Critical Load Level and Need-by Date Determination

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Purpose

- Present the process to determine the Critical Load Level (CLL) and Need-by Date(NBD) for steady-state, peak load needs

Overview

- Background
- Critical Load Level (CLL) analysis methodology
- Converting CLL to Need-by Date (NBD)
- Schedule/next steps

BACKGROUND

Background

- The November 2017 PAC presentation discussed the methodology to determine the time-sensitivity of needs
- The November 2017 presentation has been updated to clarify the determination of time-sensitivity of short circuit needs
  - The updated presentation has been posted to the PAC website as a part of the January 2018 PAC materials
    - https://www.iso-ne.com/committees/planning/planning-advisory
- This presentation is focused on additional analysis that is performed to determine Critical Load Level (CLL) and a need-by date (NBD) for steady-state, peak load needs
  - In past Needs Assessments, a Year of Need was developed for needs observed at summer peak load levels
  - However, for time-sensitive needs, a need-by date (NBD) is required as per 4.1(j) of Attachment K of the OATT
  - For conditions where a year of need is required, the year corresponding to the NBD will be used to determine the year of need

Time-sensitive Year

- As discussed in the November 2017 PAC presentation, if steady-state, peak load needs are observed in a study area a new set of base cases will be created
  - These will be in addition to the study horizon base cases (typically 10 year out peak load base cases)
- The appropriate summer peak load represented in the time-sensitive case will vary depending on whether the completion date of the Needs Assessment report occurs before June 1 versus on June 1 or later

Publishing Date of Final Needs Assessment Report	Time-sensitive year
Between January 1st and May 31st of Year N	Summer Peak of Year N+2
Between June 1st and December 31st of Year N	Summer Peak of Year N+3

Need for a Critical Load Level Analysis

- A critical load level (CLL) analysis is performed for each need that is identified in a steady-state, peak load level analysis
- The results of a CLL analysis provide information to Market Participants on the quantity and general location of resources that would satisfy the need or defer the need for regulated transmission solutions[1]
- Once a CLL is obtained, for each need a NBD will be determined for all steady-state, peak load needs
- The following sections describe the methodology used to determine CLL and NBD

[1]Section 3.1(iv) of Attachment K of the OATT

CRITICAL LOAD LEVEL ANALYSIS METHODOLOGY

Linear Method

- The method to approximate the CLL for needs uses the slope-intercept equation from two data points
- The two data points used for the slope-intercept equation are thermal loadings or voltages at two different system load levels
  - A CLL analysis is done for each transmission element or bus that experiences an overload or a voltage violation, respectively
- The linear equation obtained above is used to obtain the CLL at which the violation is no longer observed
- This linear method is an approximation that provides a reasonable estimate with minimum additional analysis

Net Load Level for Linear Method

- The load level used in the CLL analysis is the New England (NE) Net load level
- The following formula shows how the New England net load is calculated for a given summer peak load period

$$NE\ Net\ Load_{year\ x} = A_{year\ x} - B_{year\ x} - C_{year\ x} - D_{year\ x} - E_{year\ x}$$

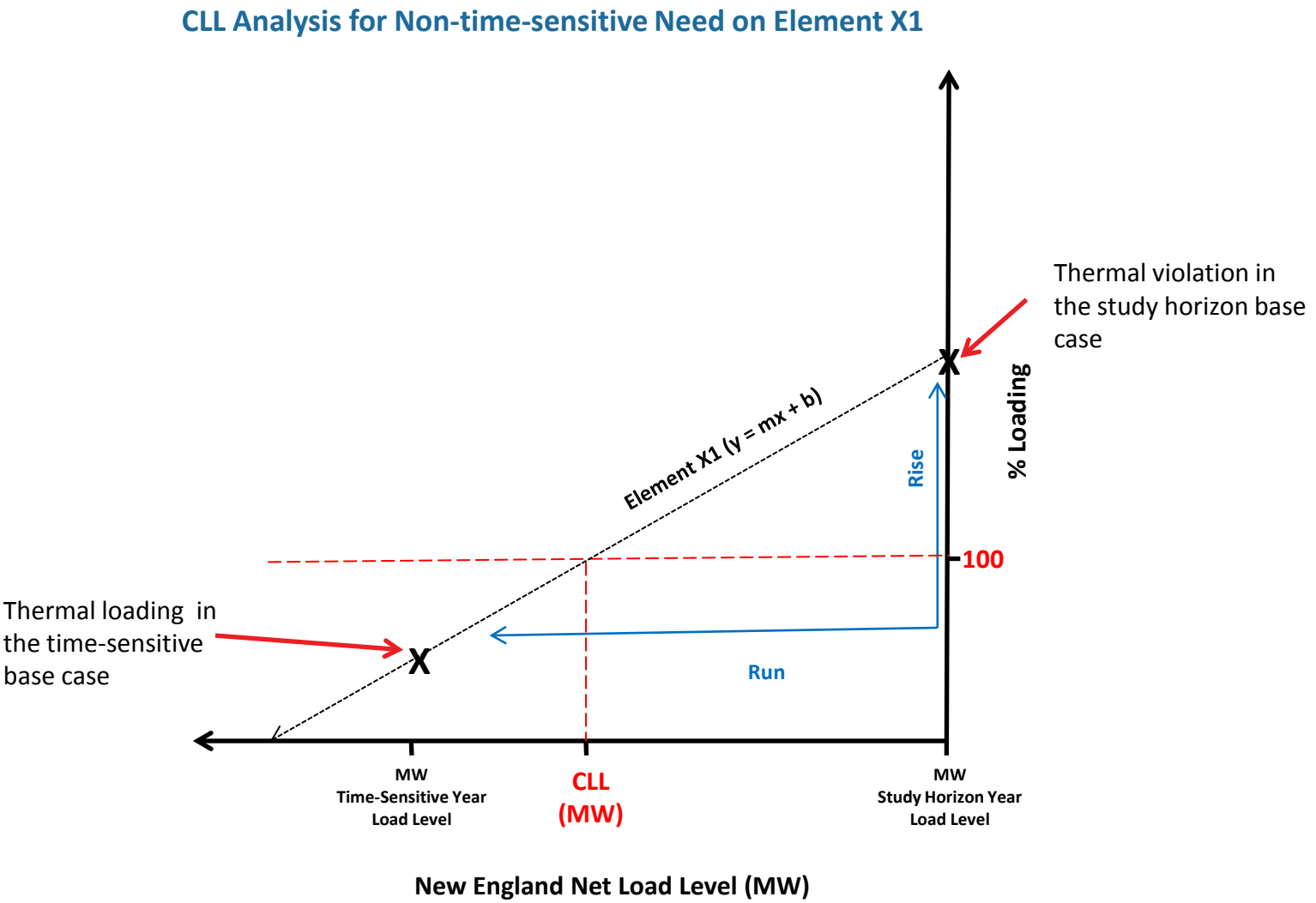
Where:

- $A_{year\ x}$ - 90/10 Summer Peak Load for year x,
- $B_{year\ x}$ - Available Passive DR acquired via the FCM for year x,
- $C_{year\ x}$ - Available Active DR acquired via the FCM for year x, and
- $D_{year\ x}$ - Available EE forecast for year x,
- $E_{year\ x}$ - Available PV for year x.

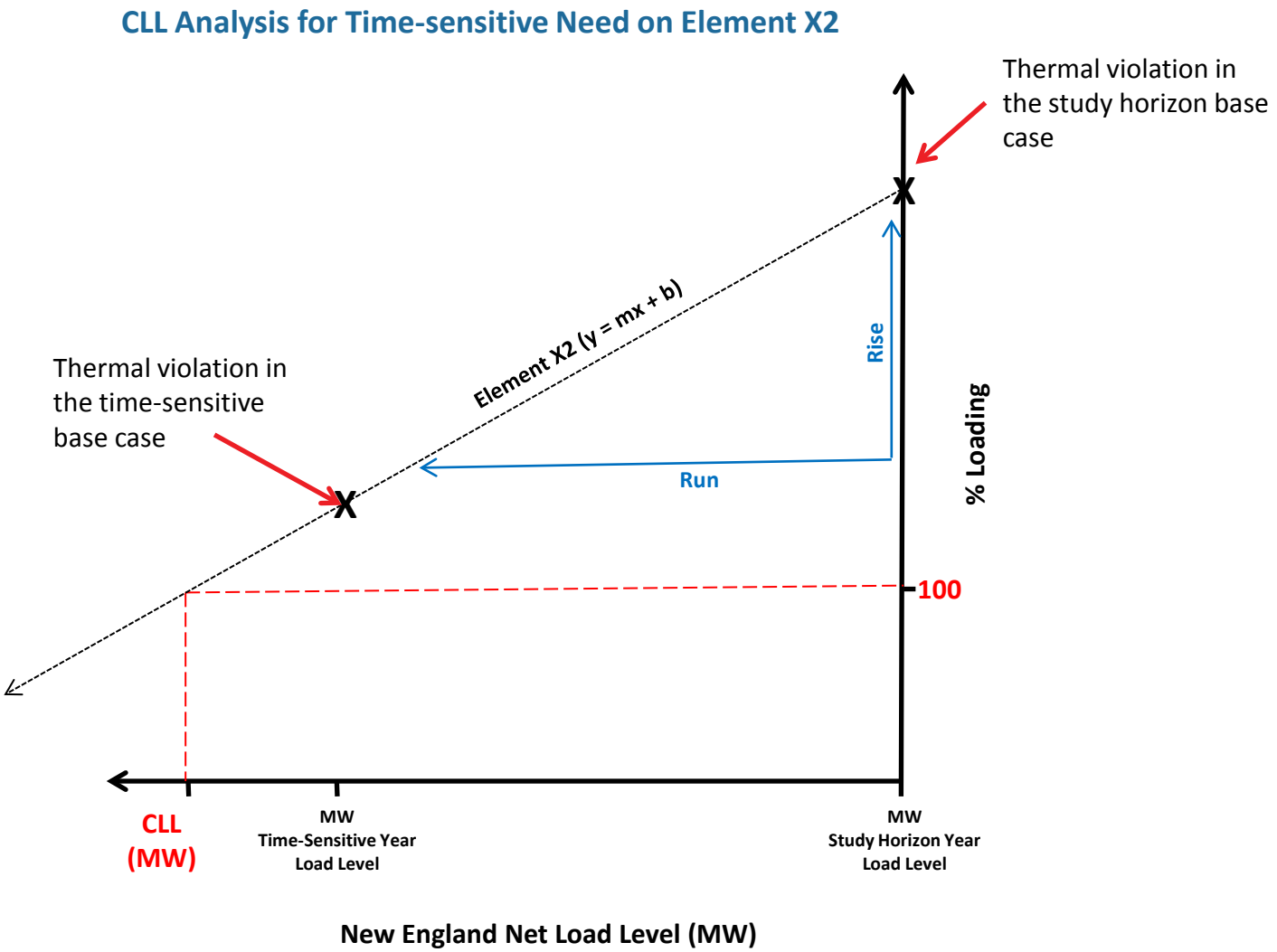
Additional Requirements for Linear Method

- The two data points adhere to the following requirements:
  - The dispatch of generators critical to the study area should be the same for the two points considered
  - The two points must correspond to the same contingency or contingency pair
- If the generators that are critical to the study area do not change between the time-sensitive base cases and the study horizon base cases, then the two data points associated with the study horizon base case and time-sensitive base case may be used to obtain the CLL
- The following slides describe Scenarios 1 and 2 in Study Area X where there are no generators that are assumed to be retired in the study-horizon base cases that are online in the time-sensitive base cases

