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**Transmission Planning Technical Guide**

**Appendix C:**

**Demand Resources Assumption Guide**

**DRAFT**

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System Planning**

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# Introduction

Beginning June 1, 2018, certain resources, formerly classified as Demand Resources are allowed to participate in the ISO New England markets as energy-only resources. The change results in new terms that will be used to represent energy-only versus capacity resources. In this document the undefined terms demand resource (DR) or passive demand resource (passive DR) will be used generically to mean demand-side resources while the proper terms will be used when more specificity is required.

Through the Forward Capacity Market (FCM), Demand Capacity Resources (DCR) can be procured to provide capacity and have future commitments similar to that of a generator. In order to reflect their impact on the system, these resources need to be modeled appropriately and consistently. This document provides guidelines for the modeling of Demand Capacity Resources in the various analyses conducted.

Additionally, the ISO publishes an Energy Efficiency (EE) 10-year forecast in the annual ISO New England Forecast Report of Capacity, Energy, Loads, and Transmission (CELT). The EE forecast recognizes projected investment in energy efficiency through state-sponsored demand side management, covering the 10-year load forecast horizon. For long-range analysis, the EE forecast is utilized in the study, when appropriate.

# Demand Resources Overview

Demand resources (DR) are installed measures that result in verifiable reductions in end-use consumption of electricity on the New England power system. There are currently three categories of DR in the FCM: On-Peak Demand Resources, Seasonal Peak Demand Resources (On-Peak Demand Resources and Seasonal Peak Demand Resources are together also called passive Demand Capacity Resources or passive DCR) and Active Demand Capacity Resources (ADCR).

## Passive Demand Capacity Resources

Passive DCR can be classified as two different types, On-Peak DR and Seasonal Peak DR. On-Peak DR and Seasonal Peak DR reduce their energy demand (MW) during peak hours and are non-dispatchable.

* are qualified in the FCM based on their
* are qualified in the FCM based on theirreduction

On-Peak DR and Seasonal Peak DR can be composed of three types of measures: Energy Efficiency, Load Management, and Distributed Generation.

* **Energy Efficiency** involves installing more efficient equipment to achieve a continuous and permanent reduction in energy use while delivering a comparable or improved level of end-use service. Such equipment can include the use of more efficient lighting, motors, refrigeration, HVAC equipment and control systems, and industrial process equipment. A significant portion of the On-Peak and Seasonal Peak DR is composed of energy efficiency.
* **Load Management** involves measures, systems, or strategies by end-use customers to curtail their electrical usage during peak hours or shift electrical use to off-peak hours which reduce the amount of capacity needed during peak hours.
* **Distributed Generation** involves behind the meter generation resources that would reduce the amount of energy that would need to be produced by other capacity resources in New England.

It should be noted that distributed generation may qualify as On-Peak DR, Seasonal Peak DR, and ADCR. This is because, as described in Section I.2.2 of the ISO New England Transmission, Markets and Services Tariff (the “Tariff”),

*“Distributed Generation means generation resources directly connected to end-use customer load and located behind the end-use customer’s meter, which reduce the amount of energy that would otherwise have been produced by other capacity resources on the electricity network in the New England Control Area provided that the aggregate nameplate capacity of the generation resource does not exceed 5 MW, or does not exceed the most recent annual non-coincident peak demand of the end-use metered customer at the location where the generation resource is directly connected, whichever is greater. Generation resources cannot participate in the Forward Capacity Market or the Energy Markets as Demand Capacity Resources or Demand Response Resources, unless they meet the definition of Distributed Generation.”*

To further clarify the definition, On-Peak DR and Seasonal Peak DR that is based on DG measures cannot participate in energy markets. Demand Response Resources (DRR) that are based on DG measures may participate in energy markets as DR up to the maximum load at the facility (when the retail delivery point reads zero). Push back of energy from a DRR will be treated as generation for the purpose of energy. However, all the output from the DRR associated with the ADCR, regardless of pushback is treated as capacity.

