# *Load Forecasting Manual*

***DRAFT 1 - 2007***

**Version: Draft 3.1.0**
**Revision Date: August xx, 2007**
**Committee Acceptance: August xx, 2007**

This document was prepared by:
*Resource and Load Adequacy*

New York Independent System Operator
3890 Carman Rd
Schenectady, NY 12303
(518) 356-6060
www.nyiso.com

***Disclaimer***
The information contained within this manual, along with the other NYISO manuals, is intended to be used for informational purposes and is subject to change. The NYISO is not responsible for the user's reliance on these publications or for any erroneous or misleading material.

# Table of Contents

# Revision History

| Revision | Date | Changes |
|---|---|---|
| | | |
| **3.1** | **8/x/07** | Add definitions of Actual Load & Adjusted Actual Load; transfer CRPP info to the new CRPP Manual; reference the NERC Mods that are satisfied by following the procedures in manual. |
| **3.0** | **8/9/06** | Complete rewrite of manual |
| **2.0** | **5/14/01** | Unavailable |
| | | |
| **1.0** | **9/23/99** | Initial Release |

# 1. OVERVIEW

## 1.1 Purpose and Scope

This manual has two purposes.

The first purpose of this manual is to explain the data reporting requirements, weather-normalization methodology, and load forecasting methodology requirements that are prescribed in the NYISO Services Tariff Sections 5.10 and 5.11 and used in the calculation of the NYCA Unforced Capacity (UCAP) Requirement. The load forecasts used in the calculation of the NYICA Unforced Capacity requirement will be referred to herein as UCAP Load Forecasts.

The second is to explain the load data submission requirements that the NYISO fulfills in its filings to NPCC, NERC, FERC, and other reliability and regulatory bodies.

~~(~~The requirements and procedures related to the load forecast data used in the daily system and market operations are covered in the ***NYISO Manual for Day Ahead Scheduling***.~~)~~

# 2. DATA, WEATHER-NORMALIZATION, AND LOAD FORECASTING METHODOLOGY SUBMISSION REQUIREMENTS FOR THE NYCA UNFORCED CAPACITY LOAD FORECAST

This section describes:

1. Key Definitions
2. Notification procedures to be followed by the NYISO
3. Data submission requirements for TOs and Municipal Electric Systems (MES)
4. The procedures the NYISO follows for
    - Evaluating the TO and MES submitted actual and weather-normalized loads at the time of the NYCA peak (and locality peaks)
    - Calculating NYCA Weather-Normalized Load + Losses (WNL+L) at the NYCA peak hour for the current capability year
    - Evaluating TO and MES Regional Load Growth Factors (RLGFs)
    - Calculating the NYCA UCAP Peak Forecast and each TO and MES load at the time of the forecasted NYCA peak

## 2.1 Key Definitions

### NYCA Peak Load

The NYCA Peak Load is the highest actual hourly integrated load in the NYCA during the period from May 1 to August 31, inclusive. (See NYISO Tariff 5.11.1)

### Adjusted Actual Load

Actual load adjusted to reflect: (i) Load relief measures such as voltage reduction and Load Shedding; (ii) Load reductions provided by Demand Side Resources; (iii) normalized design weather conditions; (iv) Station Power delivered that is not being self-supplied pursuant to Section 4.24 of the ISO Services Tariff; (v) adjustments for Special Case Resources and EDRP. (See NYISO Tariff 2.2a)

### Demand Side Resources (DSM)

Resources located in the NYCA that are capable of reducing demand in a responsive, measurable and verifiable manner within time limits, and that are qualified to participate in competitive energy markets and, to the extent that the NYISO's software can support their participation, certain Operating Reserve markets pursuant to the ISO Services Tariff and the ISO Procedures. (See NYISO Tariff 2.39)

### Special Case Resources (SCRs)

Loads capable of being interrupted upon demand, and distributed Generators, rated 100 kW of higher, that are not visible to the ISO's Market Information System and that are subject to special rules, set forth in Section 5.12.11(a) of the ISO Services Tariff and related ISO Procedures, in order to facilitate their participation in the installed Capacity Market as Installed Capacity Suppliers. (See NYISO Tariff 2.172c)

### Emergency Demand Response Program (EDRP)

A program pursuant to which the ISO makes payments to Curtailment Service Providers that voluntarily take effective steps in real time, pursuant to ISO procedures, to reduce NYCA demand in Emergency conditions. (See NYISO Tariff 2.47a)

## 2.2 Notification Procedures to be Followed by the NYISO

Notifications will include:

1. **Capability Year Peak and Date and Hour of Occurrence:** The NYISO will provide information to the TOs and MESs by September 1.

