September of 2001. The OTC resolution and DG collaborative will provide a strong foundation and blueprint for regulators in individual states to go through their regulation development process.

It is critical for participants in wholesale markets and government entities to support the efforts of environmental regulators to keep step with developments in wholesale electric markets and bulk power system operation. From a market efficiency standpoint, the efforts to develop appropriate permitting procedures for the use of customer-site generation in load response would ensure that customer-site generation does not have a competitive advantage over larger central generation facilities that are subject to a variety of environmental regulations. Environmental regulatory efforts should not be seen as

[17] The Northeast Power Coordinating Council reliability requirements require that ISO must be able to restore half of the loss of its second largest supply source within 30 minutes of the loss of that source.

hindering load response but instead as supporting efficient competition in a fashion consistent with citizens' demands for a clean healthy environment.

7. Provide open access for suppliers of load response communication and control

Only one provider of load response communications and control devices has been approved for the summer 2001 load response programs in New England. RETX will provide all of the communications devices for customers participating in the program. While this restrictive approach was taken in the interest of facilitating program implementation for summer 2001, it is important that subsequent load response programs permit a wide variety of suppliers to participate and offer services to customers.
In its recent report, RAP recommends the development of standard protocols for load control and ISO investment in hardware and software that communicate directly with vendors of demand-side energy services. Alliance to Save Energy also suggests creating standard communications and control protocols. Any LSE, appliance manufacturer, ESCO or telecommunications firm should be able to sell demand response equipment directly to the market.[18]

ISO New England has indicated that that in the future it will approve any software provider that can provide information in the format required by ISO New England; however, for the summer 2001 ISO has only approved one software provider. Program review in the fall should include specific consideration of this issue. For example, it would be useful to seek input from a variety of suppliers of communications and control providers to ensure that the requirement is not unduly restrictive and that a variety of suppliers can meet the criteria. There are nine gateway providers listed in the load response section of the California ISO's website. These providers may have very useful experience and insight into program implementation from their participation in the load response program in California. Load control tools and communications devices are evolving rapidly, and ISO New England's load response programs provide a central forum for educating and learning about existing and new opportunities.

Due to FERC's interest in reducing seams issues, it seems very likely that this is an area where the Commissioners will be looking for coordination and consistency. There should be specific on-going efforts to exchange information and identify best practices. The ISO MOU activities are an obvious forum for this sort of effort, as will be the recently announced standard market design, should it develop.[19]

8. Enable a variety of incentives for end use customers

Most customers in New England are insulated from wholesale market price variations; they pay state mandated average rates that are not tied to the wholesale market price, the prices are established in advance of their consumption, and they pay the bills after their

[18] RAP 2001, at 5.
[19] Press release from ISO New England, March 29, 2001.

consumption. Such average or fixed prices eliminate customers' interest in managing their grid load or reducing their grid load. The current load response programs are designed to create an incentive to overcome this barrier to load response; however, additional mechanisms to create incentives for load response should be explored over the next few years.

As a general matter, load response requires an incentive to electricity consumers to reduce their load in response to market conditions. While real-time pricing is often assumed to be a prerequisite for load response, it is only one of several options that include payments not to consume, and the opportunity to sell unused electricity into the markets. All of these options should be explored and encouraged in order to facilitate load response in New England. In determining appropriate options, it will be important, particularly for small customers, to ensure that customers are not exposed to more price volatility than they can practically manage.

One mechanism for enabling retail customers to play an active role in electricity markets is to inform them, in real-time, of prices that vary with conditions in the market. The new bid-based wholesale markets in New England create a whole new opportunity to get participation in both economic and reliability load response programs. In the past it has frequently been difficult to determine what is an appropriate payment for customer load curtailment actions. For example, prior to the development of wholesale electricity markets, one of the seminal works on real-time pricing devoted significant attention to determining what real-time price was.[20] However, the Energy Clearing Price creates a solid basis for identifying the value of load reduction in particular hours and provides an opportunity for treating demand resources and supply resources comparably.

It may not be necessary or desirable to subject each and every customer in New England to wholesale market-based pricing to achieve benefits for all customers in New England. In New England, industrial customers represent less than half of a percent of retail customers but account for twenty two percent of kilowatt-hours consumed annually.[21] Of course, industrial customers should not be the only candidates for load response, but the volume of demand associated with a relatively small percentage of customers demonstrates that even a few customers can have a large impact on total usage levels. If even only a small portion of these customers reduced their peak consumption, the benefits for all customers in New England could be large. Similarly, it is not necessary that customers be exposed directly to, and required to pay, hourly wholesale market prices; there are a variety of pricing options that can spur customers to reduce their usage of grid electricity at times of peak wholesale prices.