Scenario 1 – Non-time-sensitive need in Study Area X



Scenario 2 – Time-sensitive need in Study Area X

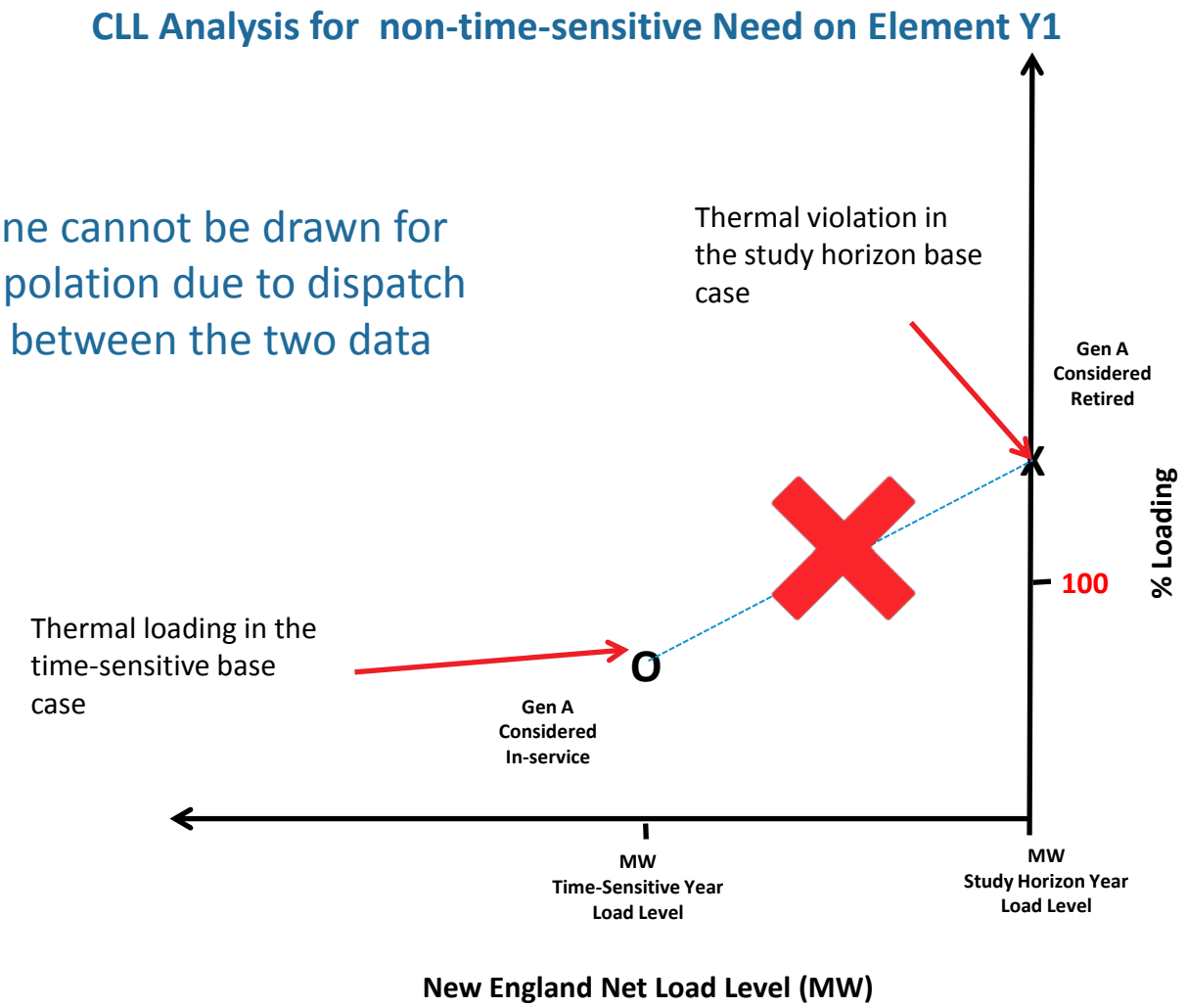


Impact of Generator Retirements

- If there are any generator retirements in the study area that are assumed to be available in the time-sensitive year but are offline in the study horizon base cases, the data points obtained from the time-sensitive base case and study horizon base case cannot be used for the linear method
  - The generation dispatches in the study area are different in both cases, and the line between the two data points would not be accurate
- In these instances, additional data points need to be created to accurately calculate the CLL
  - The following slides demonstrate this method for a time-sensitive need and a non-time-sensitive need in Study Area Y where Generator A is assumed to be retired in the study horizon base cases, but is available in the time-sensitive year
  - For a time-sensitive need, the calculated CLL provides information on the New England load level at which the needs observed in the time-sensitive year will be eliminated
    - To eliminate the need observed at the study horizon load levels, additional reduction in New England load may be required