2. **EDRP and SCR Impacts during the NYCA Peak Hour:** The NYSIO will provide information by September 15.

3. **UCAP Load Forecast Schedule:** The NYISO will release a schedule by August 31 of every year that will list the dates of when data submissions and analyses are to be completed.

4. **Evaluation of TO and MES Weather-Normalized Loads:** in November, or as determined by Schedule

5. **Evaluation of TO and MES RLGFs:** in January, or as determined by Schedule

6. **Preliminary UCAP Load Forecast:** in January, or as determined by Schedule

7. **Final UCAP Load Forecast:** in February, or as determined by Schedule.

## 2.3 Data Submission Requirements for TOs and MESs

TOs and MESs shall submit to the NYISO

1. Hourly loads for a quarter-year (first quarter is January – March, etc.) within 90 days of the quarter's end

2. Actual load at the time of the NYCA peak including a statement of whether or not transmission losses are included .

3. The weather-normalized load at the time of the NYCA peak

4. The previous five years' values for 2 and 3.

5. The MW impact of Emergency Operating Procedures (EOPs), EDRP particpants, SCRs, and Demand Side Resources (DSM).

6. For TOs with locational UCAP requirements, the actual and weather-normalized locality peak load

7. Regional Load Growth Factors

**Note:** The due dates for items 2 – 7 will be provided in the Schedule.

## Hourly Loads

TO and MES hourly loads are necessary for verification of the load at the time of the NYCA peak and for other purposes as described in Section 3 of this manual. Data may be submitted in any common electronic format.

### Actual Load at the Time of the NYCA Peak

TOs and MESs will provide their load in MW at the time of the NYCA peak for the current capability year together with a statement explaining whether this load includes transmission losses.

## Weather-Normalized Load at the Time of the NYCA Peak and Supporting Material

TOs and MESs will provide the weather-normalized load corresponding to their actual loads (provided pursuant to 2.2.2. TOs and MESs may calculate their weather-normalized load using their own procedures. However, the design criteria employed by each TO and MES shall be such that it at ensures, at a maximum, a 0.50 probability of occurrence on an annual basis.

The following supporting material will be provided:

1. A written description of the method used to derive the weather-normalized load from the actual load
2. If a statistical model is used, the model, its statistics and the data from which it was derived
3. A description and supporting data for the design conditions used in calculating the weather-normalized load

## Actual and Weather-Normalized Load at the Time of the NYCA Peak for the Five Preceding Years

Data prior to 2003 will not be required. For these years, TO and MES weather-normalized non-coincident peak load data that was previously submitted will be used. This data is used by the NYISO to evaluate RLGFs provided by TOs and MESs. If required, supporting documentation will be made available.

## MW Impact of EOPs Operating at the Time of the NYCA Peak

TOs and MESs shall provide the MW reduction achieved by EOPs, EDRP, SCRs and DSM at the time of the NYCA peak. If none of these measures were in operation at that time, a statement to that fact will be provided instead. Supporting documentation will be made available if required by the NYISO.

### Actual and Weather-Normalized Locality Peaks

TOs and MESs may have locality peaks that occur at a different time than the NYCA peak hour. If that is the case, they shall also provide the data required by Sections 2.2.2 – 2.2.5 for the hour of their locality peak.

### Regional Load Growth Factors (RLGFs)

TOs and MESs will provide the NYISO RLGFs. An RLGF is the ratio of the projected load at the time of the NYCA peak for the next capability year to the weather-normalized load at the time of the NYCA peak in the current capability year.

## 2.4 Procedures for Determining the NYISO UCAP Load Forecast

This section describes procedures the NYISO will follow to produce the UCAP Load Forecast for the next capability year. The following analyses will be performed.