## Active Demand Capacity Resources

Active Demand Capacity Resources consist of DRR that reduce their load based on ISO dispatch instructions under real-time system conditions. DRR is also dispatchable load reduction with the additional requirement of bidding into the day-ahead energy market and is integrated in the co-optimized dispatch model including acting as 10 and 30 minutes reserves. DRR must be associated with an ADCR in order to be considered as capacity in the FCM. Real-Time Demand Response resources (RTDR) and Real-Time Emergency Generation resources (RTEG) no longer exist and are replaced by ADCR.

## Energy Efficiency Forecast

The EE forecast is published to accompany the traditional 10-year load forecast, typically in early spring of each year. Energy Efficiency is a type of passive DR that could be in the form of either On-Peak DR or Seasonal Peak DR. Since identical availability assumptions are made for the Seasonal Peak DR and On-Peak DR, the same assumption will be made for the EE forecast.

The EE forecast like the load forecast projects out to the 10th year (for example 2027 is the last year in the 2018 CELT forecast). Typically, some long-range transmission planning studies like Transmission Need/Solution Steady State Analyses look out to the 11th year (2028 for the 2018 CELT). In such cases, the load forecast is extrapolated assuming the same percentage of load growth from year 10 to 11 as was the load growth from years 9 to 10. A similar process is used to forecast the EE for year 11, where the percentage EE growth from year 9 to 10 is used to obtain the growth from years 10 to 11. See the equation below for details on how to calculate any future year EE level beyond the end of the CELT forecast.

Where X represents the last year of the CELT forecast and n represents the number of years after the last year of the CELT forecast.

# Demand Resources in System Planning Analyses

System planning conducts various analyses, studies, assessments, and calculations to ensure the continued reliability of the transmission system consisting of New England Pool Transmission Facilities (PTF) on both a short-range and long-range basis. For the purposes of this guideline, a short-range assessment typically looks approximately 3 years or less into the future. A long-range assessment typically looks 3 years into the future and beyond. These analyses are performed at various load levels including but not limited to 90/10 Summer Peak Load, Off-Peak Load, and Minimum Load.

Each supply resource in the FCM obtains a summer, winter, and FCA Qualified Capacity (QC) value. The QC of a resource is the maximum obligation that the resource is allowed to take in the FCM. For each commitment period the resource obtains a Capacity Supply Obligation (CSO). The CSO is the MW of capacity obligation of a supply resource during all or a portion of the specific Capacity Commitment Period (CCP).

## Short-Range Assessment

A short-range assessment looks approximately three years or less into the future and the FCM procures resources three years ahead of time. Hence, there is greater certainty about the resources that are or will be available in this timeframe. Since all the potential study years fall into one of the cleared Capacity Commitment Periods, and most of the passive DR participates in the FCM, there is no need to incorporate any forecasted EE into this analysis. Also, the CSO for both the passive DCR and ADCR will be available to be used for this analysis. However, some of the short-range assessments, like resource adequacy related studies, may be based on Qualified Capacities.

The following list covers most of the different short-range assessments:

* FCM De-list Steady State Analysis (Permanent, Retirement, Static, Dynamic, Export, and Substitution Auction [SA] Demand Bids)
* FCM New Resource Qualification Initial Interconnection Analysis under the Network Capability Interconnection Standard Thermal Analysis
* Overlapping Interconnection Impacts Thermal Analysis (FCM New Resource Qualification Overlapping Interconnection Impacts Analysis, Overlapping Interconnection Impacts Restudy Analysis, and Preliminary Analyses of Overlapping Interconnection Impacts under the Capacity Capability Interconnection Standard)
* Forward Capacity Market Transmission Security Analysis and Capacity Zone Formation
* Installed Capacity Requirement, Maximum Capacity Limit, and Local Resource Adequacy Requirement Calculations
* Tie Reliability Benefit Studies
* North American Electric Reliability Corporation (NERC) / Northeast Power Coordinating Council (NPCC) Short-Term Reliability/Resource Adequacy Assessments
* Regional System Plan (RSP) Related Short-Term Reliability/Resource Adequacy Studies

## Long-Range Assessment

A long-range assessment looks beyond the three-year Forward Capacity Market horizon. These timeframes do not fall into a cleared Capacity Commitment Period and hence the CSO is not available for these study years. Moreover, if there is a need for these resources in these future commitment periods the de-list bids supplied would not be accepted and hence the assumption is made that these resources will be available to their full Qualified Capacity value. Also, the EE forecast will be used for the years which do not fall into a cleared FCM Capacity Commitment Period.

