ISO New England Manual for

Measurement and Verification of On-Peak Demand Resources and Seasonal Peak Demand Resources

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Introduction

About This Manual

The ***ISO New England Manual for Measurement and Verification of On-Peak Demand Resources and Seasonal Peak Demand Resources*** is one of a series of manuals. This manual provides guidance and required criteria for the Measurement and Verification Documents of On-Peak Demand Resources and Seasonal Peak Demand Resources (sometimes collectively referred to as "passive demand resources") participating in the Forward Capacity Market administered by the ISO pursuant to Market Rule 1, Section III.13.

The reader should refer first to Market Rule 1 for an explanation and information regarding that aspect of the operation of the Forward Capacity Market or requirements for complying with the Forward Capacity Market. This manual provides additional implementation or other detail to those provisions in Market Rule 1, which require the Market Participant to take an action.

Section 1: Overview

1.1 Overview

To demonstrate performance of On-Peak and Seasonal Peak Demand Resources, Market Participants shall comply with the measurement and verification standards defined in this manual. The Measurement and Verification Documents submitted by the Project Sponsor during the Forward Capacity Market qualification process are reviewed and approved by the ISO, and are the basis for determining the qualified capacity of On-Peak and Seasonal Peak Demand Resources. As demand-reducing measures are installed, these documents are also used to establish the demand reduction performance achieved by On-Peak and Seasonal Peak Demand Resources, which determines the commercial capacity of the resource and financial settlement in the Forward Capacity Market.

Market Rule 1, Section III.13.1.4 requires that Project Sponsors of On-Peak Demand Resources or Seasonal Peak Demand Resources submit Measurement and Verification Documents. These documents shall be reviewed and are subject to approval by ISO New England. The ***ISO New England Manual for Measurement and Verification of On-Peak Demand Resources and Seasonal Peak Demand Resources*** describes the content of the Measurement and Verification Plan necessary to comply with the requirements established in Market Rule 1, Section III.13.1.4. This manual specifies the required information, details, approaches, methodologies, conditions, calculations, variables, parameters, monitoring, validations, reporting, certifications, responsibilities, and plan format for Measurement and Verification Plans and provides information concerning how certain data must be submitted to the ISO.

On-Peak Demand Resources and Seasonal Peak Demand Resources qualified for participation in the Forward Capacity Market shall consist of demand reduction measures registered as Demand Assets in CAMS. All criteria and requirements for the Asset Registration Process are contained in Market Rule 1 and ***ISO New England Manual for Registration and Performance Auditing, M-RPA***.

Section 2: Project Information

2.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan each of the measures, systems, processes and/or strategies that make up its project.

The Measurement and Verification Plan shall include how each of the measures, systems, processes and/or strategies will be installed and operated to result in additional and verifiable reductions in end-use demand on the electricity network in the New England Control Area.

The expected performance of the project as reported in the project overview of the Measurement and Verification Documents is based on the average demand reduction that the resource is expected to produce during Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours as applicable. If any variables used to estimate the project's expected performance are unknown or assumed, the Project Sponsor shall provide information and an explanation relating to any proxy variables or alternative forecasts. The ISO will review the information and explanations provided and determine whether those documents are applicable for use in the Measurement and Verification Plan.

The project description in all Measurement and Verification Documents associated with the project shall be consistent with the project description in the Project Sponsor's New Capacity Show of Interest Form submission, including the *New Demand Resource Project Description* form found on the ISO website.

2.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan or *New Demand Resource Project Description* form, as applicable, each of the following[1]:

(1) Lead Market Participant;

(2) Project contact name, phone, and e-mail;

(3) Resource name and identifier;

(4) Project name and identifier;

(5) Project Sponsor's Market Participant status;

(6) Demand Capacity Resource type (On-Peak Demand Resource or Seasonal Peak Demand Resource);

(7) Load Zone;

(8) Project location, including the name and address of the retail customer(s) where the project will be implemented for projects including Distributed Generation, Energy Efficiency, and/or Load Management implemented at a single facility with an expected performance greater than or equal to 5 MW;

(9) Program name, describing overall program or operation of On-Peak Demand Resources and Seasonal Peak Demand Resources (e.g., residential lighting);

(10) Measures, end uses, systems, processes, or strategies that will be implemented;

(11) Types of facilities in which the measures, systems, processes, or strategies will be implemented;

(12) Customer classes and end-uses served;

(13) Types of measures that will be implemented: Energy Efficiency, Load Management, or Distributed Generation;

(14) Directly metered or stipulated/sampled measures;

(15) Weather sensitive measures;

(16) Estimated demand reduction (MW) per measure and/or per customer facility (measured at the Retail Delivery Point), including supporting documentation (e.g., engineering estimates or documentation of verified savings from comparable projects) to substantiate

[1] Some of the required information is submitted through the Forward Capacity Market Tracking System (FCTS) interface. As a result, some of the information is inherently identified by the registered user inputting the information (such as Project Sponsor and by default their Market Participant status).

the reasonableness of the expected capacity that the Project Sponsor intends to qualify to participate in the Forward Capacity Market;

(17) Expected demand reduction value of the project during Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours (as applicable);

(18) The date by which the Project Sponsor expects to reach commercial operation;

(19) Status under the ISO generation interconnection procedures, if applicable;

(20) A description of the typical qualifications and experience of the Project Sponsor's project team members and subcontractors that will be directly involved in measurement and verification activities.

For projects where one or more of the requirements identified in items (8) thru (13) listed above are not explicitly known at the time the Project Sponsor submits its Measurement and Verification Plan to the ISO for review and approval, the Project Sponsor shall provide best approximations of proposed activity with respect to programs, measures, customer classes served, and location. The manner in which project development efforts will be pursued shall be consistent with the approach identified in the Project Sponsor's submitted *New Demand Resource Project Description* form, *Customer Acquisition Plan*, Measurement and Verification Plan, and funding plan submitted to the ISO as part of the project's qualification process.

The Project Sponsor shall provide to the ISO information that demonstrates the products, services, systems, processes, and measures actually installed or affected are functionally equivalent to those identified in its Measurement and Verification Plan and Critical Path Schedule.

2.3 Additional Requirements for Certain Distributed Generation

For projects greater than 5 MW at a single Retail Delivery Point involving the use of Distributed Generation, the Project Sponsor shall include, in the *New Demand Resource Project Description* form, submitted during the New Capacity Show of Interest Submission Window, and in the Measurement and Verification Documents, submitted by the New Capacity Qualification Deadline, the following information:

(1) The aggregate nameplate capacity of the Distributed Generation; and

(2) The most recent annual non-coincident peak demand (absent Distributed Generation output) of the end-use customer. In the case where Distributed Generation measures are to be installed at a new facility, engineering estimates of the non-coincident peak demand will be submitted.

Section 3: Project General Assumptions

3.1 Overview

The Measurement and Verification Plan must specify the method(s) used to determine the demand reduction performance achieved by the resource during the Capacity Commitment Period. The Project Sponsor shall specify in its Measurement and Verification Plan any variables that affect the project's electrical energy usage (such as outside temperature, time of day, process changes, occupancy, etc.) that will be measured or monitored and used in the determination of the project's performance.

For resources consisting of Energy Efficiency, the Market Participant shall report the average monthly demand reduction performance during Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours (as applicable) upon approval of the Demand Asset registration. For resources consisting of Distributed Generation or Load Management, the Market Participant shall report the hourly output or hourly load reduction during all hours, upon approval of the Demand Asset registration.

3.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan all substantive assumptions for the project's performance, including but not limited to, baseline energy usage, post measure installation energy usage, process changes, and Measure Life. The Project Sponsor shall explain the basis for all such assumptions.

