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2014 NCTPC – MISO - PJM Joint Inter-regional Reliability Study Scope

Purpose and Limitations of Study

The purpose of this 2014 NCTPC – MISO - PJM joint inter-regional study is to evaluate potential impacts to the transmission systems of Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP), the “study area”. The potential impacts will be those that result from loop flows caused by Midcontinent Independent System Operator, Inc. (MISO) generation resources that were cleared in the PJM 2016/2017 base residual capacity auction (BRA) to be delivered to the PJM Interconnection (PJM).

Some of these cleared MISO resources may have preexisting firm delivery service to PJM load and some may have yet to procure this necessary firm transmission service. This study will distinguish the 2016/17 BRA MISO resources that have yet to procure the firm service and will limit the analysis to this resource list. Resources already possessing firm service should be embedded in the existing planning processes of the Eastern Interconnection and already accounted for in past regional planning analyses that ensure maintenance of existing long term firm service, by assuming their roll over rights are exercised. The purpose of this analysis is to identify impacts rather than to determine limits to the yet to be procured and necessary firm delivery service.

This study addresses the North Carolina Utilities Commission request to study whether the MISO resources cleared in the 2016/17 BRA may be expected to exacerbate loop flows on the transmission grid of North Carolina. Specifically the Commission requests the study to determine whether the planned imports would be likely to cause DEC and DEP to alter their joint dispatch in a manner that increases costs and whether the planned imports would reduce the North Carolina transmission grid reliability. This NCTPC study scope will focus on the grid reliability question. A parallel scope to be accomplished during 2014 will address the potential cost impacts. The joint dispatch cost impact question will be addressed by PJM and DEC/DEP as explained under the Study Methodology section below.

CEII and Confidential Data

The power flow and related study files are Critical Energy Infrastructure Information. Some specific information from PJM’s BRA is confidential information. All CEII and confidential information that become study materials will be subject to the applicable procedures including those of PJM, DEC, DEP and MISO.

Overview of the Study Process Scope

The respective Regional Stakeholder bodies will be engaged for this study according to each Region’s established process. Both the NCTPC and PJM will provide at least 1 week notice of

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their respective stakeholder processes that will address this study scope, analysis and results. Each will also provide stakeholder meeting attendance information and the meeting materials related to the study at least three working days in advance of the public stakeholder meetings. This will allow stakeholders in each region to participate in both regional processes. For NCTPC, the Planning Working Group will be the principal technical resource for this analysis. PJM and MISO planning staffs will provide the counterpart technical resources to work with the PWG to perform this joint inter-regional study. In addition, the MISO Planning Advisory Committee and the PJM Transmission Expansion Advisory Committee will be the principal avenue for MISO and PJM stakeholder input. The scope of the proposed study process will include the following steps (initial work has been drafted on some of the steps as detailed below :)

1. Study Assumptions

- Study assumptions selected
 - Reference Case modeling assumptions
 - Scenario assumptions to evaluate

2. Study Criteria

- Establish the study criteria to be used to evaluate system performance

3. Case Development

- Develop the models needed to perform the study

4. Methodology

- Determine the methodologies that will be used to carry out the study

5. Technical Analysis and Study Results

- Perform the study analysis and produce the results.

6. Assessment and Impacts Identification

- Evaluate the results to identify impacts caused by the transfer of the MISO resources cleared in the PJM 2016/2017 Base capacity auction on the DEC and DEP transmission systems.

7. Solution Development

- Identify potential solutions to the impacts as may be appropriate
- Test the effectiveness of the potential solutions through additional studies as needed and modify the solutions as necessary.
- Perform a high level cost analysis for each of the proposed solutions.
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8. Report on the Study Results and identification of next steps

- Prepare a study report
- Provide study results as input to joint PJM/NCTPC study of production cost impact of BRA

Each of these study steps is described in more specific detail below.

