



North Carolina Transmission Planning Collaborative

2022 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 and/or Public Policy Study requests 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.

Two Public Policy requests and four Local Economic Study requests were received from TAG stakeholders by the February 4th deadline for the 2022 study year.

The first Public Policy Study request proposed an analysis to evaluate the potential impacts of the development of PJM off-shore wind on the NC transmission system. After review and discussion with the sponsor requesting this study analysis, the request was put on hold.

The second Public Policy Study request proposed an analysis to evaluate 9 GW of solar resources being incorporated into the NC transmission system. After review and discussion with the sponsor requesting this study analysis, the NCTPC and the sponsor agreed to continue discussions to refine the scope of this request. This study analysis is not included in the 2022 scope of work at this time. The study analysis could be initiated later this year as the NCTPC and sponsor continue their discussions to refine the scope of work.¹

The Local Economic Study requests proposed hypothetical resource transfer analysis in various MW amounts (500MW and 750MW) from DEP and PJM to SCPSA in 2029. To accommodate these Local Economic Study requests, the NCTPC will incorporate these study requests into the resource supply analysis that models hypothetical transfers across the NCTPC interface with

¹ To support the Clean Energy Plan in North Carolina, Duke Energy has proposed 18 proactive projects across DEC and DEP to be considered for approval by the NCTPC. These projects are intended to be a first step to allow for solar expansion in known constrained areas. As we work to further refine the scope of this Public Policy Study request, we will also evaluate the status of the proposed projects and determine how they should be modeled for this study.



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neighboring systems. This hypothetical resource supply analysis will evaluate a total of 14 transfers in the NCTPC study year 2032/33 Winter. The specifics of these Local Economic Study requests are identified in the Study Assumptions section below.

The TAG members will have the opportunity to provide input on all the study scope elements of the Reliability 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.

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.



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- 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, benefits and risks.
- 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.

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

Study Assumptions

The specific assumptions selected for the 2022 Study are:

- The years to be studied (study years) will be 2027 Summer and 2027/2028 Winter for a near term reliability analysis and 2032/2033 Winter 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 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 TARA 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.
- The tables below list the major generation facility additions and retirements included in the 2027 Summer, 2027/2028 Winter, and 2032/2033 Winter study models.



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Major Generation² Facility Additions in 2022 Study Models³

Company	Generation Facility	2027S	2027/ 2028W	2032/ 2033W
DEC	Lincoln County CT (525 MW)	Included	Included	Included
DEC	Apex PV (30 MW)	Included	Included	Included
DEC	Aquadale PV (50 MW)	Included	Included	Included
DEC	Bear Branch PV (35 MW)	Included	Included	Included
DEC	Beaverdam PV (42 MW)	Included	Included	Included
DEC	Blackburn PV (61.7 MW)	Included	Included	Included
DEC	Broad River PV (50 MW)	Included	Included	Included
DEC	Brookcliff PV (50 MW)	Included	Included	Included
DEC	High Shoals PV (16 MW)	Included	Included	Included
DEC	Hornet PV (75 MW)	Included	Included	Included
DEC	Lick Creek PV (50 MW)	Included	Included	Included
DEC	Misenheimer PV (74.4 MW)	Included	Included	Included
DEC	Oakboro PV (40 MW)	Included	Included	Included
DEC	Olin Creek PV (35 MW)	Included	Included	Included
DEC	Partin PV (50 MW)	Included	Included	Included
DEC	Pelham PV (32 MW)	Included	Included	Included
DEC	Pinson PV (20 MW)	Included	Included	Included
DEC	Quail PV (30 MW)	Included	Included	Included
DEC	Speedway PV (22.6 MW)	Included	Included	Included

² Major Generation Threshold is considered to be 10 MW or greater and connected to the transmission system

³ As we work to further refine the scope of this study, we will evaluate the status of these proposed new generation sites and retirements, and determine how they should be modeled for this study.



