RTEP - MAAC Standard IIC Procedure

1.0 Introduction

All generator interconnections in PJM require the performance of a MAAC Project Filing, demonstrating the generator's ability to be connected to the system consistent with the reliability criteria specified by MAAC. The procedures for preparing and submitting such a filing are under review. However, the tests required in such a MAAC Filing will continue to include the ability for the system to be operated reliably for certain lower probability contingencies. MAAC Standard IIC requires that the PJM system withstand the following outages without resulting in facility overloads: line fault with stuck breaker, double circuit line, or a faulted circuit breaker.

2.0 Study Objectives

The goal of the RTEP – MAAC Standard IIC Procedure is to determine if, under peak load conditions, there are any overloads due to multiple facility outages.

3.0 General Procedures and Assumptions

Step 1: Each generator in PJM with certified capacity rights is initially modeled at 90% of installed capacity, and all new generation applicants **before** the unit under study are set at 0 MW but available to be turned on. Then the first few units in queue A are turned on at 90% capacity until the net PJM interchange equals the firm interchange target. Generation applicants **after** the queue position under study are not modeled in the analysis.

For example, to study unit B75, you would turn all existing PJM certified capacity and the first few units in queue A to 90%, until you meet the net firm interchange target. The rest of queue A and units B1- B74 would be set to 0 MW but available to be turned on for study. Generation applicants after queue position B75 are not modeled.

Step 2: The PJM transmission system is essentially analyzed facility by facility to determine if contingency overloads can occur. For each analyzed facility, an electrical circle is drawn which includes all units that have 10% or greater distribution factor on the facility being analyzed. Then a load flow simulation is performed using a DC simulation which studies various combinations of generator outputs within the 10% DFAX circle. Each unit in the 10% circle is modeled operating between 90% and 100% of its installed capacity (0% to 100% for generation applicants), and proportionately displacing all other generation, both inside and outside the 10% circle, to maintain a constant net PJM interchange with the rest of the world. Any, several, or all the units within the 10% circle can be set at 100% output.

Step 3: For any identified overloads, the distribution factor of ALL generators on the facility is determined (includes units with certified capacity rights and also units which have requested capacity in the PJM Generation Interconnection Request Queues). Generators are sorted in a list from highest 'positive' distribution factor to least, through

zero, and then continuing through the units with a 'negative' distribution factor (units which counterflow the overload), so that the last unit in the list has the greatest counterflow or negative DFAX on the overloaded facility.

Steps 1-3 are performed twice: once with the unit under study turned on at it's full requested capacity value, and again with the unit turned off. If the unit had a beneficial effect or had no effect on an overload, then the unit is relieved of culpability for that particular overload. If the unit under study increased the severity of an overload, then the unit's impact on the overloaded facility is 'tagged' for further study.

Step 4: For each facility that the unit under study overloaded or contributed to an overload, the DFAX list is analyzed, and essentially split into two lists. The first list includes all generators (certified units and generation applicants) with greater than 10% DFAX on the overloaded facility, sorted in order of descending DFAX. The units with the highest DFAX are sequentially turned on at full capacity until the expected availability of the selected units is as close to but not less than 50%. Units with certified capacity rights and also units with queue positions ahead of the unit under study are turned on in the 50/50 list. All remaining certified capacity in PJM is proportionately displaced to maintain the firm net interchange. Generation applicants that don't make the 50/50 list remain off.

The second DFAX list includes all remaining queued generators which did not get turned on at 100% in the first DFAX list and that have either greater than a 10% DFAX on the facility or a maximum output which when multiplied by the unit's DFAX is greater than 5% of the line's rating. The cumulative effect of these units can sometimes have a significant impact on the results. However, turning these units on will typically create too much localized generation, and a localized capacity emergency condition elsewhere when the rest of PJM is proportionally displaced to maintain the net firm interchange. Therefore, to account for the effect of these units on the facility in question, the facility loading is adjusted by an adder,

Facility Loading Adder = Σ (Requested Capacity * DFAX * 0.85)

This Facility Loading Adder will account for the effect of other generator applicants *without actually turning them on*. If the sum net effect of the generation applicants before the queue position under study have a beneficial effect on the overloaded facility, then the loading of the overloaded facility will be decreased to account for this beneficial effect. Similarly, the facility loading will be increased if generators before the queue position under study will further add to the overload.

In short, the 50/50 DFAX list will define the study area *for this particular overloaded facility* by determining which units to turn up to 100% of capacity. All remaining units with PJM certified capacity rights are proportionally displaced to some level below 90% output, to maintain the firm PJM interchange. All generator applicants before the queue position under study are turned off, but are accounted for by increasing or decreasing the loading of the overloaded facility, depending on whether the net effect of those units on the overload is beneficial or detrimental.