

Chapter 1 - NYISO PRL Program Overview

Introduction

The New York Independent System Operator (NYISO) has implemented programs to induce retail customers to adjust their consumption according to prevailing wholesale market conditions. Accordingly, these price-responsive load (PRL) programs have been designed to integrate, to the extent possible, load management actions by customers into NYISO operations.¹ Customers can participate in any program for which they qualify by registering with the NYISO and curtailing their electricity usage under the program provisions and protocols. Some programs also allow customers to operate behind-the-fence generation, generally referred to as distributed generation (DG), during curtailment events to reduce the net load taken from the system, and thereby mimic a load curtailment.²

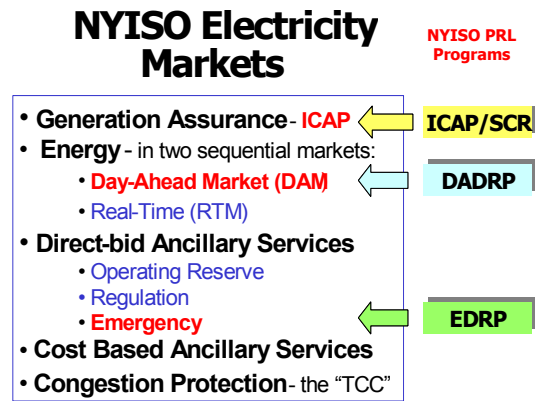


Fig. 1-1 NYISO Electricity Markets

As Fig. 1-2 illustrates, PRL programs are offered for three of the five categories of markets the NYISO oversees. The Installed Capacity Program/Special Case Resources (ICAP/SCR) program utilizes load management capabilities to augment the supply of generation used by the NYISO as standing reserves, which is especially

NYISO PRL Program Features

| | Market Function | Eligible | Event Notice | Payment |
|-------|--------------------|--------------------------------|---------------------------------------|----------------------------------|
| ICAP | Installed Capacity | > 100 kW | Day-ahead advisory, 2 hour notice | S/kW Market value of ICAP |
| EDRP | Emergency Capacity | > 100 kW can aggregate | 2 hour notice | Greater of \$.50/kWh or RTM LBMP |
| DADRP | Economic Energy | 1 MW increments, can aggregate | Bid by 5am, day-ahead, notice by noon | Greater of Bid S/kWh or DAM LBMP |

Fig. 1-2: PRL Program Features

¹ The provisions of the PRL programs are authoritatively described in the program manuals that are available from the NYISO.

² The NYS Department of Environmental Conservation regulates the operation of small, noncommercial electrical generation units, limiting the conditions under which many such units can operate and thereby limiting participation in NYISO PRL programs.

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important in areas of the state that are capacity deficient. The Day-Ahead Demand Response Program (DADRP) allows load curtailment resources to compete against generation in the NYISO's day-ahead auction, which helps ensure competitive bidding behavior. The Emergency Demand Response Program (EDRP) creates a new and unique category of ancillary services that are valuable in maintaining short-term system reliability. The NYISO intends to expand participation of PRL resources to the real-time market and to ancillary service markets. Viewed differently, the existing PRL programs can be classified by the type of physical service they provide to the market. Two PRL programs provide dispatchable capacity to the market, and one provides scheduled energy service. They are described below.

ICAP/SCR and EDRP

The NYISO provides two means by which customers can offer load curtailment capability as a system resource, through its generation assurance market under terms that approximate a call option valued at the market-clearing price of capacity (ICAP/SCR), and as a dispatchable resource that is paid the prevailing market-clearing energy price, subject to a floor price provision, at the time of event (EDRP). The latter can be viewed as an as-available, pay-on-performance arrangement.