Section 4: Equipment, Measures, and Practices

4.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan a description of the equipment, measures, and/or practices to be implemented for the On-Peak Demand Resource or Seasonal Peak Demand Resource.

4.2 Requirements

The Project Sponsor shall provide in its Measurement and Verification Documents specifications of the equipment or types of equipment for projects being installed and/or modified. The equipment, measure, and practice specifications may include, but are not limited to: engineering analyses utilized to specify equipment, program design measures and/or practices, or applications of equipment, measure, and practices relative to end use or processes in the facility.

For projects involving changes to business practices or strategies, the Project Sponsor shall specify the practice or strategy that will affect the facility's energy usage relative to baseline conditions.

Section 5: Measurement and Verification Approach

5.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan which of the approved methodologies or combination of methodologies identified in Section 5.2 of this manual are proposed for use in determining the project's performance values.

If the Project Sponsor elects a methodology other than those listed in this manual, the Project Sponsor shall include in its Measurement and Verification Plan an acceptable justification for the methodology or combination of methodologies proposed for its project. Project Sponsors shall provide references not limited to: engineering practices in the measurement and verification literature, reference reports, local, state, or federal manuals or code to demonstrate that its proposed measurement and verification approach is appropriate and will produce accurate and reliable performance values. The ISO shall determine whether the proposed alternative methodology is consistent with Market Rule 1 and is acceptable for use in the Measurement and Verification Plan.

5.2 Acceptable Measurement and Verification Methodologies

This manual contains the minimum standards required for measurement and verification methodologies for On-Peak Demand Resources and Seasonal Peak Demand Resources. While projects consisting of Energy Efficiency may use any appropriate measurement and verification methodology outlined in this section:

(1) Projects that include the use of Distributed Generation shall follow Option B and directly measure the electrical demand (MW) output of the Distributed Generation.

(2) Projects that include Load Management measures shall follow Option B or Option C.

(3) For projects consisting of Distributed Generation or Load Management, performance must be measured during all hours.

(4) If statistical sampling is used to determine any variables, factors, parameters, engineering factors, or load shapes used in the calculation of performance values for On-Peak Demand Resources or Seasonal Peak Demand Resources, the statistical sampling must satisfy the requirements described in Section 7 of this manual.

5.2.1 Option A: Partially Measured Retrofit Isolation/Stipulated Measurement

Option A may involve: an equipment specific retrofit or replacement, new installation, or a system level Measurement and Verification assessment. Option A is intended for Energy Efficiency where either performance factors (such as lighting wattage) or operational factors (such as operating hours) can be measured on a spot or short-term basis during baseline establishment and post-installation periods, or for measures for which a measured proxy variable, in combination with well-established algorithms and/or stipulated factors, can provide an accurate estimate of the On-Peak Demand Resource's or Seasonal Peak Demand Resource's expected performance.

Option A methodology consists of the following:

(1) The factors, parameters, and/or variables not measured can be stipulated based on assumptions, analysis of historical data, or manufacturer's data. If a stipulated factor is subject to change over the Measure Life, the Project Sponsor shall specify how the changes will be factored into the calculation of the performance value.

(2) Option A involves measuring a variable other than electrical demand (MW) and using that variable in the calculation of the On-Peak Demand Resource's or Seasonal Peak Demand Resource's performance (MW). Measurements can include short-term or long-term end-use metering of a variable such as current (amperage) and voltage to calculate demand, equipment operating status (on/off), equipment operating times, equipment quantities (i.e., number of units installed, cubic feet of insulation installed) or facilities served where the performance value per facility is constant.

(3) Option A requires that a correlation be established between the metered/monitored proxy variable and electrical demand (MW). The Project Sponsor may establish the correlation by conducting short-term monitoring or a series of spot measurements of both stipulated parameters, and correlating the data sets (e.g., by performing a regression analysis) to determine the functional relationship between the two parameters.

(4) Engineering correlations may also be specified using documented engineering algorithms or as part of an engineering simulation.

(5) Equipment manufacturer's data, equipment data compiled by a recognized industry group or equipment data compiled as part of a state-sponsored demand side management program (i.e., lighting fixture wattage tables) may be used in combination with the other measurements, variables or factors as identified above to calculate the On-Peak Demand Resource's or Seasonal Peak Demand Resource's performance. Data from a manufacturer shall be determined in a manner consistent with standards established by a recognized United States government agency or nationally recognized industrial manufacturing association.

5.2.2 Option B: Retrofit Isolation/Metered Equipment

Option B involves a retrofit or system-level measurement and verification assessment. The approach is intended for retrofits with performance factors and operational factors that can be measured at the component or system level using interval electrical demand meters, as defined in Section 10 of this manual, installed on the affected end-use equipment. Any alternative methodology must comply with the requirements in Market Rule 1.

Option B methodology consists of the following:

(1) Spot or short-term electrical demand measurements can only be used when variations in operations are not expected to change over the Measure Life.

(2) Electrical demand measurements shall be made during all hours where performance reporting is required to determine performance across the Measure Life of the project.

(3) This method may be applied when the electrical loads to be impacted by the project are small relative to the building load, a facility does not currently have whole-premise interval metering, or if end-use electrical demand data can be readily obtained from a building energy management or control system.

(4) The Project Sponsor shall take into consideration any interactive effects that may alter electrical loads on other end-use equipment being monitored.

5.2.3 Option C: Whole Facility/Regression

Option C estimates On-Peak Demand Resource and Seasonal Peak Demand Resource performance by analyzing the overall energy use in a facility and identifying the impact of the implemented measure on the total building or facility energy use patterns. The evaluation of

whole-building or facility level metered data is completed using techniques ranging from simple billing comparison to multivariate regression analysis.

Option C methodology consists of the following:

(1) The performance of On-Peak Demand Resources or Seasonal Peak Demand Resources is measured using whole-premise interval meters.

(2) Option C is most applicable to measures whose impact on energy usage cannot be measured directly, such as insulation or other building envelope measures.

(3) Option C may not be useful in situations where the performance value is expected to be small relative to the total facility load, due to the small "signal-to-noise ratio."

5.2.4 Option D: Calibrated Simulation

Option D involves calibrated computer simulation models of component or whole building energy usage to determine measure energy savings. Engineering simulation models (such as DOE-2) can model both residential buildings (homes, apartments, and condominiums) as well as more complex commercial buildings. Operational simulations can be used for industrial processes that take into account the specifics of the process addressed by the energy efficiency actions. Both engineering and operational simulations are made more powerful by calibrating these methods to actual MW and MWh data from the site or process being examined. Short-term metering and monitoring are methods that produce data that can be used to adjust engineering simulations. This approach is generally termed "calibrated engineering simulations." Linking simulation inputs to baseline and post-installation conditions completes the calibration. Characterizing baseline and post-installation conditions may involve metering performance and operating factors both before and after the retrofit. Long-term whole-building energy use data may be used to calibrate the simulations.

(1) Project Sponsors using Option D for existing buildings, systems, processes, or equipment shall calibrate the simulation model to actual MW or MWh data from the buildings, systems, processes, or equipment being modeled.

5.3 Alternative Measurement and Verification Methodologies

The Project Sponsors may propose alternative methodologies not listed in Section 5.2 of this manual. Project Sponsors proposing alternative methodologies shall demonstrate that the alternative methodologies will be equivalent to one of the accepted methodologies described in Section 5.2 of this manual, conform to Market Rule 1, and demonstrate justifiable need for deviation from the acceptable methodologies described in Section 5.2 of this manual based on unique project requirements. Alternative measurement and verification methodologies are subject to approval by the ISO.

