



North Carolina Transmission Planning Collaborative

2015 NCTPC Study Scope Document

Purpose of Study

The purpose of this study is to assess the Duke Energy Carolinas (“DEC”) and Duke Energy Progress (“DEP”) transmission systems’ reliability and develop a single collaborative transmission plan for the DEC and DEP transmission systems that ensures reliability of service in accordance with NERC, SERC, DEC, and DEP requirements. In addition, the study will also assess Local Economic Study 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 analysis to evaluate various resource supply scenarios that model hypothetical transfers across the NCTPC interface with the neighboring systems. In addition, the NCTPC will perform two Local Economic Study Process scenarios proposed by stakeholders. These two scenarios are described in the case development section.

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 Local Economic Study 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.

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
- Determine the different resource supply scenarios to evaluate

4. Methodology

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



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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 Local Economic Study Process scenarios, if applicable

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

Study Assumptions

The specific assumptions selected for the 2015 Study are:

- The years to be studied (study year) will be 2020 Summer and 2020/2021 Winter for a near term reliability analysis and 2025 for a longer term reliability analysis. 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 DEC and DEP 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



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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).

- In all three study cases, DEC and DEP will include the Western Carolinas Modernization Transmission Projects that have planned in-service dates of December 1, 2019, that are a result of a 600 MW Transmission Service Request (TSR).
- DEP will assume that Asheville 1 and 2 coal units will be shut down in all three study cases. The summer cases will include a CPLW BA import of 601 MW and the winter case will include a CPLW BA import of 701 MW. It is also assumed that the 150 MW DEP purchase from the SOCO Rowan resource will terminate at the end of 2019. The import into CPLW BA will come from transfers from CPLE BA except for the 1 MW from TVA.
- 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 2015, the PWG will analyze, among its resource supply options, cases that examine the impacts of sixteen different hypothetical transfers into, out of and through the DEC and DEP systems. 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 2015 Collaborative Plan Report.
- Two additional Local Economic Study Process scenarios provided by stakeholders 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 2015 Collaborative Plan Report for use by all stakeholders in developing resource supply plans for the future.

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



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

Case Development

- The most current MMWG system models will be used for the systems external to DEC and DEP as a starting point for the Base Case to be used by both DEC and DEP in their analyses.
- The Base Case will include the detailed internal models for DEC and DEP and will include current transmission additions planned to be in-service for the given year (i.e. in-service by summer 2020 for 2020S cases and in-service by the winter for 2020/2021W cases as well as in-service by summer 2025 for 2025S cases).
- 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).
- DEC and DEP will each create their respective generation down cases from the common Base Case and share the relevant cases with each other
- Additional 2025 cases will be developed to evaluate the resource supply scenarios of sixteen hypothetical transfers. These resource supply scenarios will include the following:



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Resource Supply Options 2025 Hypothetical Transfer Scenarios

Resource From	Sink	Test Level (MW)
PJM	DUK ¹	1,000
SOCO	DUK	1,000
SCEG	DUK	1,000
SCPSA	DUK	1,000
CPL ²	DUK	1,000
TVA	DUK	1,000
PJM	CPL	1,000
SCEG	CPL	1,000
SCPSA	CPL	1,000
DUK	CPL	1,000
DUK	SOCO	1,000
PJM	DUK / CPL	1,000 / 1,000
DUK / CPL	PJM	1,000 / 1,000
CPL	PJM	1,000
DUK	PJM	1,000
SOCO ³	PJM	1,000

¹ DUK is the Balancing Area for DEC

² CPL is the eastern Balancing Area for DEP

³ This hypothetical transfer is intended to evaluate the impact of a 1000MW Southern Co transaction through the DEC/DEP transmission system into PJM.

- Two additional cases will be developed to evaluate the Local Economic Study Process scenarios that were submitted by the stakeholders and approved by the OSC. The first scenario, submitted by Clean Line Energy, will evaluate a 661 MW capacity transfer in the 2020 timeframe from the TVA Shelby 500 kV substation (north of Memphis) to DEC and DEP with the total allocated between each based on share of combined load. The second scenario, submitted by NCEMC, will evaluate forced outages of multiple nuclear units in DEC and DEP in the 2020 timeframe. Specifically, all Westinghouse 1980's vintage nuclear units are to be outaged. These specific units include: McGuire Units 1 and 2, Harris Unit 1, and Catawba Units 1 and 2. The capacity replacement of these forced outages will be from DEC and DEP units internally first before replacement of remainder of required energy equally from Southern Company and PJM Market.



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Study Methodology

- DEC and DEP will exchange contingency and monitored element files so that each can test the impact of the other company's contingencies on its transmission system. 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.

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:

- 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

- 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.
- DEC and DEP will test the effectiveness of the potential solution alternatives using the same cases, methodologies, assumptions and criteria described above.
- DEC and DEP will develop rough, planning-level cost estimates and construction schedules for the solution alternatives.



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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.

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 for the Local Economic Study Process scenarios that were included as part of the 2015 study analysis.