1. Reconciliation of TD loads at NYCA Peak
2. Calculation of TO and MES Load Less Losses (LLL)
3. Evaluation of TO and MES Weather-normalized Load and Losses
4. Allocation of Weather-normalized Losses to TOs and MESs
5. Evaluation of TO and MES Regional Load Growth Factors
6. Forecast of TO/MES loads at time of predicted NYCA Peak

#### 1. Reconciliation of TD load at NYCA Peak

TOs and MESs submit their load at the time of the NYCA peak in accordance with Section 2.2.2 of this manual. NYISO will calculate TD loads by adding TO and appropriate MES loads. These will be compared to TD billing loads from the NYISO Decision Support System (DSS). Adjustments will be made as necessary to account consistently for losses~~, load modifiers~~ and other demand modifications. If the TD loads calculated from the TO and MES data does not match the DSS TD load, NYISO will discuss and try to resolve the difference with the TO and MES. If the unresolved difference is less than 1%, NYISO will accept the TO plus MES calculation. If the unresolved difference exceeds 1%, NYISO will determine the appropriate TD load and submit it for comment to the Load Forecasting Task Force and the ICAP Working Group.

**2. Calculation of TO and MES Load Less Losses (LLL)**

Losses will be obtained from the NYISO DSS for each TD. In cases where TOs reported their load inclusive of losses, the LLL will be calculated by deducting the NYISO DSS losses from the reported load. In cases where the TO reported load does not include losses, no loss deduction is necessary. MES loads are reported net of losses.

**3. Station Load**

Station Load may be deducted by TOs and MESs in calculating LLL. If so, the unit(s) for which the deduction and the amount of the deduction shall be reported to the NYISO.

**4. Evaluation of TO and MES Weather-Nnormalized Load and Losses**

NYISO will produce its own estimate of the weather-normalized load for each TO and MES. These estimates will be produced using models and design criteria the NYISO develops. The NYISO will compare its own estimates with those submitted by the TOs and MESs in according to Section 2.2.3 using two comparisons:

If the adjustments to the actual load calculated by the NYISO and a TO or MES differ by 25% or less, the NYISO will accept the submitted estimate.

**OR**

If the weather-normalized load calculated by the NYISO differs from that calculated by a TO or MES differs by 1% or less, the NYISO will accept the submitted estimate.

If both differences exceed their thresholds, the NYISO and TO will investigate and attempt to reconcile it.

If it is not possible to reconcile the difference, the NYISO will use its own estimate of the weather-normalized load for that TO. The TO may dispute the NYISO's decision to substitute its weather-normalized load for the TO's, pursuant to the Expedited Dispute Resolution Procedures specified in the NYISO Services Tariff Section 5.16.

If a MES does not submit a weather-normalized load, the NYISO will calculate one for it by applying the ratio of the weather-normalized to actual load of the TO in whose TD the MES is located to the MES actual load.

Losses will be weather-normalized for each TO using the same proportion of weather-normalized load to actual load as was determined for it.

**5. Allocation of Weather-Nnormalized Losses to TOs and MESs**

The total of all TO and MES weather-normalized loads will be calculated. This is the NYCA weather-normalized peak load less losses (W/N LLL). The total of all weather-normalized losses will be calculated by adding all TO weather-normalized losses.

Total weather-normalized losses will be allocated to each TO and MES according to the

ratio of its W/N LLL to the NYCA W/N LLL. The result will be the weather-normalized load plus losses (W/N L+L) for each TO and MES.

The sum of all TO and MES W/N L+Ls will be the NYCA weather-normalized peak load for the capability year.

Each TO and MES W/N L+L will be the basis to which its RLGF will be applied to calculate its forecasted load at the time of the NYCA peak in the forecasted capability year.

**6. Evaluation of TO and MES Regional Load Growth Factors**

NYISO will evaluate Capability Year RLGFs by comparing them to the following:

1. Recent Historical Load Growth - RLGFs should be within a range of historical year-to-year growth rates of Actual Adjusted Peak Load (AAPL) experienced in the previous five calendar years.