Capacity Calls Option - ICAP/SCR

The NYISO requires member Load Serving Entities (LSEs) to secure installed capacity (ICAP) for each six-month capability season equal to about 118% of the load they serve.³ LSEs can acquire their ICAP requirements through bilateral contracts with qualified generators or purchase their needs from the capacity auctions administered by the NYISO. Retail consumers can register their load curtailment capability as an ICAP Special Case Resource (ICAP/SCR) and either sell that capacity to an LSE directly, or offer it for sale through the NYISO capacity auctions. Customers that make such sales are required to curtail consumption equal to their ICAP/SCR obligation when called upon to do so by the NYISO. System operators dispatch ICAP and ICAP/SCR resources when system reserve shortages are forecast, always with at least two hours notice, but only if prior 24-hour advanced notice was given.⁴

³ Capability periods begin May 1 and November 1

⁴ When the NYISO foresees the need to deploy ICAP resources, it notifies load curtailment resources a day ahead thereby creating the opportunity, but not the obligation, for system operators to call an event the next

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Under the 2002 program provisions, ICAP/SCR customers receive the sales value of their capacity and face steep penalties for any failure to comply with curtailment calls, which are substantially the same benefit and penalty provisions under which generators selling ICAP operate. Customers must subscribe at least 100 kW of curtailable load through a Responsible Interface Party (RIP) that, due to the penalty provisions, must meet NYISO credit worthiness requirements.⁵ The NYISO allows RIPs to aggregate curtailable loads to meet this requirement or for their commercial purposes. RIPs must ensure that data is read and submitted to the NYISO after events and when tests are invoked to certify the curtailment capability, which are the same conditions applied to generation ICAP.

Curtailment performance under ICAP/SCR is defined by the difference between the participant's capability period-specific CBL (customer baseline load) and its actual metered usage during the event. If the participant utilizes a DG to meet its obligation, it may meter the output of that unit to establish compliance. The CBL is the average non-coincident measured demand for four months of the previous year corresponding to the capability period.⁶ To avoid a penalty, the participant must curtail at least as much load as it sold as ICAP/SCR for the capability period. Failure to perform results in a derating of the customer's ICAP/SCR capability, which requires that the participant arrange for an alternative, replacement ICAP resource or face deficiency penalties.⁷

As Available, Pay-on-Performance: EDRP

The Emergency Demand Response Program (EDRP) solicits curtailable load that can be dispatched on two-hour notice to meet anticipated reserve shortfalls. Participants register at least 100 kW of curtailable load through a Curtailment Service Provider (CSP).⁸ Smaller customers

day. Because generators that have sold ICAP are required to schedule or bid an equivalent capacity amount into the day-ahead market, the notice provision is not applicable to them.

⁵ Customers can be an LSE themselves by registering as a direct serve customer and thereby act as their own RIP.

⁶ Measured Demand during the months of June, July, August, and September are used for the summer capability season CBL, while the months of December, January, February, and March are used for the winter CBL.

⁷ The NYISO can also impose a test to ascertain the participant's ability to meet the curtailment requirement, although such tests are generally undertaken only when no curtailment events have been nor are likely to be called in a capability period.

⁸ Customers can register to be a direct serve customer or a limited customer, both of which allow the

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can participate through a CSP that is willing to aggregate loads to meet the minimum size requirement. In addition to LSEs (that are CSPs by definition), NYISO allows otherwise unaffiliated entities to register as a CSP solely for the purposes for registering customers with NYISO to participate in EDRP. These latter entities do not have to show credit worthiness because no penalties are assessed for nonperformance, as described further below.

When the NYISO determines that EDRP resources are needed, it issues a call that an event has been declared. The event notice also specifies the start and end time for the event, which includes at least four consecutive hours. After declaring an event, the NYISO may extend the event period by notifying customers thereof, and it may cancel the third and fourth hours of a declared event, again by notifying customers prior to the start of the third hour.⁹

Participants that curtail during an event receive the greater of \$500/MWH or the applicable prevailing locational-based marginal price (LBMP) of energy for curtailed load, as long as the event is of four or more hours in duration. If the NYISO cancels the event after two hours, customers that continue to curtail receive the LBMP for such curtailments in the third and fourth hours. The NYISO LBMP market cap of \$1,000/MWH establishes the maximum EDRP curtailment payment.

