



3/31/2022

Support for NYISO Capacity Accreditation Project

Eduardo Ibanez, Ph.D.; Mitch Bringolf

GE Energy consulting

Overview



Goal: Support the NYISO in the selection of the technique used to determine the capacity credit or capacity value for different resources, using GE MARS

Today we will provide more detail on the concrete steps to calculate the ELCC for incremental resources

Effective load-carrying capability (ELCC) technique in this project



To measure the ELCC of a particular resource type, of a concrete size, at a location:

1. Start with the LCR database Record initial (target) LOLE
2. Add the incremental MWs of the representative unit to the desired location LOLE is reduced
3. Iteratively, remove perfect capacity LOLE starts increasing
4. Stop when the NYBA reliability is back to (1) LOLE is back to the initial LOLE

Convergence criteria

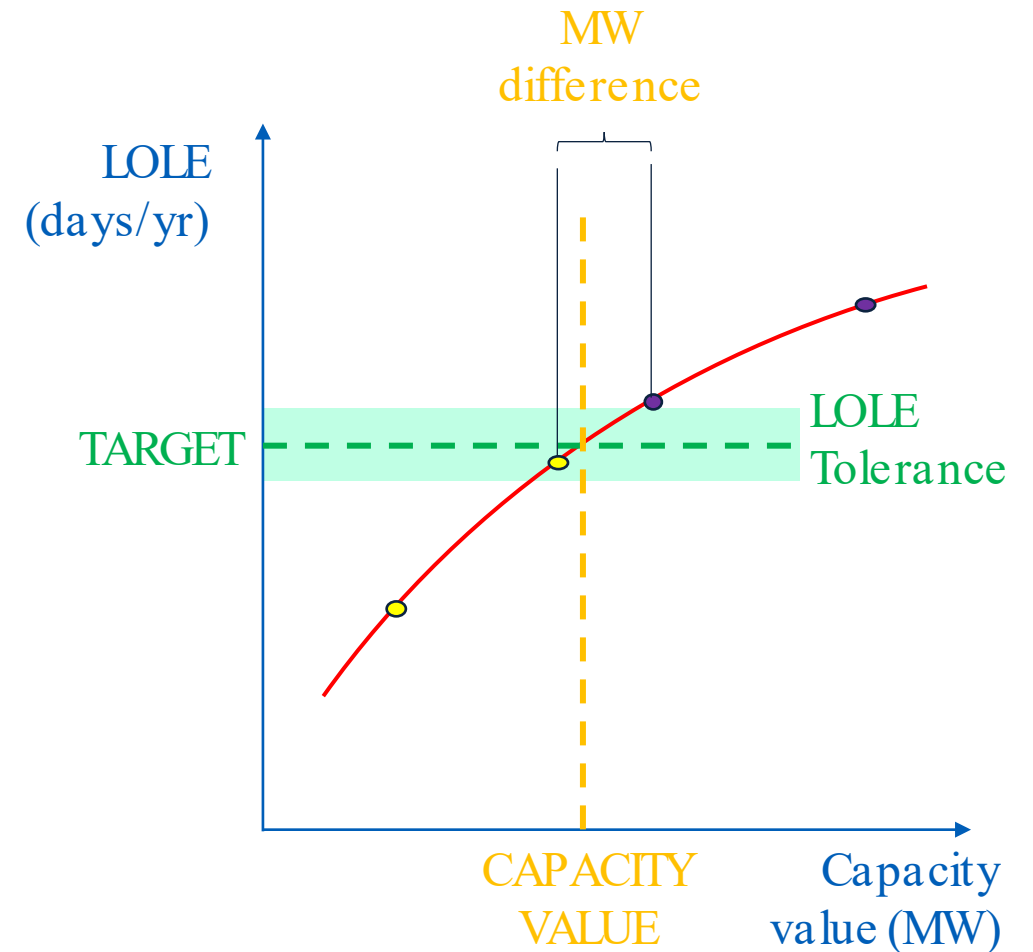


ELCC cannot be calculated directly, an iterative process is needed to get an estimate.