A key issue in the development of economic load response is the pricing and contractual relationship between a retail customer and its supplier. A load serving entity that purchases wholesale electricity for resale to retail customers, or that purchases through a wholesale contract tied to wholesale market prices, is exposed to real-time wholesale prices and can benefit from the load reductions by its retail customers. Consequently,

[20] Schweppe, Caramanis, Tabors, and Bohn 1988.
[21] EIA 1996.

there could be an incentive for electricity suppliers to encourage retail customers to reduce their consumption at peak pricing times, enabling the supplier to either avoid purchases at peak hour prices, or to be able to sell excess electricity at peak hour prices.

Retail prices don't have to be equal to wholesale prices, but there are benefits from having them at least vary with wholesale prices.[22] There are a variety of pricing mechanisms that a retail electricity provider can offer to a customer to spur retail customer load response.[23] Having a variety of pricing options is an essential component of competition; otherwise customers will be insulated from market price.[24] The main point is to tap into a customer's ability and interest in managing its use of grid electricity in order to obtain the most efficient use of grid-supplied electricity. A recent review of real-time pricing programs in the United States and the UK, as well as summer 2000 data from California, concludes that offering hourly prices leads to a demand response that reduces wholesale prices during times of capacity constraints.[25] The article discusses a variety of pricing options that offer benefits over traditional utility interruptible load programs. One important benefit of such pricing programs is that they lead to stability in both wholesale market prices and a customer's bill by giving each customer the ability to control usage based on hourly prices. A few pricing options are listed below for illustration; however this list is not comprehensive or exclusive, new options are continually being proposed.

- Hourly wholesale price pass-through, with the customer's price tied directly to the wholesale price of power for all kilowatt-hours or for consumption above a particular baseline.
- Stable retail pricing with a shared savings approach to wholesale pricing, for example where a customer is paid for actual interruptions during peak pricing times based on the savings from not having to purchase peak price electricity or from being able to sell excess electricity at peak prices.
- Prices that vary with wholesale prices but do not constitute a direct pass-through. For example customers could pay a guaranteed price as long as the wholesale price remains below a certain level and then they may pay spot prices or agreed upon "'critical' or 'super-peak' prices."[26]

Many suppliers are eager for the opportunity to offer a variety of pricing options to retail customer. For example, in comments to the Massachusetts Department of Telecommunications and Energy a variety of suppliers have indicated their eagerness to offer a variety of pricing options to customers when those customers have advanced metering.[27]

[22] Professor Paul Joskow, presentation to the Massachusetts Electricity Roundtable, March 23, 2001.
[23] Pricing options are described in a variety of sources including Hirst and Kirby 2000 and Braithwait and Faruqui 2001.
[24] Hirst and Kirby 2000, at 2.
[25] Braithwait and Faruqui 2001.
[26] See Hirst and Kirby 2000, at 13-34, for a more detailed discussion or price offerings.
[27] See, e.g. comments of Automated Energy Inc. and comments of Competitive Retail Providers in DTE 00-41.

Even very simple time-differentiated pricing that includes only a peak and off-peak rate can trigger some customer efforts to reduce their consumption during the peak pricing time through base-load energy efficiency or load management. For example, a Vermont rate structure that included winter and summer electricity rates for retail customers had an enormous effect on load shapes.[28] A high winter peak rate spurred greater efficiency in peak winter loads in Vermont (such as conversions of electric space heating), just as a high summer peak rate could spur greater efficiency in peak summer loads such as air-conditioning. While a peak/off-peak pricing structure could reduce seasonal price spikes in the region, it will not provide the regional benefit of market power mitigation since suppliers need not fear customer reaction to high prices in any individual hour.[29]

9. Explore metering issues

A common misperception about load response is that, in order for it to work, all customers must be exposed to real-time prices and have interval meters. As discussed above, even load response from a small percentage of customers can have significant benefits to all customers; therefore it is not necessary for *all* customers to participate in load response in order to achieve widespread benefits. However, it will be important in the next few years to consider issues associated with enabling more pervasive load response; whether such pervasive load response requires interval metering, and whether widespread interval metering is feasible in cost and implementation.