Under EDRP, performance is defined as the difference between the participant's hourly CBL (customer baseline load) and its actual metered usage during the event. The CBL for weekdays is defined as the average of the usage, in each event hour, during the five highest usage days out of the last ten days. For weekends, the CBL is the average hourly usage for the two highest usage days out of the previous three corresponding (either Saturday or Sunday) weekend days. In picking the days over which to average, curtailment days are excluded. There is no penalty under EDRP for failure to curtail during an event.

Joint ICAP/SCR and EDRP Subscription

Although the aforementioned demand response programs were designed to serve as a means for participating in different aspects of the NYISO's market, customers were allowed to

customer to act as its own CSP for purposes of EDRP.

⁹ An event cancellation generally results when the system operators, foreseeing a reserve shortfall, calls EDRP early on in the day, and then finds that when the time comes, the resources are not needed. In this case, they would notify customers at the event start time that the event would be cancelled after two hours. This has occurred only once in two years of operation.

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subscribe to both the EDRP and ICAP/SCR programs in 2001 and 2002. This accommodation allowed load curtailments to be paid by both programs when ICAP/SCR event calls were coincident with EDRP curtailments opportunities; ICAP/SCR provided an upfront payment (\$/kW) and EDRP provided an energy payment (\$/kWh), which enhanced both programs' participation benefits.

However, ICAP/SCR obligations were separately measured from EDRP curtailments. To ascertain whether or not an ICAP/SCR participant met its obligation, its event demand was compared to its ICAP/SCR requirement, using the CBL based on the past summer's maximum demand. Then, the EDRP CBL, which measures performance relative to recent average hourly usage, was applied to each event hour to determine the level of EDRP curtailments that were paid at the EDRP energy rate. As a result, a customer could be deemed to not have fulfilled its ICAP/SCR obligation and yet receive EDRP payments, since EDRP has no noncompliance penalty.

PRL Energy Program: DADRP

Retail customers can bid load curtailments into the NYISO's day-ahead market through any LSE that accommodates program participation. DADRP curtailment bids, which are subject to a \$50/MWH floor and a \$1,000/MWH ceiling, include a \$/MWH price and bid conditioning provisions, such as minimum and maximum curtailment levels each hour, and a requirement that curtailments be scheduled over a fixed block of hours. If the bid is scheduled, the participant is considered to have contracted with the NYISO to deliver the curtailment the next day as specified, commensurate with a scheduled generation bid into the day-ahead market. If the bid is not scheduled, then the participant reverts to the provisions of its retail service arrangement.

If the participant curtails the amount scheduled, a payment equal to the day-ahead LBMP times the scheduled amount (and only that amount, there is no credit for over-performance) is paid to the LSE. The LSE receives a credit in the same amount, which eliminates its exposure to differences between the day-ahead and real-time LBMPs.¹⁰ If the participant fails to curtail the

¹⁰ When the participant curtails, the result is that the LSE is put into a long position; it has scheduled generation in excess of what it will serve if it had covered that participant's load either with a bilateral contract or through a price cap load bid accepted in the day-ahead market. That long position would otherwise be closed in the real-time market by a payment to the LSE for the curtailment amount at the real-time LBMP. As a result, the scheduling of a DADRP bid exposes the LSE to the day-ahead/real-time price spread, which can be positive or negative. By crediting the LSE in the DAM with the same amount that the participant receives for the curtailment, the LSE is made whole; it buys the curtailment amount in the DAM

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amount scheduled in any hour of the scheduled event, the LSE is charged with a penalty equal to 110% of the greater of the scheduled day-ahead LBMP or the real-time LBMP. All payments for curtailments and assessments of noncompliance penalties are made by the NYISO to the LSE. The contract between the LSE and the participant determines how the flow of funds impacts the participant.¹¹ The curtailment performance determination and metering requirements are the same as for EDRP.

2002 Program Participation

Appendix 6A contains extensive tables and graphs that summarize PRL participation in 2002 by program, zone, sponsor, and other distinguishing factors. The adjacent table summarizes EDRP and DADRP participation in 2002. A general characterization of the participant population is provided below.