Scenario 3 – Non-time-sensitive need in Study Area Y

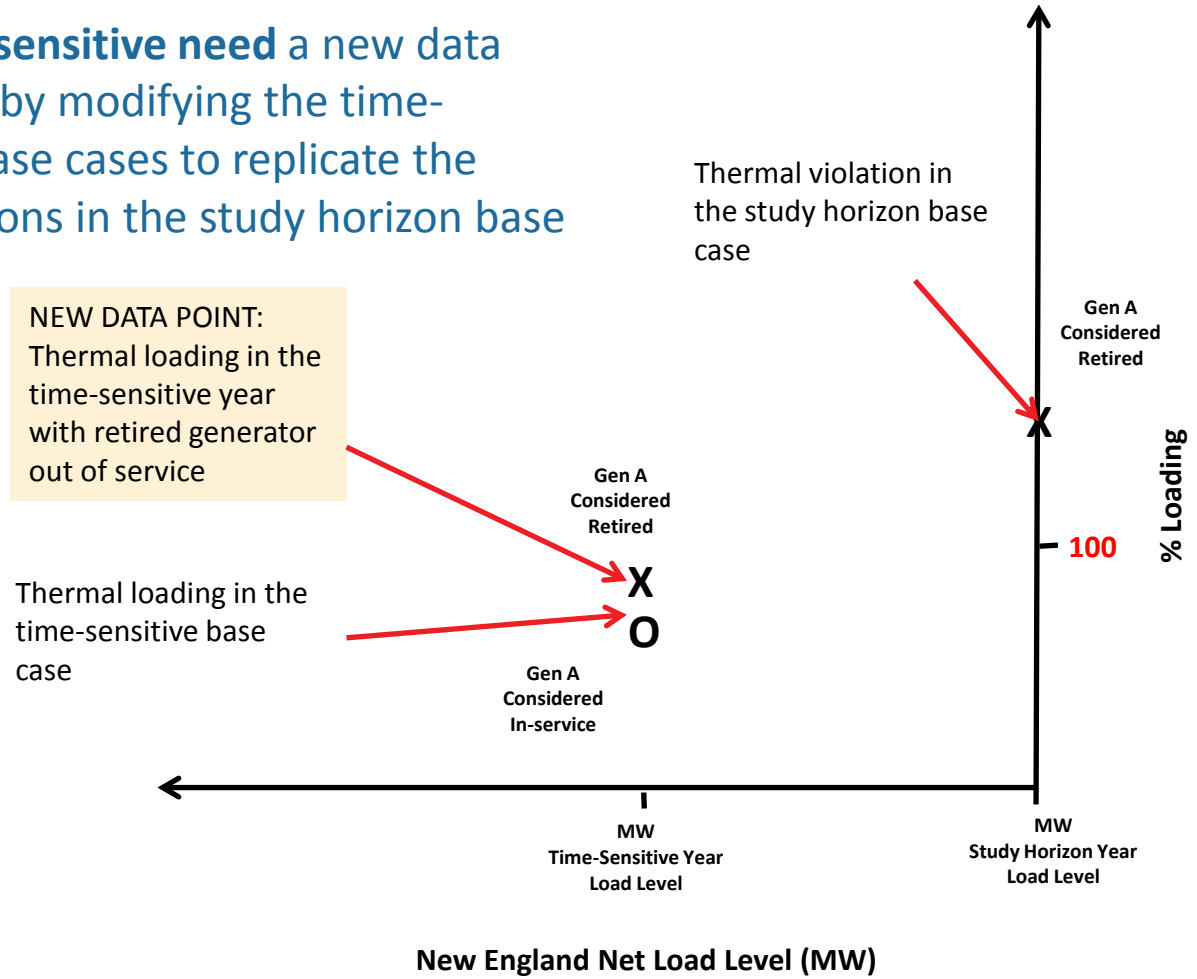
A straight line cannot be drawn for linear extrapolation due to dispatch differences between the two data points



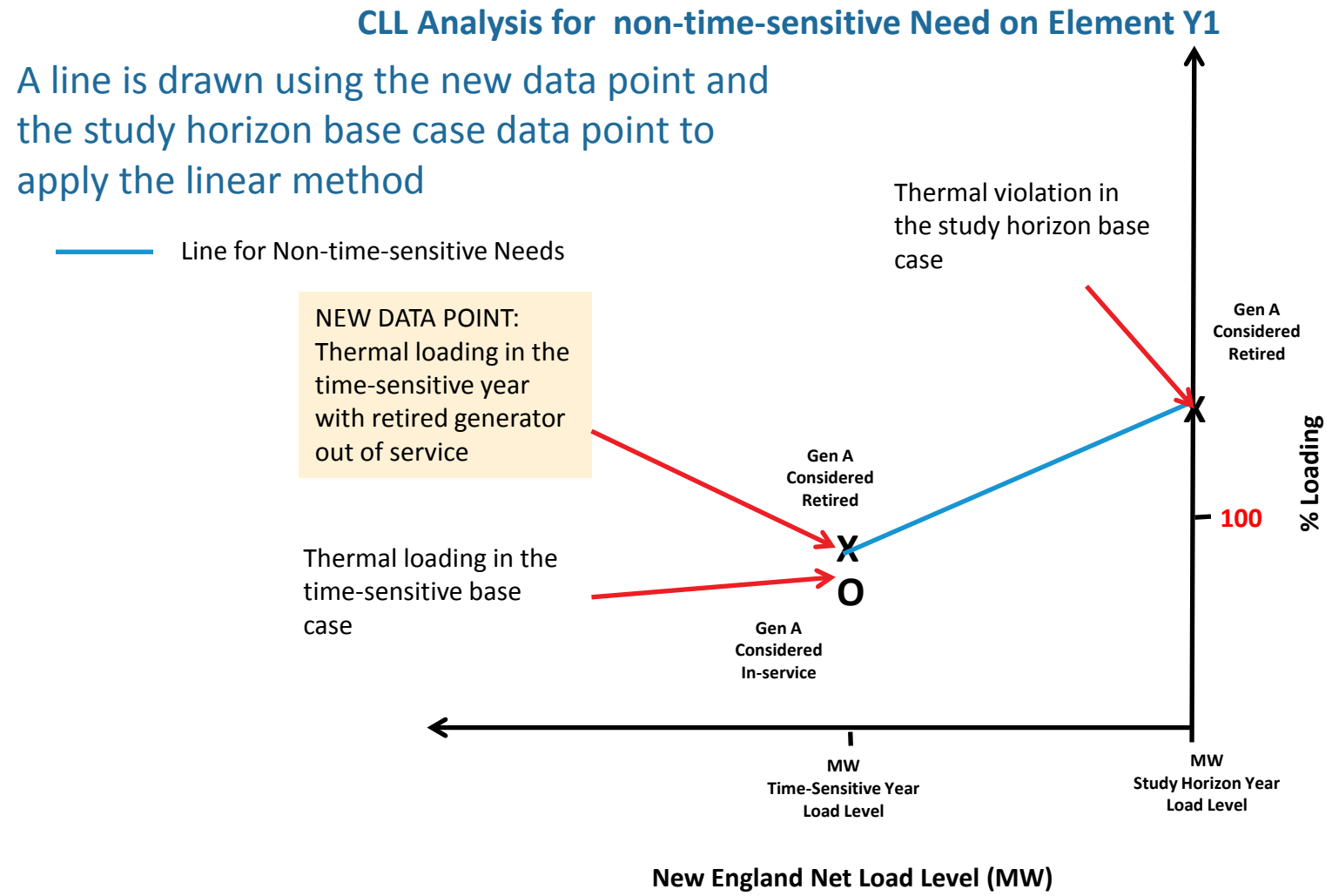
Scenario 3 – Non-time-sensitive need in Study Area Y

