CONCEPT OF OPERATION (COO)

Real Time Demand Reduction Program (RTDRP)

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1 INTRODUCTION

There is a desire by Loads to be able to participate in the NYISO real-time energy and ancillary service markets. The current NYISO tariff envisions the capability for loads to provide reserves in the real-time markets although Northeast Power Coordinating Council (NPCC) rules continue to impose some restrictions on this capability with respect to the market for spinning reserves. New York State Reliability Council (NYSRC) rules also currently restrict loads from supplying reserves. These rules will need to be modified in thee near future. With the exception of pumped storage generation, no loads are currently participating in the NYISO's reserve markets.

The new Real Time Scheduling (RTS) system developed as part of the move to Standard Market Design (SMD) 2.0 has been designed to support bidding, scheduling and dispatch of qualified loads using the same scheduling and dispatch functionality as is used for generation. Loads participating in real-time load reduction bidding must be able to respond to dispatch instructions from the NYISO and will be required to have adequate telemetry such that the ISO operators can monitor their output in a normal 5-minute dispatch or during a reserve activation to ensure compliance with the NERC Disturbance Control Standards (DCS).

In order for this capability to be fully functional it is necessary to define the specific requirements for how a load's telemetered consumption and subsequent reduction will be translated into a quantity of supply to be used by the Energy Management System (EMS).

As NYISO proceeds with the development and implementation of the new ~~Real Time Scheduling (~~RTS~~)~~ system that will displace the current Balancing Market Evaluation (BME) and Security Constrained Dispatch (SCD) software programs, it is necessary to define the terms under which demand side resources (DR) will participate in the real-time markets. The NYISO already has in place a Day-Ahead Demand Response Program (DADRP) that allows DR to participate in the NYISO Day-Ahead markets on terms comparable to generators. DR may submit startup cost bids, minimum run times, and incremental energy bids that essentially provide the same flexibility offered to supply resources. The intent of the evolving RTS system is to allow DR similar flexibility in the Real-Time markets for reserves as a number of entities have expressed interest in participating in these markets.

2 DISCUSSION

2.1 Background

The following describes the characteristic proposed for load reduction bidding.

Markets:

- Energy
- 10 and/or 30 minute reserve
- ICAP Special Case Resources (SCRs)

Modeling:

- Modeled as a generator
- Modeling would be similar to what is currently done for DADRP providers in SCUC

Bidding:

- Capable of bidding into the real-time markets on an equivalent basis to a generator
- Must provide an energy bid (including startup cost and min run times)~~in addition to 10-min and/or 30-min reserve bids which are established based on response rates~~ (under SMD 2.0 separate ancillary service bids are no longer provided for).
- Must bid as on-dispatch
- Real-time load reduction bidders are eligible to participate in EDRP or SCR, but the same capacity cannot participate in both programs during the same time periods~~hours~~.

Communications and Metering:

- Must provide real-time metering and communications with the ISO via the TO on an equivalent basis to other sources of supply.
- The design would permit aggregation of loads behind a meter point, however the specific rules pertaining to the communication between the loads to be aggregated and the aggregated signal sent to the ISO, is a separate effort to be addressed by the working group.
- The net output that is calculated from the real-time load reduction would be calculated as the difference between a baseline load just prior to activation and actual load after dispatch.
- The baseline would be established from real time metered values with a smoothing function that can be tuned to account for the variability of different types of loads. A complete description of how this will work is provided in Section 3.4.

