Chapter 1 – Report Overview

Background

The potential improvements to electricity market performance from exposing wholesale transactions to retail price responsiveness have been well documented. This is especially true in situations where the possibility for capacity shortfalls, and resulting high prices, is uncomfortably large. A price topology that only periodically exhibits high prices is conducive to programs that direct customers to curtail or shift load under very specific conditions. To ensure that the maximum market benefits are realized, the New York Independent System Operator (NYISO) has, for the past three years, operated 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 distributed generation (DG) during curtailment events to reduce the net load taken from the system, and mimic a load curtailment.[2]

PRL programs are offered in three of the five markets the NYISO oversees. Two of these PRL programs provide capacity that can be dispatched to the market, while the third provides scheduled energy service.

By utilizing load management capabilities to augment the supply of generation used by the NYISO as standing reserves, the **Installed Capacity Program/Special Case Resources (ICAP/SCR)** program (first implemented in 2000) can be critically important in capacity-

[1] The provisions of the PRL programs are authoritatively described in the program manuals 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.

deficient regions of the State. Customers that qualify their load curtailment capability can sell their ICAP/SCR capacity, which generates a stream of payments that the other two PRL programs do not, a feature appealing to many customers in spite of the penalties assessed for non-compliance.[3] The NYISO exercises its demand call on ICAP/SCR during periods of reserve shortfalls.[4] In addition, an ICAP/SCR participant receives an energy payment when they curtail, equal to the higher of the prevailing locational-based marginal price (LBMP) or the strike price it nominated upon enrollment.[5]

The **Emergency Demand Response Program (EDRP)**, implemented initially in 2001, creates a unique category of ancillary services that are valuable in maintaining short-term system reliability.[6] The NYISO notifies participants at least two hours in advance of when curtailments are needed to supplement conventional generation resources. Customers that curtail during the specified periods are paid either the LBMP or $500/MWH, whichever is higher. As the result of a 2003 program change to reflect scarcity pricing, the $500/MW floor price can set the real-time LBMPs during EDRP events.

In part to help ensure competitive bidding behavior, the **Day-Ahead Demand Response Program (DADRP)**, also implemented in 2001, allows load curtailment resources to compete directly against generation in the NYISO's day-ahead auction. Participants submit demand reduction bids that are treated as comparable to supply bids of generators. If scheduled, they receive market prices for load reductions that are scheduled for the next day. By bidding directly with generators, prices in the day-ahead market can be set by scheduled DADRP demand reduction bids. If a participant fails to fully deliver a scheduled demand reduction bid, any shortfall is settled at the higher of the day-ahead or real-time market price. During the first two years of DADRP operation, there was also an additional 10% penalty.

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[3] Customers that sell their ICAP/SCR through the NYISO deficiency auction receive monthly payments.

[4] Customers are no longer able to participate in both ICAP/SCR and EDRP programs, but they could do so in both 2001and 2002, in which case they received PRL benefits only when the NYISO coincidently call for curtailments under both programs.

[5] Participants nominate a strike price from $0-$500/MWH, which are used to dispatch curtailments when the amount of load relief needed is less than the amount enrolled. The strike price can be changed monthly

[6] The NYISO is currently working to expand participation of PRL resources both in the real-time market and in ancillary service markets.

Overview of Program Performance

During the first three years of operation, these PRL programs have met with considerable success. For example, in the first year of EDRP operation (2001), 292 participants supplied over 400 MW of sustained load reduction, over a total of 17 hours on three consecutive summer days, when system reserves were short.

Enrollment in EDRP increased dramatically in 2002, to 1,711 customers (some of whom were enrolled in both EDRP and ICAP/SCR). Moreover, EDRP participants in 2002 subscribed more load for curtailment, 1481 MW, representing a more than three-fold increase from 2001. Approximately 58% of 2001 EDRP participants re-enrolled in the 2002 programs, an indication of high program satisfaction.[7]

In 2002, curtailments under EDRP were called on two consecutive days in April, and one day in each of the months of July and August. In the April events, curtailments were called for only in the downstate pricing zones. EDRP curtailments on those days were modest, about 70 MW on average, due to the early date on which they occurred. Few of the previous summer's participants were prepared to curtail so early in the season, and recruitment for the summer of 2002 had just begun. The July and August events were declared statewide. For these events, average hourly curtailment performance over the 10 curtailment hours was about 668 MW, ranging from an hourly low of 550 MW to a high of over 800 MW. [8]

As a result of the program changes, customers were no longer able to enroll in both EDRP and ICAP/SCR programs in 2003. By summer's end, there were 1,321 customers enrolled in EDRP, somewhat below the high of 1,534 customers that were in EDRP only in 2002.

In 2003, EDRP events were called only for the two days following the blackout of August 14, 2003. Since these EDRP customers were asked to remain off the system during those days, they, along with participants in ICAP/SCR gave NYISO the opportunity to pick up additional non-interruptible load of 800-900 MW at a total payout of between $6 and $8 million.

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[7] See Neenan Associates (2002) for a detailed evaluation of the 2001 programs.

[8] See Neenan Associates and CERTS (2003) for a detailed evaluation of the 2002 programs.

However, according to the system operators, there is no unambiguous way to estimate how much longer restoration would have taken without the EDRP and ICAP/SCR programs.

Over the past three years, participation in the Day-Ahead Demand Response Program (DADRP) has been modest in comparison to the other two programs. In 2001, over a dozen customers subscribed to this adaptation of the real-time pricing principle to wholesale energy markets, providing over 25 MW of load reduction coincident with peak summer prices.[9] Despite an increase in customer enrollment, from 16 to 24 customers, customer-bidding activity in the 2002 DADRP decreased compared to 2001; during the summer of 2002, scheduled bids accounted for only 55% of the MWs scheduled in 2001.[10] In 2003, 27 customers enrolled in DADRP, and the scheduled load reduction during the summer months was about 70% of the 2001 level.