CLL Analysis for non-time-sensitive Need on Element Y1

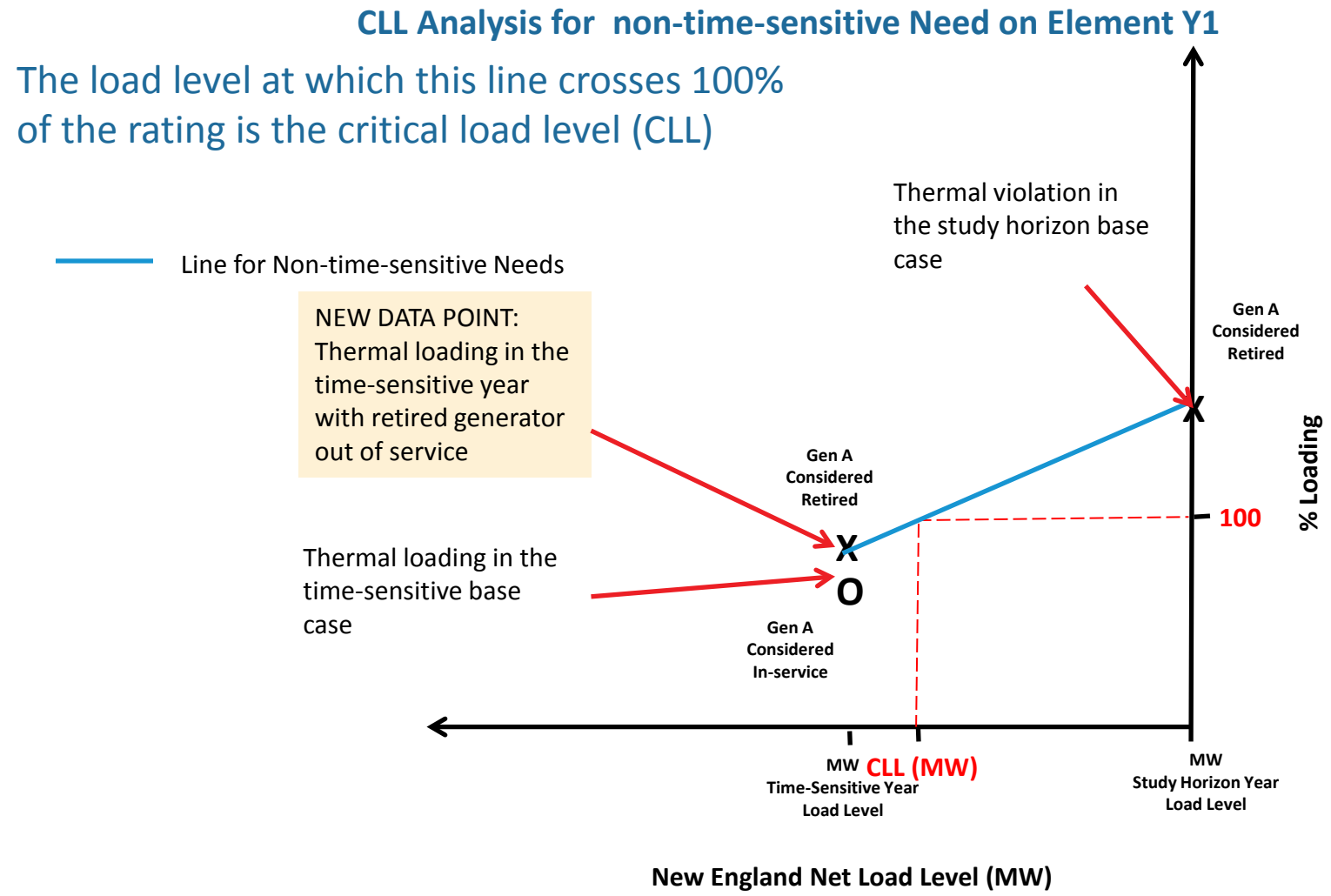
For a **non-time-sensitive need** a new data point is created by modifying the time-sensitive year base cases to replicate the dispatch conditions in the study horizon base case