Payments:

- The load would collect an Availability Payment equal to the applicable ancillary service market clearing price in each interval that it was scheduled to provide reserves.
- Like a generator, the load could potentially set the clearing price for energy and reserves when scheduled.
- When the reserve is dispatched the load is no longer charged for the energy it is not consuming. There is no LBMP-based energy payment to loads selected to provide reserves

Metering:

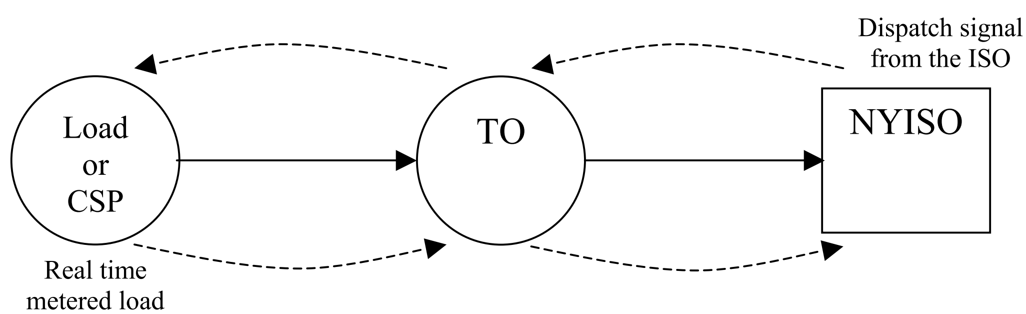
The load would provide real-time metering via the TO to the NYISO EMS. The metered value, as a generation quantity would be ignored until RTD gave the unit a schedule. When RTD dispatches the load or converts the reserve to energy, then the EMS/SCADA would take the last 6-sec calculated baseline value (smoothed as necessary and determined in advance) and use this as the baseline going forward for the supply calculation. The response would be measured as the actual load after activation compared to the baseline load just prior to activation. When the unit was scheduled off again, then the EMS/SCADA would revert to ignoring the loads MW quantity again.

Normal Mode:

1. If $RTD_{sch} = 0$ then SCADA ignores.
2. Gen MW output passed to the EMS = 0

When Reserve is activated:

1. If $RTD_{sch} > 0$ then SCADA stores the last baseline value.
2. Gen MW output passed to the EMS = SCADA Baseline Value – Current Actual Metered Load



2.2 Business Need

Potential Benefits:

- Increased participation by loads in NYISO markets is a key NYISO objective.
- Increase participation by loads in real-time is consistent with the direction identified in FERC's proposed Standard Market Design.
- This capability could make additional resources available to the system to meet load and reserve requirements.

2.3 System Impact

- SCADA/EMS development will need to handle the transformation of the telemetered load's response into a MW output.
- Billing code revisions will need to address energy payment exception for dispatched loads as well as revised calculations for BPCG payments, assuming no energy payment.
- Loads participating in real-time load reduction bidding will need to coordinate with their TO/Meter Service Provider (MSP) and the ISO to establish the required metering.
- ~~Language in the NYSRC rules will need to be updated to reflect the inclusion of dispatchable loads as potential reserve suppliers.~~

3 DESCRIPTION

DR resources will have the opportunity to participate in the real-time energy and reserve markets as dispatchable resources capable of receiving and following 5-minute basepoints from RTD. The following discussion assumes that DR participation will be limited to dispatchable loads participating in the NYISO reserve markets.

~~In the case of DR resources that are directly interfacing with the ISO, it is assumed that the resource will employ substantially identical metering and communications infrastructure as a generator visible to the ISO would use. For smaller DR resources it is not likely to be economically feasible for the resource to install the required metering or perform the necessary bidding functions. For these resources, it is anticipated that Curtailment Service Providers (CSPs) will aggregate these resources for dispatch in a manner comparable with the larger DR resources~~. ~~A CSP may employ alternate methods for communicating with their loads for metering purposes, however the CSP will be required to interface with the ISO in either the supported ICCP protocol or with the Hathaway Plant Data Interface (PDI) capability developed as part of the Direct Generator Communications (DGC) project.~~

It is assumed for this discussion that the rules and requirements for DR participation in ancillary services markets are substantially similar to those applicable to generators, including performance criteria and incentives that are designed to discourage non-performance. While the RTS design will not preclude DR participation in the regulation market, such functionality will not be enabled in the initial deployment of RTS.

For the purposes of loads participating in the real-time market under RTS, no distinction is made between loads that actually curtail and loads that have the capability to modify their apparent load on the system through self-supply by on-site generation.