Section 6: Establishing Baseline Conditions

6.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan the methodology used to determine baseline conditions for the measures comprising its project. Baseline conditions are defined as the load (MW) that would have existed, but for the implementation of a demand reduction measure that affected such measure's load.

The Project Sponsor shall identify in its Measurement and Verification Plan any and all equipment, systems, practices or strategies, or type of the aforementioned, whose alteration from its baseline condition operation will lead to reduced demand.

6.2 Requirements for Baseline Conditions

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with each of the applicable requirements listed below.

(1) For projects where the demand reduction results from measures involving variable load equipment or equipment whose operation is time-dependent or weather-dependent, the baseline conditions shall be calculated for each hour performance reporting is required.

(2) For projects where the demand reduction is actively controlled by the Project Sponsor, facility personnel, or an energy management system, results from measures involving variable load equipment or equipment whose operation is time-dependent or weather-dependent and baseline conditions are calculated based on historical hourly load or output data, the Project Sponsor shall demonstrate that the variance in the historical hourly load or output data used in the calculations of baseline conditions comply with the statistical reliability criteria set forth in Section 7.2 of this manual.

(3) For Load Management projects where the demand reduction is actively controlled by the Project Sponsor, facility personnel or an energy management system, or is produced during specific intervals by removing operating equipment from service, reducing electrical usage of operating equipment, or shifting load between periods, the Project Sponsor must establish baseline conditions for all hours by estimating the load that would have existed but for the implementation of the Load Management measure.

(4) For Energy Efficiency projects in which failed equipment is replaced by a more efficient equivalent or by an alternative strategy for delivering comparable equipment operation or process function or output, the baseline values shall be the level of efficiency required by applicable state code or federal energy efficiency standard, or standard practice if there is no applicable state code or federal energy efficiency standard. If applicable, the Project Sponsor shall identify the method by which the baseline condition may be adjusted over the Measure Life. If standard practice is used as the basis for the baseline condition, it shall be documented in the Measurement and Verification Plan.

(5) For Energy Efficiency projects in which operating equipment is replaced with a more efficient equivalent unit, the baseline condition is the MW load of that operating equipment across the Demand Resource On-Peak Hours, or expected Demand Resource Seasonal Peak Hours. In the absence of a measured baseline, the baseline values shall be level of efficiency required by applicable state code or federal energy efficiency standard or standard practice if there is no applicable state code or federal energy efficiency standard. If applicable, the Project Sponsor shall identify the method by which the baseline condition may be adjusted over the Measure Life. If standard practice is used as the basis for the baseline condition, it shall be documented in the Measurement and Verification Plan.

(6) For On-Peak Demand Resources or Seasonal Peak Demand Resources, Project Sponsors shall indicate compliance with baseline methodologies as well as specify the baseline methodology consistent with North American Energy Standards Board (NAESB)

Business Practices for Measurement and Verification of Wholesale Electricity Demand Response:

(a) Baseline Type-I: A baseline performance evaluation methodology based on historical interval meter data, which may also include other variables such as weather and calendar data.

(b) Baseline Type-II: A baseline performance evaluation methodology that uses statistical sampling to estimate the electricity usage of the end-use customer facilities that are part of the On-Peak or Seasonal Peak Demand Resource where interval metering is not available on the entire population.

(c) Metering Generator Output: A performance evaluation methodology, used when a generating unit is located behind the Retail Delivery Point, in which the proposed Demand Asset's performance is based, in whole or in part on the output of the Distributed Generation. Distributed Generation is required to be directly metered and provide hourly output for all hours.

6.3 Additional Requirements Involving New Construction or Major Renovations

For new construction or major renovation projects, the baseline conditions shall be equal to the load during Demand Resource On-Peak Hours, Demand Resource Seasonal Peak Hours and/or all hours as applicable for equipment meeting the level of efficiency required by:

(1) Applicable state code or federal energy efficiency standard, or

(2) Standard practices, provided the Project Sponsor can document the standard practices in the Measurement and Verification Plan, if there are no applicable state codes or federal energy efficiency standards, or

(3) Standard practices that are less stringent than applicable state code or federal energy efficiency standards, provided the Project Sponsor can document the less stringent standard practices by providing a study, report or analysis conducted in a manner consistent with the requirements of this manual, or

(4) Standard practices that are more stringent than applicable state code or federal energy efficiency standards, provided the Project Sponsor can document the more stringent standard practices in the Measurement and Verification Plan.

Section 7: Statistical Significance

7.1 Overview

The Project Sponsor shall demonstrate in its Measurement and Verification Plan that statistical sampling will meet or exceed the statistical precision and accuracy requirements as identified in Market Rule 1 and in this Section. The Measurement and Verification Plan shall include a description of the methods used to mitigate and adjust for the potential types of bias resulting from statistical methods. Where monitoring is specified over the measure life, the Measurement and Verification Plan shall demonstrate how accuracy and precision will be maintained over the Measure Life.

Statistical sampling cannot be used for Distributed Generation projects.

7.1.1 Requirements

(1) All Project Sponsors shall include a description of methods used to achieve precision and accuracy requirements applicable to the measurement and verification approach.

(2) If the measurement and verification methodology includes the use of measurement and verification reference documents including but not limited to, engineering estimates, load profiles, Measure Life, and coincidence factors, the Project Sponsor shall provide justification for use in the measurement and verification methodology.

(3) If the measurement and verification methodology includes calculations based on engineering-based direct measurements, measurement of proxy variables, or simulations, the Project Sponsor shall include methods to control relevant types of bias including, but not limited to: (a) accuracy and calibration of the measurement tools described elsewhere in this manual; (b) measurement error; (c) engineering model bias; (d) modeler bias; (e) deemed parameter bias; (f) meter bias; (g) sensor placement bias; and (h) sample selection bias or non-random selection of equipment and/or circuits to monitor.

(4) If the measurement and verification methodology includes calculations using regression or statistical analyses, the Project Sponsor shall include methods to control relevant types of bias including, but not limited to: (a) model misspecification; (b) statistical validity; (c) error in measuring variables; (d) autocorrelation; (e) heteroscedasticity; (f) collinearity; (g) outlier data points; and (h) missing data.

(5) If the measurement and verification methodology includes any form of population sampling, survey or interview data, the Project Sponsor shall include methods to control relevant types of bias including, but not limited to: (a) construct validity; (b) sampling frame versus population; (c) selection bias (for a sample and for a census attempt where not all sites within the census received usable data); (d) non-response bias; (e) error in measuring variables; (f) sample homogeneity relative to project (external validity); (g) outlier data points; and (h) missing data.

(6) All requirements in Section 7 of this manual shall be included in the Measurement and Verification Plan and included in a sampling plan attached to the Measurement and Verification Plan as part of the supporting Measurement and Verification Documents.

7.2 Statistical Sampling

Sampling the total population of demand reduction measures is permitted, provided the population estimates derived from sampling achieve 10% relative precision with no less than an 80% confidence interval. Additional statistical sampling requirements as it relates to precision and accuracy are described below.

7.2.1 General Requirements

If sampling will be conducted, the Project Sponsor shall include each of the following general sampling conditions:

(1) A description of the population to be sampled,

(2) The required sample size in accordance with this manual,

(3) The estimated sample size, plus contingencies for sampling bias, as described in Section 7.2.2 of this manual,

(4) All assumptions and calculations for determining the sample size, and

(5) The method for selecting sample points.