2. Relationship to Economic Indicators - The NYISO will clearly outline for all market participants the economic parameters it will use in developing these relationships no less than thirty days before date the TOs are required to submit RLGFs.

> a. The ratio of the annual growth in TO/MES load at the time of NYCA peak, reflected in the RLGFs, to annual growth in economic indicators, as provided to the NYISO by its economic forecasting consultant, shall be calculated by the NYISO for each TO.
>
> b. The ratio of each predicted RLGF to the annual growth in economic indicators, as provided to the NYISO by its economic forecasting consultant, shall be calculated by the NYISO.
>
> c. The ratios calculated in 2.a. should be consistent with the ratios calculated in 2.b. The selection of indicators and criteria for deciding consistency between 2.a. and 2.b. are to be determined by the LFTF.

3. Projections performed by NYISO - NYISO will develop independent projections of RLGFs and use them in evaluating those submitted for Section 2.2.7. The NYISO will post on the NYISO website for all market participants the assumptions and methodologies used to develop its projected RLFGs for each Transmission District.

The NYISO will develop a range for each of the three criteria above. If the NYISO determines that a TO/MES forecast is not within the range provided for at least two of the three criteria above, the NYISO and TO/MES will attempt to reconcile and explain the difference. If the difference cannot be reconciled, the NYISO will inform the TO/MES of that fact and that it intends to substitute its RLFG for the submitted one. The TO/ MES may dispute the NYISO's decision to substitute its RLGF, pursuant to the Expedited Dispute Resolution Procedures specified in the NYISO Services Tariff Section 5.16.

If, as a result of the deliberations between the NYISO and TO required under Section

5.16.1, the NYISO decides to accept a TO forecast that does not fall within the range provided for at least two out of three above criteria, any Market Participant may dispute that decision pursuant to the Expedited Dispute Resolution Procedures specified in the ***NYISO Services Tariff Section 5.16***.

The only RLGFs, which may be disputed under the Expedited Dispute Resolution Procedures are those developed by the TO/ MES and the NYISO.

**7. Forecast of TO/ MES Load at ~~time~~ Time of P~~p~~redicted NYCA Peak**

The forecast of each TOs and MES s load at the time of the NYCA peak for the upcoming capability year will be calculated by multiplying the W/N L+L for each, as determined in Section 2.3.4, by the appropriate RLFG, calculated in 2.3.5.

The sum of the TO and MES loads at the time of the NYCA peak will be the NYCA peak forecast for the capability year.

3. NERC MOD SECTION

~~Load forecast data is used by the NYISO in its own analyses of the adequacy and reliability of the NYCA system in the CRPP. To meet these requirements, the NYISO produces ten-year forecasts of sendout and summer and winter peak for the NYCA and each of its eleven zones.~~ As of June 2007, the North American Electric Reliability Council (NERC) requires all firms involved in the generation, transmission, distribution and users of the bulk power system to demonstrate their compliance with certain reliability standards. The standards are part of the NERC Compliance Monitoring and Performance Program (MOD). This Manual fulfills some of these compliance standards, as listed below.

MOD 16.1

The Planning Authority and Regional Reliability Organization shall have documentation identifying the scope and details of the actual and forecast (a) Demand data, (b) Net Energy for Load data, and (c) controllable DSM data to be reported for system modeling and reliability analyses.-

Table 3.1 - NERC Compliance Monitoring and Performance Program Requirements

| Key | Text of Requirement | Re M |
|---|---|---|
| MOD-016-1-R1. | The Planning Authority and Regional Reliability Organization shall have documentation identifying the scope and details of the actual and forecast (a) Demand data, (b) Net Energy for Load data, and (c) controllable DSM data to be reported for system modeling and reliability analyses. | |
| MOD-016-1-R1.1. | The aggregated and dispersed data submittal requirements shall ensure that consistent data is supplied for Reliability Standards TPL-005, TPL-006, MOD-010, MOD-011, MOD-012, MOD-013, MOD-014, MOD-015, MOD-016, MOD-017, MOD-018, MOD-019, MOD-020, and MOD-021. The data submittal requirements shall stipulate that each Load-Serving Entity count its customer Demand once and only once, on an aggregated and dispersed basis, in developing its actual and forecast customer Demand values. | |
| MOD-016-1-R2. | The Regional Reliability Organization shall distribute its documentation required in Requirement 1 and any changes to that documentation, to all Planning Authorities that work within its Region. The Regional Reliability Organization shall make this distribution within 30 calendar days of approval. The Planning Authority shall distribute its documentation required in R1 for reporting customer data and any changes to that documentation, to its Transmission Planners and Load-Serving Entities that work within its Planning Authority Area. The Planning Authority shall make this distribution within 30 calendar days of approval. | |