Purpose of the Report

In each of the three years of PRL program operation, the NYISO has undertaken an extensive review and evaluation of both EDRP and DADRP. This report contains the third in that series of yearly evaluations of the performance of the New York Independent System Operator's (NYISO) price responsive load (PRL) programs. We assess the performance of both EDRP and DADRP for the year 2003.[11] The evaluation is based on data collected to populate a project database designed for that purpose.

There are several important aspects to the evaluation of the PRL programs. The effects of PRL program performance on electricity markets are among the most important. These major **market effects** include:

- Estimated changes in electricity prices;

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[9] In conventional retail real-time pricing programs, customers respond to posted market-clearing prices, which do not directly take into account the possible price response. DADRP curtailment bids by end-use customers are offered in advance and fully integrated in the price setting mechanics, thereby insuring that they exercise influence over the level of prices all customers face.

[10] See Neenan Associates (2002) and Neenan Associates and CERTS (2003) for a detailed evaluation of the 2001 and 2002 programs.

[11] See the NYISO December 1, 2003 filing with FERC for a summary of the results presented herein.

- Estimated collateral benefits—redistribution of payments from generators to customers, or vice versa;
- Program payments by NYISO to participants ; and
- Estimated reduction in the risk of an outage.

An additional cost is the payments made by LSEs to ICAP/SCR participants, which is not included in this analysis.[12] Another major component of this year's evaluation is an examination of the implications of changes, introduced in 2003, to PRL provisions and protocols.[13]

In the evaluation of PRL programs, it is also critical to estimate the effects of EDRP load reduction on system security and its value in terms of reducing the expected value of unserved energy. These effects of EDRP have been addressed in previous evaluations. In contrast, since DADRP is designed to improve market efficiency, it is important to know the effect of DADRP load reductions on the size of the deadweight social losses in the day-ahead market.[14]

In 2003, the EDRP and ICAP/SCR programs were called only during the recovery from the August 14th blackout. Also, there was a decision not to attempt to run a "live" real-time market, and instead to set hourly prices in the real-time market at the corresponding day-ahead prices. Because real-time prices were set administratively, there are no 2003 **price effects** to estimate in the real-time market. However, it is critical to estimate the value of these resources to **system reliability**, as the system was re-built after the blackout. This part of the evaluation has required some modifications to the methodology for valuing these resources when system-wide

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[12] Customers that sell ICAP/SCR directly to LSEs do so under bilateral contracts, the terms of which are not publicly available.

[13] These include: a) uncoupling of EDRP and ICAP/SCR programs (after the substantial growth in EDRP enrollment and load subscription during 2002); b) establishment of a bid curve for ICAP/SCR resources and the imposition of a $500/Megawatt-hour (MWh) bid cap; c) imposition of a $50/Mwh bid floor price for DADRP; d) extension of participation in DADRP bidding to demand resource providers, e) removal of the 10% non-compliance penalty for DADRP; and f) impact of scarcity pricing rules, if adopted, during PRL events. Given the post-blackout-only invocation of EDRP in 2003, much of this part of the evaluation must be in terms of examining the potential effects, using information about participation and price response from the two previous years' evaluations.

[14] A complete explanation of the application of welfare theory to these PRL programs is provided in Appendix 3-A.

reserves are short of required levels. Another issue of importance in this regard is the extent to which the value of these resources is location specific.

For purposes of the 2003 evaluation, market effects can only be estimated in the DAM due to the scheduling of DADRP bids, but as suggested above, this year's evaluation is the first to focus also on estimating DADRP's contribution to market efficiency by calculating reductions in social deadweight welfare losses resulting from scheduled DADRP bids. Such an analysis is a critical component in the examination of the long-term efficacy of DADRP. Since this part of the evaluation of DADRP was not conducted previously, we also report similar calculations for 2001 and 2002, to put the discussion of the long-term efficacy of DADRP into a proper 3-year perspective.

To place the DADRP analysis and evaluation in proper perspective, we begin with some descriptive data to characterize the nature of load and LBMPs in the DAM and RTM. The data cover several major zones or groups of zones for which separate hourly prices are determined. These data are compared with similar data for 2001 and 2002, to see if there are any major differences from previous years in the general level and variability in prices and demand. These observations help determine how best to re-calibrate the electricity supply models needed to estimate the market effects of DADRP.[15] We estimate these supply models for the spring and summer months of 2003. [16]

We go on to characterize the changes in LBMP due to changes in load served in percentage terms by using the price flexibility of supply: the percentage change in price due to a one percent change in load served. We then provide the results of the analysis designed to estimate the value of EDRP resources during and immediately after the system blackout. This

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[15] This re-calibration is designed to exploit ways to improve the methodology by: a) examining planning and operational data that better characterize the impact of dispatched PRL resources on system reliability; b) re-specifying real-time supply models to reflect the impact of new pricing rules invoked when PRL resources are dispatched; and c) re-specifying the day-ahead supply flexibility model to capture contemporaneous market supply conditions. In an effort to test formally for any systematic changes in the NY electricity markets, we made an attempt to pool the data for the past three summers and estimate price flexibilities for each of the past three years, see Appendix 2-C.

[16] A complete explanation of the application of welfare theory to these PRL programs is provided in Appendix 3-A.

discussion is followed by the evaluation of DADRP, including the extended social welfare implications. In keeping with our attempt to identify any emerging trends in the markets or the performance of these PRL programs, we make every attempt to compare the finding in this year's evaluation with those of the past two years.