The following list covers most of the different long-range assessments:

* System Impact Study (SIS) Steady State Analysis
* Transmission Needs Assessment / Solutions Study Steady State Analysis and Market Resource Alternative Analysis
* Transfer Limit Steady State Analysis
* Steady State Analysis (Area Review, Bulk Power System Testing, and Interregional Analysis)
* Short Circuit Analysis
* Transient Stability Analysis
* NERC/NPCC Long-Term Reliability/Resource Adequacy Assessments
* RSP Related Resource Adequacy Studies

# System Planning Analyses

The following sections summarize the various types of reliability analyses performed within system planning. Additionally, these sections describe the types of demand resources that will be modeled within each analysis.

System planning analyses will be divided into short-range and long-range analyses to facilitate discussion of the DR assumptions.

## Short-Range Analysis

### FCM De-list Steady State Analysis (Permanent, Retirement, Static, Dynamic, Export, and SA Demand Bids)

#### Analysis Overview

A Permanent De-list Bid (PDL) is a request to permanently remove all or part of a resource from the FCM. An approved PDL does not result in the retirement of any associated (mapped) assets and a generator with an approved PDL will not have its Interconnection Rights terminated.

A Retirement De-list Bid (RDL) is a request to retire a generator or Demand Capacity Resource from the FCM. Once retired as a result of a cleared RDL or the election of unconditional treatment, a generator’s Interconnection Rights (IR) are terminated and any other generating assets that are associated (mapped) to the resource are also retired. For Demand Capacity Resources with a cleared RDL or that elected unconditional treatment, the Demand Capacity Resource will be retired from the FCM but any other associated Demand Response Resources are retired separately and may not be used to support new Qualified Capacity (QC) for the same CCP in which it was retired.

A Static De-list Bid is an option for an Existing Capacity Resource to remove capacity from the Capacity Market at higher prices where the de-list bid is submitted in advance of the auction for a single CCP.

A Dynamic De-list Bid is an option for an Existing Capacity Resource to remove capacity from the Capacity Market at lower prices where the de-list bid is submitted during the auction for a single CCP.

As described in Section III.13 of Market Rule 1, an Export De-list Bid is an option for an Existing Generating Capacity Resource within the New England Control Area other than an Intermittent Power Resource or an Intermittent Settlement Only Resource seeking to export all or part of its capacity during a CCP. An Export De-list Bid (EDL) that is subject to a multiyear contract to sell its capacity outside the New England Control Area will be studied with the DR assumptions used for RDL and PDL Bids.

A substitution auction demand bid is an option for an Existing Capacity Resource to remove capacity from the Capacity Market at lower prices where the demand bid is submitted during the substitution auction (SA), following the Forward Capacity Auction. When submitted for the entire resource, a cleared SA demand bid results in the retirement of the resource and the loss of the generator’s or external elective transmission upgrade’s Interconnection Rights (IR).

#### Typical Load Level(s)

90/10 Summer Peak Load[[1]](#footnote-1), Off-Peak, and Minimum Load

#### DR Represented in Analysis

All analyses will include the impact of passive DCR and ADCR in Peak Load Level analyses, as these resources are intended to be available and utilized under these conditions. The existing Demand Capacity Resources (On-Peak DR, Seasonal Peak DR, and ADCR) will be modeled at their QC level to begin the delist analysis. All resources with accepted de-list bids are modeled at their Qualified Capacity minus the de-listed amount.