Study Assumptions

The specific assumptions selected for the 2014 joint NCTPC – MISO - PJM inter-regional scenarios are:

- The study year will be 2016 summer. The study load level will be summer peak load.
- Generation will be dispatched for each control area in the cases to meet load in accordance with a security constrained economic dispatch order. PJM will provide generation redispatch to accommodate the imports of the studied external resources from MISO. MISO will provide the generation dispatch for the MISO Balancing Authority Area, including interchanges with neighboring regions, consistent with its regional planning criteria. Also included will be generation up and down scenarios to account for generation contingency adjustments near the PJM/NCTPC interface.
- PSS/E and/or MUST (or similar programs) will be used for the study.
- Load growth / DR-EE assumptions will be in accordance with each study party's practice.
- Generation (additions & retirements), interchange and other assumptions will be coordinated between the NCTPC, MISO and PJM as needed.

Study Criteria

The study criteria will utilize the applicable planning criteria of each of the systems. The study will include the following reliability criteria elements:

- NERC
- SERC
- Regional
- Individual Transmission Owner

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Case Development

The 2013 series MMWG system models will be used for the systems external to DEC, DEP, MISO and PJM as a starting point for the Base Case to be used by the NCTPC, MISO and PJM in their analyses.

The Base Case will include the detailed internal models for DEC, DEP, MISO, and PJM and will include current transmission additions planned to be in-service for the selected study year.

An “All Firm Transmission” Case(s) will be developed which will include all current OASIS confirmed long term firm transmission reservations assuming roll-over rights are exercised through the study year. The case development process will reconcile the firm interchange in the MMWG interchange table and the DEC, DEP, MISO and PJM detailed reliability planning models inserted into the study case to the current DEC, DEP, MISO, and PJM OASIS long term firm reservations.

Study Methodology

Flow analysis

- NCTPC, PJM, and MISO will exchange contingency and monitored element files so that the impact on the study area of the combined DEC, DEP and PJM contingencies can be determined.
- Full AC Contingency Analysis will be assumed using MUST or similar program. Note: This evaluation is NOT limited to an AC N-1 Contingency Analysis unless the Participants involved conclude that it would be sufficient to address the study purpose.
- Initially, power flow analyses will be performed based on the assumption that thermal limits will be the controlling limit. Voltage, stability, short circuit and phase angle studies may be performed if circumstances warrant.
- The study analyses will be conducted in a fully coordinated and transparent effort by both NCTPC and PJM technical staffs.

Economic Analysis

- A scope for the associated economic analysis to be performed in parallel with the flow analysis of this scope document will be developed by DEC/DEP and PJM. Necessary information from this scope may become inputs to the economic analysis

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Technical Analysis and Study Results

The technical analysis will be performed in accordance with the study methodology. Results from the technical analysis will be reported throughout the study area to identify transmission elements approaching their limits such that NCTPC, MISO and PJM are aware of potential impacts and appropriate steps can be identified to correct these impacts as may be appropriate.

NCTPC and PJM will report results based on:

- Thermal loadings greater than 90%.

Assessment and Problem Identification

- NCTPC and PJM will both run the contingency analysis assessment of the study area. The analysis will use the appropriate regional and transmission owner reliability criteria for the transmission facilities of the study area. Results from the assessments will be correlated and documented. These results will be reviewed and discussed with the respective stakeholder groups for feedback.

Solution Development

- NCTPC and PJM will test the effectiveness of the potential solutions using the cases, methodologies, assumptions and criteria developed pursuant to the above scope.
- NCTPC and PJM will develop approximate, planning-level cost estimates for the solution alternatives.

Selection of a Recommended Solutions

- The alternative sets of transmission improvements developed by the NCTPC and PJM will be reviewed and discussed with their respective stakeholder groups for feedback.

Report on the Study Results

- The NCTPC and PJM will compile all the study results and prepare a study report for review and discussion with their respective stakeholder groups. The final study report will include a comprehensive summary of all the study activities as well as a list of transmission improvement options including estimates of costs.