7.2.2 Sample Size Requirements

If population sampling will be conducted, the Project Sponsor shall satisfy each of the requirements listed below for determining the sample size:

(1) Where one or more samples are used, the required sample size(s) shall be based upon achieving 10% relative precision with an 80% confidence level. If an On-Peak Demand Resource or Seasonal Peak Demand Resource project consists of multiple facilities or measures and the Project Sponsor uses multiple sample sets to estimate the aggregated On-Peak Demand Resource's or Seasonal Peak Demand Resource's performance, the estimate shall have the minimum precision and accuracy requirement applied to (1) each sample or combination of samples used, (2) the combination of all samples, or (3) stratified samples as described in Section 7.2.2(2) of this manual.

(2) If the On-Peak Demand Resource's or Seasonal Peak Demand Resource's performance value is estimated from a sample drawn from two or more strata, the overall sample size shall be based upon achieving 10% relative precision with an 80% confidence interval. Strata shall be defined as any subset of the project's population that is based on operational constants, variables and characteristics. The concept of strata includes, but is not limited to: measures, practices, equipment, programs in a state sponsored demand side management portfolio or subsets of an entire population of affected equipment at a facility having similar operating characteristics.

(3) All sampling calculations shall incorporate methods to compensate for potential data loss through:

(a) Over sampling

(b) Sample site replacement in the course of the study,

(c) Demonstration that precision and confidence targets will still be met with a smaller sample size.

(4) The Project Sponsor shall identify methods for controlling bias in sample selection including, but not limited to random sampling, use of a census or rolling census for each sample, and delineation of any strata used.

(5) The coefficient of variation (c.v.) used to derive the required sample size shall be the measured c.v. for the primary measurement including all its error components.

(6) The Project Sponsor shall identify methods for controlling bias attributed to the c.v. as it relates to sample size determination.

(7) If a c.v. from a prior Measurement and Verification Plan or supporting document approved by ISO New England is not available for the primary measurement applicable to the segments of sites, installed measures, and/or strategy, the Project Sponsor shall use a default value for the initial c.v., not less than 0.5 for homogeneous samples (samples from populations that are uniform with respect to operational constants, variables and characteristics) and 1.0 for heterogeneous samples (samples from populations that are variable with respect to operational constants, variables and characteristics), until such time that a c.v. can be estimated from the project sample population.

(8) If a method such as stratified ratio estimation is used to take advantage of supporting information for the population, the c.v. may be adjusted to take account of the added efficiency of the stratification and estimation methodology and must still meet the requirements in Section 7.2.2.

7.2.3 Sample Size Calculation Requirements

The formulas below shall be used for the calculation of required sample size and precision. Alternative sample size determination may be used provided they meet the minimum requirements set forth in Section 7.2.2 of this manual and are documented in the Measurement and Verification Plan.

(1) The Project Sponsor shall calculate the sample number to achieve a precision of 10% using the following equation, utilizing a *t* value of 1.282, which corresponds to a two tailed 80% confidence interval of an infinite population, where

n’ = number of samples in an infinite population

c.v. = coefficient of variation as set by a default value or where it is known, and

r.p. = precision

$$n' = \left\{ \frac{1.282 \times c.v.}{r.p.} \right\}^2$$

(2) The sample size (n) for the finite population (N) less than 200 shall be calculated using the following equation, where

n' = number of samples in an infinite population

$$n = \frac{n'}{1 + \frac{n'}{N}}$$

7.3 Sample Size Recalibration Based on Monitoring Data

In the absence of a reliable c.v. the Project Sponsor may use a default c.v. as described in Section 7.2.2. However, once performance data has been collected, the Project Sponsor shall demonstrate that the level of precision and accuracy is met using the sampling methodology by calculating the relative precision with a new c.v. estimate.

7.3.1 Requirements

(1) The Project Sponsor shall calculate and report (as determined by the ISO) the relative precision of sampling studies based on the measured estimate of the sample coefficient of variation calculated using the following equations, where:

$\overline{x}$ = sample mean

s = standard deviation

n' = number of samples in an infinite population

r.p. = precision

$$c.v. = \frac{s}{\overline{x}}$$

$$r.p. = \frac{1.282 \times c.v}{\sqrt{n'}}$$

(2) Where a study design is based on a finite population (*N*) less than 200, the relative precision of the sampling study shall be calculated using the following equation, where:

n = number of samples in a finite population

N = total number of units in the population

r.p = precision

$$r.p. = \sqrt{1 - \frac{n}{N}} \frac{1.282 \times c.v}{\sqrt{n}}$$

(3) If a method such as stratified ratio estimation is used to take advantage of supporting information for the population, the estimated c.v. and achieved relative precision may be

adjusted to take account of the added efficiency of the stratification and estimation methodology.

7.4 Sampling Over Load Zones

If the Project Sponsor conducts sampling for a population of similar Demand Assets spanning multiple Load Zones, the Project Sponsor shall include in its Measurement and Verification Plan the requirements listed below:

7.4.1 Requirements

(1) The Project Sponsor shall demonstrate that the accuracy and precision requirements discussed above apply to the overall population of proposed Demand Assets being studied, rather than to the project or projects within each individual Load Zone.

(2) The Project Sponsor shall demonstrate the method for controlling any bias attributed to sampling across Load Zones.

Section 8: Performance Calculations

8.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan methodologies for calculating the resource's performance in all hours (except for Energy Efficiency projects, which are only required to calculate performance during Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours, as applicable). Such information shall be provided in supporting Measurement and Verification Documents. The description shall include, but not be limited to the following factors used in the performance value calculations:

(1) Equations and formulas

(2) Assumptions

(3) Manufacturers equipment specifications

(4) Direct measurement data

(5) Indirect measurement data

(6) Engineering factors, parameters, and other variables

If one or more of the factors listed above are not known or not available at the time the Project Sponsor submits its Measurement and Verification Plan to the ISO, the Project Sponsor shall specify when the unknown or unavailable factors will be known and available. Further, the Project Sponsor shall indicate if the absence of known factors would at any time during the performance hours in a Capacity Commitment Period, cause the statistical precision and accuracy of the performance value to fall below the minimum requirement established in Market Rule 1 and Section 7 of this manual.

8.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the following requirements:

(1) The reported monthly performance shall achieve at least a 10% relative precision at an 80% confidence level.

(2) If baseline conditions are used in the calculation of the Demand Asset's performance, the Project Sponsor shall make adjustments to the baseline conditions to reflect actual operating conditions during Demand Resource On-Peak Hours, Demand Resource Seasonal Peak Hours and/or all hours as applicable.

(3) Formulas used by the Project Sponsor to determine performance shall include any modifying factors, including, but not limited to, coincidence with applicable performance hours, realization rate, Measure Life, and equipment failure rate.

(4) If a project consists of multiple sites and/or measures, the Project Sponsor may calculate the aggregated performance during the applicable performance hours for each asset as the sum of all measured performance, provided that each measured performance achieves at least a 10% relative precision at an 80% confidence level, or the aggregated performance achieves at least a 10% relative precision at an 80% confidence level.

(5) If sampling will be conducted, the project's aggregated performance in each Load Zone shall be calculated from the measured data of the sample, consistent with the methodologies indicated in the sampling plan.

Section 9: Monitoring Parameters and Variables

9.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with requirements relative to the variables that will be measured, monitored, counted, recorded, collected, and maintained to determine the project's performance during Demand Resource On-Peak Hours, Demand Resource Seasonal Peak Hours and/or all hours as applicable.

The Project Sponsor shall specify in its Measurement and Verification Plan if alternative variables other than kW, MW, kWh, or MWh will be measured, monitored, recorded, collected, and maintained.