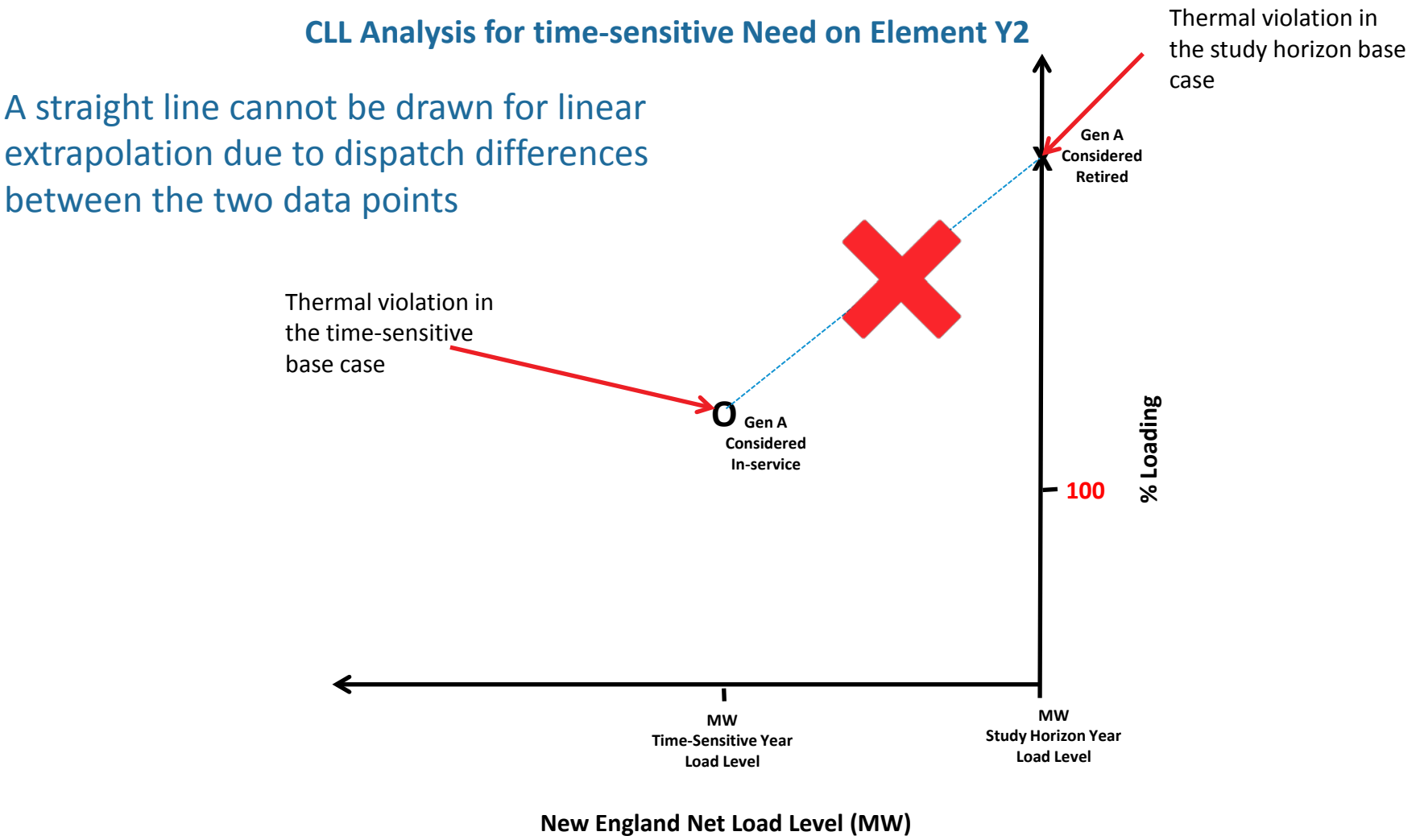
Scenario 3 – Non-time-sensitive need in Study Area Y



Scenario 3 – Non-time-sensitive need in Study Area Y



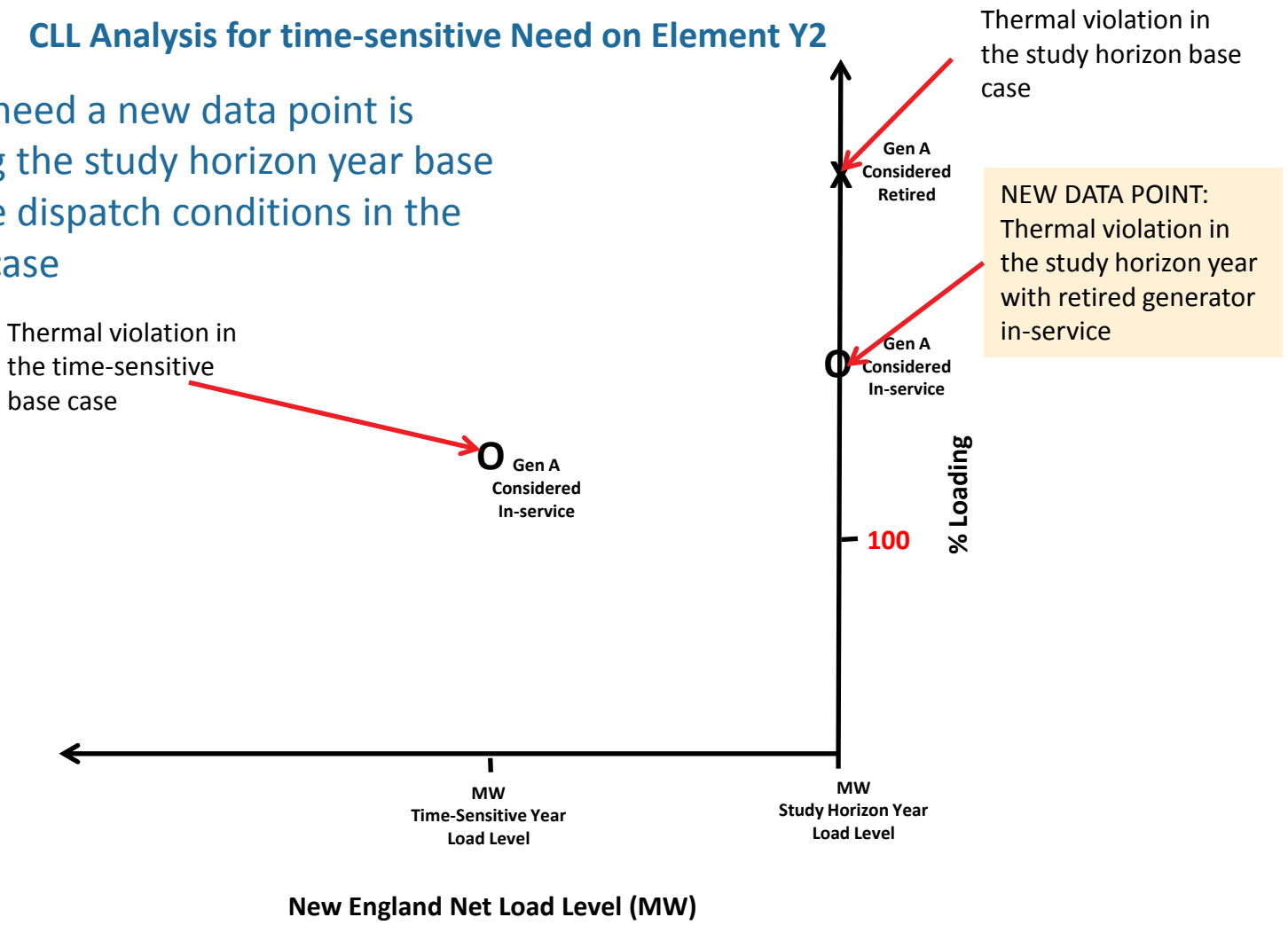
Scenario 4 – Time-sensitive need in Study Area Y