New York: Summer 2002 Experience

| | Participants/ MW | Events | Load Curtailed | Payments |
|-----------------------|---------------------|-------------------------------------|-----------------------------------|--------------|
| EDRP 2002 | 1711 1481 MW | 22 hr Downstate 10 hr Upstate | ~668 MW 34% of CBL (summer) | \$3.3 mil |
| 2001 | 292/712 | 23/17 | 425/38% | \$4.2 |
| DADRP 2002 | 24 | 1486 MWH scheduled | ~14 MW (average) | \$0.1 |
| 2001 | 16 | 2694 | 8 | \$2 |

Fig. 1-3: Summer 2002 PRL Program Summary

As the adjacent figures show (Fig. 1-3 and Fig. 1-4), the demand response programs enjoyed increased participation over 2001,

2002 Renewals

| | | |
|---------------------|--------------------|------------------------|
| DADRP 77% | EDRP 58% | ICAP/SCR 69% |
|---------------------|--------------------|------------------------|

Fig. 1-4: 2002 Renewal Rates

but DADRP continues to be very low, comparatively and nominally.¹² Participation in EDRP increased over five-fold, from just fewer than 300 in 2001 to over 1,600 in 2002.¹³ Renewal rates that range between 58%-77% among the three programs are encouraging,

as it indicates that customer expectations of program benefits are largely being met - an important

at the LBMP and then gets exactly that amount back. This provision makes the LSE neutral, at least with regard to DADRP bidding and to the LSE’s subsequent market price exposure.

¹¹ In this discussion, EDRP refers to both customers enrolled in EDRP and those enrolled in both EDRP and ICAP/SCR.

¹² In this discussion, EDRP refers to customers enrolled in EDRP only and those enrolled in both EDRP and ICAP/SCR.

¹³ Participation count excludes 20,000 residential customers that were subscribed and counted as an aggregation.

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issue from marketers given the cost of acquiring participants. In addition, as customers become more experienced, the amount they curtail should increase and the hourly variance should drop, which improves the reliability, and therefore the value of these resources.

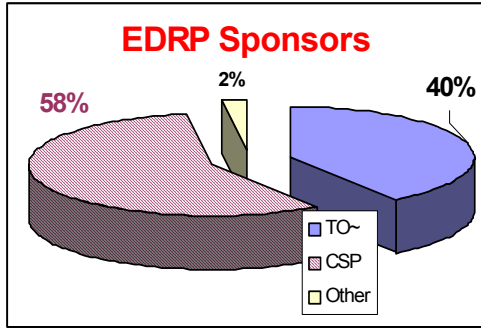


Fig. 1-5: EDRP Enrollment by Provider Type

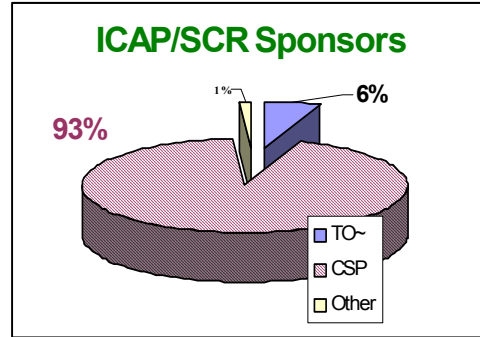


Fig. 1-6: ICAP/SCR Enrollment by Provider Type

Another positive trend is the increase in the number of CSPs marketing EDRP. They increased in number from 12 in 2001 to over 20 in 2002, accounted for 58% of the customers participating in the EDRP and provided 21% of the total MWH load reductions. The average EDRP hourly curtailment of 668 MW over the 10 event hours during the summer of 2002 is 50% higher than the corresponding value for 2001.¹⁴ The EDRP payments were only about 27% higher in 2002, which reflects the lower number of event hours (12 versus 18 event hours state-wide in 2001, plus another 5 hours downstate).