Off-Peak and minimum load level testing is performed based on a fixed load level that is representative of historical data. Since the historical data includes the effect of demand resources, DR will not be explicitly modeled for off-peak load level conditions.

This analysis will exclude forecasted EE since the analysis pertains to an upcoming FCA commitment period.

### FCM New Resource Qualification Initial Interconnection Analysis under the Network Capability Interconnection Standard Thermal Analysis

#### Analysis Overview

As described in ISO New England Planning Procedure No. 10 (PP 10), the initial interconnection analysis is performed consistent with criteria and conditions described in ISO New England Planning Procedure No. 5-6 (PP 5-6). For the proposed New Generating Capacity Resource, if the thermal analysis has not been or will not be conducted as part of a Feasibility or System Impact Study under the L/SGIP, the objective of the initial interconnection thermal analysis to identify if any system upgrades are needed to satisfy the thermal and short-circuit performance requirements of ISO New England Planning Procedure No. 3 (PP 3), NPCC Directory #1, and NERC TPL-001 on a regional (i.e. New England Control Area) and sub-regional basis, subject to the conditions analyzed.

#### Typical Load Level(s)

90/10 Summer Peak Load

#### DR Represented in Analysis

The initial interconnection analysis includes the impact of ADCR and passive DCR as these Demand Capacity Resources are intended to be available and utilized under these system conditions. The initial value for the DCR before applying any performance factor is based on the following:

This analysis will exclude forecasted EE since the analysis pertains to an upcoming Forward Capacity Auction commitment period.

### Overlapping Interconnection Impacts Thermal Analysis (FCM New Resource Qualification Overlapping Interconnection Impacts Analysis, Overlapping Interconnection Impacts Restudy Analysis, and Preliminary Analyses of Overlapping Interconnection Impacts under the Capacity Capability Interconnection Standard)

#### Analysis Overview

As described in PP 10, the analysis of overlapping interconnection impacts under FCM is intended to determine if a proposed New Generating Capacity Resource or new Active Demand Capacity Resource provides incremental capacity to the system in a manner that meets the Capacity Capability Interconnection Standard (CCIS) established in the Large/Small Generator Interconnection Procedures (L/SGIP).

#### Typical Load Level(s)

90/10 Summer Peak Load

#### DR Represented in Analysis

The overlapping interconnection impacts analysis includes the impact of ADCR and passive DCR as these Demand Capacity Resources are intended to be available and utilized under these system conditions. The initial value for the DCR before applying any performance factor is based on the following:

This analysis will exclude forecasted EE since the analysis pertains to an upcoming FCA commitment period.

### Forward Capacity Market Transmission Security Analysis and Capacity Zone Formation

#### Analysis Overview

As described in PP 10, “Prior to each FCA, the ISO shall determine the capacity requirement of each import-constrained Load Zone or import-constrained subdivision of a Load Zone, by performing a Transmission Security Analysis (TSA). The TSA will be performed in accordance with Section III.12.2.1.2 of Market Rule 1 and the assumptions described in Section 7.1 and Appendix A of this procedure.” The analysis for capacity zone formation is triggered by the aforementioned TSA analysis and hence the same assumptions will be utilized for the capacity zone formation.

#### Typical Load Level(s)

90/10 Summer Peak Load

#### DR Represented in Analysis

These analyses are performed on a short-range basis and thus include the impact of passive DCR and ADCR as these resources are intended to be available and utilized under these conditions.

These analyses will exclude forecasted EE since the analysis pertains to an upcoming Forward Capacity Auction commitment period and will utilize the Summer Qualified Capacity for the Demand Capacity Resources.