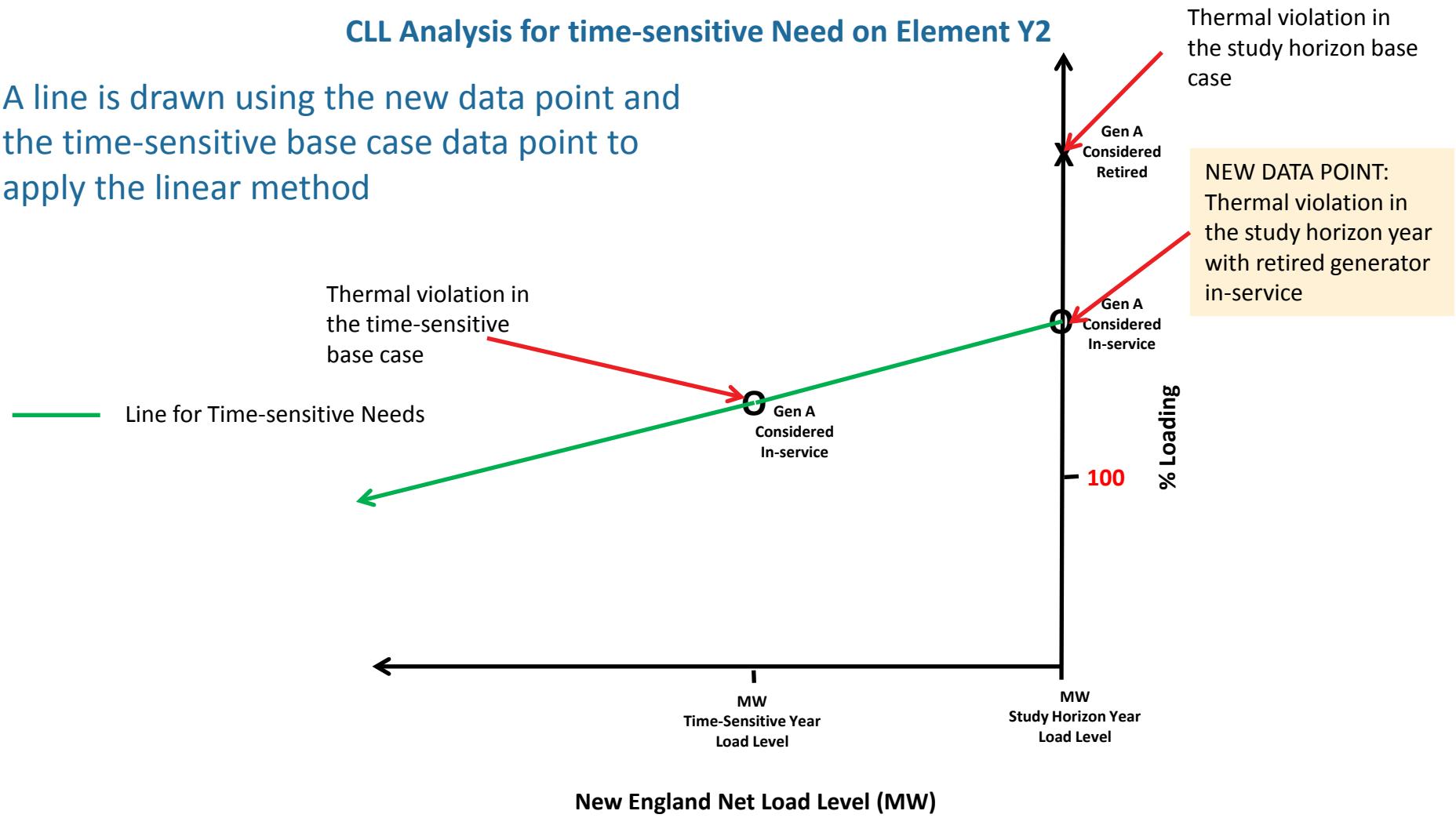
Scenario 4 – Time-sensitive need in Study Area Y