3.1 Modeling

DR resources will be modeled as a generator in the RTS similar to the current DADRP, and consider~~will facilitate the use of~~ minimum run times and startup costs. The NYISO will evaluate the costs of these demand reduction bids concurrently with supply bids and select the combination that minimizes total bid production cost. These DR resources are then scheduled or dispatched against a forecast load that has the load reduction added back in. By putting the load back into the forecast, the software can continue to select and dispatch down the DR resources if it is economic to do so.

3.2 Dispatchable Demand Response Resources

Dispatchable DR resources will be chosen automatically from among all available suppliers of 10-minute non-synchronous and 30-minute non-synchronous reserve and, like all other suppliers, will not provide an explicit MW amount for reserves or an availability price. When selected to supply non-synchronous reserve, the amount will be determined automatically from the capabilities of the resource as indicated through the MW response rate per minute provided in their bid. Bids for dispatchable DR resources are submitted hourly and all parameters of their bid are locked for the hour once the real-time market closes prior to the start of each hour.

Note that NPCC rules do not permit loads to provide spinning reserves at this time, however RTS would accommodate their participation in these services should the rules change in the future.

3.3 Communication and Metering Requirements

~~Generally, metering should be consistent with or the same as those required for generation with real-time metering information coming back to the ISO. As such, metered MW values will be required on all DR resources, either as a direct customer or as a composite generator (DRU) from a CSP. All DR Resources will be required to have interval billing metering.~~ DR resources participating in the real-time market must meet the telemetering requirements of their local TO and will have the option to communicate directly with the ISO through the capabilities under development for the direct generator communications project.

A dispatchable DR resource must make provision to receive command and control information from the ISO in order to be a provider of these services (Reference Services Tariff, Section 5.8) and requires real-time metering to the ISO via the supported ICCP protocol or with the Plant Data Interface (PDI) capabilities developed for the direct generator communications project.

CSPs may have multiple aggregated Demand Response Units (DRUs) metered through their "control room". Where a DRU is made up of an aggregation of smaller curtailable loads and/or distributed generators, the CSP may propose metering and communication methods to be used between the CSP and the aggregated loads. The NYISO will establish generic standards to ensure that the communications meet its needs for parameters such as, but not limited to, reliability, scan rate and accuracy. The CSP responsible for a DRU would then be responsible for applying these pre-approved protocols and communicating the aggregated combination to the NYISO in the appropriate time frame and format.

3.4 "Smoothing" of Meter Data for Determination of Performance Baseline

3.4.1 Determining Baseline Consumption

Baseline performance refers to the load consumption immediately prior to a reserve pickup event. For some loads, consumption may be a relatively constant value. For varying loads such as arc furnaces, real power consumption will vary continuously and will require some filtering prior to measuring performance.

An exponential smoothing algorithm provides for flexible smoothing using the generic formula:

$$X(t) = k * x(t) + (1-k) * X(t-1) \qquad [1]$$

Where

- X(t) is the smoothed value of baseline load at time t
- x(t) is the instantaneous metered baseline load at time t
- X(t-1) is the smoothed value of baseline load at time t-1, (i.e., the previous 6-second reading)
- k is a smoothing constant between 0 and 1

For relatively non-varying loads, a value of k close to 1 can be used, resulting in the smoothed and instantaneous values being essentially the same. For loads with wide real power variations over a time frame of seconds to minutes, a value of k close to 0 is used. The effect is that of a low-pass filter with a variable cutoff frequency, lower values of k corresponding to lower cutoff frequencies.

The exponential smoothing function can be related to an N-point moving average by recognizing that (1-k)/k = N/2. It is anticipated that a range of k values will be set up and assigned to loads depending upon their relative variability.

For all demand response participants in the real-time reserves markets, X(t) will be calculated at each 6-second interval. At the point where a reserve pickup event is initiated (See page 2 under "When reserve is activated"), the last calculated value of X(t) will be saved as the baseline consumption value (termed BASELINE in the subsequent discussion).