### Installed Capacity Requirement, Local Resource Adequacy Requirement (LRA), Local Sourcing Requirement (LSR), Maximum Capacity Limit (MCL), and Demand Curve Calculations

#### Analysis Overview

The ICR is the amount of resources needed to meet the NPCC Full Member Resource Adequacy Criterion defined for the New England Control Area such that the probability of disconnecting non-interruptible customers (a loss of load expectation [LOLE]) no more than once every ten years (an LOLE of 0.1 days per year). The methodology for calculating the ICR is set forth in Section III.12.1 of Market Rule 1. The ICR is calculated in advance of every FCA and Annual Reconfiguration Auction (ARA).

As described in Section III.12.2 of Market Rule 1, the ISO is required to calculate the capacity requirements for each modeled Capacity Zone associated with an upcoming FCA and ARAs. The LSR shall represent the minimum amount of capacity that must be procured within an import-constrained Capacity Zone and the MCL shall represent the maximum amount of capacity that can be procured in an export-constrained Capacity Zone to meet the ICR.

In addition, Section III.12.1 of Market Rule 1 states that the ISO shall determine, by applying the same modeling assumptions and methodology used in determining the ICR, the capacity requirement values for the applicable Systemwide and Capacity Zone Capacity Demand Curves.

#### Typical Load Level(s)

All Load Levels

#### DR Represented in Calculations

These analyses include the impact of passive DCR and ADCR by modeling the DCR Summer Qualified Capacity as supply-side resources. The impact of DCR is included in the calculations since these resources are qualified as existing capacity resources for the Capacity Commitment Period (CCP) under study. The DCR Summer Qualified Capacity is modeled in MW blocks by Load Zones and by type of DCR with a performance assumption applied.

This analysis excludes forecasted EE since the analysis is within the FCM timeline.

### Tie Reliability Benefit Studies Calculations

#### Analysis Overview

As described in Section III.12.9 of Market Rule 1, the ICR, LRA, MCL, and Demand Curve values shall be calculated assuming appropriate tie benefits, if any, available from interconnections with adjacent Control Areas.

#### Typical Load Level(s)

All Load Levels

#### DR Represented in Calculations

The DCR Qualified Capacity is modeled in MW blocks by the thirteen RSP sub-areas and by type of DCR with a performance assumption applied.

This analysis excludes forecasted EE since the analysis is within the FCM timeline.

### NERC/NPCC Short-Term Reliability/Resource Adequacy Related Assessments

#### Assessments Overview

Annually, NERC and NPCC conduct deterministic and probabilistic reliability/resource adequacy assessments covering the short-term to meet NERC and NPCC compliance reporting requirements. The deterministic assessments would use a single value peak load forecast for the study period of interest while the probabilistic assessments would use a distribution of peak loads for the study period of interest. The data relating to capacity, energy, load and transmission are all based on the latest CELT report.

#### Typical Load Level(s)

Deterministic assessments typically would use the 50/50 Peak Load while the probabilistic assessments would use the full range of the load forecast.

#### DR Represented in Assessments

These NERC/NPCC short-term assessments include the impacts of both passive DCR and ADCR. The DCR could be modeled in aggregate on a systemwide basis or by subarea depending on the nature of the assessment. The amount of these passive DCR and ADCR are based on the amount as listed in the most recent CELT report.

### RSP Related Resource Adequacy Studies

#### Analysis Overview

Resource adequacy related studies use two basic calculation methodologies. One methodology employs probabilistic mathematics reflecting probabilistic input assumptions and the other methodology employs deterministic mathematics reflecting deterministic input assumptions.

#### Typical Load Level(s)

All Load Levels, depending on the study

#### DR Represented in Studies

In ICR and related values calculations, DCR is modeled with the Summer Qualified Capacity ratings and assumed forced outage rate.

## Long-Range Analysis

### System Impact Study Steady State Analysis

#### Analysis Overview

A System Impact Study (SIS) steady state analysis is a rigorous assessment designed to ensure that new generation added to the region’s transmission system or changes to the transmission system itself will not adversely impact its reliability or operating characteristics. This analysis assesses both the thermal and steady state voltage characteristics of the system under normal and postulated contingency conditions against a set of pre-defined performance criteria. Simulation results that fall outside of the performance criteria are then addressed to ensure that system reliability is maintained.