EDRP overall curtailment performance in 2002 was higher than last year, but exhibited greater variability, as the figure shows. The increased level of joint EDRP and ICAP/SCR participation would be expected to reduce the EDRP portfolio variability. As the

EDRP Summer 2002 Performance

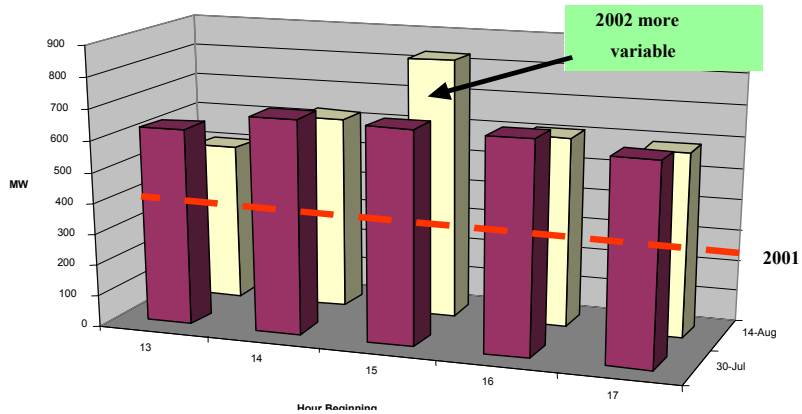


Fig. 1-7: EDRP Performance – Summer 2002

ICAP/SCR non-performance penalty acts as an incentive to achieve and maintain the full

¹⁴ Unless otherwise indicated, the 2002 values are for the two event days of the summer of 2002 that applied to all zones and all registered customers. EDRP was invoked on two April days for a total of 12

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curtailment obligation, so too would the high level of renewals, help those customers with experience improve their performance. However, the smaller size of the new participants, combined with their inexperience, act as a counterforce pulling the average curtailment size down. The average participant load size dropped from just over 4 MW in 2001 to slightly less than 1 MW in 2002.

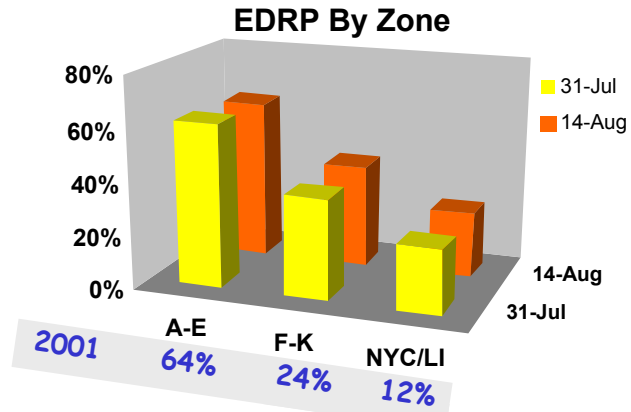


Fig. 1-8: EDRP Zonal Performance

In terms of achieving another important program objective, to increase participation in the downstate zones, the results are encouraging, but more improvement is still needed. EDRP curtailments in New York City and Long Island comprised about 20% of the state total, up from last year’s 12%. EDRP curtailments in zones F-K, which is more constrained than their western counterpart zones, also increased as a percentage state-level curtailment. Still, given concerns about capacity shortage downstate in the next year or two, focusing on increasing participation and performance in those zones seems warranted.

Participants in EDRP are predominantly from the manufacturing and government and institutions sectors, with growing representation from the service sectors. A comparison of the distribution of participants and informed non-participants, as illustrated below, suggest that business activity, a key characteristic used by CSPs to promote and market EDRP cost-effectively, does little to