9.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with each of the requirements listed below. When equipment manufacturer, model, serial number and age are not readily available, the Project Sponsor must specify alternative means of acquiring or estimating the required information.

(1) For projects affecting **HVAC systems,** the Project Sponsor shall, at a minimum, collect and maintain the following information:

(a) On HVAC equipment: equipment capacity, quantity, manufacturer, model and serial numbers, and age.

(b) On HVAC system controls: location of zones, temperature set-points, control set-points and schedules, and any special control features such as occupancy based controls, as available.

(2) For projects affecting **building envelope,** the Project Sponsor shall, at a minimum, collect, maintain and report on all key variables affecting savings associated with the measures.

(3) For projects affecting **interior or exterior lighting systems,** the Project Sponsor shall, at a minimum, collect and maintain the following information: number and types of lamps and ballasts, with nameplate data.

(4) For projects affecting **major electric consuming equipment,** the Project Sponsor shall, at a minimum, collect and maintain the following information: equipment capacity, quantity, manufacturer, model and serial numbers and age.

(5) For projects affecting **weather sensitive electrical loads including HVAC**, where temperature, humidity or degree-days will be used in the calculation of performance, the Project Sponsor shall collect and maintain representative site weather data, either measured on-site or obtained for a nearby site, from the National Climatic Data Center. On-site measurement equipment shall satisfy the measurement equipment requirements described in Section 10 of this manual.

(6) For projects that include Distributed Generation, the Project Sponsor shall measure and record the electrical output of each generating unit during all hours, using an interval meter that satisfies the measurement equipment requirements described in Section 10 of this manual. Data for each individual generator is required to be retained by the Project Sponsor for a period of at least two years. Additionally, the Project Sponsor shall report data for each of the assets registered for each project pursuant to the deadlines specified in the ***ISO New England Manual for Market Rule 1 Accounting, Manual M-28***.

For assets consisting of generation behind a single Retail Delivery Point:

(a) The hourly output of the generation shall be adjusted for parasitic loads for all hours; and

(b) For facilities capable of Net Supply and not already providing 5-minute facility metered load data, the hourly end-user metered load at the Retail Delivery Point shall be reported for all hours in the settlement month. The requirement to submit these data may be waived by the ISO if the total nameplate generation capacity behind the Retail Delivery Point is under 5 MW. If this requirement is waived by the ISO, any demand reduction produced shall not be increased by average avoided peak transmission and/or distribution losses.

For assets consisting of generation located behind multiple Retail Delivery Points performance shall be reported as:

(c) The aggregate total of generation output for all hours; and

(d) For assets where one or more facility is capable of Net Supply, the aggregate hourly load of the Retail Delivery Points for all hours. The requirement to submit these data may be waived by the ISO. If this requirement is waived by the ISO, any demand reduction produced shall not be increased by average avoided peak transmission and/or distribution losses.

Section 10: Measurement Equipment Specifications

10.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with requirements for measurement, monitoring and/or data recording device type that will be used to measure, monitor and record data for each parameter and variable indicated in the Project Sponsor's Measurement and Verification Plan pursuant to Section 9 of this manual.

The Project Sponsor may specify in its Measurement and Verification Documents alternatives to the requirements in this section provided the alternatives meet the minimum specifications, function and quality for measurement, monitoring and/or data recording devices that will be installed and operated to measure, monitor and/or record data from each of the parameters and variables indicated in the Project Sponsor's Measurement and Verification Plan pursuant to Section 9 of this manual.

10.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the following requirements:

(1) All solid-state measurement, monitoring, and data recording equipment shall meet or exceed the relevant standards set by the American National Standard Institute ("ANSI") or equivalent standard for the equipment.

(2) Measurement, monitoring and data recording equipment that is directly measuring watt-hour, volt-hour, volt-ampere-hours, reactive volt-ampere-hour, and the associated demand components should conform to ANSI or equivalent standards for the equipment.

(3) Instruments or transducers for the analog or digital measurement of volt, volts-squared, amperes, amperes-squared, phase angle, volt-amperes, watts, and reactive volt-amperes should conform to ANSI or equivalent standards for the equipment.

(4) Data recorders that are recording pulses from measurement and monitoring devices shall utilize a pulse rate within the resolution capabilities of the recorder.

(5) All measurement, monitoring, and data recording equipment installed on electric circuits with significant harmonics shall meet the relevant standards provided by the Institute of Electrical and Electronics Engineers (IEEE).

(6) Any measurement or monitoring equipment that directly measures electrical demand (MW) shall be a true root mean square measurement device with an accuracy of no less than ±2%.

(7) Any measurement or monitoring equipment that directly measures electrical demand from three-phase devices shall be installed such that measurements are taken on all three-phases to account for any phase imbalance or an equivalent method that can measure electrical demand using two phases.

(8) Any measurement or monitoring equipment that directly measures electrical demand on circuits with significant harmonics shall have a digital sampling rate of at least 2.6 kHz as defined in the relevant IEEE standards.

(9) Any measurement or monitoring equipment of proxy variables that do not directly measure electrical demand, including but not limited to voltage, current, temperature, flow rates and operating hours, shall have an accuracy rating such that the overall accuracy of the calculated demand (MW) using the proxy variables is not less than ± 2%.

(10) Any measurement or monitoring equipment of current (amps) and nominal voltage used to calculate electrical demand shall include the power factor of the end-uses in the demand (MW) calculations.

(11) Data recorders shall be synchronized in time, within an accuracy of ± 2 minutes per month, with the National Institute of Standards and Technology ("NIST").

(12) All measurement, monitoring, and data recording equipment shall be calibrated by the Project Sponsor or its independent calibration contractor in such a way to meet or exceed the Federal Energy Management Program ("FEMP") Measurement and Verification Guidelines, applicable American Society of Heating, Refrigeration and Air Conditioning Engineers ("ASHRAE") standards, NIST, or equivalent standard for the equipment.

(13) The Project Sponsor shall ensure that all measurement, monitoring, and data logging equipment shall be maintained in such a way as to meet or exceed industry and manufacturer maintenance standards.

(14) The Project Sponsor shall maintain documentation on all measurement, monitoring, data recording equipment maintenance, and calibration activities. Documentation and records shall be maintained as specified in Section 12 of this manual.

(15) The Project Sponsor shall provide to the ISO, upon request, measurement equipment maintenance, calibration and testing records to demonstrate that the Project Sponsor's measurement equipment is calibrated and maintained in accordance the requirements described in this manual.

(16) Interval metering devices shall collect electricity usage data at a frequency of 15 minutes or less.

(17) The Project Sponsor may propose alternative methods to demonstrate the measurement, monitoring and data recording equipment used in the determination of performance of the On-Peak Demand Resource or Seasonal Peak Demand Resource provided it satisfies the accuracy, calibration and maintenance standards described in this manual subject to ISO approval.

Section 11: Monitoring Frequency and Duration

11.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with requirements for monitoring frequency and duration of each monitoring parameter and variables indicated in the Project Sponsor's Measurement and Verification Plan pursuant to Section 9 of this manual.

11.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the following requirements:

(1) For Demand Assets consisting of Energy Efficiency:

a. The duration and frequency of metering and/or monitoring shall be sufficient to ensure an accurate representation of the amount of electrical demand used during periods in which baseline conditions are measured and during Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours (as appropriate).

b. All measurements shall be taken at typical system conditions within the time periods and frequency that shall demonstrate coincidence with the Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours.

c. If independent parameters, such as, but not limited to, temperature, humidity, or heating degree days, are used in the calculation of performance values, the Measurement and Verification Documents shall specify methods to ensure that the duration and frequency of parameter measurements are sufficient to accurately represent the amount of electrical demand used during periods in which baseline conditions are measured and during Demand Resource On-Peak Hours or Demand Resource Seasonal Peak Hours (as appropriate).

