

Attachment C: PJM Deliverability Testing Methods

[\[Part of Attachment C\]](#)

C.5 PJM Load Deliverability Procedure—Capacity Emergency Transfer Limit (CETL)

1.0 Introduction

PJM specifies a reliability objective regarding each study area's ability to import needed and available capacity assistance. The purpose of performing a Capacity Emergency Transfer Objective/Limit Study (CETO/CETL) also known as a Load Deliverability study is to verify that this objective is met. Load Deliverability analysis is therefore one of the tests applied to validate the deliverability of PJM capacity resources to PJM load. Load Deliverability analysis is performed for a study area. At present, load deliverability study areas consist of individual zones, sub-zones and the geographical combinations of zones. Eighteen zones and sub-zones have thus far been identified. The zones correspond to the present power flow areas of the PJM operating companies. Five global study areas which are geographical combinations of power flow zones have thus far been identified.

2.0 Study Objectives

The goal of a PJM Load Deliverability study is to establish the amount of emergency power that can be reliably transferred to the study area from the remainder of PJM and the areas adjacent to PJM in the event of a generation deficiency within the study area (the study area's CETL). This transfer limit, in combination with its corresponding CETO, is then used to determine if the import capability required to meet the reliability objective is sufficient. An indicator of the amount of reserve transfer capacity (if any) available is also provided.

3.0 General Procedures and Assumptions

3.1 Independent Study Area Generation Capacity Deficiency

For the purposes of analysis, each tested study area within the PJM control area is assumed to be experiencing a generation deficiency independently. Thus, the remainder of PJM and adjacent non-PJM areas are operating normally and are assumed to be able to supply the study area with emergency power up to the limit of their available reserves. The amount of reserves considered available from any adjacent non-PJM area may be changed to reflect historical data. Generally the procedure first tests the limit based on PJM reserves. The resource supply is opened to areas external to PJM as necessary, based on a reasonable expectation of such external support.

3.2 Consistency with PJM Emergency Operations Procedures

In all cases, the study area CETL analysis should reflect actual PJM emergency operations procedures designed to make as much power available to the deficient study area as possible under the prevailing system conditions. This should include (but is not limited to):

- The operation of any available PJM generation regardless of system economics.
- The activation of any PJM Active Load Management (ALM) schemes that may serve to unload limiting facilities ~~(this assumption is included in the PJM entity load forecast.)~~ to the extent that it does not reduce the load in the area under test below expected 50/50 load levels.
- The modification of any transfers modeled in the base case.
- The adjustment of any Phase Angle Regulators (PARs) which PJM or PJM member companies control (within existing agreements for emergency operation).
- The activation of any approved PJM or PJM member company operating procedure (procedure descriptions are available in Manual 3.)
- Re-dispatch of capacity resources in PJM are allowed internal to the study area to relieve an overload provided that the CETO is increased by the amount of generation re-dispatch required to eliminate the internal overload.

4.0 Base Case Development

Two separate base case models are developed as may be necessary; a PJM summer peak case to study summer-peaking study areas and a PJM winter peak case to study winter-peaking study areas (The need for a winter case is assessed annually. Currently the only PJM winter peaking area has summer and winter peaks sufficiently close to enable the analysis on only a summer peak case.) The RTEP load flow case nearest to the study time period should be selected and modified as required (modeling the projected load, generation, and transmission system configuration for the target study period).

To calculate plausible generator outage scenarios, a file containing the installed MW capacity and the Generator Unavailability Subcommittee (GUS) five-year planning equivalent forced outage rate demand (EFORd) for every PJM capacity resource will be developed. Related data is available at <http://www.nerc.com/page.php?cid=4|43|47>.

4.1 Study Area Capacity Deficiency Assumptions

The study area being evaluated is assumed to be experiencing the generation deficiency due to a combination of higher-than-expected load demand (a 90/10 load forecast) and greater-than-expected generator unavailability. The 90/10 load forecast level is simulated by modeling 105% of the study area's load expected to be served at the time of the 50/50 peak load contained in the latest LAS report along with generator outage scenario(s) that would lead to a generation deficiency which cause a transmission limitation.

4.2 Study Area CETL Base Case Modeling Summary

- Behind the Meter and energy only generation should be modeled at the average historic MW output during the previous years 10 highest load hours for the study area each hour being selected from a different day.
- No study areas will be defined less than a peak load of 1500 MW.
- Generator reactive output will be reduced in proportion to the MW scaling reduction for any generation that is modeled below the rated capability.
- The 5% load adder is assumed to be at 0.8 power factor.
- Normal and emergency ratings included in the power flow will be those applied in Operations (at 35°C).
- PAR setting should be 1000 MW to NJ at Ramapo, 1000 MW to NJ at Waldwick , and 1000 MW into ConEd at Goethals and Farragut. PARs located within PJM may be operated as needed subject to the appropriate agreements (if any) and PJM Operating Company practices. Except as follows.



- PAR settings during subsequent contingency analysis can decrease the 1000 MW delivery to ConEd at Goethals and Farragut to as low as 600 MW delivery as required to enhance deliverability to the eastern study areas.
- 90/10 load levels in the area under test will be reduced by the available energy efficiency, demand response and [price responsive demand]. The greater of the 90/10 load in the area under test reduced by the total amount of energy efficiency, demand response and [price responsive demand] or the 50/50 load, will be modeled in the area being tested.

C.7 Generator Deliverability Procedure

1.0 Introduction

To maintain reliability in a competitive capacity market, resources must contribute to the deliverability of the Control Area in two ways. First, energy must be deliverable, from the aggregate of resources available to the Control Area, to load in portions of the applicable PJM region experiencing a localized capacity emergency, or deficiency. PJM utilizes the CETO / CETL procedure to study this “deliverability of load”. Second, capacity resources within a given electrical area must, in aggregate, be able to be exported to other areas of PJM that are experiencing a capacity emergency. PJM utilizes a Generator Deliverability procedure to study the “deliverability of individual generation resources”. This document provides the procedure for Generator Deliverability.

2.0 Study Objectives

The goal of the PJM Generator Deliverability study is to determine if the aggregate of generators in a given area can be reliably transferred to the remainder of PJM. Any generators requesting interconnection to PJM must be “deliverable” in order to be a PJM installed capacity resource.

3.0 General Procedures and Assumptions

Step 1: Develop Base case

The RTEP base case is developed for a reference year 5 years in the future. All RTEP identified system upgrades and Supplemental RTEP Projects are included in the system model. Load is modeled at a non-diversified forecasted 50/50 summer peak load level reduced by energy efficiency as per the latest load forecast. All approved firm interchange is included with roll-over rights. Generation and Merchant Transmission projects that have proceeded at least through the execution of the Facility Study Agreement stage of the interconnection process are considered in the model along with any associated network upgrades. The starting point dispatch is developed as explained in the next step. PJM uses a uniform reduction of generation in place of discrete forced outages for this test due to the significant bias any one specific outage pattern can have on the final overload results.