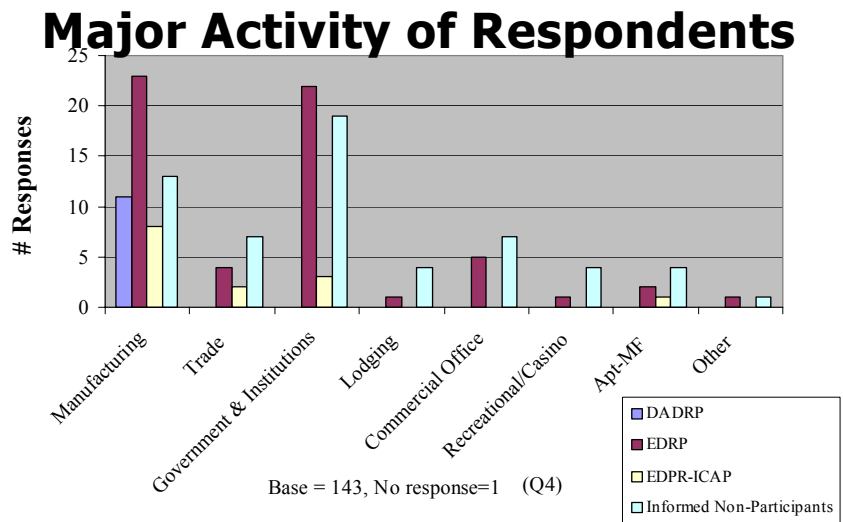


Fig. 1-9: Major Activities of Survey Respondents

hours in the downstate zones only and provided about 70 MW of load relief.

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account for participation. DADRP participants are relatively larger customers involved in primary industries, like chemicals, wood products, and other manufacturing enterprises.

Customers who replied to our survey indicated that impediments to participation varied among customer types. While both commercial (80%) and institutional (55%) customers reported that occupant comfort was a primary impediment to shifting load, commercial enterprises face a loss of business if customers are uncomfortable. Concerns about production schedules were cited by 75% of industrial customers as the primary impediment to shifting load during summer peak days.

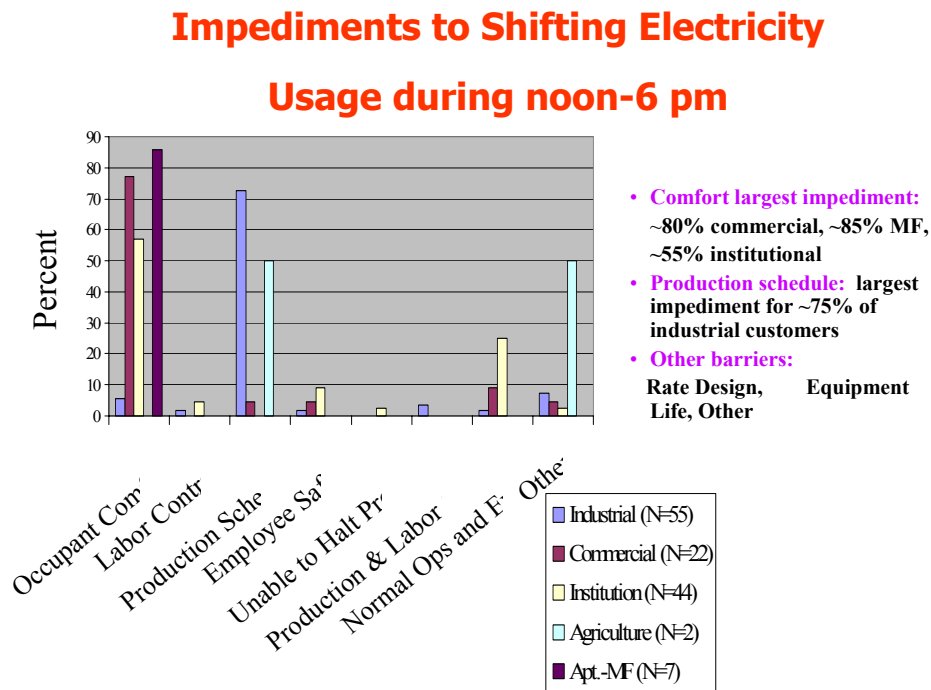


Fig. 1-10: Reported Impediments to Shifting Use

In the chapters that follow, the characteristics of participants and high performers are explored further using a variety of statistical and modeling techniques. The results reveal much about the barriers to participation that will be useful in expanding the current programs as they evolve to keep pace of the NYISO market operations.