(2) For Demand Assets consisting of Load Management or Distributed Generation:

a. Metering and/or monitoring shall be conducted in all hours and shall be sufficient to ensure an accurate representation of the amount of electrical demand used or generated in all hours for baseline estimation (if applicable) and for performance determination.

(3) The Project Sponsor may propose alternative methods for monitoring frequency and duration for each monitoring parameter and variable indicated in the Project Sponsor's Measurement and Verification Plan pursuant to Section 9 of this manual providing the proposed methodology meets all the minimum requirements specified in Market Rule 1 and Section 11 of this manual.

Section 12: Data Validation, Retention and Management

12.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the requirements for systems, processes and methods for validation, estimation of missing data, and maintenance of all data used in the calculation of performance values. Unless otherwise specified, the Project Sponsor shall retain all data used in the calculation of performance values for a period of at least two years from the time at which that measure ceases to be a component of an On-Peak Demand Resource or Seasonal Peak Demand Resource.

12.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the following requirements:

(1) For On-Peak Demand Resource or Seasonal Peak Demand Resource projects targeting customer facilities with greater than or equal to 10 kW of demand reduction per facility, the Project Sponsor shall maintain the following:

(a) Retail customer's address,

(b) The retail customer's utility distribution company,

(c) Distribution Company account identifier such as account number or meter number,

(d) Measures installed, and

(e) The corresponding monthly demand reduction value until: the end of the Measure Life, the Demand Asset is retired, or until the On-Peak Demand Resource or Seasonal Peak Demand Resource is permanently de-listed or retired from the Forward Capacity Market.

(2) For On-Peak Demand Resource or Seasonal Peak Demand Resource projects targeting customer facilities with less than 10 kW of demand reduction per facility, the Project Sponsor shall have the option of maintaining records as described above for customer facilities with greater than or equal to 10 kW of demand reduction per facility, or maintaining records of aggregated demand reduction and measures installed by Load Zone, and Distribution Company for each resource.

(3) The Project Sponsor shall validate all measured data used in the demand reduction performance calculations. Data that has failed validation may not be used in any demand reduction performance calculation.

(4) For projects involving an individual facility, generating unit, or energy consuming equipment, the Project Sponsor shall conduct the following validation checks on any interval data from an individual facility:

(a) Time Check: The Project Sponsor shall validate that the measurement devices time clock is within ± two minutes of the true time as defined by the National Institute of Standards and Technology.

(b) Sum Check: The Project Sponsor shall validate that the difference between the sum of the values recorded over the intervals and the value recorded by the meter over the same time period is within plus or minus two percent. This check may be done on either usage or pulse data, provided the data scaling is consistent throughout the period.

(c) High/Low Check: The Project Sponsor shall establish minimum and maximum expected values for each Demand Asset, facility, or measure. The minimum and maximum values shall be based on equipment ratings or historical equipment and/or facility usage data. The Project Sponsor shall identify any and all interval data that is greater than the maximum expected value or less than the minimum expected value. Any such interval data shall be deemed to fail validation.

(d) Zero Value Check: The Project Sponsor shall identify any and all interval data with a value equal to zero. The Project Sponsor shall verify whether or not the zero value is the correct value for that interval. If the Project Sponsor determines that the zero value is incorrect, the Project Sponsor shall substitute a corrected or estimated non zero value for the zero value, or shall indicate that the data is incorrect and will be excluded from performance calculations. Under no circumstances shall the Project Sponsor substitute a zero value for missing interval data.

(e) The Project Sponsor shall identify all estimated data used in the demand reduction performance calculations, as well as the methodology used to develop the estimate. Any such estimates must be communicated to the ISO along with the methodology for developing them.

(f) The Project Sponsor shall classify all data that has passed validation and is used in the demand reduction performance calculations as either: (i) actual data, (ii) estimated data or (iii) missing data. The data classification shall be stored along with the data values in the Project Sponsor's data retention and management system described in Section 12.1.

(g) If meter data is found to be inaccurate, the Project Sponsor shall promptly notify the ISO.

Section 13: Performance Reporting

13.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the requirements for monthly data performance reporting.

13.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with the following requirements:

The Project Sponsor shall report (including revisions), for each of its Demand Assets, the performance and meter data or performance applicable to the On-Peak Demand Resource or Seasonal Peak Demand Resource in the Obligation Month as described in ***ISO New England Manual for Market Rule 1 Accounting, M-28***. Additional information that must be reported includes:

(1) The Project Sponsor shall provide to the ISO on a monthly basis, engineering calculations, reference materials, meter readings, and any other data necessary to support the reported performance values for each of its Demand Assets. The ISO may update the reported performance based on its review of the supporting documentation provided with the submittals or through an audit as provided in Market Rule 1 Section III.13.6.1.5.4.

(2) For On-Peak Demand Resources and Seasonal Peak Demand Resources using statistical sampling (per Section 7.2 of this manual), the Project Sponsor shall provide to the ISO, as part of its Annual Certification of Accuracy of Measurement and Verification Documents as specified in Section 14.2 of this manual, a statement that the calculation of the demand reduction performance complies with the minimum statistical significance requirements described in Section 7.2.2 of this manual. The Project Sponsor shall specify any deviations from minimum statistical significance requirements and any and all actions taken to correct deviations.

(3) For On-Peak Demand Resources or Seasonal Peak Demand Resources where performance values are derived using baseline conditions, the Project Sponsor shall provide to the ISO on a monthly basis a description of any and all adjustments made to baseline conditions used in the performance value calculations.

Section 14: Independence and Auditing

14.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan compliance with requirements for measurement and verification processes that will be conducted by independent third-parties. An independent third-party is a party that is not an Affiliate of the Project Sponsor, that has no financial interest in the outcome of the certification, and that is qualified in the measurement and verification of On-Peak Demand Resource or Seasonal Peak Demand Resource measures.

The Project Sponsor shall specify in its Measurement and Verification Plan that the Project Sponsor shall provide an Annual Certification to the ISO that the On-Peak Demand Resource or Seasonal Peak Demand Resource projects continue to perform in accordance with the submitted Measurement and Verification Plan and with the Measurement and Verification Documents reviewed and approved by the ISO for the applicable Capacity Commitment Period.

14.2 Requirements

The Project Sponsor shall indicate in its Measurement and Verification Plan compliance with the following requirements:

(1) The Project Sponsor shall maintain an Annual Certification of Accuracy of Measurement and Verification Documents, with a statement certifying that the projects for which the Project Sponsor is requesting compensation continue to perform in accordance with the submitted Measurement and Verification Documents approved by the ISO. Acceptable methods for satisfying the Annual Certification of Accuracy of Measurement and Verification Documents include, but are not limited to, certification by a state public utility commission with jurisdiction over the project, or an auditor that is not an Affiliate of the Project Sponsor, that has no financial interest in the outcome of the certification, and that is qualified in the measurement and verification of On-Peak Demand Resource or Seasonal Peak Demand Resource measures.

(2) The Project Sponsor shall cooperate in any unannounced audits or tests of On-Peak Demand Resources or Seasonal Peak Demand Resources conducted by the ISO. Audits may be conducted on a periodic basis, or at the ISO's discretion, should the ISO have a reason to suspect a deficiency in the Project Sponsor's compliance with any requirement. Onsite audits will be coordinated with the Project Sponsor and scheduled during normal business hours.