| | |
|---|---|
| MOD-017-0-R1. | The Load-Serving Entity, Planning Authority and Resource Planner shall each provide the following information annually on an aggregated Regional, subregional, Power Pool, individual system, or Load-Serving Entity basis to NERC, the Regional Reliability Organizations, and any other entities specified by the documentation in Standard MOD-016-0_R 1. |
| MOD-017-0-R1.1. | Integrated hourly demands in megawatts (MW) for the prior year. |
| MOD-017-0-R1.2. | Monthly and annual peak hour actual demands in MW and Net Energy for Load in gigawatthours (GWh) for the prior year. |
| MOD-017-0-R1.3. | Monthly peak hour forecast demands in MW and Net Energy for Load in GWh for the next two years. |
| MOD-017-0-R1.4. | Annual Peak hour forecast demands (summer and winter) in MW and annual Net Energy for load in GWh for at least five years and up to ten years into the future, as requested. |
| MOD-018-0-R1. | The Load-Serving Entity, Planning Authority, Transmission Planner and Resource Planner's report of actual and forecast demand data (reported on either an aggregated or dispersed basis) shall: |
| MOD-018-0-R1.1. | Indicate whether the demand data of nonmember entities within an area or Regional Reliability Organization are included, and (???) |
| MOD-018-0-R1.2. | Address assumptions, methods, and the manner in which uncertainties are treated in the forecasts of aggregated peak demands and Net Energy for Load. |
| MOD-018-0-R1.3. | Items (MOD-018-0_R 1.1) and (MOD-018-0_R 1.2) shall be addressed as described in the reporting procedures developed for Standard MOD-016-0_R 1. |
| MOD-018-0-R2. | The Load-Serving Entity, Planning Authority, Transmission Planner and Resource Planner shall each report data associated with Reliability Standard MOD-018-0_R1 to NERC, the Regional Reliability Organization, Load-Serving Entity, Planning Authority, and Resource Planner on request (within 30 calendar days). |
| MOD-019-0 -R1. | The Load-Serving Entity, Planning Authority, Transmission Planner, and Resource Planner shall each provide annually its forecasts of interruptible demands and Direct Control Load Management (DCLM) data for at least five years and up to ten years into the future, as requested, for summer and winter peak system conditions to NERC, the Regional Reliability Organizations, and other entities (Load-Serving Entities, Planning Authorities, and Resource Planners) as specified by the documentation in Reliability Standard MOD-016-0_R 1. |
| MOD-020-0-R1. | The Load-Serving Entity, Transmission Planner, and Resource Planner shall each make known its amount of interruptible demands and Direct Control Load Management (DCLM) to Transmission Operators, Balancing Authorities, and Reliability Coordinators on request within 30 calendar days. |
| MOD-021-0-R1. | The Load-Serving Entity Transmission Planner and Resource Planner's forecasts shall each clearly document how the Demand and energy effects of DSM programs (such as conservation, time-of-use rates, interruptible Demands, and Direct Control Load Management) are addressed. |

| | | |
|---|---|---|
| MOD-021-0-R2. | The Load-Serving Entity, Transmission Planner and Resource Planner shall each include information detailing how Demand-Side Management measures are addressed in the forecasts of its Peak Demand and annual Net Energy for Load in the data reporting procedures of Standard MOD-016-0_R 1. | |
| MOD-021-0-R3. | The Load-Serving Entity, Transmission Planner and Resource Planner shall each make documentation on the treatment of its DSM programs available to NERC on request (within 30 calendar days). | |