Changes in PRL Programs for 2003

Several changes have been proposed, and are under review in the Price Responsive Load Working Group, for the 2003 PRL programs to improve performance and further integrate them into the NYISO’s operations.

Demand Response Programs

In order to better integrate the demand response programs into NYISO operations, ICAP/SCR and EDRP could be sequentially dispatched based on need. System operators would determine if the level of reserves warrant using demand response to alleviate the condition. If so, the obliged ICAP/SCR resources would be called first and then EDRP resources would be dispatched only if they are needed.

The change from coincident to sequential dispatch of ICAP/SCR and EDRP would result in changes in two program provisions and would also impact how LBMPs are set when events are called, as follows:

- Separate ICAP/SCR and EDRP load nominations.

Starting next year, customers would be required to nominate curtailable load to either ICAP/SCR or EDRP. Customers could offer load curtailments in both programs, but they would have to demonstrate that they have sufficient metering to distinguish between loads in ICAP/SCR and EDRP.

- New dispatch protocols

When system operators determine that demand response resources should be dispatched, they would specify the level required on a zonal basis, and then proceed to dispatch the available resources beginning with ICAP/SCR. If the available zonal ICAP/SCR resource is less than what is needed, all available EDRP resources in the zone would be dispatched. If, instead, the ICAP/SCR resources exceed the amount of demand response needed, the system operator would determine which of the available ICAP/SCR resources to dispatch using a strike-price methodology. All ICAP/SCR resources would be arranged according to their strike price, from lowest to highest, and then dispatched starting from the lowest and continuing up the bid curve until the need is met. ICAP/SCR resources with strike prices above that of the last resource dispatched would not be required to curtail and would be deemed in compliance with their ICAP/SCR requirement for that event.

ICAP/SCR resources that reduce load during a declared event would receive the prevailing LBMP, with a bid production cost guarantee. If the market LBMPs are below the customer's strike price, then the customer would be paid an additional amount to make up the difference. EDRP resources would continue to receive the higher of \$500/MWH or prevailing LBMP when they curtail during a declared EDRP event.

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- Impact on Real-Time market LBMPs

Previously, ICAP/SCR and EDRP resources were not directly considered in setting LBMPs during periods when they were dispatched. It is proposed that starting in 2003, the price paid to these resources would be taken into account in setting prices utilizing a hybrid-pricing rule. In short, if the PRL resources that were dispatched displaced an available generation unit, in whole or in part, and as a result the LBMP fell, then the LBMP would be set at the level of the marginal PRL resource. In the case when only ICAP/SCR resources are dispatched, the PRL price that is considered would be that paid to the last, most expensive, resource dispatched. In the case when EDRP is also called, then the EDRP \$500/MWH floor would be used.

PRL Energy Program

In order to promote greater participation in DADRP, two changes to the program have been proposed for 2003. First, the penalty provision for non-compliance may be lowered to fall more in line with the rules generators abide by in the Day-Ahead Market. Currently, customers that fail to curtail the amount scheduled pay 110% of the higher of the scheduled DAM LBMP or the real-time LBMP. Second, the NYISO has agreed to allow CSPs to offer DADRP services to any customer. Previously, only an LSE could sponsor DADRP participation. However, participating CSPs will be required to meet credit worthiness standards that will be established by the NYISO.

Report Overview

Chapter 2 describes the goals of the 2002 PRL program performance review, establishes a set of hypotheses about program performance that serve to direct the data gathering phase and the methods used to analyze this collected data. Chapter 3 describes the design and administration of the customer survey in greater detail. Chapter 4 reports the results of analyses directed at understanding why customers participate by identifying and characterizing barriers to participation. Chapter 5 summarizes how customers responded to curtailment events using a variety of measures of performance. Chapter 6 quantifies the level and flow of benefits arising from curtailments undertaken in the April and summer (July and August) 2002 EDRP events. Chapter 7 reports on a survey conducted with technology and commodity firms to ascertain their interest in becoming involved with offering PRL programs, with a focus on how NYSERDA PON programs can be most useful in attracting them into the market.