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Company	Generation Facility	2027S	2027/ 2028W	2032/ 2033W
DEC	Stanly PV (50 MW)	Included	Included	Included
DEC	Stony Knoll PV (22.6 MW)	Included	Included	Included
DEC	Sugar PV (60 MW)	Included	Included	Included
DEC	Two Hearted PV (22 MW)	Included	Included	Included
DEC	West River PV (40 MW)	Included	Included	Included
DEC	Westminster PV (75 MW)	Included	Included	Included
DEC	Healing Springs PV (55 MW)	Included	Included	Included
DEP	Cabin Creek Solar (70.2 MW)	Included	Included	Included
DEP	Gold Valley Solar (78.8 MW)	Included	Included	Included
DEP	Nutbush Solar (35.0 MW)	Included	Included	Included
DEP	Camp Lejeune Battery (11.0 MW)	Included	Included	Included
DEP	Sapony Creek (23.4 MW)	Included	Included	Included
DEP	Loftins Crossroads (75.0 MW)	Included	Included	Included
DEP	Roxboro CC Units 1-2 (2700 MW)	Not Included	Not Included	Included



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Major Generation⁴ Facility Retirements in 2022 Study Models⁵

Company	Generation Facility	2027S	2027/ 2028W	2032/ 2033W
DEC	Allen 1-5 (1083 MW)	Retired	Retired	Retired
DEC	Cliffside 5 (574 MW)	Retired	Retired	Retired
DEC	Lee 3 (120 MW)	Retired	Retired	Retired
DEP	Darlington Co 1,2,3,4,6,7,8,10 (514 MW)	Retired	Retired	Retired
DEP	Blewett CTs 1-4 and Weatherspoon CTs 1-4 (232 MW)	Retired	Retired	Retired
DEP	Roxboro Units 1-4 (2462 MW)	Not Retired	Not Retired	Retired
DEP	Mayo Unit 1 (746 MW)	Not Retired	Not Retired	Retired

- 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 2022, the PWG will analyze, among its resource supply options, cases that examine the impacts of fourteen different hypothetical transfers into and out of the DEC and DEP systems. These fourteen hypothetical transfer scenarios are identified in the table below:

⁴ Major Generation Threshold is considered to be 10 MW or greater and connected to the transmission system

⁵ As we work to further refine the scope of this study, we will evaluate the status of these proposed new generation sites and retirements, and determine how they should be modeled for this study.



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Resource Supply Options 2032/33 Winter Hypothetical Transfer Scenarios

ID	Resource From	Sink	Test Level (MW)
1	PJM	DUK ¹	1,000
2	SOCO	DUK	1,000
3	CPLÉ ²	DUK	1,000
4	TVA ³	DUK	1,000
5	PJM	CPLÉ	1,000
6	DUK	CPLÉ	1,000
7	DUK	SOCO	1,000
8	PJM	DUK / CPLÉ	1,000 / 1,000
9	DUK / CPLÉ	PJM	1,000 / 1,000
10	CPLÉ	PJM	1,000
11	DUK	PJM	1,000
12	DUK ⁴	TVA	1,000
13	DUK	SCPSA	750
14	PJM ⁵	SCPSA	500

¹ DUK is the Balancing Authority Area for DEC

² CPLÉ is the eastern Balancing Authority Area for DEP

³ This hypothetical transfer is intended to evaluate the impact of a 1,000 MW TVA transaction through the SOCO transmission system into DUK.

⁴ This hypothetical transfer is intended to evaluate the impact of a 1,000 MW DUK transaction through the SOCO transmission system into TVA.

⁵ This hypothetical transfer is intended to evaluate the impact of a 500 MW PJM transaction through the DUK transmission system into SCPSA.

- 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 Participants on the viability of these options for meeting future load requirements. The results of this analysis will be included in the 2022 Collaborative Transmission Plan Report.

Study Criteria

The study criteria used will promote 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:



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- NERC Reliability Standards
- 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.
- 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 2027 for 2027S cases and in-service by the winter for 2027/2028W cases as well as in-service by the winter of 2032 for 2032/2033W 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 2032/33 winter cases will be developed to evaluate the resource supply scenarios of the fifteen hypothetical transfers identified under the Study Assumptions section.

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.

DEC and DEP 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

- Each utility will utilize its own reliability criteria for its own transmission facilities. Each utility 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.

Selection of a Recommended Collaborative Transmission Plan

- The PWG will compare alternatives and select the preferred solution alternatives, balancing costs, benefits and risks.
- 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 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.