(3) The Project Sponsor shall allow the ISO to audit testing and calibration records and order and witness the testing of metering and measurement equipment installed pursuant to the On-Peak Demand Resource's or Seasonal Peak Demand Resource's approved Measurement and Verification Plan.

(4) The Project Sponsor shall be responsible for all expenses associated with installing, maintaining, calibrating and testing the metering, data recording and retention, and measurement equipment installed pursuant to the On-Peak Demand Resource's or Seasonal Peak Demand Resource's approved Measurement and Verification Plan.

Section 15: Measurement and Verification Supporting Documents

15.1 Overview

The Project Sponsor shall provide a list in its Measurement and Verification Plan of all reports, studies, specifications, and other documents referenced in its Measurement and Verification Plan. Such documents shall be submitted as Measurement and Verification Documents.

15.2 Requirements

The Project Sponsor shall indicate in its Measurement and Verification Plan compliance with the following requirements:

(1) All reports, studies, specifications and other documents referenced in the Project Sponsor's Measurement and Verification Plan shall have been prepared and published within five years of the Measurement and Verification Plan's submission date to the ISO.

(2) The Project Sponsor shall specify in its Measurement and Verification Plan adequate justification for use and relevance of reports, studies, specifications, and other documents referenced in the Project Sponsor's Measurement and Verification Plan published more than five years from the time of the Measurement and Verification Plan's submission. Additional justification for use of out of date documents shall be submitted in addendums to the Measurement and Verification Documents by the New Capacity Qualification deadline or Existing Capacity Qualification deadline for the applicable Forward Capacity Auction for reports, studies, specifications, and other documents referenced in the Project Sponsor's Measurement and Verification Plan that become out of date during after a Capacity Commitment Period and shall be subject to ISO approval.

(3) The Project Sponsor shall provide to the ISO electronic copies (and upon request hardcopies) of any and all reports, studies, specifications and other documents referenced in its Measurement and Verification Plan.

Section 16: Responsible Parties

16.1 Overview

The Project Sponsor shall specify in its Measurement and Verification Plan the parties involved in various aspects of the project.

16.2 Requirements

The Project Sponsor shall specify in its Measurement and Verification Plan the parties involved in various aspects of the project, including but not limited to the names or titles of the parties, professional qualifications, and typical responsibilities in the following areas:

(1) Project management

(2) Measure implementation

(3) Measure operation and maintenance

(4) Measurement equipment calibration and testing

(5) Monthly demand reduction calculations

(6) Data validation, retention and management

(7) Monthly performance reporting

(8) Independent project auditing

(9) Quality assurance

Section 17: Measurement and Verification Plan Format

17.1 Overview

The Project Sponsor shall prepare and submit its Measurement and Verification Documents in a format and manner as specified by the ISO.

17.2 Requirements

The Project Sponsor's Measurement and Verification Plan shall contain all information as specified in sections 2 through section 16 this manual in a format specified by the ISO[2]. In each Section, Project Sponsor shall specify required elements of its proposed plan and indicate compliance with all the applicable requirements specified in this manual.

[2] The Measurement and Verification Plan form for Demand Resources is available on the ISO website. http://www.iso-ne.com.

Section 18: On-Peak and Seasonal Peak Demand Resource Auditing

18.1 Overview

This section of the manual discusses how the ISO will audit On-Peak Demand Resources and Seasonal Peak Demand Resources.

All communication between the ISO and the Market Participants regarding auditing will be through the Lead Market Participant. Market Rule 1, Section III.13.6.1.5 defines the audit types, audit requirements and audit results that are established for On-Peak Demand Resources and Seasonal Peak Demand Resources.

18.2 Initiating an Audit

The Lead Market Participant may request an On-Peak or Seasonal Peak Demand Resource audit at any time, but the requested audit window start date for the audit request will determine the month to be evaluated during the audit.

The ISO shall review and approve or deny any customer requested audits. The ISO shall deny any audit request that does not comply with the provisions of this manual or Market Rule 1.

If approved, the ISO will conduct the audit within 20 Business Days of the requested date. The audit will be conducted following the audit window start date, and in no case will the audit be completed before the initial performance data submittal deadline for the month. The date and time of the audit will be unannounced.

18.2.1 Audit Process

Audits of an On-Peak Demand Resource will be conducted by simultaneously evaluating the Average Hourly Output or Average Hourly Load Reduction of each Demand Asset during the applicable hours for the season.

Audits of a Seasonal Peak Demand Resource will be conducted by evaluating the Average Hourly Output or Average Hourly Load Reduction of each Demand Asset during the Demand Resource Seasonal Peak Hours. If there are no Demand Resource Seasonal Peak Hours in a month during the Passive DR Auditing Period, performance during the applicable Demand Resource On-Peak Hours for the like season in that month may be used.

Performance for measures without interval meters may be based on estimated hourly data or stipulated performance data to establish the Average Hourly Load Reduction. Pursuant to the measurement and verification methodology applicable to the measure type, demand reduction capabilities are established using reported performance data across Demand Resource On-Peak Hours or reported Demand Resource Seasonal Peak Hours.

Revision History

Approval

Approval Date: April 13, 2007 Effective Date: April 13, 2007

Revision History

Revision: 1 -	Approval Date: August 2, 2007
Section No.	Revision Summary
List of Figures and Tables…..	Added "ISO New England Business Procedures" to the Table 1.1 title.
Introduction…	Added "ISO New England Business Procedures" to this section.
Table 1.1……	Added "ISO New England Business Procedures" to the title and adds "Ancillary Service Schedule No. 2 Business Procedure" to the Transmission column.
A2.4(7) & A4.4……	Replaced "90 days following the dispatch day" with "the 101 day Data Reconciliation Process deadline".

Revision: 2 -	Approval Date: May 7, 2010
Section No.	Revision Summary
Entire Manual revised to reflect the Forward Capacity Market as contained in Section III.13 of Market Rule 1.	

Revision: 3 -	Approval Date: May 6, 2011
Section No.	Revision Summary
6.4.1……..	Added a reference to Section 6.4.1.1(4)(a) for the location of the Customer Baseline adjustment description to the first sentence and deleted the second and third sentences.
6.4.1.1(4)(a)(i)..	Added reference to dispatch results from a Demand Response audit, deleted reference to a Real-Time Price Response event being initiated, and clarified that the actual usage would occur before the first Reduction Deadline in the dispatch day.
6.4.1.1(4)(a)(ii).	Clarified that the actual usage would occur before the first Reduction Deadline in the dispatch day.
6.4.1.1(4)(a)(iii)	Deleted the reference to a Real-Time Price Response Asset and clarified that the actual usage would occur for the two hours commencing two and a half hours before the first Reduction Deadline in the dispatch day.
6.4.1.1(4)(a)(iv)	Added a new subsection (iv) describing the Customer Baseline adjustment for a Real-Time Price Response Asset participating in the Day-Ahead Load Response Program or a Real-Time Price Response event occurring in the dispatch day.
6.4.1.1(4)(a)(v).	Previous subsection (iv) becomes the new subsection (v).
6.4.1.1(4)(a)(vi)	Previous subsection (v) becomes the new subsection (vi) and the previous content is replaced with a new sentence detailing the application of the Customer Baseline

	adjustment for the second and subsequent consecutive event days when there are multiple consecutive dispatch days for an asset.

