



North Carolina Transmission Planning Collaborative

2012 NCTPC Study Scope Document

Purpose of Study

The purpose of this study is to assess the Progress Energy Carolinas (“Progress”) and Duke Energy Carolinas (“Duke”) transmission systems’ reliability and develop a single collaborative transmission plan for the Duke and Progress transmission systems that ensures reliability of service in accordance with NERC, SERC, Progress and Duke requirements. In addition, the study will also assess Enhanced Access option scenarios provided by the Transmission Advisory Group (“TAG”) and approved for study by the Oversight Steering Committee (“OSC”). The Planning Working Group (“PWG”) will perform the technical analysis outlined in this study scope under the guidance and direction of the OSC.

This year the NCTPC will also perform a joint inter-regional study with PJM to evaluate the interaction of off-shore wind injections into the NC / Progress Energy and PJM / Dominion systems. The PWG will work with the PJM planning staff to perform this joint inter-regional study as part of the overall 2012 NCTPC Study Scope.

The TAG members will have the opportunity to provide input on all the study scope elements of both the Reliability Planning Process as well as the Enhanced Transmission Access Planning Process as the study activities progress. This will include input on the following: study assumptions; study criteria; study methodology; case development and technical analysis; problem identification; assessment and development of solutions (including proposing alternative solutions for evaluation); comparison and selection of the preferred transmission plan; and the transmission plan study results report. The TAG members may also propose Enhanced Access scenarios for the year 2022 for evaluation in the study.

Overview of the Study Process Scope

The scope of the proposed study process will include the following steps:

- 1. Study Assumptions**

- Study assumptions selected

- 2. Study Criteria**

- Establish the criteria by which the study results will be measured

- 3. Case Development**

- Develop the models needed to perform the study



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- Determine the different resource supply scenarios to evaluate
- 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. Initially, power flow analyses will be performed based on the assumption that thermal limits will be the controlling limit for the reliability plan. Voltage, stability, short circuit and phase angle studies may be performed if circumstances warrant.
- 6. Assessment and Problem Identification**
 - Evaluate the results to identify problems / issues
- 7. Solution Development**
 - Identify potential solutions to the problems / issues
 - Test the effectiveness of the potential solutions through additional studies and modify the solutions as necessary such that all reliability criteria are met.
 - Perform a financial analysis and rough scheduling estimate for each of the proposed solutions (e.g., cost, cash flow, present value)
- 8. Selection of a Recommended Collaborative Transmission Plan**
 - Compare alternatives and select the preferred solution alternatives – balancing cost / benefit / risk
 - Select a preferred set of transmission improvements that provide a reliable transmission system to customers most cost effectively while prudently managing the associated risks
- 9. Report on the Study Results**
 - Prepare a report on the recommended Collaborative Transmission Plan
 - Include study results for the Enhanced Access scenarios, if applicable

Each of these study steps is described in more specific detail below. The joint NCTPC – PJM inter-regional study portion of the 2012 Study Scope will generally follow the same study process and steps except as noted.



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Study Assumptions

The specific assumptions selected for the 2012 Study are:

- The years to be studied (study year) will be 2017 Summer and 2017/2018 Winter for a near term reliability analysis and 2022 for a longer term reliability analysis. The study year for the joint NCTPC – PJM Wind Scenarios will be 2027 Summer.
- Each Load Serving Entity (“LSE”) will provide a list of resource supply assumptions and include the resource dispatch order for each of its Designated Network Resources in the Progress and Duke control areas. Generation will be dispatched for each LSE in the cases to meet that LSE’s peak load in accordance with the designated dispatch order. LSEs will also include generation down scenarios for their resources, if applicable (e.g., generation outage with description of how generation will be replaced, such as by that LSE’s dispatch orders).
- PSS/E and/or MUST will be used for the study.
- Load growth assumptions will be in accordance with each LSE’s practice.
- Generation, interchange and other assumptions will be coordinated between Participants as needed.
- For a variety of reasons (such as load growth, generation retirements, or power purchase agreements expiring), some LSEs may wish to evaluate other resource supply options to meet future load demand. These resource supply options can be either in the form of transactions or some “hypothetical” generators which are added to meet the resource adequacy requirements for this study. In 2012, the PWG will analyze, among its resource supply options: 1) cases that locate a 500 MW generating plant in Davidson County near the Duke Energy Buck Plant; and 2) cases that locate renewable wind generation off the North Carolina / Virginia coast as part of the joint NCTPC – PJM inter-regional study analysis. The PWG will analyze these hypothetical resource options to determine if any reliability criteria violations are created. Based on this analysis, the PWG will provide feedback to the TAG on the viability of these options for meeting future load requirements. The results of this analysis will be included in the 2012 Collaborative Plan Report.
- Enhanced Access scenarios provided by the TAG and approved by the OSC will be incorporated into the study process in a manner similar to the resource supply option scenarios. The results of this analysis will be included in the 2012 Collaborative Plan Report for use by all stakeholders in developing resource supply plans for the future.