The technique used (bisection search) keeps track of guesses above and below the target LOLE (in purple and yellow, respectively)

The process converges when:

- The evaluated LOLE is within the LOLE tolerance band (0.0005 days/year, or third decimal)
- The best guesses above and below the LOLE target are less than 1 MW apart



Marginal Reliability Improvement (MRI) technique



Steps:

1. Start with the LCR database and record the LOLE ($LOLE_i$) Step 1 of the ELCC technique
2. Add the incremental MWs of the representative unit to be measured and record the LOLE ($LOLE_m$) Step 2
3. Replace the incremental MWs of the representative unit with perfect capacity of the same size in the same location and record the LOLE ($LOLE_p$) Additional simulation

$$\text{The capacity value is } \frac{LOLE_i - LOLE_m}{LOLE_i - LOLE_p}$$

The capacity value formula can also be described as:

$$\frac{\Delta LOLE_{resource}}{\Delta LOLE_{perfect\ capacity}}$$

Where $\Delta LOLE_{resource}$ is the change in the initial LOLE from the addition of the incremental MWs of the representative unit and $\Delta LOLE_{perfect\ capacity}$ is the change in the initial LOLE from the addition of perfect capacity of the same size in the same location.

The MRI technique produces capacity values bounded by 0 and 1 as the system with the incremental MWs of the representative unit cannot be more reliable than the system with perfect capacity of the same size in the same location (*i.e.*, $\Delta LOLE_{resource}$ will be less than or equal to $\Delta LOLE_{perfect\ capacity}$)





2/24/2022

Confidential. Not to be copied, reproduced, or distributed without prior approval.

CAUTION CONCERNING FORWARDLOOKING STATEMENTS:

This document contains "forward-looking statements"—that is, statements related to future events that by their nature address matters that are, to different degrees, uncertain. For details on the uncertainties that may cause our actual future results to be materially different than those expressed in our forward-looking statements, see <http://www.ge.com/investor-relations/disclaimer-caution-concerning-forward-looking-statements> as well as our annual reports on Form 10-K and quarterly reports on Form 10-Q. We do not undertake to update our forward-looking statements. This document also includes certain forward-looking projected financial information that is based on current estimates and forecasts. Actual results could differ materially to total risk-weighted assets.]

NON-GAAP FINANCIAL MEASURES:

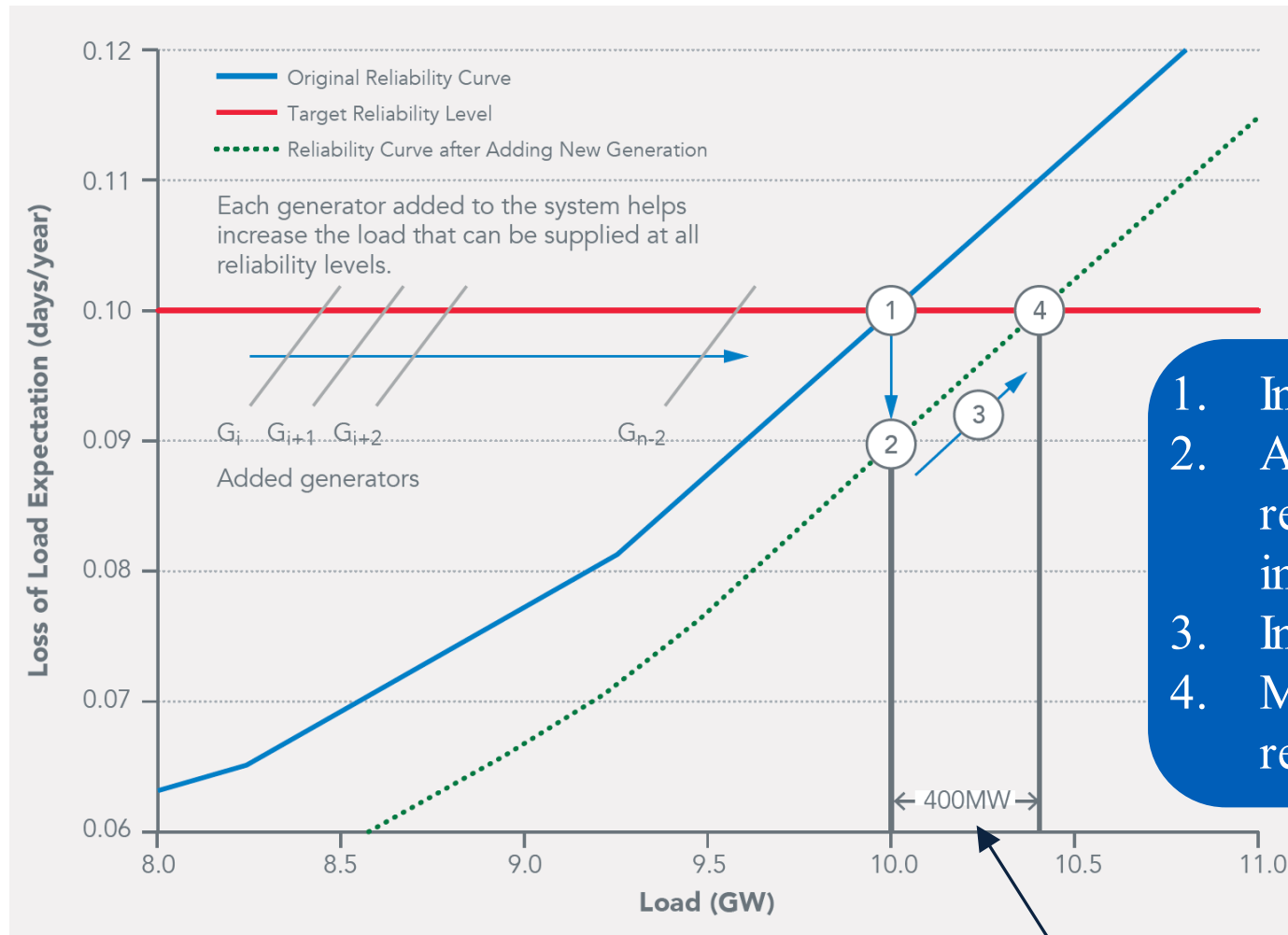
In this document, we sometimes use information derived from consolidated financial data but not presented in our financial statements prepared in accordance with U.S. generally accepted accounting principles (GAAP). Certain of these data are considered “non-GAAP financial measures” under the U.S. Securities and Exchange Commission rules. These non-GAAP financial measures supplement our GAAP disclosures and should not be considered an alternative to the GAAP measure. The reasons we use these non-GAAP financial measures and the reconciliations to their most directly comparable GAAP financial measures are posted to the investor relations section of our website at www.ge.com. [We use non-GAAP financial measures including the following:

- Operating earnings and EPS, which is earnings from continuing operations excluding non-service-related pension costs of our principal pension plans.
- GE Industrial operating & Vertical earnings and EPS, which is operating earnings of our industrial businesses and the GE Capital businesses that we expect to retain.
- GE Industrial & Verticals revenues, which is revenue of our industrial businesses and the GE Capital businesses that we expect to retain.
- Industrial segment organic revenue, which is the sum of revenue from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial segment organic operating profit, which is the sum of segment profit from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial cash flows from operating activities (Industrial CFOA), which is GE's cash flow from operating activities excluding dividends received from GE Capital.
- Capital lending net investment (ENI), excluding liquidity, which is a measure we use to measure the size of our Capital segment.
- GE Capital Tier 1 Common ratio estimate is a ratio of equity



—
Additional slide

Effective load-carrying capability (ELCC) technique



1. Initial system
2. Add resource, reliability improves
3. Increase load
4. Match initial reliability target

J. Katz, P. Denholm "Using Wind and Solar to Reliably Meet Electricity Demand, Greening the Grid" <http://www.nrel.gov/docs/fy15osti/63038.pdf>

Capacity value