Enabling participation in the load response program by a large number of small customers may be difficult, and cannot likely be addressed in the short-term. The majority of customers in New England have their usage metered on a monthly basis using meters that record cumulative kilowatt hours consumed over the course of a month but do not distinguish the time of consumption. Customers' patterns of consumption are assumed to fall into certain load profile categories. However, a significant problem arises when electricity customers and their suppliers are charged for retail consumption based on average customer load profiles rather than actual customer usage. A load serving entity that is charged for usage on a customer load profile basis will not benefit from any reduction in its customers' usage at peak pricing times. In this case, there is no incentive for the load-serving entity to work with customers to reduce peak electricity usage.

For retail customers and their suppliers to derive benefits from load response, it is necessary to be able to recognize changes in the customer's electricity usage relative to their normal usage. Over the long term, advanced metering can be an enabling vehicle for customers to modify their electricity usage in response to price signals or reliability concerns. Advanced metering need not imply time-of-use rates; however it can enable the measurement of a customer's usage at specific time intervals. Widespread advanced metering faces multiple obstacles including cost, feasibility of installing thousands of new meters, and issues pertaining to ownership of the meters. Advanced metering is not likely to become widely accessible to customers in New England in the next year or two because of the costs of installing meters on a piecemeal basis.

[28] Presentation of Richard Cowart to Massachusetts Electricity Roundtable, March 23, 2001.
[29] Borenstein 2001, at 2.

There is some debate over how widely advanced metering should be adopted. For example, some suggest that sufficient load response will be available from large customers so that widespread advanced metering is not necessary to achieve the benefits of load response. Others argue that advance metering is a necessary component of customer choice and will enable a variety of electrical service offerings to customers.

Advanced metering does not only mean interval metering. There are alternatives to interval meters. For example, a small clamp attached to the wire leading to a meter can transmit near real-time information to a communications device, producing a similar capability to an interval meter, albeit slightly less accurate.[30] As load response becomes more fully developed, innovation will occur in the field of metering, enabling new and innovative load response opportunities. While a full analysis of metering issues was beyond the scope of this project, they are important issues that must be considered and addressed going forward and will clearly have an important impact on the on-going development of load response.

10. Ensure on-going review to continue program improvement

The program will be reviewed in the fall of 2001. Because the integration of load response into wholesale markets is so new, it will be critical to ensure on-going program review and improvement following fall 2001. For example, during the development of the load response program in New England there was significant attention and concern related to the potential for customers to game the program by getting paid through the load reduction program for actions that they would have taken even in the absence of the program. Attention to such details is critical, particularly in the early stages of developing the program in order to get the widest possible support for the program. However, much more attention must devoted to identifying what are really gaming behaviors and what behaviors are in fact consistent with efforts to encourage customers to modify their use of grid electricity in response to wholesale price variations.

The determination of the baseline from which one measures load reductions is very important. In the program proposed by NEPOOL and ISO New England, a customer's baseline would be based on the previous ten business days' actual hourly usage with an adjustment based on pre-interruption loads. This approach, while not including a specific weather adjustment, does provide a mechanism for recognizing a variety of factors that could affect a customer's load on any given day. This is a better approach than that being used in the most recent load response programs in New York. In New York the baselines would <u>not</u> be weather-adjusted. The failure to adjust baselines for weather variations creates opportunities for significant inaccuracies, windfalls to customers who have not taken any steps to modify their load, and inability to recognize some instances where a customer has modified their load. This is a significant flaw that can greatly complicate the administration of the program, and has the potential to render it completely ineffectual. On-going program review offers the opportunity to continue to refine baseline determination, and to assess whether weather-specific adjustment is necessary.

[30] Personal communication with Kim Weaver, EVP, Stonewater Software, June 6, 2001.

In reviewing the program, it will be important to be discerning about what is actual gaming behavior. Inappropriate gaming behavior must be identified as a customer modifying their behavior to get paid but in a manner that provides no public value. One example that market participants discussed frequently in the course of developing the market rules and procedures was where a customer would schedule planned and routine maintenance to avoid peak pricing times and receive payments through the load response program. While on its face this appears to be an instance of a customer being paid to do something that they would have to do anyway, affecting the timing of routine maintenance could in fact be within the range of load response options that are useful to encourage. The point of increasing demand elasticity is to ensure that customers consider the time of the electrical usage and incorporate the cost of such usage into their overall decision-making.