#### Typical Load Level(s)

90/10 Summer Peak Load, Off-Peak Load, and Minimum Load

#### DR Represented in Analysis

An SIS steady state analysis is performed on a long-range basis of the system and thus would include the impact of EE and ADCR in Peak Load Level (90/10) analyses as these demand resources are intended to be available and utilized under these system conditions.

EE is modeled based on the most recent CELT forecast. ADCR are modeled based on the most recently concluded Forward Capacity Auction. The initial value for the ADCR before applying any performance factor is based on the following:

Off-Peak and Minimum Load level testing is performed based on a fixed load level that is representative of historic data. Since the historic data includes the effect of demand resources, they will not be explicitly modeled for the Off-Peak and Minimum Load level conditions. The exception to this is if there is a significant generator known to be considered as a DR which may impact the study results. DR, when it consists of a generator and is explicitly modeled, is to be included and treated consistent with other generators in the study area.

### Transmission Needs Assessments / Solution Studies Steady State Analysis and Market Resource Alternative Analysis

#### Analysis Overview

A transmission Needs Assessment / Solutions Study steady state analysis assesses both the thermal and steady state voltage characteristics of the system under normal and postulated contingency conditions against a set of pre-defined performance criteria. Simulation results that fall outside of the performance criteria are then addressed to ensure that overall system reliability is maintained.

The Market Resource Alternative analysis is based on the results of the transmission Needs Assessment steady state analysis and is aimed at providing possible long-range alternative hybrid solutions to remove the thermal and voltage constraints identified in the transmission Needs Assessment.

#### Typical Load Level(s)

90/10 Summer Peak Load, Off-Peak Load, and Minimum Load

#### DR Represented in Analysis

A transmission Needs Assessment / Solutions Study steady state analysis is performed on a long-range basis of the system and thus would include the impact of EE and ADCR in Peak Load Level (90/10) analyses as these demand resources are intended to be available and utilized under these system conditions.

EE is modeled based on the most recent CELT forecast. ADCR are modeled based on the most recently concluded Forward Capacity Auction. The initial value for the DCR before applying any performance factor is based on the following:

Off-Peak and Minimum Load level testing is performed based on a fixed load level that is representative of historic data. Since the historic data includes the effect of demand resources, they will not be explicitly modeled for the Off-Peak and Minimum Load level conditions. The exception to this is if there is a significant generator known to be considered as a DR which may impact the study results. DR, when it consists of a generator and is explicitly modeled, is to be included and treated consistent with other generators in the study area.

As the Market Resource Alternative analysis is based on the transmission Needs Assessment steady state analysis, the DR representation is the identical to its representation in the transmission Needs Assessment.

### Transfer Limit Steady State Analysis

#### Analysis Overview

A transfer limit steady state analysis assesses both the thermal and steady state voltage characteristics of the system under normal and postulated contingency conditions against a set of pre-defined performance criteria. This analysis is performed to establish transmission interface limits which prevent thermal overloads or cascading thermal overloads or cascading voltage collapse from occurring on the system. Simulation results that fall outside of the performance criteria are then utilized to establish limits to ensure that overall system reliability is maintained.

#### Typical Load Level(s)

90/10 Summer Peak Load and Off-Peak Load

#### DR Represented in Analysis

A transfer limit steady state analysis is performed on a long-range basis of the system and thus would include the impact of EE and ADCR in Peak Load Level (90/10) analyses as these demand resources are intended to be available and utilized under these system conditions.

EE is modeled based on the most recent CELT forecast. ADCR are modeled based on the most recently concluded Forward Capacity Auction. The initial value for the DCR before applying any performance factor is based on the following:

Off-Peak and Minimum Load level testing is performed based on a fixed load level that is representative of historic data. Since the historic data includes the effect of demand resources, they will not be explicitly modeled for the Off-Peak and Minimum Load level conditions. The exception to this is if there is a significant generator known to be considered as a DR which may impact the study results. DR, when it consists of a generator and is explicitly modeled, is to be included and treated consistent with other generators in the study area.