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Study Criteria

The study criteria with which results will be evaluated will be established, promoting consistency in the planning criteria used across the systems of the Participants, while recognizing differences between individual systems. The study criteria will include the following reliability elements:

- NERC Reliability Standards
- SERC requirements
- Individual company criteria (voltage, thermal, stability, short circuit and phase angle)

Case Development

- The most current MMWG system models (except the PJM system representation) will be used for the systems external to Duke and Progress as a starting point for the Base Case to be used by both Progress and Duke in their analyses. The PJM system model representation will be the latest system model developed by PJM.
- The Base Case will include the detailed internal models for Progress and Duke and will include current transmission additions planned to be in-service for the given year (i.e. in-service by summer 2017 for 2017S cases and in-service by the winter for 2017/2018W cases as well as in-service by summer 2022 for 2022S cases). Duke and Progress will also develop a 2027 Summer model to provide PJM with a system model for the joint NCTPC – PJM inter-regional study analysis.
- An “All Firm Transmission” Case(s) will be developed which will include all confirmed long term firm transmission reservations with roll-over rights applicable to the study year(s).
- Duke and Progress will each create their respective generation down cases from the common Base Case and share the relevant cases with each other. Duke and Progress will exchange similar information with PJM to be used in the joint inter-regional analysis.
- Year 2022 cases will be developed to evaluate a hypothetical 500 MW resource supply option located in Davidson County sinking on the Duke system.
- Summer 2027 study cases will be developed for the joint NCTPC – PJM off-shore wind scenarios. These wind scenarios will evaluate the following options to meet load demand forecasts in the study, including evaluating any beneficial impact of the off-shore wind scenarios on reliability projects identified in the PWG base reliability plan.



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Joint NCTPC – PJM 2012 Study (for study year 2027)			
Injection Location	Scenario #1	Scenario #2	Scenario #3
PJM / Dominion	1,000	2,000	4,500
NCTPC / Morehead City	1,000	1,500	3,500
NCTPC / Southport	1,000	1,500	2,000
Total	3,000	5,000	10,000

2012 Scenario #1:

- The 1,000 MW from the offshore wind resources injected at the PJM / Dominion Landstown substation are transmitted to NC using firm Point-to-point transmission service.
- The sink location(s) of the 1,000 MW of wind energy from PJM and the 2,000 MW of wind energy injected into the NC system will be split with 40% sinking in Progress Energy (East) and 60% sinking in Duke.

2012 Scenario #2:

- The 2,000 MW from the PJM offshore wind resources that are injected at the Dominion Landstown substation are injected into PJM with the specific sink location(s) within the PJM system to be determined by PJM.
- The sink location(s) of the 3,000 MW of wind energy injected into the NC system will be split with 40% sinking in Progress Energy (East) and 60% sinking in Duke.

2012 Scenario #3:

- The 4,500 MW from the PJM offshore wind resources that are injected at the Dominion Landstown substation are injected into PJM with the



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specific sink location(s) within the PJM system to be determined by PJM.

- The sink location(s) of the 5,500 MW of wind energy injected into the NC system will be modeled to reflect the following sink allocations:

Scenario #3 Wind Generation Injection in NC system – Sink Allocations

Participating Transmission Owners	Participation Factor (%)	MW Allocation On Peak	MW Allocation Off Peak
Progress Energy Carolinas	29.1	640	1,600
Duke Energy	43.6	960	2,400
PJM	27.3	600	1,500
Total	100.00%	2,200 MW	5,500 MW

- Other additional cases will be developed as required and approved by the OSC to evaluate the Enhanced Access scenarios submitted by the TAG.

Study Methodology

- Progress and Duke will exchange contingency and monitored element files so that each can test the impact of the other company's contingencies on its transmission system. Duke and Progress will exchange similar information with PJM to be used in the joint inter-regional analysis.
- Initially, power flow analyses will be performed based on the assumption that thermal limits will be the controlling limit for the reliability plan. Voltage, stability, short circuit and phase angle studies may be performed if circumstances warrant.
- Duke, Progress and PJM will generally follow this same study methodology for the joint inter-regional study portion of the 2012 Study.

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 all Participants are aware of potential issues and appropriate steps can be identified to correct these issues, including the potential of identifying previously undetected problems.

Progress and Duke will report results throughout the study area based on:



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- Thermal loadings greater than 90%.
- Voltages less than 100% for 500 kV and less than 95% for 230 kV, 161 kV, 115 kV, and 100 kV buses; pre- to post-contingency voltage drops of 5% or more.

Assessment and Problem Identification

- Duke, Progress, and PJM for their portions of the 2012 inter-regional study, will each run their own assessments. Each party will utilize its own reliability criteria for its own transmission facilities. Each party will document the reliability problems resulting from its assessments. These results will be reviewed and discussed with the TAG for feedback.

Solution Development

- The PWG will develop potential solution alternatives to the identified reliability problems.
- The TAG will have the opportunity to propose solution alternatives to the identified reliability problems.
- Duke, Progress and PJM for their portion of the 2012 inter-regional study, will test the effectiveness of the potential solution alternatives using the same cases, methodologies, assumptions and criteria described above.
- Duke, Progress and PJM for their portion of the 2012 inter-regional study, will develop rough, planning-level cost estimates and construction schedules for the solution alternatives.

Selection of a Recommended Collaborative Transmission Plan

- The PWG will compare alternatives and select the preferred solution alternatives, balancing cost / benefit / risk.
- The PWG will select a preferred set of transmission improvements that provides a reliable and cost effective transmission solution to meet customers' needs while prudently managing the associated risks.
- The preferred set of transmission improvements developed by the PWG will be reviewed and discussed with the TAG for feedback.



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Report on the Study Results

The PWG will compile all the study results and prepare a recommended collaborative plan for the OSC review and approval. Prior to the OSC's final review and approval, the final draft of the study report will be reviewed and discussed with the TAG members to solicit their input on the recommended collaborative plan. The final report will include a comprehensive summary of all the study activities as well as the recommended transmission improvements including estimates of costs and construction schedules. The report will also include study results and information related to any sensitivity analysis, the resource supply options scenarios including the joint inter-regional study perform with PJM, and any Enhanced Access scenarios that were included as part of the 2012 study analysis.