CLL Analysis for time-sensitive Need on Element Y2

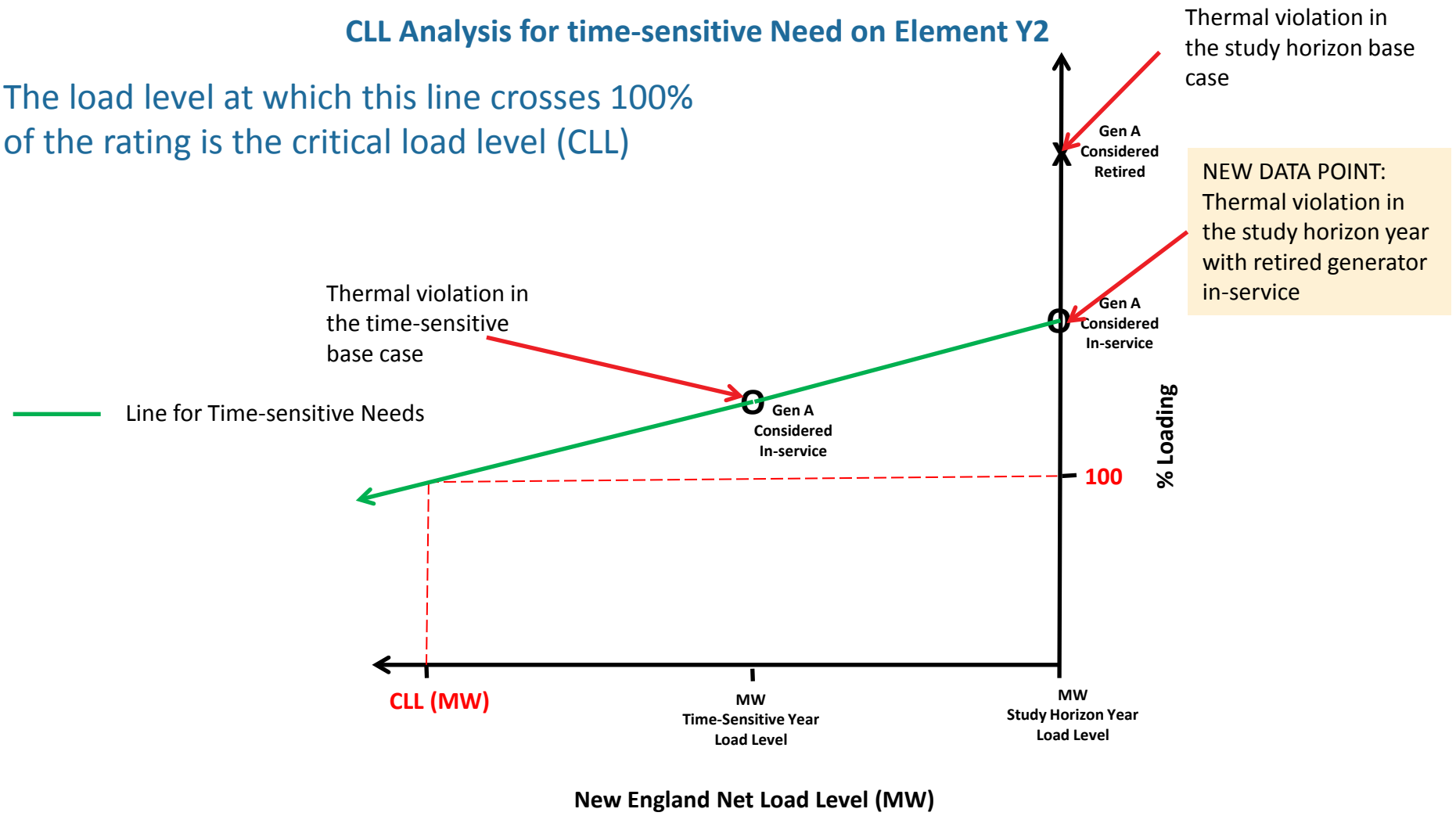
For a time-sensitive need a new data point is created by modifying the study horizon year base cases to replicate the dispatch conditions in the time-sensitive base case



Scenario 4 – Time-sensitive need in Study Area Y



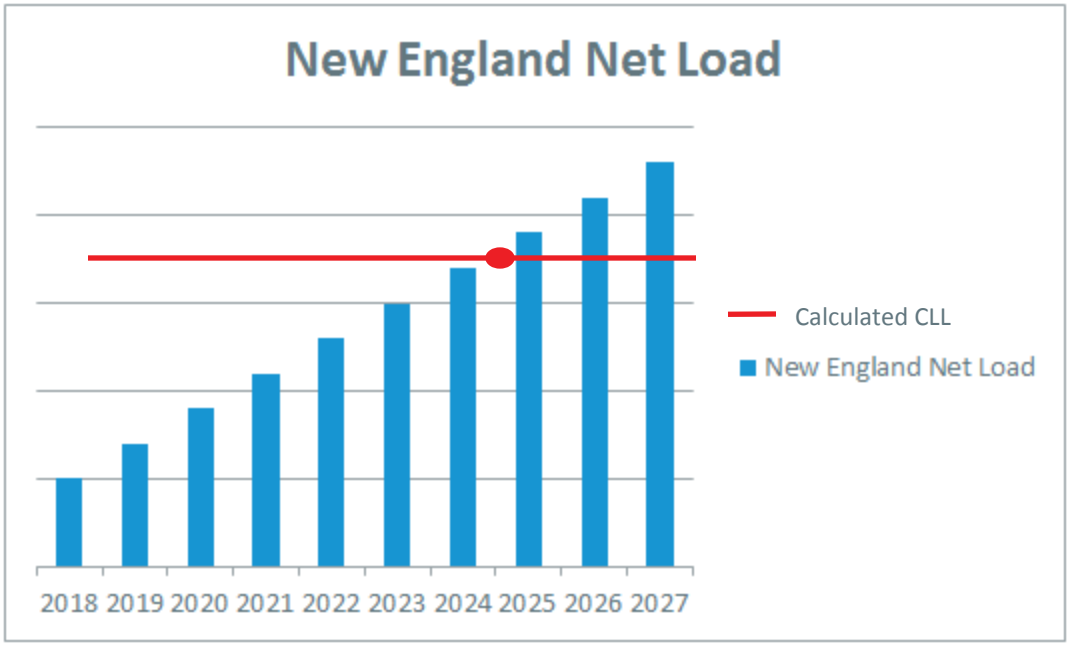
Scenario 4 – Time-sensitive need in Study Area Y



CONVERTING CLL TO NEED-BY DATE

Converting CLL to NBD

- For a given CLL value, the NBD represents June 1st of the year that corresponds to the closest New England net load that is greater than or equal to the calculated CLL value
- In the example below, the need-by date would be June 1, 2025



SCHEDULE/NEXT STEPS

Schedule/Next Steps

- A draft version of the document that summarizes time-sensitivity and CLL determinations will be provided for stakeholder comment in Q1 2018
  - Once completed, this document will be added to the Transmission Planning Technical Guide