### Steady State Analysis (Area Review, Bulk Power System Testing, and Interregional Analysis)

#### Analysis Overview

A steady state analysis assesses both the thermal and steady state voltage characteristics of the system under normal and postulated contingency conditions against a set of pre-defined performance criteria. Simulation results that fall outside of the performance criteria are then addressed to ensure that overall system reliability is maintained.

#### Typical Load Level(s)

90/10 Peak Load and Off-Peak Load

#### DR Represented in Analysis

A steady state analysis is performed on a long-range basis of the system and thus would include the impact of EE and ADCR in Peak Load Level (90/10) analyses, as these demand resources are intended to be available and utilized under these system conditions.

EE is modeled based on the most recent CELT forecast. ADCR are modeled based on the most recently concluded Forward Capacity Auction. The initial value for the DCR before applying any performance factor is based on the following:

Off-Peak and Minimum Load level testing is performed based on a fixed load level that is representative of historic data. Since the historic data includes the effect of demand resources, they will not be explicitly modeled for the Off-Peak and Minimum Load level conditions. The exception to this is if there is a significant generator known to be considered as a DR which may impact the study results. DR, when it consists of a generator and is explicitly modeled, is to be included and treated consistent with other generators in the study area.

### Short Circuit Analysis

#### Analysis Overview

A short circuit analysis evaluates the effect of a proposed project’s impact on the system available fault current levels to determine the project’s impact on the short circuit duty of circuit breakers and other system equipment.

#### Typical Load Level(s)

Load Independent

#### DR Represented in Analysis

Only those passive DCR and ADCR that are explicitly modeled as generators will be included in short circuit analyses. While Energy Efficiency and Load Management programs have little bearing on short circuit analyses, Distributed Generation can contribute to the fault level calculation in distribution networks. The fault level calculation in distribution networks in the presence of Distributed Generation is the sum of the maximum fault currents due to the transmission system through the network transformer and the various generators (or possibly large motors) connected to the distribution network.

In cases where the DR is a generator, it will also contribute to the fault level calculation in the distribution network when the generator is operated in parallel with the system.

### Transient Stability Analysis

#### Analysis Overview

A transient stability analysis looks at whether or not electrical machines will remain in synchronism with new steady state power angles after a major system disturbance such as the loss of generation, load, or a transmission line. This analysis also includes evaluation of the transient voltage response of the system as well as system damping.

#### Typical Load Level(s)

90/10 Summer Peak Load and Off-Peak Load

#### DR Represented in Analysis

A transient stability analysis would include the impact of EE and ADCR in Peak Load Level analyses, as these demand resources are intended to be available and utilized under these system conditions.

EE is modeled based on the most recent CELT forecast. ADCR are modeled based on the most recently concluded Forward Capacity Auction. The initial value for the DCR before applying any performance factor is based on the following:

Off-Peak Load level testing is performed based on a fixed load level that is representative of historic data. Since the historic data includes the effect of demand resources, they will not be explicitly modeled for the Off-Peak Load level conditions. The exception to this is if there is a significant generator known to be considered as a DR which may impact the study results. DR, when it consists of a generator and is explicitly modeled, is to be included and treated consistent with other generators in the study area.

### NERC/NPCC Long-Term Reliability/Resource Adequacy Related Assessments

#### Assessments Overview

Annually, NERC and NPCC conduct deterministic and probabilistic reliability/resource adequacy assessments covering the long-term to meet NERC and NPCC compliance reporting requirements. The deterministic assessments would use a single value peak load forecast for the study period of interest while the probabilistic assessments would use a distribution of peak loads for the study period of interest. The data relating to capacity, energy, load and transmission are all based on the latest CELT report.

#### Typical Load Level(s)

Deterministic assessments typically would use the 50/50 Peak Load while the probabilistic assessments would use the full range of the load forecast.