3.4.2 Calculating Response During a Reserve Pickup Event

During a reserve pickup event, at each 6-second sampling interval, the smoothed value Y(t) of the instantaneous load y(t) will be calculated by:

$$Y(t) = k * y(t) + (1-k) * Y(t-1) \qquad [2]$$

The demand response load reserve performance at time t R(t) is then calculated as:

$$R(t) = BASELINE – Y(t) \qquad [3]$$

4 ~~ISSUES, POSITIONS, AND RESOLUTIONS~~PERFORMANCE INCENTIVES

~~4.1Performance Incentives~~

The decision not to make RTLBMP-based payments to DR resources selected to provide energy and/or reserves has important implications for DR performance during reserve pickups. This is because upon execution of a reserve pickup, the resource is converted to energy and is no longer providing reserves, thus it is not getting a payment during the event itself. Also, there are no explicit penalties for non-performance. Normally, LBMP energy prices and the payments associated with providing energy during a reserve pickup would provide a supplier with the incentive to achieve their directed basepoints as quickly as possible. The same is true of CSPs that are also the LSE for the load participating in DR, since rapid performance will either maximize revenues from the sale of load purchased in the DAM or decrease their real-time purchase obligations if they did not buy day-ahead. However, lacking an energy payment, CSPs have little or no incentive to achieve their basepoints, since it is the DR resource's LSE that will bear the costs of poor performance.

Consistent with the principle adopted in the DADRP program design that LSEs must be held harmless from the acts of third-party CSPs, a transfer payment from CSPs to LSEs equal to the level of non-performance in each interval times the difference between real time LBMP and the CSP's energy bid during that interval is required. This will insulate LSEs from actions over which they have no control, as well as provide third-party CSPs with the incentive to respond fully and quickly to NYISO instructions.

~~[INSERT SPREADSHEET EXAMPLE(S) HERE]~~

5 INTERACTION WITH OTHER DR PROGRAMS

4.25.1 RTDRP Interaction with DADRP

The RTDRP rules allow participation by resources that are also participating in the Day-Ahead Demand Reduction Program, even in instances where the same resource has been selected in the day-ahead market. Only those MW not sold day-ahead may participate in RTDRP and it is necessary to clarify the rules for determining performance in each market.

NYISO proposes that performance in the RTDRP will be assessed first, followed by DADRP performance. Thus in the instance where a 100 MW DADRP participant is selected to provide 20 MW and 10 MW of reserves and its actual load following a reserve pickup is only 80 MW, the resource will be deemed to have fully met its reserve obligation, but to have fallen 10 MW short of its DADRP obligation.

4.35.2 RTDRP Interaction with EDRP and SCR

The same DR MWs (i.e., measured by the same meter) may participate in DADRP, RTDRP, EDRP and SCR. However, the same MW may not participate in RTDRP during the same intervals they have been activated under EDRP or SCR.

Resources that wish to be eligible to receive energy payments during EDRP or SCR activation periods must remove those resources from the real-time market during those periods. Resources selected to provide reserves in the real-time market are expected by NYISO Operations staff to be available in the event of a reserve pickup. Allowing these resources to participate in EDRP or SCR during these same periods would lead system operators to expect the same MW to be available twice.

4.4Since DR resources selected to provide reserves will not be paid for their energy during a reserve pickup, and since such resources would be paid for energy under EDRP or SCR, the preferable solution (and one that avoids double counting) is for the resources to pull out of the RTDRP during those periods when they have been called under EDRP or SCR. The typical scenario that provides a two-hour advance notice of an SCR or EDRP event would provide sufficient time for these resources to modify their bids appropriately.

5.3 DR Participation in Day-Ahead Reserve Markets

The design of the SMD 2.0 market software would be capable of permitting DR to participate in the day-ahead reserve markets similar to the functionality proposed for the real-time market and would incorporate a full two-settlement system for DR providing reserves. However, this functionality would require significant modifications and additions to the MIS and BAS software and will not be part of the initial SMD 2 scope of work.