Revision: 4 -	Approval Date: June 1, 2012
Section No.	Revision Summary
1.3…….	Deleted the special provision for Real-Time Demand Response Assets.
2.3(4)……	Added the phrase "at the metering point in accordance with Market Rule 1".
5.1……..	Deleted the first sentence of the second paragraph.
5.2.2……	Replaced Distributed Generation with an explanation of which Assets this section applies to and added references to Market Rule 1 and the ISO New England Manuals. Deleted subsection (5).
5.3……...	Added a required demonstration of conformance with Market Rule 1 and that the alternate methods are subject to approval by the ISO.
5.4.1 & 5.4.2..	Deleted Real-Time Demand Response Event Hours.
5.6……..	Replaced Customer Baseline with Demand Response Baseline and added a reference to Section III.E.2.1 of Market Rule 1. Deleted the language on six acceptable metering configurations.
5.6.1……	Replaced the formula with a reference to Section III.E.2.1 of Market Rule 1.
5.6.2……	Replaced formula with a reference to Section III.E.2.1 for Real-Time DR Assets but retained formula for RTEG Assets metered at the generator. Added a new formula for Real-Time Demand Response Assets consisting of Distributed Generation metered at the generator.
5.6.3……	Revised section heading and replaced Distributed Generation with Real-Time Emergency Generation Asset.
5.6.4……	Revised Section heading and replaced formula with references to Sections III.E.2.1 and III.8 of Market Rule 1.
5.6.5……	Revised drawing and replaced formula with references to Sections III.E.2.1 and III.8 of Market Rule 1.
5.6.6……	Replaced "hour" with "interval".
6.1……..	Deleted references to Real-Time Demand Response Event Hours and RTEG Event Hours. Added a reference to Section III.8 of Market Rule 1 for baselines.
6.2(10)……	Added this new subsection for Real-Time Demand Response Resources, Real-Time Demand Response Assets, and Real-Time Emergency Generation Resources and application of Section III.8 of Market Rule 1 for baselines and Section III.E.2 of Market Rule 1 for metering.
6.4……..	Revised section heading to delete the reference to the Real-Time Price Response Program. Added a reference to Section III.8 of Market Rule 1.
8.1…….....	Deleted Real-Time Demand Response Event Hours and RTEG Event Hours.
9.3.2……	Deleted subsection (1) and revised subsection (2) to eliminate advance notice dispatch.
10.3.1…….	Added references to Market Rule 1 and ISO New England Manuals. Deleted several subparagraphs.
10.3.2…….	Deleted section.

11.2……	Deleted subsection (2). Revised subsection (4) to delete references to Real-Time Demand Response Event Hours and RTEG Event Hours. In subsection (5) added a reference to Market Rule 1.
11.3……	Deleted section.
12.2.4…….	Added in subsection (d) an exclusion from reporting for incorrect data. In subsection (e) added a requirement that estimated data used in the Demand Reduction Value calculations and the methodology used to develop the estimated data are to be communicated to the ISO. In subsection (g) added a requirement to notify the ISO of metering inaccuracies found.
12.3……	Deleted section.
13.2……	Deleted in subsection (1) the last sentence. In subsection (6) added a reference to Section III.13.6.1.5 of Market Rule 1. In subsection (8) added an exclusion for Real-Time Demand Response Resources and Real-Time Emergency Generation Resources. In subsection (9) added a reference to the metering point and a reference to ISO New England Manual M-28.
13.3……	Deleted section.
14.2(5)……	Added a reference to Market Rule 1.
14.3……	Deleted section.

Revision: 5 -	Approval Date: November 8, 2013
Section No.	Revision Summary
2.1, 2.2 & 2.3……..	Updated the project description submission and timing components to be consistent with Section III.13.1.4.2(a) of Market Rule 1.

Revision: 6 -	Approval Date: April 4, 2014
Section No.	Revision Summary
Various Manual Sections ……	Replaced “Demand Reduction Value” with “performance”, “Section III.8” with “Section III.8A”, “Appendix III.E” with “Appendix III.E1”.
8.1……...	Added On-Peak Resource and Seasonal Peak Resource references to this subsection.
9.2(6)(c)…….	Added a new subsection (c).
13.2(1)……	Added a new subsection (1).
13.2(4)……	Deleted previous subsection (4).

Revision: 7 -	Approval Date: October 4, 2018
Section No.	Revision Summary
Various Manual Sections	Revised for implementation of full integration of Price Responsive Demand by making this manual relevant to On-Peak and Seasonal Peak Demand Resources and

Deleting all references to Real-Time Demand Response (RTDR) and Real-Time Emergency Generation (RTEG). Rewrites some areas for clarify and corrects capitalization of defined terms throughout the manual.

Section 1……Specifies in the overview that this manual pertains to On-Peak and Seasonal Peak Demand Resources and gives a summary of the types of requirements the manual covers.

Section 2……Adds summary about the information that will be required in the M&V Plan for documenting expected performance. Removes out of date detail on Load Zone from 2.2.(7), removes obsolete term "Operable Capacity Analysis" and clarifies reference to the Critical Path Schedule. Updates Distributed Generation requirements by specifying forms, mandatory information to submit, and deadlines. Specifies requirements for "projects greater than 5MW at a single Retail Delivery Point, in section 2.3. Specifies that for Distributed Generation measures planned at a new facility, engineering estimates of non-coincident peak load must be submitted.

Section 3……Relocated auditing of On-Peak Demand Resources and Seasonal Peak Demand Resources from M-RPA Section 3 to Section 18.

Section 4…….Changes title to "Equipment, Measures, and Practices".

Section 5…...Rewrites acceptable measurement and verification methodologies for better organization, indicating which methodologies are applicable to which resource type more clearly. Clarifies timing periods for performance measurements throughout the section. Removes sections 5.4 and 5.5 because all applicable requirements are specified in other sections. Section 5.6 was removed because it was only applicable to obsolete resources, RTDR and RTEG.

Section 6…….Modifies 6.2(3) and 6.2(4) to specify appropriate baseline conditions for Load Management. Specifies for Energy Efficiency projects with replacement equipment that baseline values will be based on applicable state and federal standards or documented standard practice. Adds "and/or all hours" as applicable to cover situations where reductions are voluntary or if there is behind-the-meter generation and it is required to be metered during all hours. Corrects terms to either asset or resource level where it previously said "Demand Resource".

Section 7…….Clarifies that Distributed Generation projects are excluded from using statistical sampling. Specifies provisions applicable to On-Peak Demand Resources and Seasonal Peak Demand Resources. Removes "Dispatch Zone" from allowable sampling locations.

Section 8…….Clarifies that M&V performance methodologies shall specify how performance is established for all hours, except Energy Efficiency projects.

Section 9…….Adds "as available" to section 9.2(1). Removes incorrect timing provisions to reiterate that performance will be measured during all hours. Adds detail, "such as occupancy based controls" to section on HVAC system controls. Adds requirement that data be retained for a period of at least two years. Adds reference to M-28 for additional detail on reporting data for accounting purposes. Details reporting requirements for facilities capable of pushing back onto the rid, also known as "net supply".

Section 10…..Removes section 10.3 because it pertained to obsolete resources.

Section 11.....Specifies and updates metering and monitoring as appropriate to each measure type.

Section 12.....Adds, "data" for clarity and specificity to the data retention provision. In 12.2(2) changes "metering domain" to "Distribution Company". Section 13…..Specifies and truncates provisions, removes duplicative references to M-28, removes "work sheets" from 13.2(1) because this is no longer reported now that we use the EEM platform. Section 14……Removes section 14.2(5) because the audit rules have been moved to section 18 of this manual. Removes "Reserved" section 14.3. Section 18……Relocates information from M-RPA Section 3, describing the relevant On-Peak and Seasonal Peak Demand Resource Auditing provisions. References to RTDR, RTEG and their associated provisions have been removed from the original language.