#### DR Represented in Assessments

These NERC/NPCC long-term assessments include the impacts of both passive DCR and ADCR. The DCR could be modeled in aggregate on a systemwide basis or by subarea depending on the nature of the assessment. The amount of these passive DCR and ADCR are based on the amount as listed in the most recent CELT report.

### RSP Related Resource Adequacy Studies

#### Analysis Overview

Regional System Plan related resource adequacy studies use two basic calculation methodologies. One methodology employs probabilistic mathematics reflecting probabilistic input assumptions, and the other methodology employs deterministic mathematics reflecting deterministic input assumptions.

#### Typical Load Level(s)

All Load Levels

#### DR Represented in Studies

In probabilistic studies, DCR is modeled with its Summer CSO ratings and assumed forced outage rate. The amount modeled depends on study assumptions and scenarios. In deterministic studies, DCR is modeled based on its Summer CSO ratings. The amount modeled depends on study assumptions and scenarios.

The EE forecast is used based on the most recent CELT forecast.

# Demand Resource Modeling

DR is modeled explicitly in the base cases. This approach involves having independent negative loads at each load bus and will model an ADCR and either passive DCR or forecasted EE components separately while maintaining a constant power factor of the load at a particular bus. These negative loads will be discretely proportionate to the load at the bus with passive DCR and forecasted EE being based on a Load Zone and ADCR being based on a Dispatch Zone.

DR that are explicitly modeled in the base case as a generator will be denoted as being either a passive DCR resource or an ADCR by the following convention. The generator associated with a passive DCR will have a machine ID of “P\*” in the base case and the generator associated with an ADCR will have a machine ID of “A\*” in the base case. The “\*” will be replaced with a numerical identifier when modeled in the base case.

See Appendix J – Load Modeling Guide for ISO New England Network Model of the Technical Guide for a detailed explanation of the modeling of demand resources in the base cases.

## DR Availability in System Planning Analyses

Passive DCR is assumed to perform at 100% since passive DCR consist of a significant portion of Energy Efficiency, which is considered always “in-service”. In addition to EE, there is also base loaded DG in the passive DCR grouping, such as combined heat and power (CHP), which also performs at many more hours than the peak hours. This value will not be altered each year, but will be held constant until sufficient operating data suggests that another value is warranted. This availability will be held for the passive DCR that has cleared the FCM and for the forecasted EE.

The ADCR availability must be split into multiple categories based on the type of system assessment being performed.

* **Short-Range Assessments:**
	+ In such short-range assessments, the availability for the ADCR will be based on the most recently available localized data but may be adjusted as needed to reflect known external factors not reflected in performance audits. Such factors may include but are not limited to asset performance relative to resource CSO and reported maximum interruptible capacity.
* **Long-Range Assessments:**
	+ In such long-range assessments, ADCR should be included based on the New England average, with all areas of New England using the same availability but may be adjusted as needed to reflect known external factors not reflected in performance audits.
	+ This value will be set at 75% which is based on historical performance of similar resources. This value will not be altered each year, but will be held constant until sufficient operating data suggests that another value is warranted.
* **Resource Adequacy Assessments:**
	+ The ADCR has an assumed forced outage rate based on the historical performance (during both activations and performance audits) of DCR with CSOs over the previous five CCPs.

The use of 75% of across New England for long-range assessments may warrant further review and the use of a historical average based upon localized data may be used in the future as consistent patterns of performance begin to appear.

# Revision History

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| --- | --- | --- |
| Rev No. | Date | Reason |
| 2.0 | TBD | * Converted document to new ISO report template
* Updated document to conform with ISO style guide
* Updated guide to reflect changes to terminology with Price Responsive Demand (PRD)
* Content review to align with current process and practices
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| 1.0 | 12/06/2013 | * Original posting of guideline as Appendix C of Technical Guide
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1. Sensitivity analyses at load levels lower than 100% of the 90/10 Summer Peak New England Control area Load will be considered when such lower load levels might result in high voltage conditions, system instability or other unreliable conditions. [↑](#footnote-ref-1)